DOE/CF-0150
Volume 1

Department of Energy
FY 2020 Congressional Budget Request

National Nuclear Security Administration

Federal Salaries and Expenses
Weapons Activities
Defense Nuclear Nonproliferation
Naval Reactors

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($K)

Department of Energy Budget by Appropriation	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted $	FY 2020 Request vs FY 2019 Enacted %
Energy and Water Development, and Related Agencies					
Energy Programs					
Energy Efficiency and Renewable Energy	2,321,778	2,379,000	343,000	-2,036,000	-85.6%
Electricity Delivery and Energy Reliability	261,329	0	0	0	N/A
Electricity	0	156,000	182,500	+26,500	+17.0%
Cybersecurity, Energy Security, and Emergency Response	0	120,000	156,500	+36,500	+30.4%
Nuclear Energy	1,205,056	1,326,090	824,000	-502,090	-37.9%
Fossil Energy Programs					
Fossil Energy Research and Development	726,817	740,000	562,000	-178,000	-24.1%
Naval Petroleum and Oil Shale Reserves	4,900	10,000	14,000	+4,000	+40.0%
Strategic Petroleum Reserve	260,716	235,000	174,000	-61,000	-26.0%
Strategic Petroleum Account	8,400	10,000	27,000	+17,000	+170.0%
Northeast Home Heating Oil Reserve	6,500	10,000	0	-10,000	-100.0%
Total, Fossil Energy Programs	**1,007,333**	**1,005,000**	**777,000**	**-228,000**	**-22.7%**
Uranium Enrichment Decontamination and Decommissioning (D&D) Fund	840,000	841,129	715,112	-126,017	-15.0%
Energy Information Administration	125,000	125,000	118,000	-7,000	-5.6%
Non-Defense Environmental Cleanup	298,400	310,000	247,480	-62,520	-20.2%
Science	6,259,903	6,585,000	5,545,972	-1,039,028	-15.8%
Advanced Research Projects Agency - Energy	353,314	366,000	-287,000	-653,000	-178.4%
Nuclear Waste Disposal (26M in DNWF 050)	0	0	90,000	+90,000	N/A
Departmental Administration	189,652	165,858	117,545	-48,313	-29.1%
Indian Energy Policy and Programs	0	18,000	8,000	-10,000	-55.6%
Inspector General	49,000	51,330	54,215	+2,885	+5.6%
International Affairs	0	0	36,100	+36,100	N/A
Title 17 - Innovative Technology Loan Guarantee Program	30,892	13,000	-160,659	-173,659	-1,335.8%
Advanced Technology Vehicles Manufacturing Loan Program	5,000	5,000	0	-5,000	-100.0%
Tribal Energy Loan Guarantee Program	1,000	1,000	-8,500	-9,500	-950.0%
Total, Energy Programs	**12,947,657**	**13,467,407**	**8,759,265**	**-4,708,142**	**-35.0%**
Atomic Energy Defense Activities					
National Nuclear Security Administration					
Federal Salaries and Expenses	407,595	410,000	434,699	+24,699	+6.0%
Weapons Activities	10,642,138	11,100,000	12,408,603	+1,308,603	+11.8%
Defense Nuclear Nonproliferation	1,999,219	1,930,000	1,993,302	+63,302	+3.3%
Naval Reactors	1,620,000	1,788,618	1,648,396	-140,222	-7.8%
Total, National Nuclear Security Administration	**14,668,952**	**15,228,618**	**16,485,000**	**+1,256,382**	**+8.3%**
Environmental and Other Defense Activities					
Defense Environmental Cleanup	5,988,048	6,024,000	5,506,501	-517,499	-8.6%
Other Defense Activities	840,000	860,292	1,035,339	+175,047	+20.3%
Defense Nuclear Waste Disposal (90M in 270 Energy)	0	0	26,000	+26,000	N/A
Total, Environmental and Other Defense Activities	**6,828,048**	**6,884,292**	**6,567,840**	**-316,452**	**-4.6%**
Total, Atomic Energy Defense Activities	**21,497,000**	**22,112,910**	**23,052,840**	**+939,930**	**+4.3%**
Power Marketing Administrations					
Southeastern Power Administration	0	0	0	0	N/A
Southwestern Power Administration	11,400	10,400	10,400	0	N/A
Western Area Power Administration	93,372	89,372	89,196	-176	-0.2%
Falcon and Amistad Operating and Maintenance Fund	228	228	228	0	N/A
Colorado River Basins Power Marketing Fund	-23,000	-23,000	-21,400	+1,600	+7.0%
Total, Power Marketing Administrations	**82,000**	**77,000**	**78,424**	**+1,424**	**+1.8%**
Federal Energy Regulatory Commission (FERC)	**0**	**0**	**0**	**0**	**N/A**
Subtotal, Energy and Water Development, and Related Agencies	**34,526,657**	**35,657,317**	**31,890,529**	**-3,766,788**	**-10.6%**
Excess Fees and Recoveries, FERC	-9,000	-16,000	-16,000	0	N/A
Title XVII Loan Guarantee Program Section 1703 Negative Credit Subsidy Receipt	0	-107,000	-15,000	+92,000	+86.0%
Sale of Northeast Gas Reserve	0	0	-130,000	-130,000	N/A
Sale of Northeast Home Heating Oil Reserve	0	0	-27,000	-27,000	N/A
Total, Funding by Appropriation	**34,517,657**	**35,534,317**	**31,702,529**	**-3,831,788**	**-10.8%**

National Nuclear Security Administration
Overview

	(Dollars in Thousands)				
	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 vs. FY 2019 $	FY 2020 vs. FY 2019 %
National Nuclear Security Administration					
Federal Salaries and Expenses	407,595	410,000	434,699	+24,699	6.0%
Weapons Activities	10,642,138	11,100,000	12,408,603	+1,308,603	11.8%
Defense Nuclear Nonproliferation	1,999,219	1,930,000	1,993,302	+63,302	3.3%
Naval Reactors[a]	1,620,000	1,788,618	1,648,396	-140,222	-7.8%
Total, National Nuclear Security Administration	**14,668,952**	**15,228,618**	**16,485,000**	**+1,256,382**	**8.3%**

Overview

The National Nuclear Security Administration (NNSA) FY 2020 Request is $16,485,000,000, an increase of $1,256,382,000 (8.3 percent) above the FY 2019 Enacted level to sustain and modernize the U.S. nuclear stockpile and aging infrastructure; prevent, counter, and respond to nuclear terrorism and proliferation threats; and provide safe and effective integrated nuclear propulsion systems to the U.S. Navy. The Request also supports efforts to recruit, train, and maintain a highly skilled workforce that effectively and efficiently delivers NNSA programs and achieves the mission aligning the NNSA federal workforce to meet the needs of today and the future. NNSA has pursued a disciplined process in defining the requirements to meet nuclear security and nonproliferation policy goals, support the Navy, and support a highly skilled federal workforce.

NNSA Future-Years Nuclear Security Program

	(Dollars in Thousands)			
	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
National Nuclear Security Administration				
Federal Salaries and Expenses	435,302	444,096	453,066	462,673
Weapons Activities	12,793,804	13,017,873	13,143,863	13,404,546
Defense Nuclear Nonproliferation	2,005,071	2,029,927	2,058,034	2,100,056
Naval Reactors	1,683,823	1,711,104	1,747,037	1,783,725
Total, National Nuclear Security Administration	**16,918,000**	**17,203,000**	**17,402,000**	**17,751,000**

NNSA's FYNSP topline for FY 2021 – FY 2024 is $69.3 billion and provides stable and consistent funding, which is key to the current and future nuclear strategy and enterprise. NNSA uses a disciplined budget process where options, supported by cost estimates, are developed and assessed. This budget supports the current stockpile, life extension programs, modernization efforts, and the scientific tools necessary for these efforts and consistent with the 2018 Nuclear Posture Review (NPR).

Public Law Authorizations

- P.L. 106-65, National Nuclear Security Administration Act, as amended
- P.L 115-244, Energy and Water Development Appropriations Act, 2019
- P.L 115-232, John S. McCain National Defense Authorization Act for Fiscal Year 2019

[a] Funding does not reflect the transfer to the Office of Nuclear Energy for maintenance and operation of the Advanced Test Reactor in FY 2018 and FY 2019.

Appropriation Summary by Program
Funding

(Dollars in Thousands)

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 vs FY 2019
Federal Salaries and Expenses				
Program Direction	407,595	410,000	434,699	+24,699
Total, Federal Salaries and Expenses	**407,595**	**410,000**	**434,699**	**+24,699**
Weapons Activities Appropriation				
Directed Stockpile Work	4,009,447	4,658,266	5,426,357	+768,091
Science	474,524	480,484	586,561	+106,077
Engineering	183,123	190,123	233,954	+43,831
Inertial Confinement Fusion Ignition and High Yield	544,934	544,934	480,595	-64,339
Advanced Simulation and Computing	746,244	717,119	839,849	+122,730
Advanced Manufacturing Development	85,540	81,558	136,908	+55,350
Infrastructure and Operations	3,117,803	3,087,852	3,208,442	+120,590
Secure Transportation Asset	291,168	278,639	317,162	+38,523
Defense Nuclear Security	770,577	690,638	778,213	+87,575
Information Technology and Cybersecurity	186,728	221,175	309,362	+88,187
Legacy Contractor Pensions	232,050	162,292	91,200	-71,092
Subtotal, Weapons Activities	**10,642,138**	**11,113,080**	**12,408,603**	**+1,295,523**
Use of Prior Year Balances	0	-13,080	0	13,080
Total, Weapons Activities Appropriation	**10,642,138**	**11,100,000**	**12,408,603**	**+1,308,603**
Defense Nuclear Nonproliferation Appropriation				
Defense Nuclear Nonproliferation Programs				
Global Material Security	390,108	407,108	342,350	-64,758
Material Management and Minimization	308,594	293,794	333,533	39,739
Nonproliferation and Arms Control	134,703	129,703	137,267	7,564
Defense Nuclear Nonproliferation R&D	556,504	575,570	495,357	-80,213
Nonproliferation Construction	335,000	220,000	299,000	79,000
Subtotal, Defense Nuclear Nonproliferation Programs	**1,724,909**	**1,626,175**	**1,607,507**	**-18,668**
Nuclear Counterterrorism and Incident Response Program	282,360	319,185	372,095	+52,910
Legacy Contractor Pensions	40,950	28,640	13,700	-14,940
Use of Prior Year Balances	0	-25,000	0	+25,000
Subtotal, Defense Nuclear Nonproliferation Appropriation	**2,048,219**	**1,949,000**	**1,993,302**	**+44,302**
Prior Year Balance Rescission	-49,000	-19,000	0	+19,000
Total, Defense Nuclear Nonproliferation Appropriation	**1,999,219**	**1,930,000**	**1,993,302**	**+63,302**
Naval Reactors				
Naval Reactors	1,620,000	1,788,618	1,648,396	-140,222
Total, Naval Reactors	**1,620,000**	**1,788,618**	**1,648,396**	**-140,222**
Total, NNSA	**14,668,952**	**15,228,618**	**16,485,000**	**+1,256,382**

Outyear Appropriation Summary by Program
Funding

	(Dollars in Thousands)			
	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Federal Salaries and Expenses				
Program Direction	435,302	444,096	453,066	462,673
Total, Federal Salaries and Expenses	**435,302**	**444,096**	**453,066**	**462,673**
Weapons Activities Appropriation				
Directed Stockpile Work	5,986,650	6,279,073	6,534,011	6,312,858
Science	656,768	691,053	695,755	684,911
Engineering	257,448	263,794	273,356	289,861
Inertial Confinement Fusion Ignition and High Yield	492,025	504,764	517,133	530,662
Advanced Simulation and Computing	774,574	799,474	782,272	794,000
Advanced Manufacturing Development	115,041	117,148	122,076	130,948
Infrastructure and Operations (formerly RTBF)	3,033,262	2,938,802	2,767,667	3,165,268
Secure Transportation Asset	356,826	292,720	285,453	310,072
Defense Nuclear Security	773,087	773,922	785,069	800,770
Information Technology and Cybersecurity	281,223	290,223	311,671	315,796
Legacy Contractor Pensions	66,900	66,900	69,400	69,400
Subtotal, Weapons Activities	**12,793,804**	**13,017,873**	**13,143,863**	**13,404,546**
Total, Weapons Activities Appropriation	**12,793,804**	**13,017,873**	**13,143,863**	**13,404,546**
Defense Nuclear Nonproliferation Appropriation				
Defense Nuclear Nonproliferation Programs				
Global Material Security	367,290	375,006	382,881	390,921
Material Management and Minimization	437,401	510,621	514,146	511,736
Nonproliferation and Arms Control	138,700	141,508	144,374	147,301
Defense Nuclear Nonproliferation R&D	487,278	496,089	504,402	514,478
Nonproliferation Construction	190,899	124,750	128,000	144,000
Subtotal, Defense Nuclear Nonproliferation Programs	**1,621,568**	**1,647,974**	**1,673,803**	**1,708,436**
Nuclear Counterterrorism and Incident Response Program	371,703	370,153	371,931	379,320
Legacy Contractor Pensions	11,800	11,800	12,300	12,300
Subtotal, Defense Nuclear Nonproliferation Appropriation	**2,005,071**	**2,029,927**	**2,058,034**	**2,100,056**
Total, Defense Nuclear Nonproliferation Appropriation	**2,005,071**	**2,029,927**	**2,058,034**	**2,100,056**
Naval Reactors				
Naval Reactors	1,683,823	1,711,104	1,747,037	1,783,725
Total, Naval Reactors	**1,683,823**	**1,711,104**	**1,747,037**	**1,783,725**
Total, NNSA	**16,918,000**	**17,203,000**	**17,402,000**	**17,751,000**

NNSA Overview

Overview

The FY 2020 NNSA Request of $16,485,000,000 implements four major national security endeavors: (1) use science to maintain a safe, secure, and effective nuclear weapons stockpile that deters any adversary and guarantees the defense of the Nation and its allies; (2) reduce the threat posed by nuclear proliferation and terrorism, including unsecured or excess nuclear and radiological materials both domestically and internationally; (3) prepare to respond to, and mitigate, nuclear and radiological incidents worldwide; and (4) support safe and effective integrated nuclear propulsion for the U.S. Navy.

The FY 2020 Budget Request continues to modernize America's nuclear stockpile, infrastructure, and the underlying science that supports strategic decisions and certification of the stockpile. The Request supports the U.S Navy's nuclear fleet through safe and effective integrated nuclear propulsion systems. The Request also supports the nonproliferation goals outlined in NNSA's *Prevent, Counter, and Respond—A Strategic Plan to Reduce Global Nuclear Threats (NPCR)*.

The FY 2020 Budget Request for **Weapons Activities (WA)** is $12,408,603,000, a $1,308,603,000 (11.8 percent) increase above the FY 2019 Enacted level. Weapons Activities funds programs primarily at eight NNSA Management and Operating (M&O) sites through a workforce of approximately 39,000 people managed by a Federal workforce composed of civilian and military staff. The Request is aligned with Department of Defense (DOD) requirements to ensure the U.S. nuclear deterrent continues to be safe, secure, and effective. The request supports the current stockpile, life extension programs, modernization efforts, and the scientific tools necessary for these efforts, and is consistent with the 2018 Nuclear Posture Review (NPR). NNSA is working toward the implementation of a more responsive and resilient enterprise. A key priority is rebuilding the production capability and capacity to produce necessary warhead components. NNSA will also continue to develop its research, design, development, and advanced production capacity. NNSA identified 42 tasks to implement the 2018 NPR strategies and published the NNSA NPR Implementation Plan in August 2018. NNSA is executing these tasks in coordination with DoD through the Nuclear Weapons Council (NWC).

The Request includes significant growth in Directed Stockpile Work to support Life Extension Programs and Major Alterations and Plutonium Sustainment including design activities for the Savannah River Plutonium Processing Facility and increased staffing, certification activities, and equipment installation across three sites (LANL, LLNL, and SRS). The Request for Research, Development, Test, and Evaluation (RDT&E) Programs supports required annual assessments and future LEP options and systems certification, including hydrodynamic and subcritical experiments and the infrastructure and equipment required to support these experiments. For Infrastructure and Operations, the FY 2020 Request will continue the stabilization of deferred maintenance, execute Recapitalization projects to improve the condition and extend the design life of structures, capabilities, and systems to meet program demands; decrease overall operating costs; and reduce safety, security, environmental, and program risk. The request supports an increase in funding for the Uranium Processing Facility (UPF) per the project execution plan and efforts to phase out mission dependency on the existing aged facility.

For Secure Transportation Asset, FY 2020 requested funding increases support for critical workforce capabilities and asset modernization initiatives. These initiatives include the completion of two Mobile Guardian Transporter (MGT) Test Articles to support first production unit (FPU) in FY 2025. For Defense Nuclear Security, the FY 2020 Request includes funding to fill positions in key security program areas at the sites, including protective forces, physical security systems, information security, technical security, personnel security, nuclear material control and accountability, and security program operations and planning. It also supports sustaining implementation and operation of counter-unmanned aircraft systems at sites possessing Category I special nuclear material; and supports efforts to begin implementation of the Design Basis Threat policy. It includes funding for critical Security Infrastructure Revitalization Program projects, which address high-priority security systems and related security infrastructure and equipment refresh needs. The FY 2020 Request for Information Technology and Cybersecurity enables the continuation of integration and coordination of cybersecurity and information technology support activities and functions throughout the Nuclear Security Enterprise and provides continuity of operations for NNSA's critical information technology assets.

The FY 2020 Budget Request for **Defense Nuclear Nonproliferation (DNN)** is $1,993,302,000, a $63,302,000 (3.3 percent) increase above the FY 2019 Enacted level. This increase provides for the initiation of an enhanced directed render safe capability for fourteen U.S cities, which is offset by decreases for DNN programs and University of California legacy pension payments.

The nuclear nonproliferation strategy is to work to prevent adversaries from acquiring nuclear weapons or weapons-usable materials, technology, and expertise; counter efforts to acquire such weapons or materials; and respond to nuclear or radiological accidents and incidents domestically and abroad. NNSA's nonproliferation and counterterrorism activities extend the nation's defenses far beyond America's borders. The DNN Request provides policy and technical leadership to prevent or limit the spread of materials, technology, and expertise related to weapons of mass destruction; develops technologies to detect nuclear proliferation; secures or eliminates inventories of weapons related materials and infrastructure; ensures technically trained teams and state-of-the-art equipment are prepared to respond to any nuclear or radiological incident worldwide; and supports emergency management.

The FY 2020 Budget Request for **Naval Reactors (NR)** is $1,648,396,000, a $140,222,000 (7.8 percent) decrease from the FY 2019 Enacted level. The decrease is primarily due to the planned project profiles for the Land-based S8G Prototype Refueling Overhaul, the Spent Fuel Handling Recapitalization Project, and the *Columbia*-Class Reactor Systems Development, which supports FY 2020 production, analysis, and testing execution. The decrease is partially offset by an increase in Naval Reactors Operations and Infrastructure and Naval Reactors Development activities and Program Direction general inflationary increases. The NR appropriation provides for safe and effective integrated nuclear propulsion systems for the U.S. Navy and supports operations, infrastructure, and development for the Navy's fleet of nuclear-powered aircraft carriers and submarines. This funding also provides for Naval Reactors' Federal program direction activities.

The FY 2020 Budget Request for **NNSA Federal Salaries and Expenses (FSE)** is $434,699,000, a $24,699,000 (6.0 percent) increase above the FY 2019 Enacted level. The increase provides for 63 additional Federal Full-Time Equivalents (FTEs) and additional funding for the Department's Working Capital Fund in the Building Occupancy business line. NNSA FSE funds recruiting, training, and retention of federal staff to perform program and project management and appropriate oversight of $14.4 billion in Weapons Activities and Defense Nuclear Nonproliferation funding across the nuclear security enterprise. The request provides for 1,768 Federal FTEs (1,753 funded from FSE, 15 funded from Working Capital Fund for overseas representation), space and occupancy needs, travel costs, support service contractors, training, and other related expenses.

Highlights and Major Changes in the FY 2020 Budget
Weapons Activities
The major elements of the FY 2020 Request increases Life Extension Programs (LEP) and Major Alterations (Alt) support of planned workscope for the W80-4 LEP, production and delivery of all W76-2 warheads, and expanded feasibility and design option activities for the W87-1 Modification Program (formerly IW1) so it remains aligned with current Department of Defense (DOD) nuclear modernization plans. Funding for Stockpile Systems and Services activities increase to ensure alignment with DOD modernization plans, to meet the NPR requirements for sustaining the B83, conducting a Sea-Launched Cruise Missile (SLCM) study, continuing technology developments for future weapon systems, and to maintain and modernize the base capabilities for hydrodynamic and subcritical experiments. The increase for Plutonium Sustainment supports conceptual design and pre-Critical Decision (CD)-1 activities for repurposing the Mixed-Oxide Fuel Fabrication Facility to produce 50 pits per year.

The increase to RDT&E supports recapitalization of NNSA's plutonium experimental capabilities via the Enhanced Capabilities for Subcritical Experiments program; exascale projects and increasing infrastructure demands of next-generation computing platforms to improve NNSA weapons design, stewardship, and stockpile certification capabilities to ensure the United States maintains leadership in high-performance simulations that underpin our nuclear deterrent; additional confirmatory and subcritical experiments for stockpile stewardship; weapon-aging assessments, experimental test facilities for future delivery systems and environments, enhanced threat survivability, critical surety technologies, and stockpile responsiveness.

Increases to Infrastructure and Operations (I&O) continue the long-term effort to arrest the declining state of NNSA infrastructure, improve working conditions of NNSA's aging facilities and equipment, and address safety and programmatic risks. Increases are requested for: upgrade/enhancements of aging High Explosive, Tritium and Lithium facilities; the Uranium Processing Facility to phase out mission dependency in the existing aged facility; Operations of Facilities to support programmatic tempo increases; Capability Based Investments for preliminary design of three programmatic construction projects and to provide programmatic equipment recapitalization supporting LEPs; and general-purpose construction projects including the 138kV Power Transmission System Replacement project at NNSS and Emergency Operations Center at Lawrence Livermore National Laboratory and Sandia National Laboratory. The request includes an increase for Secure Transportation Asset supporting development and pre-production efforts for the Mobile Guardian Transporter and restoring Federal Agent strength levels required for mission capacity, deferred maintenance, and minor construction projects of existing facilities. Defense Nuclear Security includes increases for critical Security Infrastructure Revitalization Program projects implementing the 10-Year Refresh Plan at all NNSA sites; Argus modernization; implementation of a technical Security Program across the enterprise; implementation and operation of Counter Unmanned Aircraft Systems at sites possessing Category I Special Nuclear Material; preliminary analysis of 2016 Design Basis Threat policy; planned equipment lifecycle replacements; and labor escalation across all security program areas at the sites. There is also a requested increase in Information Technology (IT) and Cybersecurity to continue modernization of the federal and site cybersecurity infrastructure and the NNSA Information Assurance Response Center. The increase also implements the cybersecurity requirements of a modernized network solution to address current supply chain and software assurance issues.

Defense Nuclear Nonproliferation

DNN's efforts reduce the danger that hostile nations or terrorist groups may acquire nuclear devices, radiological dispersal devices, weapons-usable material, nuclear and dual-use commodities and technology, or nuclear-related expertise. The FY 2020 Budget Request supports the conversion or shut-down of research reactors and isotope production facilities that use highly enriched uranium (HEU); the removal and disposal of weapons-usable nuclear material; the continuation of termination activities for the MOX project; continued pursuit of the dilute and dispose strategy; and improvements to the security of vulnerable materials and facilities and to partners' capacity to detect, disrupt, and investigate the illicit trafficking of these materials. DNN continues to strengthen international nuclear safeguards; control the spread of dual-use WMD material, technologies, and commodities; and ensures technically trained teams and state-of-the-art equipment are prepared to respond to any emergency domestically or aboard. DNN advances U.S. technical capabilities to detect foreign nuclear material production and weapons development activities, the movement and illicit diversion of special nuclear materials, and nuclear explosions globally. The FY 2020 Request initiates the Capability Forward initiative to establish render safe capability in fourteen U.S. cities and continues recapitalization of the Aerial Measurement System, which detects, measures, and tracks radioactive material in an emergency to determine contamination levels.

Naval Reactors

The FY 2020 Budget Request continues NR's core objective of supporting the daily safe and reliable operation of the Nation's nuclear fleet (68 submarines, 11 aircraft carriers, and 4 research, development, and training platforms), constituting about 45 percent of the Navy's major combatants. The Request supports three major DOE initiatives: *Columbia*-class Reactor Systems Development, Land-based S8G Prototype Refueling Overhaul, and Spent Fuel Handling Recapitalization Project. Funding is also requested for the program direction account for NR federal employees who directly oversee and set policies and procedures for developing new reactor plants, operating existing reactor plants, facilities supporting these plants, contractors, and the Bettis and Knolls Atomic Power Laboratories.

NNSA Federal Salaries and Expenses

The FY 2020 Budget Request builds upon on-going efforts to improve the effectiveness and efficiency of NNSA federal oversight and to meet current and future workforce needs. The request provides for 1,768 Federal FTEs (1,753 funded from FSE, 15 funded from Working Capital Fund for overseas representation). The NNSA workforce is critical to the success of the Nation's nuclear security enterprise. NNSA's focus will be to provide sufficient people, with the right capabilities, to modernize the nuclear deterrent, recapitalize an aging infrastructure, and continue to meet the requirements of the nonproliferation and counterterrorism programs. Meeting NNSA's growing mission requirements, as described in the 2018 Nuclear Posture Review (NPR), requires an aggressive hiring strategy for the next several years. Two studies, independently conducted and reported in FY 2018 by the Office of Personnel Management and the NNSA Office of Cost Estimating and Program Evaluation, identify the need to significantly increase NNSA federal staffing above the statutory 1,690 FTE ceiling.

<u>Entry Level Hires</u>: NNSA supports a variety of programs to help train and recruit the next generation of leaders in managing the nuclear stockpile, nonproliferation, nuclear security, and international security, such as the Presidential Management Fellow (PMF) program, NNSA Graduate Fellowship Program (NGFP), and Minority Serving Institutions Partnership Program (MSIPP). These programs foster the pipeline of qualified professionals who will sustain expertise through future employment in the NNSA nuclear security enterprise.

Department of Energy (DOE) Working Capital Fund (WCF) Support
NNSA's FY 2020 Budget Request includes the following for NNSA's projected support to the DOE Working Capital Fund (WCF): $71,361,000 of which $42,589,000 will be paid out of FSE; $22,723,000 out of WA; $3,699,000 out of DNN; and $2,350,000 out of NR. This funding covers selected shared enterprise activities including managing enterprise-wide systems and data, telecommunications, and supporting the integrated acquisition environment.

Legacy Contractor Pensions
NNSA requests $104,900,000 in FY 2020 for Legacy Contractor Pensions split between Weapons Activities and Defense Nuclear Nonproliferation, $86,032,000 less than the FY 2019 Enacted level. This funding provides the annual NNSA share of the DOE's reimbursement of payments made to the University of California (UC) Retirement Plan (UCRP) for former UC employees and annuitants who worked at the Lawrence Livermore National Lab (LLNL) and Los Alamos National Lab (LANL). The UCRP benefit for these individuals is a legacy cost and DOE's annual payment to the UC is required by contract. The amount of the annual payment is based on the actuarial valuation report and is covered by the terms described in the contracts. The decrease is based upon the funded status of the plan. NNSA is also covering the cost of the actuarial report included in this total.

Crosscutting Programs
The FY 2020 Budget Request continues crosscutting programs, which coordinate across the Department and seeks to tap DOE's full capability to effectively and efficiently address the United States' energy, environmental, and national security challenges. These initiatives are discussed within the Programs in which they are funded.

<u>Cybersecurity Crosscut</u>
DOE is engaged in two categories of cyber-related activities: protecting the DOE enterprise from a range of cyber threats that can adversely impact mission capabilities, and improving cybersecurity and grid resilience in the energy sector. The cybersecurity crosscut supports central coordination of the strategic and operational aspects of cybersecurity and facilitates cooperative efforts such as the Integrated Joint Cybersecurity Coordination Center (iJC3) for incident response and the implementation of Department-wide Identity, Credentials, and Access Management (ICAM).

<u>Exascale Computing</u>
Exascale systems are needed to improve NNSA weapons design, stewardship and stockpile certification capabilities to ensure the U.S. maintains leadership in high-performance simulations that underpin our nuclear deterrent that are not within the capacities of today's systems. Exascale systems' computational power is needed for increasing capable data-analytic and data-intense applications across the entire Federal complex. Exascale is a component of long-term collaboration between the interagency National Strategic Computing Initiative, the DOE/Office of Science's Advanced Scientific Computing Research program and NNSA's ASC program. Included in NNSA's Request is $309,303,000 in FY 2020 to support technologies critical to an exascale capability for the nation and incorporating exascale-class computing into the Nuclear Security Enterprise.

Top 15 Property Leases at NNSA

Rebuilding the NNSA nuclear security enterprise infrastructure requires both federal funding and public-private partnerships. NNSA has leveraged leasing arrangements, when in the government's best interest, to take advantage of using private sector construction expertise and economies-of-scale to quickly and cost-effectively acquire modern, efficient facilities for public use. The top fifteen leases for NNSA are included below with the property name, annual rent, and usable square feet as well as the funding mechanism of direct or indirect is included.

Direct Funded Leases

Site	Property Name	Annual Rent	Usable Square Feet	Funding Source
Kansas City National Security Campus	National Security Campus NNSA Complex, 14500 Botts Road	$50,992,196.31	973,516	Direct
Kansas City National Security Campus	National Security Manufacturing Center Building, 14500 Botts Road	$13,847,577.36	260,906	Direct
Pantex Plant	John C. Drummond Center Office Building (formerly known as ASC)	$8,546,000.00	342,800	Direct
Kansas City National Security Campus	Building 21	$1,541,290.55	62,527	Direct
Nevada National Security Site – Las Vegas	Southern Nevada Science Center II	$1,150,574.27	32,535	Direct

Indirect Funded Leases

Site	Property Name	Annual Rent	Usable Square Feet	Funding Source
Y-12 National Security Complex	Jack Case Office Building	$8,798,763.96	288,286	Indirect
Sandia National Laboratories – New Mexico	Innovation Parkway Office Center	$3,789,000.00	118,730	Indirect
Y-12 National Security Complex	New Hope Center	$2,924,187.24	96,431	Indirect
Sandia National Laboratories – New Mexico	Center for Global Security and Cooperation	$1,638,704.67	45,617	Indirect
Nevada National Security Site - Los Alamos	Los Alamos Operations	$1,287,074.00	45,275	Indirect
Los Alamos National Laboratory	Office Building	$1,147,965.00	22,659	Indirect
Nevada National Security Site – Santa Barbara	Special Technologies Laboratory	$1,042,075.00	42,465	Indirect
Y-12 National Security Complex	Commerce Park Uranium Processing Facility Design Facility	$884,841.83	43,253	Indirect
Sandia National Laboratories - New Mexico	Computer Science Research Institute	$842,190.00	22,355	Indirect
Sandia National Laboratories - New Mexico	Advanced MATLS Lab	$806,964.96	21,440	Indirect

Minor Construction

General Plant Projects (GPP)

Pursuant to Section 3121 of the Ike Skelton National Defense Authorization Act for FY 2011 (P.L. 111-383), notification is being provided for general plant projects with a total estimated cost of more than $5 million planned for execution.

General Plant Projects[a]

Weapons Activities – Savannah River Site

Project Title	Program	Total	Project Description	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request[a]	Outyears	Construction Design Estimate
SRS-HAOM Tritium Grab Sample Capability move to TEF	Infrastructure and Operations: Infrastructure and Safety	5,140,000	This project will move Grab Sample and mass spectrometer capabilities currently in 234-H (HAOM), a 1950s Vintage Building, Laboratory into building 264-H. This move will consolidate operations and facilitate the overall plan to shutdown 234-H.	0	0	490,000	4,650,000	490,000
234-7H Room 109 Process Area Expansion	Infrastructure and Operations: Infrastructure and Safety	7,200,000	This project will convert a storage area in building 234-7H to usable processing space. The project scope will add the necessary utilities, such as HVAC, water, power, Tritium Air Monitors, etc. and will support the transfer of capabilities from 234-H.	0	7,200,000	0	0	1,000,000

[a] Execution may be accelerated to FY 2020 depending on conditions.

Weapons Activities – Y-12 National Security Complex

Project Title	Program	Total	Project Description	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	Outyears	Construction Design Estimate
Y-12 CAS/SAS Refurbishment	Defense Nuclear Security: Operations & Maintenance	8,500,000	Project to switch the CAS and SAS to support future CAS buildout. Also, streamline cable routing for SAS to Portal communications.	0	1,000,000	7,500,000	0	925,000
9998 South Fire and Potable Water Lateral Replacement	Infrastructure and Operations: Infrastructure and Safety	5,300,000	Replace south fire water laterals for Building 9998. Both fire and portable water laterals are cast iron, installed under foundations of the facilities, and approaching 60 years old.	0	5,300,000	0	0	400,000
9204-2E 815 MCC Replacement/ Revitalization (NFEM)	Infrastructure and Operations: Infrastructure and Safety	7,000,000	Remove, replace and test a power panel and bus ducts necessary required to replace the 815 motor control centers downstream of the 815 switchgear in the 9204-2E complex.	0	175,000	6,825,000	0	689,000
9215 L-Wing MCC Replacement (NFEM)	Infrastructure and Operations: Infrastructure and Safety	7,000,000	Remove, replace and test, one bus duct, and one motor control center (MCC) located in or providing service to the L-Wing area of the 9215 complex.	0	0	7,000,000	0	637,000
9215 3rd Mill MCC[a] Replacement (NFEM)	Infrastructure and Operations: Infrastructure and Safety	7,500,000	Remove, replace and test, one bus duct, and MCC located in or providing service to the 3rd Mill area of the 9215 complex.	0	0	7,500,000	0	661,000

[a] Project is not funded, but is included as a provisional notification in the event funding becomes available to initiate the project.

Weapons Activities – Nevada National Security Site

Project Title	Program	Total	Project Description	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	Outyears	Construction Design Estimate
Area 6 to U1a Water Supply Line Replacement	Infrastructure and Operations: Infrastructure and Safety	5,000,000	Upgrade an existing section of water line that is essential in providing reliable water service to the DAF and U1a.	0	5,000,000	0	0	500,000
U1a Mining Power Center Replacement	Infrastructure and Operations: Infrastructure and Safety	5,000,000	Upgrade underground electrical distribution system at the U1a facility to meet expanding Subcritical Experiment mission requirements.	0	0	5,000,000	0	500,000

Weapons Activities – Pantex

Project Title	Program	Total	Project Description	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	Outyears	Construction Design Estimate
12-44, Cell 8	Directed Stockpile Work: Strategic Materials Sustainment	8,000,000	Reconfigure facility to support pit processing operations: weigh, leak, and SI packaging/ unpacking/surveillance/storage. Modify the cubicles for use as process staging areas. Obtain authorizations and approvals for relocation and start-up of pit processing operations.	0	1,000,000	3,500,000	3,500,000	1,000,000

Weapons Activities – Lawrence Livermore National Laboratory

Project Title	Program	Total	Project Description	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	Outyears	Construction Design Estimate
Range Facility Replacement	Defense Nuclear Security: Operations & Maintenance	9,800,000	Construct a new facility at the Small Firearms Training Facility (SFTF) located at Site 300. The new facility will replace the current 35-year old classroom that concurrently operates as an office, kitchen, and classroom which limits and obstructs training. The proposed facility will contain a functional classroom, restrooms, kitchenette, locker area, and two offices. The current classroom will be modified for storage of firearms, ammunition and supplies, and for the cleaning and maintenance of firearms.	0	9,800,000	0	0	980,000
B239 High Energy X-ray Radiography Capability Revitalization	Infrastructure and Operations: Infrastructure and Safety	7,500,000	Refurbish, in an area planned approach, facilities supporting high energy x-ray capability to include renovations such as modernizing control rooms, modernizing an existing x-ray lab to enable additional capability.	0	0	750,000	6,750,000	750,000
B321 Chiller Reliability and Safety Exhaust System Redundancy Revitalization	Infrastructure and Operations: Infrastructure and Safety	9,000,000	The B321E chiller plant will be replaced with modern units including secondary pumps that are sized to provide redundant operation for uninterrupted supply. Some safety exhaust fans within B321C will also be	0	0	800,000	8,200,000	800,000

Project Title	Program	Total	Project Description	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	Outyears	Construction Design Estimate
			replaced with redundant pairs with new capacity and new controls installed that cause automatic activation of the standby unit and maintain appropriate room pressure control.					
S200 & S300 Low Pressure Air System Upgrade, LLNL	Infrastructure and Operations: Infrastructure and Safety	5,100,000	The two applicable compressors at site 200 are 8 years old, but the manufacturer has since abandoned this technology due to premature failures. This project will replace and upgrade the capacity of two of the compressors and install backup generator capability at site 300.	0	0	500,000	4,600,000	500,000
B321 Air Handling Unit & Electrical Replacement and Upgrade	Infrastructure and Operations: Infrastructure and Safety	5,800,000	This project will replace the most critical, aged and unreliable B321A HVAC units with new energy efficient HVAC units and provide redundancy with overall increased capacity.	0	0	5,800,000	0	475,000
B810/B806 HE[a] Processing and Machining Power and Facility Upgrades	Infrastructure and Operations: Infrastructure and Safety	9,000,000	This project will install a new transformer to bring utility power to 810/806 Complex. Scope also includes a new Automatic Transfer Switch. Administrative areas will also be renovated to provide conference space.	0	0	9,000,000	0	800,000

[a] Project is not funded, but is included as a provisional notification in the event funding becomes available to initiate the project.

Weapons Activities – Los Alamos National Laboratory

Project Title	Program	Total	Project Description	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	Outyears	Construction Design Estimate
Establish IT Production Infrastructure at TA-55	Directed Stockpile Work: Plutonium Sustainment	6,500,000	Establish the requisite Information Technology (IT) infrastructure to support the expanding production mission at TA-55.	0	0	1,000,000	5,500,000	500,000
TA-16 New HE Shipping and Receiving Transfer Facility	Infrastructure and Operations: Infrastructure and Safety	7,932,000	This project will provide a new, permanent transfer facility, which will be used for shipping and receiving Department of Transportation Regulated Hazardous Materials to/from commercial carriers.	0	0	7,932,000	0	821,000
TA-55 Building 400 RLUOB Secondary Fire Pump Installation	Infrastructure and Operations: Infrastructure and Safety	6,143,000	This project will install a prefabricated packaged fire pump on a concrete pad immediately against the first floor west wall of the Central Utility Building. The fire pump will be diesel powered with a 500-gallon fuel tank.	0	0	6,143,000	0	920,000

Weapons Activities – Sandia National Laboratories

Project Title	Program	Total	Project Description	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	Outyears	Construction Design Estimate
B858N SiFab Bulk Chemical Distribution System Upgrade	Infrastructure and Operations: Infrastructure and Safety	5,300,000	Upgrade current chemical distribution system in the SNL SiFab.	0	0	5,300,000	0	350,000
SNL CA Potable Water Distribution System Revitalization	Infrastructure and Operations: Infrastructure and Safety	9,900,000	This project will replace existing underground water distribution pipelines and building water service connections on SNL/California campus. The oldest portions of the system are beyond their useful life.	0	0	9,900,000	0	1,500,000
New Radiation Protection Instrumentation Calibration Facility	Infrastructure and Operations: Infrastructure and Safety	8,000,000	This project will provide a new facility to replace buildings 818 & 819 and relocate functions to a new, remote location. These facilities contain hazardous materials, which pose a risk to adjoining buildings.	0	0	8,000,000	0	800,000
Bldg. 6715 Light[a] Initiated High Explosive (LIHE) Test Facility Upgrades	Infrastructure and Operations: Infrastructure and Safety	7,000,000	Construct a new test cell (addition) to the LIHE facility that will safely handle the increased mission-driven explosive requirements.	0	0	7,000,000	0	750,000

[a] Project is not funded, but is included as a provisional notification in the event funding becomes available to initiate the project.

Defense Nuclear Nonproliferation – Sandia National Laboratories

Project Title	Program	Total	Project Description	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	Outyears	Construction Design Estimate
New Stabilization Training Facility (9940 Site)	Nuclear Counterterrorism and Incident Response Program: Counterterrorism and Counterproliferation	7,400,000	New Stabilization Training facility located at Site 9940 to satisfy the current & growing needs of the Stabilization program.	0	0	7,400,000	0	0

Naval Reactors

Project Title	Program	Total	Project Description	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	Outyears	Construction Design Estimate
KS Building 83 Upgrade	Naval Reactors	5,945,000	The purpose of this project is to re-configure Building 83 and extend its useful life for the foreseeable future of the Kesselring Site. The primary objective is to execute upgrades that will assure Building 83 supports warehouse operations through 2040. The secondary objective is to realize an opportunity to repurpose a portion of Building 83 square footage as office space.	0	0	525,000	5,420,000	525,000
KS High Yard 30 Upgrade	Naval Reactors	8,269,000	Will consolidate HY 40 and HY 30 to reduce the number of transformers and associated equipment from four to one. It also adds metal-clad switchgear in HY 30.	0	0	623,000	7,646,000	623,000
KS Natural Gas Infrastructure	Naval Reactors	7,346,000	This project will provide necessary engineering and labor	0	0	655,000	6,691,000	655,000

Project Title	Program	Total	Project Description	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	Outyears	Construction Design Estimate
			to bring natural gas to the KS boilers in Building 8 by connecting to the National Grid Infrastructure. It will install necessary piping underground through the KS reservation, underneath the fence, and to the boiler house. The current boilers will be converted to dual fuel capability (gas and oil) in accordance with manufacturer's recommendation. Natural gas will be piped to boilers including extension capped stubs for a potential future boiler.					

50 US Code 2746 requires that if the total estimated cost for construction design in connection with any construction project exceeds $2,000,000, funds for that design must be specifically authorized by law. NNSA requests Congressional Authorization for 2020 General Plant Projects exceeding the $2,000,000 design threshold for the following project:

FY 2020 General Plant Projects – Design Over $2 Million

Weapons Activities – Los Alamos National Laboratory

Project Title	Program	Total	Project Description	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	Outyears	Construction Design Estimate
PF-4 Power and Communications Systems Upgrade	Infrastructure and Operations: Infrastructure and Safety	16,000,000	Design and construct redundant fiber optic communication pathways to the Central Alarm Station (CAS) and Secondary Alarm Station (SAS) and back-up power through Building 142. Specifically, the project will provide Uninterruptible Power Supply (UPS) and dual telecommunication services to a central location in TA-55 PF-4 to afford a point of connection for future security system renovations projects. UPS services will be distributed from TA-55 PF-142 and telecommunication services will be extended from the CAS and SAS backbones to locations within PF-4 for use by future upgrades.	0	0	16,000,000	0	5,287,000

General Plant Projects Subject to Section 3119 of the FY 2019 National Defense Authorization Act

As directed in the FY 2018 National Defense Authorization Act, this section provides the requested project information for projects with a total project cost (TPC) over $10 million.

Project	Site	Project Description	Program	TPC	Construction Design Estimate	Project Milestones		
						Project Start	Design Complete	Construction Complete
PF-4 Fire Suppression System Crit Safety (2 Over 1) Upgrades	LANL	Project will correct approximately 16 seismic risks that could adversely affect the safety class PF-4 basement fire suppression system (FSS). The scope includes: relocating existing HVAC fans above FSS piping and several sprinklers too close to facility equipment (column capitals and electrical equipment such as conduit, lighting and cable trays) The scope will also include bracing FSS piping supported with eccentric beam supports, that may be impacted by the equipment during a seismic event.	Infrastructure and Operations: Infrastructure and Safety	10,400,000	1,561,000	FY 2020	FY 2021	FY 2022
PF-4 Power and Communications Systems Upgrade	LANL	Design and construct redundant fiber optic communication pathways to the Central Alarm Station (CAS) and Secondary Alarm Station (SAS) and back-up power through Building 142. The project will provide Uninterruptible Power Supply (UPS) and dual telecommunication services to a central location in TA-55 PF-4 to afford a point of connection for future security system renovations projects. UPS services will be distributed from TA-55 PF-142; telecommunication services will be extended from the CAS and SAS backbones to locations within PF-4.	Infrastructure and Operations: Infrastructure and Safety	16,000,000	5,287,000	FY 2020	FY 2020	FY 2021

Project	Site	Project Description	Program	TPC	Construction Design Estimate	Project Milestones		
						Project Start	Design Complete	Construction Complete
New Nondestructive Evaluation (NDE) Building	LLNL	The project relocates NDE inspection capabilities to a modern above-ground facility of approximately 13,000 GSF. The new facility will provide modern, flexible open laboratory workspace for x-ray systems.	Infrastructure and Operations: Infrastructure and Safety	15,000,000	1,500,000	FY 2020	FY 2020	FY 2022
New U1a Mission Technical Support Facility	Nevada	Existing support structures at the U1a Complex consist of a series of aging trailers and temporary buildings that were consistent with the complex's original experimental purpose. These facilities are increasingly unfit to support the evolution of the Sub Critical Experiments (SCE) mission. This project will provide approximately 10,000 sq ft of new space for SCE support functions for NNSS and national laboratory personnel. This project will leverage off the experience gained at Mercury in developing new buildings.	Infrastructure and Operations: Infrastructure and Safety	13,500,000	950,000	FY 2019	FY 2019	FY 2021
New Mercury Building 23-462	Nevada	This project includes design and construction scope for the third building in the Mercury Campus. The project will provide 10,000 sq ft of new enduring office space supporting the National Laboratories and replaces aging and failing infrastructure at the NNSS Mercury complex.	Infrastructure and Operations: Infrastructure and Safety	13,800,000	950,000	FY 2020	FY 2020	FY 2022
Nonproliferation Testbed Tunnel Excavation	Nevada	Project will include excavating, reinforcing, and finishing an underground tunnel to host a future nonproliferation testbed facility.	Defense Nuclear Nonproliferation R&D	17,900,000	800,000	FY 2020	FY 2020	FY 2021

Project	Site	Project Description	Program	TPC	Construction Design Estimate	Project Milestones		
						Project Start	Design Complete	Construction Complete
New Advanced Fabrication Facility	Pantex	The project will construct a new 20,000 sq ft. Advanced Fabrication Facility in Zone 11 at Pantex. This new facility will relocate the inert machining operations from Buildings 11-20 and 11-50 which allows high explosives machining capacity to be restored at 11-50 for Life Extension Programs, Enhanced Surveillance Campaign, Plant Directed Research and Development, and other programs. In addition, this project eliminates the need for costly investments in Building 11-20 (plumbing, flooring, electrical system, Heating, Ventilation, and Air Conditioning (HVAC) system and other safety systems investments) which are estimated to cost at least $12M.	Infrastructure and Operations: Infrastructure and Safety	17,000,000	1,000,000	FY 2020	FY 2020	FY 2021
Zone 12 PIDAS Vehicle Barriers	Pantex	Install a robust Vehicle Barrier System to replace the current cable barrier that is on the security fence with a new standalone barrier on the secure side of the PIDAS.	Defense Nuclear Security: Operations & Maintenance	11,250,000	208,000	FY 2020	FY 2020	FY 2024

Project	Site	Project Description	Program	TPC	Construction Design Estimate	Project Milestones		
						Project Start	Design Complete	Construction Complete
Reliable Dry Room Installation and Li Battery Pack Rapid Prototyping Lab Installation	SNL	Tenant improvements to the new Agile High Bay Facility to stand up backup power sources production operations, reducing risk in the operations currently located in Building 894. The shell of the Agile High Bay Facility is currently being designed with about 10,000 NSF of temporary lab space. To use the facility, tenants must fund all design and construction costs for their uses. Power Sources intends to be the first tenant to occupy the Agile High Bay facility, requiring a significant portion of its lab space, until a permanent Power Sources facility is identified and ready for occupancy. To support production, Sandia will implement a thermal battery production dry room and Li-primary cell and power assembly production area.	Infrastructure and Operations: Capability Based Investments	12,000,000	1,100,000	FY 2019	FY 2019	FY 2020
High G Surveillance Testing Capability Refurbishment (Pantex)	SNL	The high G surveillance testing capability is provided by two centrifuges at WETL (Pantex) which are aging and will be past their useful lives in the 2023 timeframe. This capability must be recapitalized in a manner that allows operation of two centrifuges at all times. This project will procure a third centrifuge and construct a facility to house it (either a stand-alone building, or a WETL addition).	Infrastructure and Operations: Capability Based Investments	18,000,000	1,700,000	FY 2020	FY 2021	FY 2022

Project	Site	Project Description	Program	TPC	Construction Design Estimate	Project Milestones		
						Project Start	Design Complete	Construction Complete
New Explosive Manufacturing Science and Technology (EMSAT) Facility	SNL	The proposed new explosives manufacturing facility will provide an in-house capability for the receipt, processing, production, assembly, testing and qualifying, storage, and shipping of classified and non-classified explosive components and materials in relatively small quantities. The proposed facility will be approximately 18,000 sq ft.	Infrastructure and Operations: Infrastructure and Safety	17,500,000	1,500,000	FY 2020	FY 2020	FY 2023
234-7H New Utility Support Building and Exhaust Ventilation System Installation	SRS	This project will construct a small utility support building including installation of a dedicated exhaust ventilation system for 234-7H. The current exhaust system for 234-7H is part of 234-H and the capability must be separated in order to facilitate the overall plan to shutdown 234-H.	Infrastructure and Operations: Infrastructure and Safety	11,900,000	1,700,000	FY 2019	FY 2020	FY 2022
Mobile Melt-Consolidate System	SRS	Design and build a mobile capability to treat unirradiated and irradiated weapons-usable nuclear material in situ at sites around the world. The facility will melt, dilute, and consolidate weapons-usable nuclear material with other materials to downblend uranium, encapsulate fission products, and produce a standard geometry ingot that is less attractive than the input material and ready for disposal in-country. After use, the facility will be deactivated, returned to the United States, and refurbished before can be reused. The operational life in any given use case will likely be less than one year.	Material Management and Minimization: Nuclear Material Removal	10,633,000	1,336,000	FY 2020	FY 2020	FY 2021

Project	Site	Project Description	Program	TPC	Construction Design Estimate	Project Milestones		
						Project Start	Design Complete	Construction Complete
105-K Entry Control Facility Expansion	SRS	Construct an expanded Entry Control Facility (ECF) within the 105-K Building to accommodate increased personnel and material ingress/egress required for the expedited removal of surplus plutonium from the Savannah River Site. The ECF will increase the number of personnel lanes, relocate existing facility features to alter entry/exit paths, and install the necessary security sensors and equipment.	Material Management and Minimization: Material Disposition	13,000,000	1,800,000	FY 2020	FY 2020	FY 2021
Northeast Boundary Area	NRF	This project will construct and install electrical and communication distribution infrastructure for system reliability and for the NRF site future growth and layout. It will also construct and install security systems that provide detection and assessment of unauthorized personnel attempting to access NRF via the Northeast portion of the site. This project is required to support future planned buildings outside of the current limited area that support the NRF mission (including the Spent Fuel Handling Project). An expansion of the electrical and communication systems infrastructure is required to support the NRF mission to process and examine Naval Nuclear fuel and materials to maintain the superiority of the United States Navy. If this project is not completed, adequate electrical power and communications will not be available to support the projects identified with specific mission needs.	Naval Reactors	13,700,000	1,200,000	FY 2019	FY 2019	FY 2020

Project	Site	Project Description	Program	TPC	Construction Design Estimate	Project Milestones		
						Project Start	Design Complete	Construction Complete
RML HVAC Upgrade Design	KL	This project includes the design and installation of a new heating ventilation and air conditioning system for the Radioactive Materials Laboratory (RML). Approximately 80% of the current RML heating system is out-of-commission and there is no centralized air conditioning for the RML. If the condition of the heating system is not addressed, the system will continue to fail which could lead to failure of the hot cell windows (i.e., cracking) due to temperature gradients, which would likely result in a radiological event. Not installing an air conditioning system will result in continued delays to work during summer months. Heat stress evaluations will need to be performed for Controlled Surface Contamination Work during the summer, which expends additional resources and will result in schedule delays. This decreases productivity during the summer and could result in delays to critical test milestones and deliverables. This also results in unacceptable working conditions for personnel during the summer months.	Naval Reactors	18,230,000	1,945,000	FY 2020	FY 2023	FY 2024

Institutional General Plant Projects for NNSA

Los Alamos National Laboratory

Project Title	Program	Total	Project Description	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	Outyears	Construction Design Estimate
Radio Chemistry (RC) TA-48-0001 HVAC and Controls Upgrades	Institutional	6,000,000	TA-48-0001 HVAC and Controls Upgrades. Upgrade the HVAC in the facility to address aging air handling and exhaust fan components, remove legacy system components, and upgrade controls system from analogue to digital controls.	0	1,000,000	5,000,000	0	600,000

Sandia National Laboratories

Project Title	Program	Total	Project Description	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	Outyears	Construction Design Estimate
New Training Consolidated Fabrication and Laboratories Tent Replacement (aka 9940H)	Institutional	7,000,000	The tent facility (Building 9940D) is falling into disrepair. Repair of this tent facility will continue to be an issue as the shop and assembly functions contained within will endure for the foreseeable future for the training activities conducted.	0	7,000,000	0	0	500,000
840 Multi-Program Lab & Office Building -CDC West High Bay Lab Installation	Institutional	5,100,000	Project includes interior renovations in the southwest high bay to provide a mechanical lab with smaller electrical and chemical labs. Includes assembly and disassembly of complex systems with robust testing. Additional space needs include a project room, certified rigging area, and storage for parts and supplies.	0	5,100,000	0	0	500,000

Project Title	Program	Total	Project Description	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	Outyears	Construction Design Estimate
Systems Research B868 - Vault 2 Expansion	Strategic Partnerships Projects	6,496,000	Commission design and construction to renovate existing office space into lab space. Relocate existing personnel in future expansion space into other areas of equal security level. Phased construction to allow for operations to continue with the least amount of disruption to current and ongoing projects.	0	6,496,000	0	0	696,000
New Transshipment Staging Warehouse	Strategic Partnerships Projects	7,000,000	Existing facility is old and nearing its useful life. It has many issues with aged and "to capacity" systems, and it does not provide room to maneuver. Provide a modern, state of the art staging warehouse, sited logically, with proper maneuvering clearances.	0	7,000,000	0	0	500,000

Pantex

Project Title	Program	Total	Project Description	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	Outyears	Construction Design Estimate
Bldg. 12-70 (Cafeteria) Remodel	Institutional	9,000,000	Reconfigure building 12-70 Cafeteria to accommodate new and revised capabilities in support of site wide capabilities, which include laundry, and change rooms.	0	0	4,500,000	4,500,000	500,000

Institutional General Plant Projects for NNSA – (>$10M)

Project	Site	Project Description	TPC	Construction Design Estimate	Project Milestones		
					Project Start	Design Complete	Construction Complete
New Pantex Flexible Support Facility	Pantex	Project will construct a facility of flexible design to address current space needs for new employees supporting mission and project requirements and a much needed Cyber Network and Security Operations Center.	15,000,000	500,000	FY 2019	FY 2019	FY 2020
Bldg. 9113 Cafeteria Modernization & Addition	Y-12	Project will renovate and increase capacity of the Building 9113 Cafeteria inside the Y-12 Protected Area. The Building 9113 cafeteria is a satellite to the main cafeteria located in the Property Protection Area of the plant and is undersized to meet the demands of increasing workload across the site, including new construction and excess facility disposition. Additionally, the cafeteria has not been upgraded in 30 years, and does meet today's codes and standards for a food service area.	10,000,000	250,000	FY 2020	FY 2020	FY 2020

Project	Site	Project Description	TPC	Construction Design Estimate	Project Milestones		
					Project Start	Design Complete	Construction Complete
New B321G Manufacturing Building	LLNL	The proposed addition to building 321C (up to 10,000 sq ft) will add institutional high bay manufacturing space in support of Lawrence Livermore National Laboratory's growing national security programs, such as Weapons Complex Integration (WCI) life extension programs, National Ignition Facility & Photon Science (NIF&PS) defense technologies, and GS counterproliferation programs. The expanded Vault Type Room (VTR) shop capacity will address the increased need for the combination of precision, special materials, and classified manufacturing required by multi-programmatic missions across the Laboratory. The building will be connected to the current B321C VTR manufacturing area via a secure passage for efficient work flow.	15,000,000	1,000,000	FY 2019	FY 2020	FY 2021
Construct General Purpose Office Building in Pajarito Corridor	LANL	Utilize modular construction methodology to procure and erect a new 20,000 sq. ft. office facility.	19,000,000	900,000	FY 2020	FY 2020	FY 2022
Construct New Parking Structure at in TA-03	LANL	Construction of a multi-story parking structure to house approximately ~300 vehicles with parking for both private occupancy (POVs), motorcycles, required ADA spaces/accessibility and government vehicles (GOVs).	18,000,000	800,000	FY 2019	FY 2019	FY 2020
New Construct Parking Structure in Pajarito Corridor	LANL	Construction of a multi-story parking structure to house ~300-400 vehicles with parking for both private occupancy (POVs), motorcycles, required ADA spaces/accessibility and government vehicles (GOVs).	18,000,000	800,000	FY 2019	FY 2019	FY 2020

Project	Site	Project Description	TPC	Construction Design Estimate	Project Milestones		
					Project Start	Design Complete	Construction Complete
New Secure Office Building	SNL	The Secure Office Building is generic; designed to be shared by any division that requires "Need to Know" space. Additionally, it will be a corporately managed asset and provide flex space to relocate and co-locate personnel, as well a corporate owned VTC. This will enable better utilization of space at high security and lower security levels than these groups currently occupy.	19,400,000	1,900,000	FY 2019	FY 2019	FY 2020
New Kauai Test[a] Facility (KTF) Administrative Operations Support Building	SNL	Construct permanent and resilient structure to house the Administrative and Operations Support. Currently housed in 50-60 year old tractor trailer "Pups" and manufactured trailers. The current facilities are prone to failures, lack fire protection, do not meet accessibility requirements, and are prone to catastrophic failure with more frequent hurricane activity on the island.	18,000,000	1,500,000	FY 2020	FY 2020	FY 2021

[a] Strategic Partnership Project.

This report responds to legislative language set forth in Conference Report (H.R. Conf. Rep. No. 108-10) accompanying the Consolidated Appropriations Resolution, 2003 (Public Law 108-7) (pages 886-887), which directs the Department of Energy provide an annual year-end report on maintenance expenditures to the Committees on Appropriations.

Direct-Funded Maintenance and Repair[a]

(Dollars in Thousands)

Direct-Funded Maintenance and Repair Site	FY 2018 Actual Cost	FY 2018 Planned Cost	FY 2019 Planned Cost	FY 2020 Planned Cost
Naval Nuclear Laboratory	19,595	19,568	21,310	26,130

Indirect-Funded Maintenance and Repair

(Dollars in Thousands)

Indirect-Funded Maintenance and Repair Site	FY 2018 Actual Cost	FY 2018 Planned Cost	FY 2019 Planned Cost	FY 2020 Planned Cost
Kansas City National Security Campus	0	0	0	0
Sandia National Laboratories	80,573	75,750	70,000	68,000
Los Alamos National Laboratory	63,853	59,700	60,098	63,350
Lawrence Livermore National Laboratory	55,222	55,000	60,379	60,103
Pantex Plant	27,560	20,009	15,885	16,207
Y-12 National Security Complex	48,936	12,476	38,660	45,032
Savannah River Site	0	0	0	0
Nevada National Security Site	23,707	31,700	39,900	45,316
Naval Nuclear Laboratory	25,468	26,123	23,002	25,549
Total, Indirect-Funded Maintenance and Repair	**325,319**	**280,758**	**307,924**	**323,557**

[a] Additional Direct-Funded Maintenance and Repair is included in the Infrastructure and Operations section of the Congressional Justification.

Excess Facilities

(Dollars in Thousands)

Direct-Excess Facilities[a] Site	FY 2018 Actual Cost	FY 2018 Planned Cost	FY 2019 Planned Cost	FY 2020 Planned Cost
Naval Nuclear Laboratory	111,399	134,964	167,972	187,729

Indirect-Excess Facilities Site	FY 2018 Actual Cost	FY 2018 Planned Cost	FY 2019 Planned Cost	FY 2020 Planned Cost
Kansas City National Security Campus	0	0	0	0
Sandia National Laboratories	1,440	1,586	1,033	370
Los Alamos National Laboratory	8,658	5,500	2,320	11,803
Lawrence Livermore National Laboratory	1,277	868	929	996
Pantex Plant	460	2,257	530	7,949
Y-12 National Security Complex	0	0	1,273	1,496
Savannah River Site	0	0	0	0
Nevada National Security Site	0	0	200	0
Naval Nuclear Laboratory	299	254	283	281
Total, Excess Facilities	**12,134**	**10,465**	**6,568**	**22,895**

Disposition Only

Indirect-Excess Facilities Site	FY 2018 Actual Cost	FY 2018 Planned Cost	FY 2019 Planned Cost	FY 2020 Planned Cost
Kansas City National Security Campus	0	0	0	0
Sandia National Laboratories	1,440	1,586	1,033	370
Los Alamos National Laboratory	8,238	5,100	1,870	11,353
Lawrence Livermore National Laboratory	412	3	50	106
Pantex Plant	460	2,257	530	7,949
Y-12 National Security Complex	0	0	1,273	1,496
Savannah River Site	0	0	0	0

[a] Additional Direct-Excess Facilities funding is listed in the Infrastructure and Operations section of the Congressional Justification.

Indirect-Excess Facilities Site	FY 2018 Actual Cost	FY 2018 Planned Cost	FY 2019 Planned Cost	FY 2020 Planned Cost
Nevada National Security Site	0	0	200	0
Total, Excess Facilities	**10,550**	**8,946**	**4,956**	**21,274**

Maintenance Only

Indirect-Excess Facilities Site	FY 2018 Actual Cost	FY 2018 Planned Cost	FY 2019 Planned Cost	FY 2020 Planned Cost
Kansas City National Security Campus	0	0	0	0
Sandia National Laboratories	0	0	0	0
Los Alamos National Laboratory	420	400	450	450
Lawrence Livermore National Laboratory	865	865	879	890
Pantex Plant	0	0	0	0
Y-12 National Security Complex	0	0	0	0
Savannah River Site	0	0	0	0
Nevada National Security Site	0	0	0	0
Total, Excess Facilities	**1,285**	**1,265**	**1,329**	**1,340**

Site Estimates
(Dollars in Thousands)

Site	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request				
			FSE	WA	NN	NR	Total
Argonne National Laboratory	47,341	47,549	428	47,241	300	-	47,969
Bettis Atomic Power Laboratory	591,482	685,949	-	-	-	600,547	600,547
Brookhaven National Laboratory	8,625	9,244	-	8,893	391	-	9,284
Chicago Operations Office	2,000	2,000	-	-	-	-	-
Consolidated Business Center	659	-	-	-	-	-	-
General Atomics	14,700	-	-	-	-	-	-
Headquarters	1,456,613	1,676,058	314,011	257,835	1,581,878	142,813	2,296,538
Idaho National Laboratory	224,049	275,656	-	73,216	1,770	205,572	280,558
Kansas City Field Office	44,998	7,406	7,413	-	130	-	7,543
Kansas City National Security Campus	671,091	753,436	-	55,722	939,869	-	995,592
Knolls Atomic Power Laboratory	727,075	740,237	-	-	547	677,574	678,121
Lawrence Berkeley National Laboratory	9,824	9,093	-	8,782	650	-	9,432
Lawrence Livermore Field Office	17,077	18,779	18,779	-	-	-	18,779
Lawrence Livermore National Laboratory	1,539,659	1,469,430	-	134,746	1,511,576	-	1,646,322
Livermore Field Office	846	-	-	-	-	-	-
Los Alamos Field Office	15,446	17,665	17,727	-	51	-	17,778
Los Alamos National Laboratory	2,067,438	2,156,934	-	284,923	1,887,954	-	2,172,877
National Energy Technology Laboratory	32,667	20,235	131	-	31,663	-	31,794
Naval Reactors Laboratory Field Office	21,174	21,166	-	-	-	21,890	21,890
Naval Research Laboratory	11,600	10,250	-	-	3,000	-	3,000
Nevada Field Office	96,085	98,405	17,851	50	80,606	-	98,507
Nevada National Security Site	414,139	355,272	-	91,044	368,871	-	459,916
Nevada Site Office	-	1,350	-	-	-	-	-
NNSA ABQ Complex (all other sites)	824,219	891,762	-	116,638	526,795	-	643,433
NNSA Production Office	72,241	33,725	24,820	10,250	4,000	-	39,070
Oak Ridge Institute for Science and Engineering	5,045	2,849	629	1,916	360	-	2,905
Oak Ridge National Laboratory	141,491	145,487	275	91,743	43,933	-	135,951
Office of Science and Technical Information	471	465	-	42	433	-	475
Pacific Northwest National Laboratory	279,116	271,406	1,400	226,332	63,249	-	290,981
Pantex Plant	795,286	825,063	-	9,266	950,163	-	959,429
Princeton	164	170	-	177	-	-	177
Richland Operations Office	6,937	1,804	-	1,858	-	-	1,858
Sandia Field Office	22,644	22,972	23,261	-	1,017	-	24,278
Sandia National Laboratories	2,028,064	2,116,556	-	242,109	1,990,774	-	2,232,883
Savannah River Operations Office	284,283	203,843	5,734	190,100	50	-	195,884
Savannah River Site	377,841	440,582	-	169,550	355,982	-	525,532
Savannah River Site Office	1,619	1,159	-	-	2,250	-	2,250
Service Center	-	289	-	298	-	-	298
Stanford Linear Accelerator Center	140	1,852	-	1,833	90	-	1,923
University of Rochester/LLE	75,000	80,000	-	-	80,000	-	80,000
Westinghouse TRU Solutions (WIPP)	7,257	10,085	-	9,539	-	-	9,539
Y-12 National Security Complex	1,781,545	1,859,515	2,240	50,400	1,889,051	-	1,941,691
Adjustments	(49,000)	(57,080)	-	-	-	-	-
Grand Total	14,668,952	15,228,618	434,699	2,084,502	12,317,403	1,648,396	16,485,000

FY 2018 NDAA Requirement
Section 3132—Annual Report on Service Support Contracts of the National Nuclear Security Administration. Requires the Administrator to submit, along with NNSA's annual report on service support contracts, information regarding the cost of service support contracts and identification of the program or program direction accounts that support each such contract.

FY 2017 NDAA Requirement
"…require with each budget submission the NNSA provide a report that provides the number of full time equivalent employees under section 3241A of the NNSA Act (50 U.S.C. 2441a), the number of service support contracts and whether the contracts are funded with program funds, the number of full time equivalent employees under each contract and the number in each contract that have been employed for more than 2 years."

Service support Contracts
SEC. 3138. ANNUAL REPORT ON NUMBER OF FULL-TIME EQUIVALENT EMPLOYEES AND CONTRACTOR EMPLOYEES. Section 3241A of the National Nuclear Security Administration Act (50 U.S.C. 2441a) is amended by adding at the end the following new subsection:

''(f) ANNUAL REPORT.—The Administrator shall include in the budget justification materials submitted to Congress in support of the budget of the Administration for each fiscal year (as submitted with the budget of the President under section 1105(a) of title 31, United States Code) a report containing the following information as of the date of the report:

''(1) The number of full-time equivalent employees of the Office of the Administrator, as counted under subsection (a).

''(2) The number of service support contracts of the Administration and whether such contracts are funded using program or program direction funds.

''(3) The number of full-time equivalent contractor employees working under each contract identified under paragraph
(2).

''(4) The number of full-time equivalent contractor employees described in paragraph (3) that have been employed under such a contract for a period greater than two years.''.

The FSE chapter of the budget provides information for (f)(1). The following table provides information required in paragraphs (f)(2) and (f)(3). NNSA does not have information to address paragraph (f)(4). NNSA is not privy to employment information for contractors performing under support service contracts. As a result, we cannot provide details for subsection paragraph (f)(4) which falls under the responsibility of each individual contractor employer when determining who will perform the scope of work required by the terms and conditions of each contract. The typical length of a support service contract is 5 years. Recurring follow-on contracts may or may not employ the same contractor employees; however, it is the responsibility of the contractor to provide appropriate staff and exercise its best efforts and cooperation to effect an orderly and efficient transition to a successor.

For this Annual Service Support table, we continue to include Technical and Management (professional) support service contracts and <u>exclude</u> the following services: Management and Operating contracts, contracts for housekeeping, custodial, physical security, IT helpline, maintenance, and facilities maintenance

Vendor Name	Contract Number	Order Number ("Unavailable" where orders do not exist)	Fund Description	Obligations to Date	Maximum Value (Ultimate Value incl. options)	Total FTEs
Alutiiq Commercial Enterprises LLC	NA0002827	Unavailable	FSE	$4,264,461	$7,040,109	11.00
American Federal Security and K-9 Solutions - 2, LLC	NA0002253	Unavailable	Program	$3,102,951	$3,102,951	19.00
Apogee Group, LLC	89233118CNA000056	Unavailable	Program	$907,018	$2,251,618	1.00
BANDA GROUP INTERNATIONAL, LLC	NA0002388	Unavailable	Program	$4,961,068	$5,302,674	5.00
BANDA GROUP INTERNATIONAL, LLC	NA0002903	Unavailable	FSE	$552,218	$813,664	2.00
BANDA GROUP INTERNATIONAL, LLC	NA0003412	Unavailable	Program	$2,814,945	$3,810,113	2.00
BANDA GROUP INTERNATIONAL, LLC	NA0003413	Unavailable	Program	$5,059,064	$5,151,756	2.00
CE2 CORPORATION, INC.	GS00F207CA	DT0012670	FSE	$1,053,928	$4,123,198	4.50
CE2 CORPORATION, INC.	GS-00F-207CA	89233118FNA400024	FSE	$668,485	$668,485	6.00
CE2 CORPORATION, INC.	GS-00F-207CA	DT0011828	FSE	$651,425	$2,074,683	3.00
CE2 CORPORATION, INC.	GS-00F-207CA	DT0012834	FSE	$728,724	$1,422,620	2.00
CE2 CORPORATION, INC.	GS-10F-0321V	DT0007776	FSE	$2,688,041	$2,978,812	5.00
CE2 CORPORATION, INC.	GS-10F-0321V	DT0008938	FSE	$6,904,642	$10,786,473	15.00
CE2 CORPORATION, INC.	GS-10F-0321V	DT0009471	FSE	$1,751,031	$3,076,651	4.00
CE2 CORPORATION, INC.	GS-10F-0321V	DT0009761	FSE	$7,294,073	$12,203,754	14.00
Chenega Professional & Technical Services, LLC	NA0003496	DT0012824	Both	$5,710,078	$10,635,189	19.00
Chenega Professional & Technical Services, LLC	NA0003754	Unavailable	Program	$3,433,962	$9,620,304	14.00
COHNREZNICK LLP	MA0011836	89233118FNA000029	Program	$500,940	$500,940	4.80
COHNREZNICK LLP	MA0011836	89233118FNA000030	Program	$800,366	$800,366	4.80
COHNREZNICK LLP	MA0011836	89233118FNA000031	Program	$325,349	$325,349	4.80
COHNREZNICK LLP	MA0011836	BP0005348	Program	$1,590,024	$1,590,024	4.80
Corporate Allocation Svcs, Inc.	GS-10F-0311U	DT0011033	Program	$4,346,069	$4,422,995	6.50
Corporate Allocation Svcs, Inc.	GS-10F-0311U	DT0012654	Program	$298,858	$462,065	1.00
Corporate Allocation Svcs, Inc.	NA0000777	BP0005605	Program	$451,989	$894,192	1.00
COVENANT PARK INTEGRATED INITIATIVES	GS-00F-430GA	89233118FNA400044	Program	$500,000	$2,691,252	4.00
CRITERION SYSTEMS, INC.	NA0002615	89233118FNA000015	Program	$5,771,504	$35,488,318	39.00
CRITERION SYSTEMS, INC.	NA0002615	BP0005221	Program	$5,556,749	$11,654,715	11.00
DIGON SYSTEMS, LLC	NA0003441	Unavailable	Program	$1,703,206	$1,729,743	1.00
DOXCELERATE CORPORATION	NA0003349	Unavailable	FSE	$422,752	$687,892	1.50
Fox Rothschild LLP	NA0003792	89233118FNA400079	Program	$1,441,920	$1,441,920	1.40
Fox Rothschild LLP	NA0003792	89233118FNA400110	Program	$40,700	$40,700	0.04
HENRY L STIMSON CENTER	NA0002456	Unavailable	Program	$2,403,656	$2,612,366	3.00
Innovative Reasoning LLC	GS-10F-0224Y	DT0008760	Program	$25,015,247	$33,386,921	65.00
INNOVATIVE TECHNOLOGY PARTNERSHIPS LLC	GS-10F-0495M	DT0014072	FSE	$769,409	$2,936,727	2.50
INTERNATIONAL SERVICES AND ADVISORS, INC	NA0003742	Unavailable	Program	$4,526,717	$7,702,036	4.00
Intuitive Information Systems Technologies, LLC	GS-06F-0962Z	DT0013389	Both	$2,495,230	$3,999,474	11.00
J.G. Management Systems, Inc.	DENA0000727	BP0005948	FSE	$312,842	$805,352	1.50
J.G. Management Systems, Inc.	GS-00F-0014Y	89233118FNA400056	Program	$240,501	$1,231,912	1.80
J.G. Management Systems, Inc.	GS-00F-0014Y	89233118FNA400094	FSE	$123,800	$1,231,878	1.00
J.G. Management Systems, Inc.	GS-00F-0014Y	89233118FNA400103	FSE	$625,365	$954,287	2.00
J.G. Management Systems, Inc.	GS-00F-0014Y	89233118FNA400104	FSE	$769,125	$1,209,001	2.00
J.G. Management Systems, Inc.	GS-00F-0014Y	DT0011413	Program	$1,014,427	$1,821,940	3.00
J.G. Management Systems, Inc.	GS-00F-0014Y	DT0011516	Program	$5,077,658	$8,725,667	6.00
J.G. Management Systems, Inc.	GS-00F-0014Y	DT0012665	Both	$840,257	$2,729,405	4.00

Vendor Name	Contract Number	Order Number ("Unavailable" where orders do not exist)	Fund Description	Obligations to Date	Maximum Value (Ultimate Value incl. options)	Total FTEs
JDG ASSOCIATES, INC.	GS-22F-9735H	DT0005869	Both	$349,005	$356,500	1.00
Lakeworth Group, LLC, The	NA0002552	Unavailable	Program	$397,262	$3,990,443	0.25
LINK TECHNOLOGIES INC	GS00F216CA	DT0013473	Program	$4,554,000	$8,002,098	17.00
LONGENECKER & ASSOCIATES, INC.	GS-00F258CA	89233118FNA400109	FSE	$897,415	$3,270,552	0.50
LONGENECKER & ASSOCIATES, INC.	GS-00F-258CA	DT0014047	FSE	$1,759,352	$1,759,352	4.50
LONGENECKER & ASSOCIATES, INC.	GS-10F-0479N	DT0007874	FSE	$684,699	$847,456	1.00
LONGENECKER & ASSOCIATES, INC.	GS-10F-0479N	DT0008761	Program	$7,140,632	$9,619,133	20.50
LONGENECKER & ASSOCIATES, INC.	GS-10F-0479N	DT0009564	Both	$2,340,919	$3,196,321	6.00
LONGENECKER & ASSOCIATES, INC.	GS10F111AA	89233118FNA400112	Program	$1,148,029	$8,334,807	8.00
LONGENECKER & ASSOCIATES, INC.	NA0000978	BP0003739	Program	$2,308,056	$4,766,388	2.50
Ltd Global, LLC	89233118CNA000052	Unavailable	FSE	$263,521	$3,860,842	5.00
Ltd Global, LLC	NA0002396	Unavailable	Program	$1,893,641	$2,826,021	0.90
Ltd Global, LLC	NA0003116	Unavailable	FSE	$1,344,987	$2,157,867	5.00
Ltd Global, LLC	NA0003420	Unavailable	FSE	$888,994	$1,841,106	3.16
MELE ASSOCIATES, INC.	GS-00F-243CA	DT0013157	Program	$16,502,660	$47,745,330	28.50
MELE ASSOCIATES, INC.	GS-00F-243CA	DT0013826	Both	$4,853,540	$20,395,756	7.00
MELE ASSOCIATES, INC.	NA0001356	BP0003375	Program	$29,785,006	$32,407,341	22.00
MELE ASSOCIATES, INC.	NA0001356	BP0003826	Program	$35,553,331	$46,292,334	15.00
MELE ASSOCIATES, INC.	NA0001356	BP0004561	Program	$11,654,873	$14,560,733	25.00
MELE ASSOCIATES, INC.	NA0003061	89233118FNA000008	Program	$2,603,073	$13,783,092	9.00
MONTECH INC.	NA0003445	Unavailable	Both	$965,000	$1,262,170	2.53
MONTECH INC.	NA0003599	Unavailable	FSE	$307,146	$917,017	1.00
MONTECH INC.	NA0003675	Unavailable	Both	$79,757	$240,432	4.00
Parsons Government Services Inc.	GS00F0005R	DT0009614	Program	$6,497,898	$6,565,752	2.75
Parsons Government Services Inc.	GS00F0005R	DT0010584	FSE	$3,057,863	$3,057,863	2.75
Parsons Government Services Inc.	GS00F0005R	DT0010585	Both	$1,925,870	$1,925,870	1.20
Parsons Government Services Inc.	GS00F0005R	DT0010586	FSE	$5,383,312	$5,383,312	8.10
Parsons Government Services Inc.	GS00F0005R	DT0010869	Program	$1,456,131	$1,484,354	1.50
Parsons Government Services Inc.	GS00F0005R	DT0011157	Program	$1,166,878	$1,193,183	1.90
Parsons Government Services Inc.	GS00F0005R	DT0011750	Program	$1,430,366	$2,288,453	0.90
Parsons Government Services Inc.	GS00F0005R	DT0012626	Program	$3,026,323	$3,090,266	5.60
Parsons Government Services Inc.	GS00F0005R	DT0012681	Both	$1,784,461	$2,780,226	2.00
Parsons Government Services Inc.	GS00F0005R	DT0013042	Program	$366,046	$366,096	0.50
Parsons Government Services Inc.	GS00F0005R	DT0013131	Program	$1,185,000	$2,557,185	1.00
Parsons Government Services Inc.	GS00F0005R	DT0013499	Program	$285,123	$1,039,053	0.40
Parsons Government Services Inc.	GS00F0005R	DT0013580	Program	$893,627	$2,176,550	0.80
Parsons Government Services Inc.	NA0002895	89233118FNA000001	Program	$353,169	$1,514,947	0.50
Parsons Government Services Inc.	NA0002895	89233118FNA000011	Program	$151,877	$151,877	0.75
Parsons Government Services Inc.	NA0002895	89233118FNA000012	Program	$190,094	$190,094	1.00
Parsons Government Services Inc.	NA0002895	89233118FNA000013	Both	$1,178,161	$3,526,619	0.27
Parsons Government Services Inc.	NA0002895	89233118FNA000014	FSE	$1,474,003	$1,474,003	2.70
Parsons Government Services Inc.	NA0002895	89233118FNA000016	Program	$144,115	$366,481	0.50
Parsons Government Services Inc.	NA0002895	89233118FNA000017	Program	$386,956	$427,256	0.80
Parsons Government Services Inc.	NA0002895	89233118FNA000018	Program	$197,899	$197,899	1.00

Vendor Name	Contract Number	Order Number ("Unavailable" where orders do not exist)	Fund Description	Obligations to Date	Maximum Value (Ultimate Value incl. options)	Total FTEs
Parsons Government Services Inc.	NA0002895	89233118FNA000020	FSE	$315,448	$315,448	0.10
Parsons Government Services Inc.	NA0002895	89233118FNA000021	Program	$1,196,801	$1,196,801	3.75
Parsons Government Services Inc.	NA0002895	89233118FNA000022	FSE	$1,034,886	$3,092,893	0.50
Parsons Government Services Inc.	NA0002895	89233118FNA000023	FSE	$447,412	$447,412	2.25
Parsons Government Services Inc.	NA0002895	BP0005844	Program	$178,274	$178,652	1.50
Parsons Government Services Inc.	NA0002895	BP0005907	Program	$512,205	$619,063	1.50
Perikin Enterprises, LLC	89233118CNA000039	Unavailable	FSE	$50,000	$459,215	1.00
PERTEK 2, LLC	NA0003707	Unavailable	Program	$3,258,809	$3,826,317	7.00
PERTEK, LLC	NA0003206	Unavailable	Program	$2,724,691	$3,169,171	5.00
PERTEK, LLC	NA0003207	Unavailable	Program	$2,269,702	$3,967,309	4.00
PROJECT ENHANCEMENT CORPORATION	GS-00F-0004T	89233118FNA400114	FSE	$994,000	$4,581,605	4.36
PROJECT ENHANCEMENT CORPORATION	GS-00F-0004T	DT0009849	Program	$4,915,174	$8,504,469	9.00
PROJECT ENHANCEMENT CORPORATION	GS-00F-0004T	DT0011426	Program	$34,289,497	$76,691,263	74.50
RHINOCORPS, LTD CO.	NA0003782	Unavailable	Program	$2,950,490	$6,963,815	15.00
Sigma Science, Inc.	89233118DNA000008	89233118FNA400085	Program	$445,824	$445,824	1.00
Sigma Science, Inc.	89233118DNA000008	89233118FNA400090	FSE	$155,786	$267,433	1.00
Sigma Science, Inc.	89233118DNA000009	89233118FNA400080	Program	$169,087	$169,087	1.00
Sigma Science, Inc.	89233118DNA000009	89233118FNA400081	Program	$233,167	$233,167	1.00
Sigma Science, Inc.	89233118DNA000009	89233118FNA400084	Program	$165,994	$165,994	1.00
Summit Exercises and Training LLC	GS-00F-030DA	89233118FNA400091	Program	$1,261,267	$10,558,330	12.00
TECHNOMICS, Inc.	GS-00F-103DA	89233118FNA400047	FSE	$1,483,113	$13,901,934	7.00
TECHSOURCE, INC.	GS00F003DA	DT0010708	Program	$1,325,927	$4,591,096	2.50
TECHSOURCE, INC.	GS-00F-003DA	DT0011223	Program	$3,090,987	$5,421,459	2.50
TECHSOURCE, INC.	GS-00F-003DA	DT0011895	Program	$2,950,632	$8,194,040	3.50
TECHSOURCE, INC.	GS-00F-003DA	DT0012050	Program	$2,632,000	$3,589,501	4.00
TECHSOURCE, INC.	GS-00F-003DA	DT0012211	Program	$1,832,049	$3,280,698	0.50
TECHSOURCE, INC.	GS-00F-003DA	DT0012554	Program	$1,829,134	$2,826,958	3.00
TECHSOURCE, INC.	GS-00F-003DA	DT0013032	Program	$5,603,427	$11,459,404	9.50
TECHSOURCE, INC.	GS-00F-003DA	DT0013055	Both	$10,315,578	$13,574,881	20.50
TECHSOURCE, INC.	GS-00F-003DA	DT0013256	Program	$1,867,000	$4,220,327	3.00
TECHSOURCE, INC.	GS-00F-003DA	DT0013337	Program	$2,240,000	$7,173,479	3.00
TECHSOURCE, INC.	GS-00F-003DA	DT0013591	Program	$1,174,638	$4,232,011	4.00
TECHSOURCE, INC.	GS-00F-003DA	DT0014080	Program	$4,650,000	$8,997,165	8.50
TECHSOURCE, INC.	NA0000461	BP0004432	Program	$11,674,157	$18,987,109	15.00
TECHSOURCE, INC.	NA0000461	BP0005608	Program	$7,521,778	$12,846,466	10.00
Tuva, LLC	NA0003424	Unavailable	Program	$6,650,000	$26,764,078	32.00
Vector Resource, Inc	GS-00F-0004U	89233118FNA400001	Program	$725,000	$2,538,581	4.50
Vector Resource, Inc	GS-00F-0004U	89233118FNA400013	Program	$997,551	$2,136,507	8.00
Vector Resource, Inc	GS-00F-0004U	89233118FNA400053	FSE	$1,660,304	$4,504,054	8.00
Vector Resource, Inc	GS-00F-0004U	DT0012067	Program	$2,433,000	$2,974,878	3.50
Vector Resource, Inc	GS-00F-0004U	DT0012586	Program	$15,881,177	$37,034,897	27.50
WYANT DATA SYSTEMS, INC	GS-35F-0557K	DT0010108	Program	$5,500,000	$6,952,743	9.00
Wyrembelski, Julie A	89233118CNA000026	Unavailable	Program	$91,400	$158,800	1.00
Grand Total				**$433,018,209**	**$823,545,249**	**883.66**

Federal Salaries and Expenses

Federal Salaries and Expenses

Federal Salaries and Expenses
Proposed Appropriation Language

For expenses necessary for Federal Salaries and Expenses in the National Nuclear Security Administration, [$410,000,000] *$434,699,000*, to remain available until September 30, [2020]*2021*, including official reception and representation expenses not to exceed [$12,000] *$17,000*.

Explanation of Changes

The FY 2020 Budget Request for NNSA Federal Salaries and Expenses (FSE) is $434,699,000, a $24,699,000 (6 percent) increase above the FY 2019 Enacted level for the salaries, benefits, and other expenses of 1,768 federal full-time equivalents (FTEs), 1,753 paid from FSE, 15 paid from Working Capital Fund. The increase primarily reflects the request of 63 additional FTEs and additional funding to the Department's Working Capital Fund.

Public Law Authorizations

- P.L. 106-65, National Nuclear Security Administration Act, as amended
- P.L. 115-232, John S. McCain National Defense Authorization Act for Fiscal Year 2019
- P.L. 115-244, Energy and Water, Legislative Branch, and Military Construction and Veterans Affairs Appropriations Act, 2019

Federal Salaries and Expenses

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
	(Dollars in Thousands)			
NNSA Federal Salaries and Expenses	**407,595**	**410,000**	**434,699**	**+24,699**

Outyears for Federal Salaries and Expenses

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
	(dollars in thousands)			
NNSA Federal Salaries and Expenses	**435,302**	**444,096**	**453,066**	**462,673**

Overview

NNSA. FSE provides for the salaries and benefits of 1,768 FTEs, space and occupancy needs, travel costs, support service contractors, training, and other related expenses. Seventy-five percent of FSE funds are for employee salaries and benefits.

Funding by Object Class

Salaries and Benefits: Provides $326,768,000 for salaries and benefits of the federal staff. The NNSA workforce consists of a diverse cadre of engineers, project managers, scientists, foreign affairs specialists, and highly technical support staff that performs program and project management and appropriate oversight of the national security missions related to the safety, security, and effectiveness of the nuclear weapons stockpile; supporting the nuclear modernization program; nuclear nonproliferation efforts; emergency response; safeguards and security oversight; strategic coordination of counterterrorism and counterproliferation initiatives; and safe, secure, and compliant facilities and infrastructure. The workforce is also comprised of mission support staff in information technology and cybersecurity, technical program management, corporate project management, procurement and contract management, safety and health, cost estimating and program evaluation, financial management, human capital management, and legal services.

NNSA staff are located throughout the United States, reflecting NNSA's work with the nuclear security enterprise. FSE funds federal staff geographically located in Washington, DC; Germantown, Maryland; Albuquerque, New Mexico; and at seven federal field offices: Kansas City Field Office (Missouri); Lawrence Livermore Field Office (California); Los Alamos Field Office (New Mexico); Nevada Field Office (Nevada); NNSA Production Office (Texas and Tennessee); Sandia Field Office (New Mexico); and Savannah River Field Office (South Carolina). NNSA also manages the Department's overseas presence, including DOE staff in 14 foreign countries. NNSA supervises both federal employees and locally employed staff, and reimburses the Department of State for International Cooperative Administrative Support Services (ICASS) and Capital Security Cost Sharing (CSCS) charges. DOE funds its overseas presence through the Working Capital Fund (WCF) for administrative and operational support to Departmental personnel.

Travel: Provides $14,050,000 for travel necessary to conduct NNSA business. Domestic travel provides management oversight, public outreach, travel related to training, and national security assistance and interface between NNSA Headquarters, NNSA Field Offices, DOE laboratories and production facilities, and local governments. International travel is a key element of NNSA's nonproliferation work.

Support Services: Includes $26,614,000 for Management and Professional Services to assist or train staff to achieve efficient and effective management and operation of activities and systems, including administrative support, funding for Environmental Safety and Health activities, Corporate Project Management program, and the NNSA Graduate Fellowship Program (NGFP).

Other Expenses: Provides $67,267,000 for the following items:

Training: Provides $3,802,000 for necessary learning, career development, and skills maintenance of the NNSA Federal staff. Includes valuable learning activities for NNSA Headquarters and Field Offices, and corporate training, as managed by the NNSA's Chief Learning Officer. The NNSA corporate training program encompasses the Technical Qualification Program (TQP) and federal and agency mandated training (such as executive, managerial, and supervisory training). It also funds: Leadership Development Programs; Mid-Level Leadership Development Program; Executive Development Program; 360 Assessments; Rotations; NNSA 1st Year (Onboarding) Program; Mentoring; Coaching; and other learning events. Funding is also provided for each NNSA organization with an emphasis on individual employees' training and developmental needs.

Space and Occupancy: Supports $16,385,000 in Space and Occupancy costs for Headquarters and the field. The request includes the functional transfer of activities from Secure Transportation Asset (STA) Program Direction. With the planned completion of the Albuquerque facility in FY 2020, operational funding is consolidated in FSE and Weapons Activities, Information Technology and Cybersecurity (IM) to provide efficiencies in operations. The funding transfer is equivalent to current STA operational cost for the Albuquerque complex.

Working Capital Fund: Provides $42,589,000 for FSE’s contribution to the Department’s WCF. FSE funds a majority of NNSA contributions to the Department’s WCF, a financial management tool for improving the delivery of common administrative services. The Department’s WCF budget chapter details the programs funded through the WCF.

Other Expenses: Provides $4,491,000 in funding for activities required for NNSA’s federal personnel, including field site investigations in coordination with the DOE General Counsel, headquarters security investigations costs, and other miscellaneous procurements, such as potential settlements. Also provides $17,000 for Reception and Representation funds.

Highlights of the FY 2020 Budget Request

The FY 2020 Request supports a federal staff of 1,753 FTEs providing appropriate oversight to ensure NNSA can meet growing mission requirements and commitments as described in the 2018 Nuclear Posture Review including modernizing the nuclear deterrent, recapitalizing the aging infrastructure, and continuing to meet the requirements of nonproliferation and counterterrorism programs.

Two studies, independently conducted and reported in FY 2018 by the Office of Personnel Management (OPM) and the NNSA Office of Cost Estimating and Program Evaluation (CEPE), identify the need to increase NNSA federal staffing above the 1,690 FY 2019 National Defense Authorization Act (NDAA) directed FTE ceiling.

FY 2021 - FY 2024 Strategy

NNSA’s focus will be to provide sufficient people to ensure we can modernize the nuclear deterrent, recapitalize an aging infrastructure, and continue to meet the requirements of our nonproliferation and counterterrorism programs. Meeting NNSA’s growing mission requirements, as described in the 2018 Nuclear Posture Review (NPR), requires an aggressive hiring strategy for the next several years.

Entry Level Hires

The NNSA supports programs, including OPM’s Presidential Management Fellows (PMF) program, NGFP, and Minority Serving Institutions Partnership Program (MSIPP), to recruit and train the next generation of professionals at NNSA and the nuclear security enterprise. These programs foster the pipeline of qualified, skilled specialists who will sustain expertise in the nuclear security enterprise.

In FY 2020, the FSE appropriation will provide up to $1,400,000 for NGFP support and development activities.

Federal Salaries and Expenses
Funding by Congressional Control

Federal Salaries and Expenses

Program Direction

(Dollars in Thousands)

	FY 2018 Enacted [a]	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
NNSA Federal Salaries and Expenses				
Headquarters				
Salaries and Benefits	187,982	216,128	228,288	+12,160
Travel	12,226	13,077	11,769	-1,308
Support Services	39,771	23,104	24,278	+1,174
Other Related Expenses	57,973	40,488	52,344	+11,856
Total, Headquarters	297,952	292,797	316,679	+23,882
Total, Full Time Equivalents	1,115	1,163	1,226	63
Livermore Field Office				
Salaries and Benefits	14,401	16,207	16,407	+200
Travel	355	381	343	-38
Support Services	566	831	665	-166
Other Related Expenses	1,755	1,360	1,565	+205
Total, Livermore Field Office	17,077	18,779	18,980	+201
Total, Full Time Equivalents	71	79	79	0
Los Alamos Field Office				
Salaries and Benefits	13,776	16,210	16,425	+215
Travel	441	402	362	-40
Support Services	699	541	433	-108
Other Related Expenses	530	512	507	-5
Total, Los Alamos Field Office	15,446	17,665	17,727	+62
Total, Full Time Equivalents	75	88	88	0

Program Direction, Continued

	(Dollars in Thousands)			
	FY 2018 Enacted [a]	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Sandia Field Office				
Salaries and Benefits	14,271	14,566	14,766	+200
Travel	338	354	319	-35
Support Services	1,556	262	210	-52
Other Related Expenses	6,479	7,790	7,966	+176
Total, Sandia Field Office	22,644	22,972	23,261	+289
Total, Full Time Equivalents	83	83	83	0
Nevada Field Office				
Salaries and Benefits	13,581	15,465	15,633	+168
Travel	267	295	266	-29
Support Services	418	418	334	-84
Other Related Expenses	1,604	1,618	1,618	+0
Total, Nevada Field Office	15,870	17,796	17,851	+55
Total, Full Time Equivalents	71	79	79	0
NNSA Production Office (NPO)				
Salaries and Benefits	21,654	23,303	23,636	+333
Travel	627	668	601	-67
Support Services	377	377	302	-75
Other Related Expenses	2,427	2,521	2,515	-6
Total, NNSA Production Office	25,085	26,869	27,054	+185
Total, Full Time Equivalents	124	131	131	0

Program Direction, Continued

	FY 2018 Enacted [a]	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
	(Dollars in Thousands)			
Kansas City Field Office				
Salaries and Benefits	6,040	6,170	6,269	+99
Travel	260	249	224	-25
Support Services	54	333	266	-67
Other Related Expenses	670	654	654	+0
Total, Kansas City Field Office	7,024	7,406	7,413	+7
Total, Full Time Equivalents	39	38	38	0
Savannah River Field Office				
Salaries and Benefits	5,236	5,250	5,344	+94
Travel	177	184	166	-18
Support Services	87	157	126	-31
Other Related Expenses	997	125	98	-27
Total, Savannah River Field Office	6,497	5,716	5,734	+18
Total, Full Time Equivalents	30	29	29	0
NNSA Federal Salaries and Expenses				
Salaries and Benefits	276,941	313,299	326,768	+13,469
Travel	14,691	15,610	14,050	-1,560
Support Services	43,528	26,023	26,614	+591
Other Related Expenses	72,435	55,068	67,267	+12,199
Total, NNSA Federal Salaries and Expenses	407,595	410,000	434,699	+24,699
FTEs (paid from FSE)	1,608	1,690	1,753	63
FTEs (paid from WCF)	15	15	15	0
Total FTEs	1,623	1,705	1,768	63

[a] In FY 2018, a total of $290,100,000 was spent on salaries and benefits for 1,608 FTEs, of which $276,941,000 was FY 2018 funding and $13,159,000 was prior year balances.

Support Services and Other Related Expenses

(Dollars in Thousands)

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Support Services				
Management and Professional Services	30,627	20,616	18,064	-2,552
Environmental Safety and Health Support	253	253	253	+0
Corporate Project Management Support	12,648	5,154	8,297	+3,143
Total, Support Services	**43,528**	**26,023**	**26,614**	**+591**
Other Related Expenses				
Training	3,933	3,935	3,802	-133
Space and Occupancy Costs	14,208	16,697	16,385	-312

Support Services and Other Related Expenses, Continued

(Dollars in Thousands)

Headquarters Working Capital Fund (WCF)	FY 2018 Enacted	FY 2019 Enacted [b]	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Supplies	423	423	423	+0
Building Occupancy	27,020	5,827	18,924	+13,097
Telecommunications	8,879	8,879	8,879	+0
Corporate Training Services	429	429	429	+0
iMANAGE	2,405	2,405	2,405	+0
Overseas Representation	11,259	11,259	11,259	+0
Health Services	270	270	270	+0
TOTAL, Headquarters Working Capital Fund (WCF)	50,685	29,492	42,589	+13,097
Other Expenses				
Other Services	3,597	4,932	4,474	-458
Reception and Representation	12	12	17	+5
Subtotal, Other Expenses	3,609	4,944	4,491	-453
Total, Other Related Expenses	**72,435**	**55,068**	**67,267**	**+12,199**

[b] Actual operating level in FY 2019 is $42,989,000 ($29,492,000 FY 2019 funding; $13,497,000 FY 2008 funding).

NNSA Program Direction
Outyears

	(Dollars in Thousands)			
	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
NNSA Federal Salaries and Expenses				
Headquarters				
Salaries and Benefits	228,891	235,215	241,638	248,568
Travel	11,769	11,960	12,153	12,366
Support Services	24,278	24,673	25,070	25,509
Other Related Expenses	52,344	53,145	54,006	54,926
Total, Headquarters	317,282	324,993	332,868	341,368
Total, Full Time Equivalents	1,226	1,246	1,266	1,288
Livermore Field Office				
Salaries and Benefits	16,407	16,587	16,769	16,953
Travel	343	343	343	343
Support Services	665	665	665	665
Other Related Expenses	1,565	1,565	1,565	1,565
Total, Livermore Field Office	18,980	19,160	19,342	19,526
Total, Full Time Equivalents	79	79	79	79
Los Alamos Field Office				
Salaries and Benefits	16,425	16,606	16,789	16,974
Travel	362	362	362	362
Support Services	433	433	433	433
Other Related Expenses	507	507	507	507
Total, Los Alamos Field Office	17,727	17,908	18,091	18,276
Total, Full Time Equivalents	88	88	88	88

Outyears , continued

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
	(Dollars in Thousands)			
Sandia Field Office				
Salaries and Benefits	14,766	14,928	15,092	15,258
Travel	319	319	319	319
Support Services	210	210	210	210
Other Related Expenses	7,966	7,966	7,966	7,966
Total, Sandia Field Office	23,261	23,423	23,587	23,753
Total, Full Time Equivalents	83	83	83	83
Nevada Field Office				
Salaries and Benefits	15,633	15,805	15,979	16,155
Travel	266	266	266	266
Support Services	334	334	334	334
Other Related Expenses	1,618	1,618	1,618	1,618
Total, Nevada Field Office	17,851	18,023	18,197	18,373
Total, Full Time Equivalents	79	79	79	79
NNSA Production Office (NPO)				
Salaries and Benefits	23,636	23,896	24,159	24,425
Travel	601	601	601	601
Support Services	302	302	302	302
Other Related Expenses	2,515	2,515	2,515	2,515
Total, NNSA Production Office	27,054	27,314	27,577	27,843
Full Time Equivalents	131	131	131	131

Outyears , continued

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
	(Dollars in Thousands)			
Kansas City Field Office				
Salaries and Benefits	6,269	6,338	6,408	6,478
Travel	224	224	224	224
Support Services	266	266	266	266
Other Related Expenses	654	654	654	654
Total, Kansas City Field Office	7,413	7,482	7,552	7,622
Total, Full Time Equivalents	38	38	38	38
Savannah River Field Office				
Salaries and Benefits	5,344	5,403	5,462	5,522
Travel	166	166	166	166
Support Services	126	126	126	126
Other Related Expenses	98	98	98	98
Total, Savannah River Field Office	5,734	5,793	5,852	5,912
Total, Full Time Equivalents	29	29	29	29
NNSA Federal Salaries and Expenses				
Salaries and Benefits	327,371	334,778	342,296	350,333
Travel	14,050	14,241	14,434	14,647
Support Services	26,614	27,009	27,406	27,845
Other Related Expenses	67,267	68,068	68,929	69,849
Total, NNSA Federal Salaries and Expenses	435,302	444,096	453,066	462,673
FTEs (paid from FSE)	1,753	1,773	1,793	1,815
FTEs (paid from WCF)	15	15	15	15
Total FTEs	1,768	1,788	1,808	1,830

Federal Salaries and Expenses
Program Direction

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Salaries and Benefits $313,299,000	**Salaries and Benefits $326,768,000**	**Salaries and Benefits +$13,469,000**
• Provides support for an NNSA federal staff of 1,690 full-time equivalents (FTEs). • Includes 5.5% benefit escalation.	• Provides support for an NNSA federal staff of 1,753 FTEs. • Includes 5.5% benefit escalation.	• Increase reflects 63 FTEs above the FY 2019 enacted level and 5.5% benefit escalation.
Travel $15,610,000	**Travel $14,050,000**	**Travel -$1,560,000**
• Supports domestic and foreign travel necessary as part of NNSA's mission.	• Supports domestic and foreign travel necessary as part of NNSA's mission.	• Decrease of 10% reflects planned efficiencies.
Support Services $26,023,000	**Support Services $26,614,000**	**Support Services +$591,000**
• Includes Management and Professional Services; Environment Safety and Health support; NGFP support ($20,869,000). • Includes Corporate Project Management program ($5,154,000).	• Includes Management and Professional Services; Environment Safety and Health support; NGFP support ($18,317,000). • Includes Corporate Project Management program ($8,297,000).	**Management and Professional Services (-$2,552,000):** • Decrease of $4,552,000 from the FY 2019 operating level of $22,896,000 (-20%) reflects planned efficiencies and completion of NAS/NAPA study support. • Partially offset by an increase of $2,000,000 due to the one-time reduction in FY 2019 to reflect the use of available FY 2018 balances.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
		Corporate Project Management (+3,143,000): • Increase of $2,800,000 due to a one-time reduction in FY 2019 reflects the use of available FY 2018 balances. • Increase of $343,000 from the FY 2019 operating level of $7,954,000 reflects increase project workload.
Other Expenses $55,068,000	**Other Expenses $67,267,000**	**Other Expenses +$12,199,000**
• Provides funding for Space and Occupancy costs at Headquarters and field sites ($16,697,000). • Includes FSE's contribution to the DOE WCF ($29,492,000). • Provides necessary training and skills maintenance of the NNSA federal staff ($3,935,000). • Includes funding for miscellaneous procurements ($4,944,000).	• Provides funding for Space and Occupancy costs at Headquarters and field sites ($16,385,000). • Includes FSE's contribution to the DOE WCF ($42,589,000). • Provides necessary training and skills maintenance of the NNSA federal staff ($3,802,000). • Includes funding for miscellaneous procurements ($4,491,000).	Space and Occupancy: • $312,000 decrease reflects one-time facility upgrades in FY 2019 ($1,612,000); offset by a transfer from STA Program Direction subprograms in FY 2020 for operations and

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
		maintenance costs for the Albuquerque facility ($1,300,000 FSE; $300,000 IM). Working Capital Fund: • $13,097,000 increase is due to a one-time reduction in FY 2019 to reflect the use of available FY 2018 balances. • Actual operating level is $42,989,000 ($29,492,000 FY 2019 funding; $13,497,000 FY 2018 funding). Other Expenses: • $453,000 decrease reflects planned efficiencies to accommodate additional Federal staff. Training: • $133,000 decrease reflects planned efficiencies to accommodate additional Federal staff.

Department Of Energy

FY 2020 Congressional Budget

Funding by Appropriation by Site

($K)

Federal Salaries and Expenses	FY 2018 Total Enacted	FY 2019 Enacted	FY 2020 Request
Argonne National Laboratory			
Federal Salaries and Expenses			
Federal Salaries and Expenses	461	428	428
Total, Argonne National Laboratory	**461**	**428**	**428**
Kansas City Site Office			
Federal Salaries and Expenses			
Federal Salaries and Expenses	7,024	7,406	7,413
Total, Kansas City Site Office	**7,024**	**7,406**	**7,413**
Livermore Site Office			
Federal Salaries and Expenses			
Federal Salaries and Expenses	17,077	18,779	18,779
Total, Livermore Site Office	**17,077**	**18,779**	**18,779**
Los Alamos Site Office			
Federal Salaries and Expenses			
Federal Salaries and Expenses	15,446	17,665	17,727
Total, Los Alamos Site Office	**15,446**	**17,665**	**17,727**
National Energy Technology Lab			
Federal Salaries and Expenses			
Federal Salaries and Expenses	97	131	131
Total, National Energy Technology Lab	**97**	**131**	**131**
Nevada Field Office			
Federal Salaries and Expenses			
Federal Salaries and Expenses	15,870	17,796	17,851
Total, Nevada Field Office	**15,870**	**17,796**	**17,851**
NNSA Production Office (NPO)			
Federal Salaries and Expenses			
Federal Salaries and Expenses	22,851	24,635	24,820
Total, NNSA Production Office (NPO)	**22,851**	**24,635**	**24,820**
Oak Ridge Institute for Science & Education			
Federal Salaries and Expenses			
Federal Salaries and Expenses	629	629	629
Total, Oak Ridge Institute for Science & Education	**629**	**629**	**629**
Oak Ridge National Laboratory			
Federal Salaries and Expenses			
Federal Salaries and Expenses	275	275	275
Total, Oak Ridge National Laboratory	**275**	**275**	**275**

Department Of Energy

FY 2020 Congressional Budget

Funding by Appropriation by Site

($K)

Federal Salaries and Expenses	FY 2018 Total Enacted	FY 2019 Enacted	FY 2020 Request
Pacific Northwest National Laboratory			
Federal Salaries and Expenses			
Federal Salaries and Expenses	2,996	0	1,400
Total, Pacific Northwest National Laboratory	**2,996**	**0**	**1,400**
Sandia Site Office			
Federal Salaries and Expenses			
Federal Salaries and Expenses	22,644	22,972	23,261
Total, Sandia Site Office	**22,644**	**22,972**	**23,261**
Savannah River Operations Office			
Federal Salaries and Expenses			
Federal Salaries and Expenses	6,497	5,716	5,734
Total, Savannah River Operations Office	**6,497**	**5,716**	**5,734**
Washington Headquarters			
Federal Salaries and Expenses			
Federal Salaries and Expenses	293,450	291,328	314,011
Total, Washington Headquarters	**293,450**	**291,328**	**314,011**
Y-12 National Security Complex			
Federal Salaries and Expenses			
Federal Salaries and Expenses	2,278	2,240	2,240
Total, Y-12 National Security Complex	**2,278**	**2,240**	**2,240**
Total, Federal Salaries and Expenses	**407,595**	**410,000**	**434,699**

Weapons Activities

Weapons Activities

FY 2020 Congressional Budget Justification

Weapons Activities

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Weapons Activities
Proposed Appropriation Language

For Department of Energy expenses, including the purchase, construction, and acquisition of plant and capital equipment and other incidental expenses necessary for atomic energy defense weapons activities in carrying out the purposes of the Department of Energy Organization Act (42 U.S.C 7101 et seq.), including the acquisition or condemnation of any real property or any facility or for plant or facility acquisition, construction, or expansion and the purchase of not to exceed one ambulance for replacement only, [$11,100,000,000]$12,408,603,000 to remain available until expended: Provided, That of such amount, [$102,022,000]$107,660,000 shall be available until September 30, [2020]2021, for program direction.

Explanation of Change

The FY 2020 Budget Request provides an 11.8% increase from the FY 2019 Enacted Level to support the current stockpile, life extension programs, modernization efforts, and the scientific tools necessary for these efforts, and is consistent with the 2018 Nuclear Posture Review (NPR). The Nuclear Weapons Council (NWC) will translate the NPR's policy initiatives into requirements. This request positions NNSA to support the NPR initiatives while working within the NWC as it defines the military requirements and strategic direction.

Major FY 2020 funding increases support the progression of the W80-4 Life Extension Program (LEP), expansion of efforts to meet future pit production requirements, Stockpile Systems and Services activities to ensure modernization programs remain aligned to Department of Defense (DOD) plans, improving NNSA's plutonium experimental capabilities via the Enhanced Capabilities for Subcritical Experiments program, continuing investments in Exascale computing, and recapitalization of physical and cyber security infrastructure.

Public Law Authorizations

- P.L 106-65, National Nuclear Security Administration Act, as amended
- P.L 115-244, Energy and Water Development Appropriations Act, 2019
- P.L 115-232, John S. McCain National Defense Authorization Act for Fiscal Year 2019

Weapons Activities

	(Dollars in Thousands)			
	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Weapons Activities	10,642,138	11,113,080	12,408,603	+1,295,523
Use of Prior Year Balances	0	-13,080	0	+13,080
Total, Weapons Activities	**10,642,138**	**11,100,000**	**12,408,603**	**+1,308,603**

Overview
Programs funded in the Weapons Activities appropriation support the Nation's current and future defense posture and necessary nationwide infrastructure of science, technology and engineering capabilities without conducting underground testing. Weapons Activities provides for the maintenance and refurbishment of nuclear weapons to continue sustained confidence in their safety, reliability, and performance; investment in scientific, engineering, and manufacturing capabilities for certification of the enduring nuclear weapons stockpile; and manufacture of nuclear weapon components. Weapons Activities also provides for maintenance and investment in the NNSA nuclear complex infrastructure to be more responsive and cost effective.

NNSA's Management and Operating (M&Os) contractors employ approximately 39,000 people to deliver these programs, predominantly at eight geographical sites NNSA M&O contractors, managed by a Federal workforce, are composed of civilian and military staff. Additional details about these programs will be included in the FY 2020 Stockpile Stewardship and Management Plan (SSMP).

Highlights and Major Changes in the FY 2020 Budget
Directed Stockpile Work (DSW)
DSW will continue to conduct activities that support the nuclear weapons stockpile. These activities include maintenance and surveillance; planned refurbishment; reliability assessments; weapon dismantlement and disposition; research, development, and certification of technology efforts to meet stockpile requirements; and management of strategic materials. The FY 2020 Request for Life Extension Programs (LEP) and Major Alterations (Alt) highlights planned increases in work scope for the W80-4 LEP, completion of production and delivery of all W76-2 warheads, and expanded feasibility and design option activities for the W87-1 Modification Program (formerly IW1) so it remains aligned with current DOD nuclear modernization plans Stockpile Systems and Services to ensure these activities remain aligned to DOD modernization plans, Within Plutonium Sustainment, increases will support design activities for Savannah River Plutonium Processing Facility (SRPPF) Project and increased staffing, certification activities, and equipment installation across three sites (LANL, LLNL, and SRS). The Domestic Uranium Enrichment increase supports continued efforts to down-blend available stocks of highly enriched uranium for use in tritium production, which postpones the need date for a domestic uranium enrichment capability. The Strategic Materials Sustainment increase supports recapitalization efforts, including technology advances, to reduce operational risk of material storage.

Research, Development, Test, and Evaluation (RDT&E) Programs
RDT&E will continue to develop and maintain the critical capabilities, tools, and processes needed to support science-based stockpile stewardship, refurbishment, and continued certification of the stockpile without the use of underground nuclear explosive testing. The FY 2020 request supports required annual assessments and future LEP options and systems certification, including hydrodynamic and subcritical experiments and the infrastructure and equipment required to support these experiments. The request includes increased funding for Advanced Simulation and Computing to support technologies critical to an exascale capability for the nation and incorporating exascale-class computing into the NNSA Nuclear Security Enterprise. Increased funding in the Science program will support investments in additional confirmatory and subcritical experiments for stockpile stewardship, as well as, the Enhanced Capabilities for Subcritical Experiments project, which will improve the capabilities necessary for conducting these experiments. Within the Engineering program, the request supports increases for initiatives such as NPR tasks related to delivery environments, design and qualification of future critical surety technologies, R&D and engineering efforts for the recapitalization of x-ray radiation environment testing at SATURN, and characterization of high-risk stockpile components/materials along with prioritized lifetime

assessments. The request includes increased funding for the Advanced Manufacturing Development program to support expansion of additive manufacturing for specific stockpile components, development of new manufacturing processes to replace hazardous and obsolete processes, and advanced technologies for new weapon systems.

Infrastructure and Operations (I&O)

I&O maintains, operates, and modernizes the NNSA infrastructure in a safe, secure, and cost-effective manner to support program results while maximizing return on investment and reducing enterprise risk. The program also plans, prioritizes, and constructs state-of-the-art facilities, infrastructure, and scientific tools. For FY 2020, funding will continue the stabilization of deferred maintenance, execute Recapitalization projects to improve the condition and extend the design life of structures, capabilities, and systems to meet program demands; decrease overall operating costs; and reduce safety, security, environmental, and program risk. The request supports an increase in funding for the Uranium Processing Facility (UPF) per the project execution plan and efforts to phase out mission dependency in the existing aged facility. Funding is also provided for the Chemistry and Metallurgy Research Replacement Facility (CMRR) project, the U1a Complex Enhancements Project, the Lithium Processing Facility, the Tritium Finishing Facility, the High Explosive Science & Engineering Facility, the 138kV Power Transmission System Replacement project, and Emergency Operations Centers at SNL and LLNL.

Infrastructure Modernization Initiative

The FY 2018 National Defense Authorization Act (NDAA) directed the creation of the Infrastructure Modernization Initiative (IMI) program, which the NNSA Administrator created in December 2017. The IMI will use the current budget structure with emphasis on the Recapitalization: Infrastructure & Safety and Maintenance and Repair of Facilities programs. The initial plan was transmitted to Congress in September 2018.

Capital Acquisition (CapAx) Planning Process

The NNSA developed the CapAx process to integrate the Weapons Activities planning, programming, budgeting and execution process with the DOE O 413.3B Capital Acquisition Process. This effort mirrors the NNSA LEP planning process by leveraging site expertise, programmatic reviews, and independent federal cost and schedule estimates. Representatives from all the sites and responsible federal offices provide support across DOE/NNSA. Senior NNSA leadership determines the final 25-year schedule of major projects. This schedule includes both ongoing projects and new project proposals. Resulting from the CapAx process, funding is included within Capability Based Investments for early planning on three projects: Power Sources Capability at SNL; High Explosive Synthesis, Formulation, and Production and Pantex; and the Combined Radiation Environments for Survivability Testing (CREST) Complex at SNL.

Secure Transportation Asset (STA)

STA supports the safe and secure transportation of nuclear weapons, special nuclear material, and weapon components to meet projected DOE, DOD, and other customer requirements. STA Program Direction provides funding for the secure transportation workforce, including federal agents. FY 2020 requested funding increases support for critical workforce capabilities and asset modernization initiatives and restore Federal Agent strength levels required to meet the STA mission capacity. These initiatives include the completion of two Mobile Guardian Transporter (MGT) Test Articles to support first production unit (FPU) in FY 2025. The FY 2020 increase will also support a Pre-Production Unit (PPU) Rolling Chassis Manufacturing Readiness Review and deferred maintenance and minor construction projects of existing facilities at STA's training facility in Ft. Smith, Arkansas.

Defense Nuclear Security (DNS)

DNS provides protection for NNSA personnel, facilities, nuclear weapons, and materials from a full spectrum of threats, ranging from minor security incidents to acts of terrorism. In addition, DNS provides nuclear security expertise for a broad set of 21st century national security needs, such as those in defense nuclear nonproliferation, homeland security, and intelligence. Employing more than 1,500 protective force officers, DNS secures more than 4,400 buildings and protects more than 57,000 personnel. The FY 2020 Request includes funding to fill positions in key security program areas at the sites, including protective forces, physical security systems, information security, technical security, personnel security, nuclear material control and accountability, and security program operations and planning. It also supports sustaining implementation and operation of counter-unmanned aircraft systems at sites possessing Category 0/I special nuclear material; and supports efforts to begin implementation of the Design Basis Threat policy. It includes funding for critical

Security Infrastructure Revitalization Program projects, which address high-priority security systems and related security infrastructure and equipment refresh needs.

Information Technology and Cybersecurity

IM provides a range of IT and Cybersecurity support functions, activities and manages cybersecurity operations and program areas within NNSA's M&O contractors. Additionally, the program executes and coordinates Public Key Infrastructure and other Committee on National Security Systems requirements, and leverages IT Modernization efforts across the NNSA nuclear security enterprise to increase the efficiency and cost-effectiveness of NNSA IT services consistent with the DOE Strategies. The FY 2020 request enables the continuation of integration and coordination of cybersecurity and information technology support activities and functions throughout the NNSA nuclear security enterprise and provides continuity of operations for NNSA's critical information technology assets. The Information Technology and Cybersecurity Program will make scope and funding adjustments to its existing reporting structure to better allocate and differentiate the aspects of cybersecurity and IT that exist amongst all requirements. Under the new structure Site Infrastructure will now be split into two sections entitled Site Infrastructure and Enterprise Operations to better represent which requirements are specifically intended for operating cybersecurity at the Labs and Plants versus requirements that are intended for the benefit of the enterprise.

Crosscutting programs

The FY 2020 Budget Request continues crosscutting programs across the Department to improve the overall efficiency and effectiveness of DOE's mission.

Cybersecurity Crosscut

DOE is engaged in two categories of cyber-related activities: protecting the DOE enterprise from a range of cyber threats that can adversely influence mission capabilities, and improving cybersecurity and grid resilience in the energy sector. The cybersecurity crosscut supports central coordination of the strategic and operational aspects of cybersecurity and facilitates cooperative efforts such as the Integrated Joint Cybersecurity Coordination Center (iJC3) for incident response and the implementation of Department-wide Identity, Credentials, and Access Management (ICAM).

Exascale Computing

Exascale systems are needed to improve NNSA weapons design, stewardship, and stockpile certification capabilities to ensure the U.S maintains leadership in high-performance simulations that underpin our nuclear deterrent that are not within the capacities of today's systems. Exascale systems' computational power is needed for increasing capable data-analytic and data-intense applications across the entire federal complex. Exascale is a component of long-term collaboration between the interagency National Strategic Computing Initiative, the DOE/Office of Science's Advanced Scientific Computing Research program and NNSA's ASC program.

New Brunswick Laboratory Program Office (NBL PO)

The Department proposes to transfer the NBL PO mission, scope, and operations to NNSA from the Office of Science. The NBL PO is responsible for the production of certified reference materials (CRM), providing proficiency testing services and measurement quality expertise, and ensuring distribution and availability of CRM to customers both domestically and internationally as part of interagency agreements. NNSA facilities currently support the NBL PO with the production, storage, and shipping of CRM. NBL PO fits within the NNSA mission space and supports our national security, international safeguards and nonproliferation programs, and strategic partners. Approximately $1,600,000 will be provided to NBL from Weapons Activities during FY 2020. The transfer is a management improvement because it ensures NNSA has the responsibility to oversee reference material production and distribution that directly affects NNSA production and quality throughout the nuclear security enterprise.

DOE Working Capital Fund (WCF) Support

NNSA Weapons Activities appropriation projected contribution to the DOE WCF for FY 2020 is $22,723,000 This funding covers certain shared enterprise activities including managing enterprise-wide systems, data, and telecommunications and supporting the integrated acquisition environment.

Legacy Contractor Pensions
This funding provides the Weapons Activities share of the DOE's annual reimbursement made to the University of California (UC) Retirement Plan (UCRP) for former UC employees and annuitants who worked at the Lawrence Livermore National Laboratory (LLNL) and Los Alamos National Laboratory (LANL). The UCRP benefit for these individuals is a legacy cost and required by contract. The annual reimbursement is based on the actuarial valuation report and is covered by the terms described in the contracts. These contracts are paid through the Legacy Contractor Pensions line item.

Entry Level Hires
The NNSA supports a variety of programs to help train and recruit the next generation of leaders in managing the nuclear stockpile, nonproliferation, nuclear security, and international security, such as the NNSA Graduate Fellowship Program (NGFP), the Minority Serving Institutions Partnership Program (MSIPP), and, where appropriate, the Presidential Management Fellows (PMF) program. These programs foster the pipeline of qualified professionals who will sustain expertise in these areas through future employment in the NNSA nuclear security enterprise In FY 2020, the Weapons Activities appropriation anticipates spending about $4,429,000 on the NGFP program.

Weapons Activities
Funding by Program

(Dollars in Thousands)

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Directed Stockpile Work				
Life Extension Programs and Major Alterations				
B61 Life Extension Program	788,572	794,049	792,611	-1,438
W76 Life Extension Program	224,134	48,888	0	-48,888
W76-2 Modification Program	0	65,000	10,000	-55,000
W88 Alt 370 (W88 Alteration Program)	332,292	304,285	304,186	-99
W80-4 Life Extension Program	399,090	654,766	898,551	+243,785
IW1	0	53,000	0	-53,000
W87-1 Modification Program (formerly IW1)	0	0	112,011	+112,011
Next Strategic Missile Warhead (formerly IW2)	0	0	0	
Total, Life Extension Programs and Major Alterations	**1,744,088**	**1,919,988**	**2,117,359**	**+197,371**
Stockpile Systems				
B61 Stockpile Systems	59,729	64,547	71,232	+6,685
W76 Stockpile Systems	51,400	84,300	89,804	+5,504
W78 Stockpile Systems	60,100	81,329	81,299	-30
W80 Stockpile Systems	80,087	80,204	85,811	+5,607
B83 Stockpile Systems	35,762	35,082	51,543	+16,461
W87 Stockpile Systems	83,200	83,107	98,262	+15,155
W88 Stockpile Systems	131,576	170,913	157,815	-13,098
Total, Stockpile Systems	**501,854**	**599,482**	**635,766**	**+36,284**
Weapons Dismantlement and Disposition	**56,000**	**56,000**	**47,500**	**-8,500**
Stockpile Services				
Production Support	485,400	510,000	543,964	+33,964
Research and Development Support	31,150	36,150	39,339	+3,189
Research and Deveopment Certification and Safety	196,840	201,840	236,235	+34,395
Management, Technology, and Production	285,400	300,736	305,000	+4,264
Total, Stockpile Services	**998,790**	**1,048,726**	**1,124,538**	**+75,812**
Strategic Materials				
Uranium Sustainment	24,000	87,182	94,146	+6,964
Plutonium Sustainment	210,367	361,282	712,440	+351,158
Tritium Sustainment	198,152	290,275	269,000	-21,275
Lithium Sustainment	0	29,135	28,800	-335
Domestic Uranium Enrichment	60,000	50,000	140,000	+90,000
Strategic Materials Sustainment	216,196	216,196	256,808	+40,612
Total, Strategic Materials	**708,715**	**1,034,070**	**1,501,194**	**+467,124**
Total, Directed Stockpile Work	**4,009,447**	**4,658,266**	**5,426,357**	**+768,091**

	(Dollars in Thousands)			
	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Research, Development, Test and Evaluation (RDT&E)				
Science				
Advanced Certification	57,710	57,710	57,710	+0
Primary Assessment Technologies	89,313	89,313	95,169	+5,856
Dynamic Materials Properties	120,000	120,000	133,800	+13,800
Advanced Radiography	37,600	32,544	32,544	+0
Secondary Assessment Technologies	76,833	77,553	77,553	+0
Academic Alliances and Partnerships	52,963	53,364	44,625	-8,739
Enhanced Capabilities for Subcritical Experiments	40,105	50,000	145,160	+95,160
Total, Science	**474,524**	**480,484**	**586,561**	**+106,077**
Engineering				
Enhanced Surety	39,717	39,717	46,500	+6,783
Weapon Systems Engineering Assessment Technology	23,029	23,029		-23,029
Delivery Environments (formerly Weapons Systems Engineering Assessment Technology)			35,945	+35,945
Nuclear Survivability	45,230	48,230	53,932	+5,702
Enhanced Surveillance	45,147	45,147	57,747	+12,600
Stockpile Responsiveness	30,000	34,000	39,830	+5,830
Total, Engineering	**183,123**	**190,123**	**233,954**	**+43,831**
Inertial Confinement Fusion Ignition and High Yield				
Ignition	79,575	0	0	+0
Support of Other Stockpile Programs	23,565	0	0	+0
Ignition and Other Stockpile Programs	0	101,140	55,649	-45,491
Diagnostics, Cryogenics and Experimental Support	77,915	77,915	66,128	-11,787
Pulsed Power Inertial Confinement Fusion	7,596	6,596	8,571	+1,975
Joint Program in High Energy Density Laboratory Plasmas	9,492	8,492	12,000	+3,508
Facility Operations and Target Production	346,791	350,791	338,247	-12,544
Total, Inertial Confinement Fusion Ignition and High Yield	**544,934**	**544,934**	**480,595**	**-64,339**
Advanced Simulation and Computing				
Advanced Simulation and Computing	721,244	670,119	789,849	+119,730
Construction	25,000	47,000	50,000	+3,000
Total, Advanced Simulation and Computing	**746,244**	**717,119**	**839,849**	**+122,730**
Advanced Manufacturing Development				
Additive Manufacturing	12,000	12,000	18,500	+6,500
Component Manufacturing Development	38,644	38,644	48,410	+9,766
Process Technology Development	34,896	30,914	69,998	+39,084
Total, Advanced Manufacturing Development	**85,540**	**81,558**	**136,908**	**+55,350**
Total, RDT&E	**2,034,365**	**2,014,218**	**2,277,867**	**+263,649**

	(Dollars in Thousands)			
	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Infrastructure and Operations				
Operating				
Operations of Facilities	848,470	870,000	905,000	+35,000
Safety and Environmental Operations	110,000	110,000	119,000	+9,000
Maintenance and Repair of Facilities	515,138	515,000	456,000	-59,000
Recapitalization				
Infrastructure and Safety	482,661	450,000	447,657	-2,343
Capability Based Investments	130,000	109,057	135,341	+26,284
Subtotal, Recapitalization	**612,661**	**559,057**	**582,998**	**+23,941**
Total, Operating	**2,086,269**	**2,054,057**	**2,062,998**	**+8,941**
Construction	1,031,534	1,033,795	1,145,444	+111,649
Total, Infrastructure and Operations	**3,117,803**	**3,087,852**	**3,208,442**	**+120,590**
Secure Transportation Asset				
Operations and Equipment	185,568	176,617	209,502	+32,885
Program Direction	105,600	102,022	107,660	+5,638
Total, Secure Transportation Asset	**291,168**	**278,639**	**317,162**	**+38,523**
Defense Nuclear Security				
Operations and Maintenance	**686,977**	**690,638**	**778,213**	**+87,575**
Security Improvement Program	30,000			+0
Total, Operations and Maintenance	**716,977**	**690,638**	**778,213**	**+87,575**
Construction	53,600	0	0	+0
Total, Defense Nuclear Security	**770,577**	**690,638**	**778,213**	**+87,575**
Information Technology and Cybersecurity	**186,728**	**221,175**	**309,362**	**+88,187**
Legacy Contractor Pensions	**232,050**	**162,292**	**91,200**	**-71,092**
Subtotal, Weapons Activities	**10,642,138**	**11,113,080**	**12,408,603**	**+1,295,523**
Use of Prior Year Balances	**0**	**-13,080**	**0**	**+13,080**
Total, Weapons Activities	**10,642,138**	**11,100,000**	**12,408,603**	**+1,308,603**

Outyears for Weapons Activities
Funding

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
	(Dollars in Thousands)			
Directed Stockpile Work				
Life Extension Programs and Major Alterations				
B61 Life Extension Program	750,663	667,450	539,900	326,550
W76 Life Extension Program	0	0	0	0
W76-2 Modification Program	0	0	0	0
W88 Alt 370 (W88 Alteration Program)	249,283	201,802	127,708	73,323
W80-4 Life Extension Program	1,024,000	1,091,000	1,148,010	1,108,000
IW1	0	0	0	0
W87-1 Modification Program (formerly IW1)	363,260	393,701	488,300	558,000
Next Strategic Missile Warhead (formerly IW2)	0	0	56,900	182,490
Total, Life Extension Programs and Major Alterations	**2,387,206**	**2,353,953**	**2,360,818**	**2,248,363**
Stockpile Systems				
B61 Stockpile Systems	86,468	95,715	102,262	110,514
W76 Stockpile Systems	97,513	97,723	95,086	101,083
W78 Stockpile Systems	88,593	92,600	98,000	111,557
W80 Stockpile Systems	73,921	77,618	76,281	77,883
B83 Stockpile Systems	30,795	46,952	53,254	36,646
W87 Stockpile Systems	102,139	103,200	103,796	111,998
W88 Stockpile Systems	125,936	120,075	110,075	105,592
Total, Stockpile Systems	**605,365**	**633,883**	**638,754**	**655,273**
Weapons Dismantlement and Disposition	**50,000**	**51,000**	**51,000**	**51,000**
Stockpile Services				
Production Support	555,973	572,760	579,964	597,865
Research and Development Support	41,833	44,527	46,169	51,202
Research and Deveopment Certification and Safety	248,456	262,319	275,430	302,689
Managemement, Technology, and Production	304,000	319,500	314,168	329,913
Total, Stockpile Services	**1,150,262**	**1,199,106**	**1,215,731**	**1,281,669**
Strategic Materials				
Uranium Sustainment	96,753	98,793	100,824	102,941
Plutonium Sustainment	976,813	1,222,889	1,473,491	1,289,470
Tritium Sustainment	286,000	299,000	262,000	243,690
Lithium Sustainment	29,404	30,022	30,653	31,297
Domestic Uranium Enrichment	145,000	150,000	155,000	158,255
Strategic Materials Sustainment	259,847	240,427	245,740	250,900
Total, Strategic Materials	**1,793,817**	**2,041,131**	**2,267,708**	**2,076,553**
Total, Directed Stockpile Work	**5,986,650**	**6,279,073**	**6,534,011**	**6,312,858**

	(Dollars in Thousands)			
	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Research, Development, Test and Evaluation (RDT&E)				
Science				
Advanced Certification	60,650	64,068	66,062	67,449
Primary Assessment Technologies	106,827	116,951	127,409	130,084
Dynamic Materials Properties	147,767	159,914	134,428	137,251
Advanced Radiography	35,989	37,375	38,789	42,733
Secondary Assessment Technologies	82,104	83,952	85,841	87,644
Academic Alliances and Partnerships	53,052	55,993	56,726	57,917
Enhanced Capabilities for Subcritical Experiments	170,379	172,800	186,500	161,833
Total, Science	**656,768**	**691,053**	**695,755**	**684,911**
Engineering				
Enhanced Surety	52,626	53,710	54,585	60,177
Delivery Environments (formerly Weapons Systems Engineering Assessment Technology)	39,235	39,485	42,552	44,055
Nuclear Survivability	59,500	61,000	63,650	66,655
Enhanced Surveillance	62,260	63,546	64,860	66,222
Stockpile Responsiveness	43,827	46,053	47,709	52,752
Total, Engineering	**257,448**	**263,794**	**273,356**	**289,861**
Inertial Confinement Fusion Ignition and High Yield				
Ignition	0	0	0	0
Support of Other Stockpile Programs	0	0	0	0
Ignition and Other Stockpile Programs	57,040	58,306	59,513	61,600
Diagnostics, Cryogenics and Experimental Support	67,197	69,477	71,210	72,993
Pulsed Power Inertial Confinement Fusion	8,785	9,004	9,231	9,461
Joint Program in High Energy Density Laboratory Plasmas	12,300	12,607	12,923	13,246
Facility Operations and Target Production	346,703	355,370	364,256	373,362
Total, Inertial Confinement Fusion Ignition and High Yield	**492,025**	**504,764**	**517,133**	**530,662**
Advanced Simulation and Computing				
Advanced Simulation and Computing	747,574	786,474	782,272	794,000
Construction	27,000	13,000	0	0
Total, Advanced Simulation and Computing	**774,574**	**799,474**	**782,272**	**794,000**
Advanced Manufacturing Development				
Additive Manufacturing	19,761	19,761	20,205	20,629
Component Manufacturing Development	63,566	67,552	70,828	78,129
Process Technology Development	31,714	29,835	31,043	32,190
Total, Advanced Manufacturing Development	**115,041**	**117,148**	**122,076**	**130,948**
Total, RDT&E	**2,295,856**	**2,376,233**	**2,390,592**	**2,430,382**

	(Dollars in Thousands)			
	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Infrastructure and Operations				
Operating				
Operations of Facilities	915,000	925,000	935,000	960,000
Safety and Environmental Operations	124,000	125,000	127,000	127,000
Maintenance and Repair of Facilities	480,000	490,000	510,000	525,000
Recapitalization				
Infrastructure and Safety	378,905	401,236	404,654	412,628
Capability Based Investments	127,930	126,066	128,504	131,203
Subtotal, Recapitalization	**506,835**	**527,302**	**533,158**	**543,831**
Total, Operating	**2,025,835**	**2,067,302**	**2,105,158**	**2,155,831**
Construction	1,007,427	871,500	662,509	1,009,437
Total, Infrastructure and Operations	**3,033,262**	**2,938,802**	**2,767,667**	**3,165,268**
Secure Transportation Asset (STA)				
Operations and Equipment	246,867	180,577	170,790	193,209
Program Direction	109,959	112,143	114,663	116,863
Total, Secure Transportation Asset	**356,826**	**292,720**	**285,453**	**310,072**
Defense Nuclear Security				
Operations and Maintenance	737,087	732,022	776,259	800,770
Construction	36,000	41,900	8,810	0
Total, Defense Nuclear Security	**773,087**	**773,922**	**785,069**	**800,770**
Information Technology and Cybersecurity	281,223	290,223	311,671	315,796
Legacy Contractor Pensions	66,900	66,900	69,400	69,400
Subtotal, Weapons Activities	**12,793,804**	**13,017,873**	**13,143,863**	**13,404,546**
Total, Weapons Activities	**12,793,804**	**13,017,873**	**13,143,863**	**13,404,546**

Research and Development

The Office of Management and Budget (OMB) Circular No A-11, "Preparation, Submission, and Execution of the Budget," requires the reporting of research and development (R&D) data Consistent with this requirement, R&D activities funded by NNSA Weapons Activities programs are displayed below.

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Research and Development (R&D)				
Basic	0	0	0	+0
Applied	4,758,756	4,411,257	5,212,607	+801,350
Development	227,225	207,636	268,538	+60,902
Subtotal, R&D	**4,985,981**	**4,618,893**	**5,481,145**	**+862,252**
Equipment	277,139	276,222	285,000	+8,778
Construction	61,493	85,308	106,241	+20,933
Total, R&D	**5,324,613**	**4,980,424**	**5,872,386**	**+891,962**

Directed Stockpile Work (DSW)

Overview

The Directed Stockpile Work (DSW) program encompasses five major subprograms that sustain the nation's nuclear weapons stockpile.

The subprograms are:

1. Life Extension Programs (LEPs), which extend the lifetime of the nation's nuclear stockpile while addressing defects and enhancing security and safety features, and Alterations (Alts), which address aging or obsolete components to ensure continued service life;
2. Stockpile Systems, which directly executes sustainment activities for all enduring weapons systems in the stockpile;
3. Weapons Dismantlement and Disposition (WDD), which dismantles retired weapons and dispositions retired components from the stockpile;
4. Stockpile Services, which provides the foundation and capabilities for NNSA's research, development, production, and maintenance activities; and
5. Strategic Materials, which ensures sustainment of nuclear material processing capabilities and funds the stabilization, consolidation, disposition, tracking, and accounting of nuclear materials.

The 2018 Nuclear Posture Review (NPR) provides a comprehensive analysis of the role of nuclear weapons in U.S. national security policy and outlined the direction in which the United States must move to maintain a safe, secure, and effective deterrent. NNSA has developed the requirements and tasks to implement the strategies outlined in the NPR and strengthen the underlying nuclear security enterprise.

The DSW program:

1. Provides unique skills, equipment, and logistics to enable nuclear weapons operations;
2. extends the life of existing weapons systems through authorized modifications and alterations to address technical issues and to enhance their safety, security, and effectiveness;
3. conducts scheduled weapons maintenance, including the modernization, production and replacement of limited life components;
4. conducts surveillance and evaluations to assess weapons reliability as well as detect and anticipate potential weapons issues;
5. quantifies margins of uncertainty in order to assess and certify the nuclear stockpile;
6. develops technology for insertion during weapon modifications/alterations which enhance safety, security and effectiveness;
7. provides dismantlement and disposition of weapons and components for weapons retired from the stockpile, thereby supporting nonproliferation and international goals;
8. compiles and analyzes information during the Annual Assessment process to identify and address issues;
9. develops new technologies, conducts systems engineering, matures appropriate replacements for sunset technologies, and enhances system capabilities for multi-system applications to reduce lifecycle costs and address near-term and long-term stockpile needs;
10. enhances NNSA transportation safety and security by implementing new weapon shipping configurations;
11. sustains the nuclear materials production, handling, and storage capabilities to meet long-term national requirements;
12. mitigates the risk of adversarial subversion of the stockpile components susceptible to foreign capabilities by providing Nuclear Enterprise Assurance (NEA) and hedging against technological risks and
13. executes the National Hydrodynamic Test Plan for surrogate materials and plutonium integrated weapon experiments in support of the nuclear weapons stockpile and LEPs.

Directed Stockpile Work
Funding

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
	(Dollars in Thousands)			
Directed Stockpile Work				
Life Extension Programs and Major Alterations				
B61 Life Extension Program	788,572	794,049	792,611	-1,438
W76 Life Extension Program	224,134	48,888	0	-48,888
W76-2 Modification Program	0	65,000	10,000	-55,000
W88 Alt 370 (W88 Alteration Program)	332,292	304,285	304,186	-99
W80-4 Life Extension Program	399,090	654,766	898,551	+243,785
IW1	0	53,000	0	-53,000
W87-1 Modification Program (formerly IW1)	0	0	112,011	+112,011
Total, Life Extension Programs and Major Alterations	**1,744,088**	**1,919,988**	**2,117,359**	**+197,371**
Stockpile Systems				
B61 Stockpile Systems	59,729	64,547	71,232	+6,685
W76 Stockpile Systems	51,400	84,300	89,804	+5,504
W78 Stockpile Systems	60,100	81,329	81,299	-30
W80 Stockpile Systems	80,087	80,204	85,811	+5,607
B83 Stockpile Systems	35,762	35,082	51,543	+16,461
W87 Stockpile Systems	83,200	83,107	98,262	+15,155
W88 Stockpile Systems	131,576	170,913	157,815	-13,098
Total, Stockpile Systems	**501,854**	**599,482**	**635,766**	**+36,284**
Weapons Dismantlement and Disposition	**56,000**	**56,000**	**47,500**	**-8,500**
Stockpile Services				
Production Support	485,400	510,000	543,964	+33,964
Research and Development Support	31,150	36,150	39,339	+3,189
Research and Deveopment Certification and Safety	196,840	201,840	236,235	+34,395
Management, Technology, and Production	285,400	300,736	305,000	+4,264
Total, Stockpile Services	**998,790**	**1,048,726**	**1,124,538**	**+75,812**
Strategic Materials				
Uranium Sustainment	24,000	87,182	94,146	+6,964
Plutonium Sustainment	210,367	361,282	712,440	+351,158
Tritium Sustainment	198,152	290,275	269,000	-21,275
Lithium Sustainment	0	29,135	28,800	-335
Domestic Uranium Enrichment	60,000	50,000	140,000	+90,000
Strategic Materials Sustainment	216,196	216,196	256,808	+40,612
Total, Strategic Materials	**708,715**	**1,034,070**	**1,501,194**	**+467,124**
Total, Directed Stockpile Work	**4,009,447**	**4,658,266**	**5,426,357**	**+768,091**

Outyears for Directed Stockpile Work
Funding

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
	(Dollars in Thousands)			
Directed Stockpile Work				
Life Extension Programs and Major Alterations				
B61 Life Extension Program	750,663	667,450	539,900	326,550
W76 Life Extension Program	0	0	0	0
W76-2 Modification Program	0	0	0	0
W88 Alt 370 (W88 Alteration Program)	249,283	201,802	127,708	73,323
W80-4 Life Extension Program	1,024,000	1,091,000	1,148,010	1,108,000
IW1				
W87-1 Modification Program (formerly IW1)	363,260	393,701	488,300	558,000
IW2				
Next Navy Warhead (formerly IW2)	0	0	56,900	182,490
Total, Life Extension Programs and Major Alterations	**2,387,206**	**2,353,953**	**2,360,818**	**2,248,363**
Stockpile Systems				
B61 Stockpile Systems	86,468	95,715	102,262	110,514
W76 Stockpile Systems	97,513	97,723	95,086	101,083
W78 Stockpile Systems	88,593	92,600	98,000	111,557
W80 Stockpile Systems	73,921	77,618	76,281	77,883
B83 Stockpile Systems	30,795	46,952	53,254	36,646
W87 Stockpile Systems	102,139	103,200	103,796	111,998
W88 Stockpile Systems	125,936	120,075	110,075	105,592
Total, Stockpile Systems	**605,365**	**633,883**	**638,754**	**655,273**
Weapons Dismantlement and Disposition	**50,000**	**51,000**	**51,000**	**51,000**
Stockpile Services				
Production Support	555,973	572,760	579,964	597,865
Research and Development Support	41,833	44,527	46,169	51,202
Research and Deveopment Certification and Safety	248,456	262,319	275,430	302,689
Management, Technology, and Production	304,000	319,500	314,168	329,913
Total, Stockpile Services	**1,150,262**	**1,199,106**	**1,215,731**	**1,281,669**
Strategic Materials				
Uranium Sustainment	96,753	98,793	100,824	102,941
Plutonium Sustainment	976,813	1,222,889	1,473,491	1,289,470
Tritium Sustainment	286,000	299,000	262,000	243,690
Lithium Sustainment	29,404	30,022	30,653	31,297
Domestic Uranium Enrichment	145,000	150,000	155,000	158,255
Strategic Materials Sustainment	259,847	240,427	245,740	250,900
Total, Strategic Materials	**1,793,817**	**2,041,131**	**2,267,708**	**2,076,553**
Total, Directed Stockpile Work	**5,986,650**	**6,279,073**	**6,534,011**	**6,312,858**

Directed Stockpile Work
Explanation of Major Changes
(Dollars in Thousands)

	FY 2020 Request vs FY 2019 Enacted
Directed Stockpile Work	
Life Extension Programs and Major Alteration: The increase represents continued execution of Phase 6.3 activities for the W80-4 LEP with increased funding levels as supported by the Weapon Design and Cost Report (WDCR), and continuing Phase 6.2 Activities for the W87-1 Modification Program (formerly IW1), offset by a decrease due to completion of remaining W76 warhead modifications and associated deliveries to the Navy and a decrease in component production scope for the B61-12 LEP.	+197,371
Stockpile Systems: The increase represents electronic neutron generator (ELNG) production for the B61-11 and transition costs for the B61-12 coming into the stockpile; a ramp-up in development of the W76-1 JTA3 flight test body; a minor ramp-down of component engineering support activities associated with the W78; ; for the W80 a ramp-up in maintenance activities supporting production, an increase in activities associated with the Sea-Launched Cruise Missile (SLCM) study in Development Studies/Capability Improvements, and an increase in activities in Weapon Assessment offset by a decrease in Weapon Maintenance an increase for continued surveillance and assessment activities for the B83; a ramp-up in component production to support repairs and rebuilds for the W87, growth in component development and production to support joint flight test requirements for the W87, and a rise in design agency requirements to support Ground Based Strategic Deterrent (GBSD) integration for the W87; and finally, offset by a reduction in design and development costs for the neutron generators (NGs) and Gas Transfer Systems (GTSs) for the W88.	+36,284
Weapons Dismantlement and Disposition: The decrease results from a reduction in legacy component disposition and CSA activities consistent with material and component needs for the stockpile and external customers.	-8,500
Stockpile Services: The increase represents an increase in Production Support for continued growth of base capabilities, both workforce and equipment, required to support the increased LEP workload as they reach full-scale production rates; an increase in Research and Development Support to enhance Production Agency (PA) and Design Agency (DA) (laboratory and plant) interactions in early technology development and support of execution of the 2018 Nuclear Posture Review; an increase in Research Development Certification and Safety to further invest in the early development of new technologies and advancement of existing technologies for the W87-1 and other future LEPs, to leverage technology maturation risk reduction flight tests and improve sounding rocket flight test capabilities, to enhance ground-based capabilities for system-level testing, to maintain and modernize the base capabilities for hydrodynamic and subcritical testing, and support multi-system R&D studies and Annual Assessment activities; and an increase to Management, Technology, and represents growth in multi-weapon activities needed to support fielding the LEPs following first production unit (FPU), surveillance activities, and the development of surveillance testers for weapons.	+75,812
Strategic Materials: The increase provides funding to support design activities for the Savannah River Plutonium Processing Facility (SRPPF) Project, Tritium-Producing Burnable Absorber Rods (TPBAR) production, sustainment of the strategic materials and down-blending activities to provide unobligated low enriched uranium fuel for tritium production.	+467,124
Total, Directed Stockpile Work	**+768,091**

Directed Stockpile Work
Life Extension Programs and Major Alterations

Description

Life Extension Programs (LEPs) and Major Alterations (Alts) is the stockpile management subprogram necessary to extend the expected life of stockpile systems for an additional 20 to 30 years. NNSA, in conjunction with DOD, executes a LEP following the Phase 6.X process guidelines, which provides a framework to conduct and manage refurbishment activities for existing weapons. Phase 6.1 (Concept Assessment) should provide sufficient information for the NWC to authorize Phase 6.2 (Feasibility Study and Design Options). Follow-on phases include: Phase 6.2A (Design Definition and Cost Study), Phase 6.3 (Development Engineering), Phase 6.4 (Production Engineering), Phase 6.5 (First Production) and Phase 6.6 (Full-Scale Production). For the purposes of this justification, the term "refurbishment" refers to all nuclear weapon alterations and modifications, including LEPs, modernization, and revised military requirements.

B61-12 Life Extension Program

The B61-12 LEP addresses multiple components nearing their end of life, as well as military requirements for reliability, service life, field maintenance, safety, and use control. NNSA, in coordination with the Air Force, studied a number of design alternatives to address the military's requirements, ranging from component replacement alterations to full-scope nuclear and non-nuclear refurbishments. The joint effort also included a separate study to assess the schedule and costs for each alternative. The selected option includes refurbishment of both nuclear and non-nuclear components to address aging, to assure extended service life, and to improve the safety, effectiveness, and security of the bomb. It also incorporates component reuse where possible and omits higher-risk technologies to reduce costs and schedule risks. With these upgrades and the addition of new Air Force components, the B61-12 LEP will consolidate and replace the B61-3, -4, -7, and -10 bombs variants and will reduce the number of gravity bombs. In June 2016, NNSA authorized the program to transition into Phase 6.4. The FPU is scheduled for FY 2020.

W76 Life Extension Program

The W76LEP extends the life of the weapon for an additional 30 years. NNSA completed the FPU in FY 2008 and is providing the reentry body assembly and delivery components to DOD for integration into the Trident II D5 Strategic Weapon System, which is part of the submarine-launched ballistic missile (SLBM) force.

W88 Alteration Program

The W88 Alteration Program increases the W88 lifetime by modernizing the arming, fuzing and firing (AF&F) system, improving surety, and incorporating a lightning arrestor connector. It also provides required logistical spares for sustaining the life of the system. As planned, the design of the arming and fuzing portion of the AF&F will be forward compatible with future Air Force fuze requirements and/or LEPs. The maintenance programs for NG and GTS replacement will be funded under the W88 enduring stockpile system, but actual replacement will be performed concurrently with the Alt 370 conversion. In November 2014, the NWC authorized replacement of the conventional high explosive (CHE) and associated materials on the W88 coincident with Alt 370 activities, which is referred to as CHE Refresh. The CHE Refresh scope is included in the W88 Alteration Program and leverages existing tests to the maximum extent possible to minimize costs and reduce logistical impacts to the Navy. In February 2017, NNSA authorized the program to transition into Phase 6.4, Production Engineering. The FPU is scheduled for FY 2020.

W80-4 Life Extension Program

The W80-4 LEP will extend the life of the W80- warhead for use in the Air Force Long Range Stand Off (LRSO) cruise missile. The LRSO is the replacement for the current, aging Air-Launched Cruise Missile (ALCM). The program will integrate the warhead with the replacement missile platform and address warhead component aging concerns as well as military requirements for reliability, service life, field maintenance, and surety. Key design requirements established for this LEP include using insensitive high explosives for the primary, maximizing use of common non-nuclear components (including common approaches from other designs, such as the B61-12 and W88 Alt 370), enhancing surety, and developing the warhead/missile interface in parallel with the Air Force. In July 2015 the NWC authorized the program to transition into Phase 6.2, Feasibility Study and Option Down-Select. The program received Phase 6.2A (Design Definition and Cost Study) authorization on September 28, 2017, during which the design continued to be refined and the NNSA team continued to work closely with the LRSO missile development team and contractors. The primary 6.2A deliverable, the W80-4 LEP Weapon Design and Cost Report, requiring additional resources, which are included in this budget), was completed in

December 2018 , and the W80-4 LEP Federal Program Office is awaiting NWC authorization to proceed to Phase 6.3 in 2Q FY 2019. (Other upgrades, in particular the W80-4 Alt 369, is not reported under the LEP, but is funded under the Stockpile Systems Program.)

W87-1 Modification Program (formerly IW1)
The Program will replace the W78 warhead (IW1 program) by 2030 and support fielding on the U.S. Air Force (USAF) GBSD missile system planned to replace the current Minuteman III ICBM force. The program will replace one of the oldest warheads in the stockpile and also provide improvement in warhead security, safety, and use control. FY 2020 activities include continued feasibility study of design options, technology maturation, continued program management and control implementation, requirements analysis and customer requirements review, integration with Air Force acquisition programs, and systems engineering.

W76-2 Modification Program
The 2018 Nuclear Posture Review states that the United States will modify a small quantity of existing W76-1 warheads to provide a low-yield option in the near-term. The Nuclear Weapons Council has translated policy into military requirements, and provided authorization to execute a tailored Phase 6.X process. All warhead modifications will be complete by the end of FY 2019 with final program documentation and close out activities complete in FY 2020.

Highlights of the FY 2020 Budget Request
B61-12 Life Extension Program
- Execute Phase 6.5 activities with FPU for the B61-12 LEP.

W88 Alt 370 Program
- Complete FPU of the W88 Alt 370 in FY 2020 and begin Low Rate Initial Production (LRIP) to support Initial Operational Capability (IOC) by FY 2020.

W80-4 Life Extension Program
- Execute Phase 6.3 activities for the W80-4 LEP in support of the Air Force LRSO program.

W87-1 Modification Program (formerly IW1)
- Continue W87-1 Modification Program Phase 6.2 activities.

W76-2 Modification Program
- Complete W76-2 Modification Program activities consistent with NWC direction.

FY 2021 - FY 2024 Key Milestones
B61-12 Life Extension Program
- Execute aircraft compatibility testing with dual capable aircraft (U.S. and NATO), including the USAF F-35 and B-21.
- Achieve and maintain steady state production rates at NNSA Plants and deliver B61-12 bombs to the USAF to support U.S. and NATO IOC and Full Operational Capability (FOC) dates.
- Execute System Retrofit Evaluation System Testing (REST).
- Deliver Last Production Unit (LPU) in FY 2024.

W88 Alt 370 Program
- Release final weapon development report in FY 2021.
- Conduct Retrofit Evaluation Stockpile Test (REST) flights.
- Scheduled to complete W88 Alteration by FY 2024, consistent with Nuclear Posture Review requirements.

W80-4 Life Extension Program
- Successfully completed Component Feasibility and Cost Gates for over 30 active Product Realization Teams (PRTs) and Component Requirements Reviews for over 25 active PRTs.

- Began Technology Maturation and Risk Reduction (TMRR) phase interactions with two competing LRSO Cruise Missile Contractors, including TMRR kickoff meetings, Technical Integration Meetings (TIMs), and W80-4 Project Officer Group and Subgroup interactions.
- Delivered Fit Check Units to the Air Force to verify the mechanical interface between the W80-4 warhead and LRSO Cruise Missile.
- In coordination with the W80-4 POG, develop and mature the Missile-to-Warhead Interface Control Document (MW-ICD), Stockpile-to-Target-Sequence (STS), and Military Characteristics (MCs).

W87-1 Modification Program
- Complete Phase 6.2 work in FY2021.
- Execute Phase 6.2A activities beginning in 3rd Qtr. FY 2021.
- Execute Phase 6.3 activities beginning in 3rd Qtr. FY 2022.

Next Strategic Missile Warhead Program
- Conduct feasibility studies as part the Stockpile Responsiveness Program.
- Begin start up activities in alignment with current DOD nuclear modernization plans.

FY 2018 Accomplishments
B61-12 Life Extension Program
- Successfully conducted the first High Fidelity System Flight Test utilizing high explosives with a mock pit at the Tonopah Test Range in March 2018.
- Successfully conducted the 5th System Hydrodynamic Test Shot in March 2018.
- Completed the first B-2A (System 2) Qualification Drop (DFT#8) in June 2018.
- Completed all component Final Design Reviews.
- Completed the System Final Design Review in September 2018.

W76 Life Extension Program
- The W76 LEP continued production and deliveries to the Navy within planned budgets.
- Completed Phase 6.1/6.2/6.2A activities for the W76-2 Modification Program consistent with NWC direction.

W88 Alt 370 Program
- Completed the System Final Design Review in January 2018.
- Completed the Commander's Evaluation Test-1 (CET–1) development flight test.
- Completed 12 system-level qualification tests, including three Hydrodynamic tests.
- Produced three major component and five sub-component FPUs.
- Updated the cost estimate for the Program by publishing the Baseline Cost Report.
- Continued fabrication of pre-production and production functional hardware at component, sub-assembly, and AF&F level for final qualification and next-assembly production.

W80-4 Life Extension Program
- Successfully completed Component Feasibility and Cost Gates for over 30 active Product Realization Teams (PRTs), and Component Requirements Reviews for over 25 active PRTs.
- Completed over 25 Component Requirements Reviews.
- Began Technology Maturation and Risk Reduction (TMRR) phase interactions with two competing LRSO Cruise Missile Contractors, including TMRR kickoff meetings, Technical Integration Meetings (TIMs), and W80-4 Project Officer Group (POG) and Subgroup interactions.
- Delivered Fit Check Units to the Air Force to verify the mechanical interface between the W80-4 warhead and LRSO Cruise Missile.
- In coordination with the W80-4 POG, developed and matured the Missile to Warhead Interface Control Document (MW-ICD), Stockpile-to-Target-Sequence (STS), and Military Characteristics (MCs).

W87-1 Modification Program (formerly IW1)

- Restarted the W78 warhead replacement program as the W87-1 Modification Program to meet NPR requirements.

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
B61-12 Life Extension Program $794,049,000	**B61-12 Life Extension Program $792,611,000**	**B61-12 Life Extension Program -$1,438,000**
• The program will enter Phase 6.5 in fourth quarter FY 2019 following completion of readiness activities, including a Nuclear Explosives Safety Study and Readiness Review. The reviews and complete Documented Safety Analysis will also allow NNSA to authorize nuclear explosive operations via Master Authorization Agreement (MAA) for B61-12 Assembly and Disassembly Operations. NNSA will continue shipment of Type 3 C/E trainers to the DOD for first generation training in preparation for B61-12 IOC. NNSA will produce additional Type 5B/D Trainers to support production activities. The program is on track for FPU in FY 2020. • Components will obtain QERs in FY 2019 to enable production and shipment of War Reserve (WR) hardware for final assembly. Components will continue to ramp production activities in FY 2019 to meet FPU and system production requirements documented in the B61-12 Production Control Document. • Joint qualification activities will continue in FY 2019 to enable release of system qualification and aircraft compatibility documents to support FPU and a FY 2020 Final DRAAG Review. NNSA will conduct seven joint flight tests with the USAF on the F-15, F-16, and B-2A including the final weapons certification drops on the F-15. In addition, NNSA will conduct 16 ground tests to complete final qualification of performance in normal and abnormal environments. Final system hydrodynamic physics test to support nuclear certification will be conducted. Finalize	• The program will issue the Final Weapon Development Report (FWDR) and Major Assembly Release (MAR) to support the Final DRAAG. The program will complete the Final DRAAG with the Air Force and obtain Phase 6.6 Authorization to initiate shipments to the DOD in support of CONUS and OCONUS IOC dates. Begin production and shipping of B61-12 bombs to satisfy stockpile production requirements. The program will continue to produce and ship Type 3C/E trainers to the DOD for ongoing OCONUS first generation training. The program will initiate system Retrofit Evaluation System Testing (REST). • NNSA will enter into steady state production, supporting lead-time requirements. Initiate component level surveillance testing. • Design Agencies will continue joint qualification activities on existing NATO aircraft as well as supporting aircraft compatibility and nuclear certification for the F-35 and B-21 programs.	• Nominal decrease reflects a reduction in test and qualification activities, which is largely offset by increases in component production.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
modeling and simulation analysis to support system design qualification and margin assessments will be completed.		
W76 Life Extension Program $48,888,000	**W76 Life Extension Program $0**	**W76 Life Extension Program -$48,888,000**
• Perform the Annual Assessment for the W76 LEP. • Complete remaining purchases of vendor materials to support FY 2019 approved production rates. • Complete remaining production builds at the FY 2019 approved rate and complete production of surveillance replacement components including Nuclear Explosives Package (NEP) components, the AF&F assembly, 2X Acorn GTS, and NG, as well as associated cables, elastomers, valves, pads, cushions, foam supports, telemetries, and miscellaneous parts aligned with the production schedule. • Complete last warhead deliveries for LEP in FY 2019 in agreement with the Department of the Navy and in support of submarine deployment requirements. • Complete production of REST unique hardware required for testing. • Complete FY 2019 REST Surveillance of W76 LEP production components and WR hardware. • Complete FY 2019 production of surveillance replacement components destructively tested; rebuild WR units after REST surveillance.	• Execution of project close-out activities, including archiving production tooling, procedures and reports. • Produce AF&F assemblies for life of program hardware provisioning requirements. • Complete remaining production of surveillance replacement components including detonators and valves. • Complete all remaining REST surveillance activities for Annual Assessment.	• Decrease represents completion of W76 LEP production and deliveries to the Navy.
W88 Alteration Program $304,285,000	**W88 Alteration Program $304,186,000**	**W88 Alteration Program -$99,000**
• Phase 6.4 activities will be in the final stages of pre-production. System-level WR integration activities will be in the final authorization stage for production of the Reentry Body Assembly	• Phase 6.5 activities will be in the final stages. FPU of the AF&F is planned in FY 2020, as is the RBA-level. System-level WR integration activities will be in the final authorization stage for	• A ramp down of final qualification activities is partially offset by cost increases for LRIP.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
(RBA), including all tooling, testers, equipment, facilities, technicians, safety bases, and Nuclear Explosive Safety Reviews. NNSA approval of Phase 6.5 along with the Master Authorization Agreement (MAA) is expected to be approved at the end of FY 2019, providing authorization to begin the First Production Unit (FPU). • Remaining component hardware production qualification activities will be completed in FY 2019. All components will enter or continue full scale production to support Alt 370 conversion provisioning needs derived from the NNSA production schedules. Long-lead hardware purchases and assemblies from vendors will also continue and/or be initiated. Component testing and qualification activities for the CHE Refresh portion of the program will also continue. At the conclusion of FY 2019, all components will be in production. • Final activities during the later stages of Phase 6.4 include system-level qualification and testing. The Design laboratories will conduct the system-level qualification evaluations for the RBA and Joint Test Assembly (JTA) and publish Qualification Evaluation Release (QERs). NNSA will support the two Navy-required qualification flight tests with JTAs for Demonstration and Shakedown Operation (DASO) – 29 and CET-2. The design laboratories will continue modeling and simulations of the final component and system designs to support weapon assessments, certification, and reliability. Stockpile Surveillance activities begin with initiation of a shelf life program and early planning for stockpile returns.	production of the RBA, including all tooling, testers, equipment, facilities, technicians, safety bases, and Nuclear Explosive Safety Reviews. Navy requirements will be met with IOC achieved in FY 2020. Nuclear Weapons Council (NWC) authorization of Phase 6.6, Full Rate Production will occur in FY 2020. W88 Alt 370 Major Assembly Release (MAR) Certifies the W88 Alt 370 weapon meets military requirements in FY 2020. AF&F Production Review will complete in September 2020. • All components are in full scale production to support the Alt 370 conversion provisioning needs derived from the NNSA production schedules. Long-lead hardware purchases and assemblies from vendors will also continue and/or be initiated. Quantities for component production will be monitored and delivered per the Program Control Document (PCD) to ensure IOC quantities are met. • All System Qualification tests will be complete and the DRAAG Review occurs in the third quarter of FY 2020.	

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
W80-4 Life Extension Program $654,766,000	**W80-4 Life Extension Program $898,551,000**	**W80-4 Life Extension Program +$243,785,000**
• Phase 6.2A will be completed, including the WDCR, requiring additional resources, which develops an initial planning baseline for Phase 6.3 and beyond, covering scope, schedule, cost and risks for the life of the LEP. Phase 6.3 will begin in Second Quarter of FY 2019 with significant staffing ramp-up required to complete Baseline Design Review by FY 2021. Integrated Baseline Reviews (IBRs) will be performed at all sites to ensure an effective Earned Value Management System (EVMS) and alignment of technical scope. An updated Missile-to-Warhead Interface Control Document (ICD) will be published and Stockpile-to-Target Sequence (STS) data will continue to be measured for pre-flight environments. • The System Conceptual Design Review will be conducted, followed by component Conceptual Design Reviews. Developmental lots with associated testing activities will focus on progressing Technology and Manufacturing Readiness Levels. • Warhead simulators/test units will be produced and delivered to the Air Force to conduct aircraft integration activities and augment current knowledge about the environments under which the warhead will have to perform. Hydrodynamic physics tests will be conducted within simulated missile bodies to support nuclear certification.	• Phase 6.3 and the Conceptual Design Stage will continue into FY 2020. Baseline Design Stage activities will begin after successful completion of Component Conceptual Design Reviews. Staffing levels continue to ramp up consistent with the increase in component developmental builds and testing activities. • All Component Conceptual Design Reviews will be completed. Developmental lots and associated testing/analysis will continue to increase with a focus on progressing Technology and Manufacturing Readiness Levels and transitioning towards Component Baseline Design Reviews in FY 2021. • Use of warhead simulators/test units will increase as the W80-4 LEP continues to integrate with two Cruise Missile contractors. Fit Check Units, Environmental Test Units, Static Ejection Test Warheads, and Separation Control Test Vehicle warheads will continue to be delivered to the Air Force. This equipment will be used to verify the interface between the missile and warhead and gather environmental data during ground, captive carry, and static ejection testing. Hydrodynamic physics tests will continue within simulated missile bodies to support nuclear certification.	• Phase 6.2A will be completed, including the WDCR that develops an initial planning baseline for Phase 6.3 and beyond, covering scope, schedule, cost and risks for the life of the LEP. Phase 6.3 will begin in Second Quarter of FY 2019with significant staffing ramp-up required to complete Baseline Design Review by FY 2021. Integrated Baseline Reviews (IBRs) will be performed at all sites to ensure an effective Earned Value Management System (EVMS) and alignment of technical scope. An updated Missile-to-Warhead Interface Control Document (ICD) will be published and Stockpile-to-Target Sequence (STS) data will continue to be measured for pre-flight environments. • The System Conceptual Design Review will be conducted, followed by component Conceptual Design Reviews. Developmental lots with associated testing activities will focus on progressing Technology and Manufacturing Readiness Levels. • Warhead simulators/test units will be produced and delivered to the Air Force to conduct aircraft integration activities and augment current knowledge about the environments under which the warhead will have to perform. Hydrodynamic physics tests will be conducted within simulated missile bodies to support nuclear certification. • Additional increases for resources required in the WDCR are included.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
W87-1 Modification Program (formerly IW1) $53,000,000	**W87-1 Modification Program $112,011,000**	**W87-1 Modification Program +$59,011,000**
• Restart the Feasibility Study and Design Options work suspended in FY 2014 to replace the W78 warhead (then the IW1 program) and investigate the feasibility of deploying the replacement warhead's NEP in a US Navy flight body. • Establish NNSA laboratory (DA and PA) program personnel, functions and processes required for Feasibility Study and Design Options work. • Establish Federal Program Office and required program personnel, documents, functions, and processes for Feasibility Study and Design Options work. • Evaluate proposed/assessed warhead technologies and progress maturity of select/key technologies.	• Evaluate proposed/assessed warhead technologies and progress maturity of select/key technologies. • Continue feasibility study of design options. • Continue program management and control implementation. • Requirements analysis and customer requirements review. • Integration with Air Force acquisition programs • Systems engineering. • Early system test and qualification planning.	• The increase represents continuing Feasibility Study of Design Options and Phase 6.2 Activities.
W76-2 Modification Program $65,000,000	**W76-2 Modification Program $10,000,000**	**W76-2 Modification Program -$55,000,000**
• Complete all component production at Y-12. • Complete all warhead production. • Complete all warhead deliveries to the Navy.	• Complete W76-2 Modification Program activities consistent with NWC direction. • Complete REST surveillance activities for Annual Assessment.	• The decrease represents completion of the all warhead production activities in FY 2019. In FY 2020 NNSA will complete final program documentation and close out activities.

Directed Stockpile Work
Stockpile Systems

Description

Stockpile Systems directly executes sustainment activities for the total (active and inactive) stockpile for the B61, W76, W78, W80, B83, W87, and W88 weapons. As required by 50 United States Code 2525, safety, security, and effectiveness assessments are performed to determine whether the systems can continue to be certified without the need for an underground nuclear test. Sustainment activities for each weapon system are identified by four major subprograms that support the enduring stockpile system, as well as LEPs and Alts:

Current U.S. nuclear weapons and associated delivery systems

Warheads—Strategic Ballistic Missile Platforms					
Type [a]	***Description***	***Carrier***	***Laboratories***	***Mission***	***Military***
W78	Reentry vehicle warhead	Minuteman III Intercontinental Ballistic Missile	LANL/SNL	Surface to surface	Air Force
W87	Reentry vehicle warhead	Minuteman III Intercontinental Ballistic Missile	LLNL/SNL	Surface to surface	Air Force
W76-0/1	Reentry body warhead	Trident II D5 Strategic Weapon System (Submarine Launched Ballistic Missile)	LANL/SNL	Underwater to surface	Navy
W88	Reentry body warhead	Trident II D5 Strategic Weapon System (Submarine Launched Ballistic Missile)	LANL/SNL	Underwater to surface	Navy
Bombs—Aircraft Platforms					
Type	***Description***	***Carrier***	***Laboratories***	***Mission***	***Military***
B61-3/4/10	Non-strategic bomb	F-15, F-16, certified NATO aircraft	LANL/SNL	Air to surface	Air Force/ Select NATO forces
B61-7	Strategic bomb	B-2 bomber	LANL/SNL	Air to surface	Air Force
B61-11	Strategic bomb	B-2 bomber	LANL/SNL	Air to surface	Air Force
B83-1	Strategic bomb	B-2 bomber	LLNL/SNL	Air to surface	Air Force
Warheads—Cruise Missile Platforms					
Type [a]	***Description***	***Carrier***	***Laboratories***	***Mission***	***Military***
W80-1	Air-launched cruise missile strategic weapon	B-52 bomber	LLNL/SNL	Air to surface	Air Force

LANL = Los Alamos National Laboratory
LLNL = Lawrence Livermore National Laboratory
NATO = North Atlantic Treaty Organization
SNL = Sandia National Laboratories
[a] The suffix associated with each warhead or bomb type (*e.g.*, "-0/1" for the W76) represents the modification associated with the respective weapon.

Stockpile Systems Major Activity Levels:

(1) Weapon Maintenance: Includes production of LLCs including GTSs, NGs, and other designated components as required by National Requirements Documents and/or Directive Schedules, day-to-day stockpile maintenance and repair activities, production and delivery of components for each weapon type, refurbishment and replacement of aging components to sustain stockpile life, and rebuilds.

(2) Weapon Surveillance: Includes new to support a new material laboratory (as yet undefined) material laboratory and flight tests, retrofit evaluation system laboratory and flight tests, stockpile laboratory tests, stockpile flight tests, quality evaluations, special testing, and component and material evaluation to support assessment of the safety, security, and effectiveness of the nuclear weapons stockpile. Data from these tests contributes to the Annual Assessment and memorandum to the President.

(3) Weapon Assessment: Includes activities associated with management of fielded weapon systems. Provides systems and component engineering support, support to planning, resolution, and documentation of significant finding investigations (SFIs) to include assessment of root cause, extent of conditions, and impact to system effectiveness or safety. Also includes activities associated with planning, developing, and updating the technical basis for the materials, components, and weapons and performing the weapon assessments. Finally, this includes activities associated with preparation, writing, and coordination of Annual Assessment Reports (AARs) and Weapon Reliability Reports, as well as activities needed to assess/resolve system-specific weapon response issues and to provide support to the Nuclear Explosive Safety Study Groups (NESSG) and the Nuclear Weapon System Surety Groups (NWSSG) as required.

(4) Development Studies/Capability Improvements: Includes activities associated with improvements in surveillance capabilities, technical basis improvements, technology maturation for insertion or replacement, and system/surety studies.

(5) Weapon Program Planning/Support: Includes activities associated with management of fielded weapon systems. Provides systems and component engineering support for planning, resolution, and documentation.

Stockpile Systems Description

B61 Stockpile Systems

The B61 gravity bombs are the oldest weapons in the enduring stockpile. The B61 is deployed by the Air Force on various aircrafts. The B61 family includes five modifications with two distinct categories. The strategic category includes the B61 Modifications -7 and -11, with Modification-11 being the only active earth penetrating weapon. The non-strategic category includes the B61 Modifications -3, -4, and -10, supporting our extended nuclear commitment.

W76 Stockpile Systems

The W76-0 and W76 LEP are the warheads integrated into the Trident II D5 Strategic Weapon System. It is part of the SLBM force. The W76-0/Mk4 and W76-1/Mk4A is completed by NNSA as a Reentry Body Assembly and delivered to DOD.

W78 Stockpile Systems

The Mk12A/W78 re-entry vehicle is deployed on the Minuteman III ICBM.

W80 Stockpile Systems

The W80 warhead is used in the Air Launched Cruise Missile deployed by the Air Force.

B83 Stockpile Systems

The B83 is an aircraft-delivered, strategic gravity bomb deployed by the Air Force.

W87 Stockpile Systems

The Mk21/W87 re-entry vehicle is deployed on the Minuteman III ICBM.

W88 Stockpile Systems

The W88 is integrated into the Trident II D5 Strategic Weapon System. It is part of the SLBM force. The W88/Mk5 is completed by NNSA as a Re-entry Body Assembly and delivered to DOD.

Highlights of the FY 2020 Budget Request

- Complete development, qualification, production and delivery of all scheduled LLCs for the B61, W76, W78, W80, B83, W87, and W88. LLCs include GTSs, NGs, and alteration kits delivered to sustain the nuclear weapons stockpile.
- Conduct surveillance programs for all weapon systems using data collection from flight tests, laboratory tests, and component evaluations to assess stockpile reliability, performance and safety.
- Conduct Annual Assessment activities for all weapon systems including the in-depth testing and analysis of systems, subsystems, and components.
- Analyze, evaluate, and close high priority SFIs in accordance with the currently approved baseline closure plans.
- Initiate full rate production activities for the new electronic neutron generator (ELNG) for the B61-11 program.
- Conduct Cable Pull Down Flight Test for the B61.
- Initiate transition activities of the B61 Mod 12 from the LEP to the stockpile.
- Continue full-scale development for the W76-1 Joint Test Assembly (JTA) 3 flight test body, an engineering refresh of the existing W76-1 JTA1 flight test body.
- Continue full-scale development for the W78 JTA6R flight test body, an engineering refresh of the existing W78 JTA6 flight test body.
- Continue Alt 369 production activities for the W80 program.
- Continue development and qualification activities to support Integrated Surety Architecture (ISA) requirements on the W80 program.
- Complete qualification activities and initiate production for Alt 360 on the W87 program.
- Continue integration of W87 with USAF GBSD.
- Continue procurement of W88 H1514C shipping and storage containers.
- Continue development and qualification activities toward implementing W88 Alt 940 surety improvements in conjunction with the Alt 370 through the ISA initiative.

FY 2021 - FY 2024 Key Milestones

- Conduct weapon maintenance activities in accordance with directive documents and execute repair and replacement of aging components, to include GTSs and NGs, as required.
- Conduct weapon surveillance activities in accordance with directive documents, to include: disassembly and inspections, system-level laboratory tests, joint flight testing, component and material evaluations, and assessment.
- Conduct weapon assessment activities necessary to complete Weapon Reliability and Annual Assessment Reports, which include: laboratory testing and analysis, and significant finding investigations, as required.
- Conduct weapon program planning activities associated with management of fielded weapon systems. Provide systems and component engineering support for planning, resolution, and documentation.
- Conduct development studies and capability improvements for weapon systems.

FY 2018 Accomplishments

- Delivered all scheduled LLCs for the B61, W76, W78, W80, B83, W87, and W88.
- Conducted surveillance activities for all weapon systems using data collection from flight tests, laboratory tests, and component evaluations to assess stockpile reliability without nuclear testing which culminated in completion of all Annual Assessment Reports and generation of Laboratory Director Letters to the President.
- Completed the FPU of new B61 Joint Test Assembly (JTA) configurations via successful conduct of the JTA Modernization project.
- Completed the last W76-0 flight tests for life of program.
- Completed the first B61-11 high-fidelity military trainer Refurbishment.
- Completed the B61-11 and B83 electronic neutron generator (ELNG) QER.
- Continued planning and early development for the W76 JTA 3 (JTA1 refresh).
- Completed renewal of the W76 10-Year Nuclear Explosive Safety Study (NESS) for assembly and disassembly to allow continuation of nuclear explosive operation.
- Executed successful startup of one W78 Repair.
- Completed the FY 2018 W80 Alt 369 deliveries to the Air Force.
- Established W80 Product Realization Team to support Integrated Surety Architecture (ISA) implementation plans.

- Completed B83 component testing and final report for Cycle 114 Canned Subassembly (CSA) and completed nondestructive evaluation (NDE) and Disassembly & Inspection (D&I) for Cycle 115 CSA.
- Completed Customer Requirements Review and Preliminary Design Review for JTA6R development and started the Telemetry Preliminary Design Review on the W78 program.
- Met DOD requirements for W87 Small Ferroelectric Neutron Generator retrofits.
- Completed successful MC-level Final Design Review and FPU for the W87 Alt 360.
- Initiated W87 Joint Environmental Test Unit (JETU) Product Realization Team (PRT) and related integration activities to support GBSD.
- Performed W87 Repairs retrofits.
- Continued development of W88 Alt 940 ISA transportation surety solution.
- Continued development and initiation of production for next W88 NG/GTS LLC cycle.

Stockpile Systems

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
B61 Stockpile Systems $64,547,000	**B61 Stockpile Systems $71,232,000**	**B61 Stockpile Systems +$6,685,000**
• Continue to produce LLCs. Complete qualification activities, achieve FPU, and continue production of the ELNG for the B61-11. • Continue surveillance activities, including D&I, system-level laboratory tests, joint flight tests, component and material evaluations, and assessment. • Continue weapon assessment activities necessary to provide data for Weapons Reliability Report (WRRs) and AARs, which include analyses from laboratory testing and SFIs, as required. • Perform development and qualification activities to support ISA requirements. Continue feasibility studies as required and in conjunction with DOD as necessary. • Continue activities associated with management of fielded weapon systems. Provides systems and component engineering support for planning, resolution, and documentation.	• Continue to produce LLCs. Begin production of the electronic neutron generator (ELNG) for the B61-11. • Continue surveillance activities, including D&I, system-level laboratory tests, joint flight tests, component and material evaluations, and assessment. • Increase in Weapon Assessment activities necessary to support the transition costs for the B61-12, and provide data for WRRs and AARs, which include analyses from laboratory testing and SFIs, as required. • Perform development and qualification activities to support ISA requirements. Continue feasibility studies as required and in conjunction with DOD as necessary. • Increase activities associated with management of fielded weapon systems to support the transition costs for the B61-12. Provides systems and component engineering support for planning, resolution, and documentation.	• The increase represents the production of the electronic neutron generator (ELNG) for the B61-11 in Weapon Maintenance, and the transition costs for the B61-12 coming into the stockpile in Weapon Assessment and Weapon Program Planning/Support.
W76 Stockpile System $84,300,000	**W76 Stockpile System $89,804,000**	**W76 Stockpile Systems +$5,504,000**
• Continue producing LLCs, including an increase in NG/GTS production to support W76 LEP requirements that are being assumed by the W76 Stockpile System. • Conduct W76-0 and W76-1 core surveillance activities to include D&I, system-level laboratory, and joint flight testing as more W76 LEP requirements are being assumed by stockpile systems.	• Continue producing LLCs, including an increase in NG/GTS production to support W76 LEP requirements that are being assumed by the W76 Stockpile Systems project. • Continue to conduct W76-0 and W76-1 core surveillance activities to include D&I, system-level laboratory, and joint flight testing as more W76 LEP requirements are being assumed by the stockpile systems project.	• The increase represents the ramp-up in development of the W76-1 JTA3 flight test body in Development Studies/Capability Improvements.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
• Continue to conduct weapon assessment activities necessary to complete Weapon Reliability and AARs to include laboratory/site testing and analysis, trainer refurbishments, and SFIs. The W76 Stockpile Systems project will assume more W76-1 sustainment requirements. • Begin full program execution for development of JTA3 to ensure on time FPU prior to JTA1 end of life. • Continue activities associated with management of fielded weapon systems. Provides systems and component engineering support for planning, resolution, and documentation.	• Continue to conduct weapon assessment activities necessary to complete Weapon Reliability and AARs to include laboratory/site testing and analysis, trainer refurbishments, and SFIs. The W76 Stockpile Systems project has assumed all W76-1 sustainment requirements. • Continue full program execution for development of JTA3 to ensure on time FPU prior to JTA1 end of life. • Continue activities associated with management of fielded weapon systems. Provides systems and component engineering support for planning, resolution, and documentation.	
W78 Stockpile Systems $81,329,000	**W78 Stockpile Systems $81,299,000**	**W78 Stockpile Systems -$30,000**
• Conduct maintenance activities in accordance with PCDs and execute repair and replacement of aging components as required. • Continue to conduct surveillance activities in accordance with directive documents, to include D&Is, system- level laboratory tests, joint flight testing, component and material evaluations and assessment. • Provide weapon assessment activities necessary to complete Weapon Reliability and AARs to include laboratory testing and analysis, SFIs as required. • Conduct studies in conjunction with DOD as necessary. Develop JTA6R technology to support flight test missions. • Conduct activities associated with management of fielded weapon systems. Provide systems and component engineering support for planning, resolution, and documentation.	• Conduct maintenance activities in accordance with PCDs and execute repair and replacement of aging components as required. • Continue to conduct surveillance activities in accordance with directive documents, to include D&Is, system- level laboratory tests, joint flight testing, component and material evaluations and assessment. • Continue weapon assessment activities necessary to complete Weapon Reliability and AARs to include laboratory testing and analysis, SFIs as required. • Conduct studies in conjunction with DOD as necessary. Continue to develop JTA6R technology to support flight test missions, • Continue to conduct activities associated with the management of fielded weapon systems. Provide systems and component engineering support for planning, resolution, and documentation.	• The decrease represents a ramp-down of component engineering support activities for planning, resolution, and documentation in Weapon Program Planning/Support; and a ramp-up in development of the W78 JTA6R flight test body in Development Studies/Capability Improvements.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
W80 Stockpile Systems $80,204,000	**W80 Stockpile Systems $85,811,000**	**W80 Stockpile Systems +$5,607,000**
• Continue to produce LLCs. Continue Alt 369 production. • Continue surveillance activities, to include D&I, system-level laboratory and joint flight testing, component and material evaluations (CME), assessment, and platform compatibility and testing activities. • Continue weapon assessment activities necessary to complete WRRs and AARs, which include analyses of laboratory testing and SFIs, as required. • Multi-System Transportation Attachment Device (MTAD) conduct appropriate feasibility studies in conjunction with DOD and provide laboratory and management expertise to the POG and DOD Safety Studies. • Continue activities associated with management of fielded weapon systems. Provide systems and component engineering support for planning, resolution, and documentation.	• Continue to produce LLCs. Continue Alt 369 production. • Continue surveillance activities, to include D&I, system-level laboratory and joint flight testing, CME, assessment, and platform compatibility and testing activities. • Continue weapon assessment activities necessary to complete WRRs and AARs, which include analyses of laboratory testing and SFIs, as required. • Perform development and qualification activities to support ISA/MTAD requirements. Provide laboratory and management expertise to the POG and DOD Safety Studies. • Continue activities associated with management of fielded weapon systems. Provide systems and component engineering support for planning, resolution, and documentation.	• The increase represents activities associated with the Sea-Launched Cruise Missile (SLCM) study in Development Studies/Capability Improvements and increased activities in Weapon Assessment offset by a decrease in Weapon Maintenance activities.
• **B83 Stockpile Systems $35,082,000**	**B83 Stockpile Systems $51,543,000**	**B83 Stockpile Systems +$16,461,000**
• Continue to support LLCE operations. • Continue surveillance activities, including D&Is, system-level laboratory tests, joint flight tests, CMEs, and assessment. • Continue weapon assessment activities necessary to complete WRRs and AARs, to include analyses of laboratory testing and SFIs, as required. • Continue activities associated with management of fielded weapon systems. Provides systems and component engineering support for planning, resolution, and documentation.	• Continue to support LLCE operations per NPR requirement. • Continue surveillance activities, including D&Is, system-level laboratory tests, joint flight tests, CMEs, and assessment per NPR requirement. • Continue weapon assessment activities necessary to complete WRRs and AARs, to include analyses of laboratory testing and SFIs, as required. • Continue activities associated with management of fielded weapon systems. Provides systems and component engineering support for planning, resolution, and documentation.	• The increase represents the revised program of record in accordance with the NPR.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
W87 Stockpile Systems $83,107,000	**W87 Stockpile Systems $98,262,000**	**W87 Stockpile Systems +$15,155,000**
• Continue NG production, firing set qualification and FPU activities. Reduced LLCE production and exchange related to inactive stockpile and execute repair, maintenance, and replacement of aging weapon components. Continue activities for qualification of GTS Alt 360 with an FPU in FY 2019. • Continue surveillance activities to include D&I, system-level laboratory and joint flight testing, component and material evaluations, and platform compatibility and testing activities. • Provide weapon assessment activities to include laboratory testing and analysis, POG and DOD requested studies, and SFIs, necessary to complete WRR and AAR. • Continue product realization activities for the W87 Alt 360. Continue feasibility studies as required in conjunction with the DOD. Decrease firing set development activities that would impact out year production and stockpile rebuilds. • Conduct activities associated with management of fielded weapon systems. Provide systems and component engineering support for planning, resolution, and documentation.	• Continue NG production, firing set qualification and related production activities. Continue NG retrofits, maintenance, repair, and rebuild of W87 war heads. Continue activities for qualification of GTS Alt 360 related components and full-scale GTS production to support LLCE deliveries and HEDGE. Continue to support other component production activities. • Continue surveillance activities to include D&I, system-level laboratory and joint flight testing, component and material evaluations, replacement hardware development procurement, and other surveillance production component, and other compatibility testing activities. • Continue to provide weapon assessment activities to include laboratory testing and analysis, POG and DOD requested studies, and SFIs, necessary to complete WRR and AAR. • Continue product realization activities for the W87 Alt 360. Continue GBSD feasibility studies as required in conjunction with the DOD. Decrease firing set development activities that would impact out year production and stockpile rebuilds. • Continue to conduct activities associated with management of fielded weapon systems. Provide systems and component engineering support for planning, resolution, and documentation.	The increase represents a ramp-up in component production to support repairs and rebuilds in Weapon Maintenance; a ramp-up in component development and production to support joint flight test requirements in Weapon Surveillance; and improvements to support GBSD integration in Development Studies/Capability Improvements.
W88 Stockpile Systems $170,913,000	**W88 Stockpile Systems $157,815,000**	**W88 Stockpile Systems -$13,098,000**
• Continue to execute production of weapon components required for repair, maintenance, and replacement. Continue production and	• Continue to execute production of weapon components required for repair, maintenance, and replacement. Initiate full-scale NG	The decrease represents the completion of design and development costs for the Neutron Generators and Gas Transfer Systems.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
qualification activities to achieve full-scale NG production with increased technical scope in FY 2019. Continue production and qualification activities for the GTS LLCE cycle beginning in FY 2020. Rebuild warheads only to maintain authorization basis due to W88 Alteration Program preparation, and to fully execute Alt 940 production activities. • Continue surveillance activities to include D&I, system-level laboratory and joint flight testing, CME, and platform compatibility and testing activities. Continue component surveillance activities, to include Canned Subassembly non-destructive evaluations. • Continue weapon assessment activities necessary to complete Weapon Reliability and AARs, to include laboratory/site testing and analysis, trainer refurbishments, and SFIs. Execute Alt 370 and Alt 940 SS21 authorization basis and fielding activities to support FPUs. • Continue critical Development/Integration and start system level qualification activities for surety enhancements, and replace legacy W88 System NG and remanufacture of GTS. Conduct appropriate studies in conjunction with DOD, and provide laboratory and management expertise to the POG and DOD safety studies. Execute H1514 container production. Transfer of Alt 940 activities to Weapon Maintenance due to production ramp up. • Continue and increase activities associated with management of fielded weapon systems. Provides systems and component engineering support for planning, resolution, and documentation.	production with increased technical scope in FY 2019. Continue production and production qualification activities for the GTS LLCE cycle beginning in FY 2020. Rebuild warheads only to maintain authorization basis due to W88 Alteration Program preparation, and to fully execute Alt 940 production and deployment activities. • Continue surveillance activities to include D&I, system-level laboratory and joint flight testing, CME, and platform compatibility and testing activities. Continue component surveillance activities, to include Canned Subassembly non-destructive evaluations. • Continue weapon assessment activities necessary to complete Weapon Reliability and AARs, to include laboratory/site testing and analysis, trainer refurbishments, and SFIs. Execute Alt 370 and Alt 940 SS-21 authorization basis and fielding activities to support FPUs. • Continue critical Development/Integration and start system level qualification activities for surety enhancements, and replace legacy W88 System NG and remanufacture of GTS. Conduct appropriate studies in conjunction with DOD; provide laboratory and management expertise to the POG and DOD safety studies. Execute H1514C container production. • Continue and increase activities associated with management of fielded weapon systems. Provides systems and component engineering support for planning, resolution, and documentation.	

Directed Stockpile Work
Weapons Dismantlement and Disposition

Description

Weapons Dismantlement and Disposition (WDD) is a critical element of NNSA's integrated effort to transform the enterprise and the stockpile. Specific activities include weapons disassembly, the harvesting of material and hardware for LEPs, disposition of retired warhead system components, and safety surveillance of selected components from retired warheads. Other supporting activities specific to retired warheads include conducting hazard assessments, issuing safety analysis reports, conducting laboratory and production plant safety studies, and declassification and sanitization of component parts. WDD relies on several enabling programs to complete its mission, such as Stockpile Services Production Support for shipping, receiving, and equipment maintenance; Infrastructure and Operations for infrastructure sustainment and containers; and the Office of Secure Transportation for the movement of weapons and weapon components. The FY 2017 and FY 2018 National Defense Authorization Acts (NDAA) placed a spending cap of $56,000,000 on the Weapon Dismantlement and Disposition program through FY 2021.

WDD focuses on the safe and secure dismantlement of excess nuclear weapons and components. The WDD program has four focus areas:

(1) Disassembly – WDD enables the dismantlement of weapons and canned subassemblies and is a significant supplier of material for future nuclear weapons production and Naval Reactors.

(2) Component Disposition – WDD ensures waste streams are identified to allow for the permanent disposition of weapon components.

(3) Retired Systems Management – WDD enables safety studies that ensure weapons in the stockpile awaiting dismantlement remain safe while in DOD custody.

(4) Component Characterization – WDD ensures that all potential hazards contained in weapon components are characterized to allow the weapons complex to safely work with individual weapon components.

Highlights of the FY 2020 Budget Request

- Perform weapon dismantlements to ensure material and component requirements are met.
- Perform CSA dismantlements while providing feedstock to internal and external customers.
- Perform legacy component disposition activities.

FY 2021 - FY 2024 Key Milestones

- Execute the dismantlement of weapons and CSAs and remain a significant supplier of material for future nuclear weapons production and Naval Reactors.
- Execute annual activities as stated in the annual Dismantlement Program Plan.
- Provide material and hardware for LEPs.
- Provide material for external customers.

FY 2018 Accomplishments

- Completed planned weapon and CSA dismantlements.
- Reduced legacy part inventories throughout the enterprise in accordance with site-specific disposition plans.
- Exceeded Component Disposition Goals for FY 2018.
- Completed Warhead Measurement Campaign.
- Accomplished all W84 Disassembly and Inspection (D&I) deliverables for FY 2018 and shipped several parts to safety testing location.

Weapons Dismantlement and Disposition

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Weapons Dismantlement and Disposition (WDD) $56,000,000	**Weapons Dismantlement and Disposition (WDD) $47,500,000**	**Weapons Dismantlement and Disposition (WDD) -$8,500,000**
• Continue weapon dismantlements to ensure trained labor, material and component requirements are met (e.g., W80-1 Alt 369, B61-12 LEP, and W76 LEP). • Dismantlement to benefit Production Technicians (PTs) in terms of technical training and clearances for future (LEPs). • Provide feedstock from CSAs to internal and external customers. • The laboratories will provide technical expertise and safety plans for weapons undergoing dismantlement. Enterprise sites will continue legacy component disposition activities.	• Continue weapon dismantlements to ensure trained labor, material and component requirements are met (e.g., W80-1 Alt 369, B61-12 LEP, and W76 LEP). • Dismantlement to benefit Production Technicians (PTs) in terms of technical training and clearances for future (LEPs). • Provide feedstock from CSAs to internal and external customers. • The laboratories will provide technical expertise and safety plans for weapons undergoing dismantlement. • Enterprise sites will continue legacy component disposition & CSA activities at a modified level.	• The decrease represents a reduction in legacy component disposition and CSA activities consistent with material and component needs for the stockpile and external customers. Weapon Dismantlement Program of Record remains unchanged.

Directed Stockpile Work
Stockpile Services

Description
Stockpile Services provides the logistical, mechanical, and support foundation for all DSW operations that are applicable to multiple weapon systems in the nuclear weapons stockpile. This support for all weapon systems and DSW operations includes Production Support, Research and Development Support, Research and Development Certification and Safety, and Management, Technology, and Production.

Production Support (PS)
PS provides the multi-system manufacturing base that enables the individual site capability and capacity to sustain NNSA's nuclear security enterprise's production mission. The production mission is defined as weapon assembly, weapon disassembly, component production, surveillance, and weapon safety and reliability testing. PS also enables the modernization of production capabilities to improve efficiency and ensure manufacturing operations meet future requirements. PS requires close coordination with the Advanced Manufacturing Development program, which is charged with development and initial deployment of new manufacturing and production capabilities.

Production Support activities include the following:
(1) **Engineering Operations** – Internal plant-wide activities that establish product process flows and improvements, develop and maintain operating procedures, determine critical design parameter and manufacturing process capabilities, establish process controls, metrics and quality indices, and establish and maintain process safety controls/assessments;
(2) **Manufacturing Operations** – Activities that manage and provide oversight to manufacturing departments and all internal non-weapon-type specific manufacturing operations and processes, material controls, supervision, planning and scheduling, inventory control, packaging, shipping and procurement, internal production-related transportation, and internal production related safety activities. It also includes classified manufacturing operations that cannot be associated with a particular warhead;
(3) **Quality, Supervision, and Control** – Includes activities dealing with quality control, supervision of general in-line inspection and radiography, procedures development and execution, process control certification for War Reserve products, measurement standards and calibration techniques, calibration of equipment, tooling, gages and testers, and Quality Assurance (QA)-related equipment/processes for certification;
(4) **Tool, Gage, and Equipment Services – Activities that include preparation of specifications and designs for non-weapon-type** specific tooling including tools, gages, jigs and fixtures and test equipment, as well as design and development of tester software including tester control and product assurance. This category also includes work related to verification/qualification of hardware and software, procurement processes, and maintenance, both corrective and preventative, that directly support production-related equipment/process components;
(5) **Purchasing, Shipping, and Materials Management** – Planning, engineering, supplier management, and logistics activities associated with the materials supply chain; and
(6) **Electronic Product Flow** – Activities that include internal plant-wide purchase, design, development, installation, configuration, testing, training, and maintenance of classified and unclassified computer systems including hardware and software. These activities are directly linked to the performance of site-specific production functions, but are separate and distinct from general-use administrative and office-automated systems. Supported systems in both unclassified and classified environments enable manufacturing and quality assurance functions.

Research and Development Support (RDS)
The RDS program is responsible for the programmatic and infrastructure management supporting multiple-system stockpile activities critical to DSW programs. Direct support to activities includes multiple-system flight tests, archiving of weapons data required to validate and verify computational and predictive methods without the use of underground tests, updating R&D and engineering tools to remain current with evolving technology, computer system support and cyber security compliance, quality assurance, securing databases for surety assessment tools, NEA, and liaison support between Design Agencies and Production Agencies. These endeavors support multiple systems in the existing stockpile and reduce multi-faceted risks that can affect operations and procedures for these systems.

RDS activities include the following:

(1) R&D Infrastructure Support – Addresses laboratory work that maintains the technical and scientific base including equipment, staff, and facilities. Specific activities include maintaining and upgrading computation/simulation systems and licenses, developing R&D staff with the technical skills and knowledge required to be proficient at core product testing and experimentation, and applying any tax that may be levied on an R&D program for building and capital use.

(2) Program Management and Integration for R&D Activities – Maintains financial databases, milestone tracking, risk analyses, and R&D support for the POG and the Nuclear Weapons Safety Study Group (NWSSG). Specific activities include overseeing aspects of DSW Program Management, assigning R&D laboratory personnel/assignees to external/offsite federal organizations, and managing and executing R&D support service contracts.

(3) Laboratory R&D Support to the Production Plants – Covers laboratory work required to ensure the plants can commence and continue production R&D activities. This scope is performed by laboratory' personnel imbedded at each plant. Directed R&D work ensures that nuclear enterprise assurance is incorporated into all developed technologies so the risk of insertion into the stockpile is reduced.

(4) Quality Control for R&D – Ensures that quality control procedures, methods, and processes are implemented for R&D activities.

(5) Joint Integrated Lifecycle Surety – Provides support to assess weapon-venue specific challenges and recommends solutions to improve safety and security issues in conjunction with the weapon systems groups. This consists of database administration and upkeep of the required hardware and software for the tools.

(6) Nuclear Testing Heritage (NTH) – Supports legacy commitments such as the Nuclear Testing Archive and funds efforts to preserve and make accessible nuclear test data for the design laboratories.

(7) NEA – Executes site-specific policy development, program management, and implementation of the NEA program at NNSA laboratories.

(8) Archiving Data and Management (ADAM) – Conserves historical records, knowledge, and data derived from the nuclear testing era and makes this data easily accessible to members of the stockpile stewardship community with requisite clearances and need-to-know.

<u>**Research Development Certification and Safety (RDCS)**</u>

RDCS provides the applied research, development, engineering and integration of capabilities for NNSA's stockpile stewardship and management efforts. This is accomplished through early development of components to replace sunset technologies, nuclear safety assessments and studies, systems engineering, new engineering models and algorithms, and design studies to advance technologies sufficiently for future insertions. The RDCS subprogram also conducts scaled demonstrations in relevant environments of technologies that are intended for stockpile insertion to validate performance against anticipated requirements and maintains NNSA's base hydrodynamic and subcritical experiment capabilities.

RDCS activities include the following:

- **Technology Development & Integration (TDI)** – Activities associated with the development, engineering, and integration of technologies that ensure the reliable performance, safety, and handling of current and future stockpile systems. TDI oversees the early-stage development and testing of all weapon components targeted to replace sunset technologies and modernize subsystems, defined as components facing performance, aging, and/or security issues that can have negative impacts on the performance and safety of a weapon. TDI activities reduce stockpile risk, costs, and uncertainty in operations, maintenance, and safety, and enhance the responsiveness of the nuclear stockpile to changing policy, technical, and threat environments. Moreover, TDI investments facilitate the expertise and knowledge necessary to sustain and enhance these capabilities. Weapon subsystems supported by RDCS include:

- **Gas Transfer Systems (GTS):** Activities associated with enhancing the design and capabilities of limited life components (LLCs) to offset weapon aging and uncertainty issues.

- **Neutron Generators (NGs):** Activities required for continual development and improvements associated with NG technologies to offset aging effects including components and materials, and development and qualification of improved radiation-hardened ferro-electric and ELNG designs.

- **Arming, Fuzing & Firing (AF&F):** Activities to upgrade AF&F subsystems that incorporate trusted microelectronics, control systems, and additional features, including new architectures that enhance agility, adaptability, and modularity.

- **Nuclear Explosives Package (NEP) and Related Components:** R&D activities in support of technologies required for next generation components and materials required to ensure safety, security, reliability, and performance of the aging NEPs of the enduring stockpile. Includes investigation and modeling of advanced initiation system dynamics, structural mounts, and replacement materials.

- **Material Science and Component Engineering:** Small research projects associated with applied material science and integration of technologies including, but not limited to: telemetry, sensors, and testers. This focus area is informed by the application of tailored systems engineering and integration principles.

- **Energetics:** Mature advanced power source technologies to support future tactical and strategic weapon system LEP insertions including mature explosive materials, initiation systems, detonators, technologies, tools and processes to support future tactical and strategic weapon system LEP insertions.

- **Safety** Mechanisms**:** Mature safety-related technologies required to meet normal and abnormal environmental requirements for future weapon system insertions.

- **Technology Demonstrations** – Work associated with research and development testing and evaluation activities including systems engineering and integration, test article purchase, development, build/modification, and installation, overhead (possible cost associated with platform and facility and associated infrastructure), data acquisition, analysis, and storage, and other activities and expenses associated developmental testing of one or more maturing technologies. This work includes two fundamental programmatic areas:

- **Joint Technology Demonstrator (JTD):** The JTD is a U.S. - UK strategic collaboration dedicated to the design and development of a series of joint integrated system demonstrations supporting new safety, security, and advanced manufacturing technologies. A goal of the JTD collaboration is to sustain core capabilities throughout the U.S. and UK nuclear weapons enterprises in the design, manufacture, ground testing, and assembly of flight-ready hardware. The collaboration exercises and matures capabilities in nuclear weapon science, component and subsystem technologies, cost- and time-efficient production methods, and systems integration, and seeks to reduce future programmatic risk, development and technology insertion time, and life cycle costs. These efforts target the highest risk capabilities and technologies required to minimize the risk to future weapon development activities, and has a nearer term focus than that of the Stockpile Responsiveness Program. JTD encompasses three distinct workstreams:
    - Workstream 1 (WS1) is the NNSA, US Navy, and Ministry Of Defense collaboration developing a system architecture within the Mk5 aeroshell;
    - Workstream 2 (WS2) is the NNSA and USAF collaboration developing a system architecture with the Mk21 aeroshell; and
    - Workstream 3 is collaborative technology maturation between the MOD and NNSA.
- **Future Demonstrators:** Work associated with R&D test and evaluation activities, beyond those for JTD, using demonstrator platforms such as Superfuge, Vibrafuge, HOT SHOT, ground test units (GTUs), and ANDI flight tests to gain confidence in technology maturation efforts. This work increases the frequency of technology performance data collection to drive shorter development and implementation timelines.
- **Applied Research and Development (R&D) Studies** – Applied R&D includes establishing system-level context and associated requirements for fundamental technology development, weapon certification and safety processes, weapons effects assessments, and vulnerability studies. Specific applications include: Independent Nuclear Weapons Assessment (INWAP) and activities associated with planning, data exchange and conducting cross- laboratory assessments of weapons.
- **Primary and Secondary Assessments** - Activities associated with conducting annual assessment and certification of weapon primaries and secondaries.
- **Assessment Methodologies Testing and Development -** Activities associated with advancing the processes and data used for annual assessment of the stockpile.
- **Base Hydrodynamic and Subcritical Capabilities -** Includes fielding and execution activities required to ensure that a modern suite of base hydrodynamic and subcritical capabilities are available to support integrated weapon experiments across multiple systems and system level experiments; activities associated with designing, preparing, and

assembling diagnostic capabilities for multiple systems; activities associated with providing inputs and updates to the National Hydrodynamic Test Plan for experiments supporting multiple systems; activities associated with fielding and executing experiments, initial analyses of the experimental results through data reduction, and disposition of expended of hydrodynamic experiments and sub-critical tests; and activities associated with conducting and analyzing results of hydrodynamic experiments for certifying LEPs.

Management, Technology, and Production (MTP)

The MTP program is a multi-system production based program that enhances NNSA's nuclear security enterprise integration and efficiency. MTP funding is used to provide plant and laboratory personnel to sustain the stockpile, including activities relating to surveillance laboratory/flight test data collection and analysis; weapons reliability reporting to the DOD; weapon logistics and accountability; engineering authorizations; safety assessments; Use Control technologies to keep weapons safe, secure, and available to the war fighter upon Presidential release authority; base spares used to sustain weapons in a safe reliable status; studies evaluating nuclear weapons operations safety; weapon components for use in multiple weapons systems; multi-weapon system transportation/handling gear/containers used to safely and securely store and transport weapons between DOD and DOE sites; and stockpile planning.

MTP activities include the following:

(1) Product Realization Integrated Digital Enterprise (PRIDE): Operation and maintenance of 44 classified electronic information management systems that provide optimized and secure information management capabilities required to share information across the NNSA nuclear security enterprise on weapons design, manufacturing, surveillance, accountability, vendor material purchases, LLC exchanges, dismantlement, and refurbishment;

(2) Weapons Training and Military Liaison: Staffing the multi-weapon subject matter experts for Unsatisfactory Reports (URs) associated with DOD's field issues for testing and handling gear, Technical Publications, and coding issues that allows maintenance operations to return weapons to active status. Additionally, this activity sustains critical manufacturing skills required at enterprise sites;

(3) Studies and Initiatives: Activities that re-establish critical depleted uranium-related capabilities including skilled labor; casting, rolling, forming, and machining at Y-12 to manufacture cases and CSAs for the stockpile and LEPs; and upgrades the enterprise's weapons LAPS system;

(4) General Management Support: Non-programmatic costs for program management and oversight, shared taxes, assignees, and support services contracts;

(5) Assessments & Studies (Use Control): Includes in-depth vulnerability assessments of nuclear weapons in the stockpile; identifying or developing and deploying common technologies to address vulnerabilities, if found; and special studies to support the decision processes for optimizing LEP designs and for option down-select decisions by senior officials;

(6) Surveillance: Efforts that focus on multi-system, common use, or non-weapon specific activities (data capture, flight test planning) supporting stockpile evaluation, including activities and new capabilities for surveillance transformation;

(7) External Production Missions: Provides weapon response subject matter experts across all systems and all laboratories weapon response manning is critical to sustain safe operations (should an unexpected weapon condition or anomaly be observed during operations) to support weapons delivery schedules. Supports Nuclear Safety Research and Development activities associated with nuclear operations leading to development of safety technologies with strategic partners; and improvements in safe nuclear explosive operations;

(8) Base Spares (Production): Activities that produce new non-weapon specific base spares, containers, LLC forgings, detonators, mock HE, and other weapon components; and

(9) Base Spares (Maintenance): Activities associated with maintaining existing non-weapon specific base spares, handling gear/containers, GTSs, Use Control equipment, Code Management System equipment, test equipment, and other weapon components.

Highlights of the FY 2020 Budget Request

Production Support (PS)

- Provide the manufacturing capabilities (e.g., engineering, manufacturing, quality assurance) and capacity for LEP production, enduring stockpile weapon assembly, weapon disassembly, weapon safety and surveillance testing, and reliability testing as required to meet directive schedules and meet DOD delivery schedules.
- Support manufacturing investments for detonator and detonator cable assemblies (DCA) production, and Neutron Generator Enterprise. Detonator production is expanding to encompass eight product lines and the neutron generator

line is maintaining five product lines, using new equipment to enable higher yield rates, increased maintenance/calibration services, and improving shop floor efficiency.
- Expand engineering and quality assurance processes for B61-12 LEP non-nuclear component production.
- Continue the Manufacturing Modernization Project (MMP) to support digital product production and acceptance, specifically completing the upgrade for the detonator manufacturing line completing in FY 2021.
- Continue development of Electronic Work Instruction processes and procedures for the visual factory shop floor, migrating from a paper-based product lifecycle management system to electronic media to document and collect "day zero" weapon assembly informatics.

Research and Development Support (RDS)
- Archive weapons data to preserve information from the nuclear testing era and to make this data available to researchers at the national laboratories.
- Support legacy testing heritage commitments.
- Utilize and maintain surety assessment tools.
- Provide scientific and technical support to the production plants to help achieve weapon production directives.
- Execute NEA for R&D activities.
- Support subject matter expert information exchanges with the Atomic Weapons Establishment (AWE).

Research and Development, Certification and Safety (RDCS)
- Improve existing capabilities, provide solutions for addressing gaps and shortfalls, evolve technologies to meet emerging threats and changing policy, and utilize improved technologies and methods to reduce life-cycle costs.
- Improve the capability to execute hydrodynamic and subcritical experiments that are needed by the current and future stockpile, in response to new DOD delivery platforms and replacement of legacy production materials, processes, and techniques.
- Complete the Annual Assessment Process for the stockpile, deliver the Laboratory Director Letters to the President, support the Independent Nuclear Weapons Assessment program, and support development of the WRR for delivery to DOD.
- Develop multi-system engineering analysis models and configure management of baseline models used in assessment activities.
- Develop multiple-system technologies and conduct exploratory studies to address current and emerging stockpile issues and any capability gaps and shortfalls, as well as develop components to replace aging and obsolete components technologies.
- Execute the Joint Technology Demonstrator (JTD) project, a U.S.-UK strategic collaboration to explore technology applications in a systems-context, reduce risks for future insertion, enhance workforce design and production skills, and identify process improvements for the NNSA nuclear security enterprise.
- Pursue the US Air Force/NNSA Demonstrator Initiative (ANDI) to conduct multiple technology risk reduction flight tests.
- Execute the High Operational Tempo Sounding Rocket initiative (HOT SHOT) to reduce the risk of transitioning new technologies to end users and increase the probability of technology insertion into the stockpile.
- Explore alternative technology maturation demonstration capabilities for future systems.

Management, Technology and Production (MTP)
- Execute stockpile sustainment activities providing products, components, and/or services for multi-weapon surveillance, weapons reliability reporting to DOD, weapon logistics and accountability, special materials (including depleted uranium processing), and stockpile planning.
- Support development of multi-system surveillance testers (stronglink, environmental testing equipment and centrifuges) required to support LEP testing requirements.
- Support additional multi-system weapon response and external production resources to conduct nuclear safety studies to ensure un-interrupted nuclear explosive operations at production plants.
- Increase in Use Control studies and equipment procurements to align with nuclear weapon FPUs and enduring stockpile refresh opportunities.
- Sustain multi-year effort to upgrade and integrate the weapons LAPS system used throughout the enterprise.
- Sustain efforts to re-establish special nuclear material manufacturing capability and capacity.

- Upgrade flight testing support and related equipment at Tonopah Test Range.
- Continue Models-Based Environment investments to allow NNSA to seamlessly exchange classified 3-dimensional product definition via common CADD architecture from weapon component sourcing to quality inspection.

FY 2021-FY 2024 Key Milestones
Production Support (PS)
- Meet NG quarterly production build plan as defined in the approved Neutron Generator Enterprise Integrated Program Plan (NIPP) supporting weapon system ship/delivery schedules.
- Meet Detonator production build plan as defined in the approved Detonator Production and Surveillance Program Execution Plan supporting weapon system ship/delivery schedules.
- Enable on-time completion of DSW deliverables by ensuring Process Equipment Availability.

Research and Development (R&D) Support
- Incorporate NEA into all developed technologies so that the risk of insertion into the stockpile is reduced.
- Enhance Production Agency and Design Agency collaboration.
- Operate and maintain surety assessment tools.
- Support legacy testing heritage commitments at Nevada.
- Maintain and upgrade computer systems and licenses in support of data management.

R&D, Certification and Safety (RDCS)
- JTD WS1: Complete physical, environmental, and functional ground testing of the MK5 design, execute two developmental hydrodynamic experiments, and conduct a tri-lab photon radiography experiment, and conduct U.S./UK systems demonstrations and studies.
- JTD WS2: Conduct system mechanical and electrical ground testing demonstrations for the Mk21 GTU.
- Continue development of modular and adaptable architectures with enhanced capabilities that result in a nuclear stockpile able to respond quickly and easily to changing policy, technology, and threat environments.
- Develop a state-of-health monitoring capability for future systems (e.g., embedded sensors).
- Replace current fuzing technologies with more capable technologies including advanced radars, path-length modules, inertial measurement units, and microelectronics.
- Leverage experimental platforms to demonstrate new technologies in relevant environments.
- Conduct 20 or more HOT SHOT flights, to include unclassified and classified payloads.
- Evaluate and implement re-entry concepts/environments within the HOT SHOT program.
- Annually assess and report on the safety, security, and effectiveness of the nuclear deterrent and support dual validation teams and assessments.
- Maintain and modernize the base capabilities for hydrodynamic testing to ensure the capability is available to support multiple system and system level experiments.
- Design, prepare, and assemble diagnostic capabilities for multiple system hydrodynamic and subcritical integrated weapon experiments.
- Field and execute experiments, provide initial analyses of the experimental results through data reduction, and disposition expended hydrodynamic experiments and subcritical tests.
- Support R&D studies, assessments, and analyses supporting weapon certification and safety processes, nuclear and explosives operations, and weapon effects and vulnerabilities.

Management, Technology, and Production (MTP)
- Complete and deliver equipment in accordance with Equipment Requirements Schedule PCD.
- Provide all Enterprise Modeling and Analysis Consortium (EMAC) decision support tasks for the requesting stakeholder, build/refine enterprise models supporting the parent site and EMAC overall, and submit accurate monthly status reports on time.
- Operate the Weapons Evaluation Test Laboratory (WETL) surveillance activities in accordance with the baseline plans.
- Complete and Deliver the WRR to NNSA.

FY 2018 Accomplishments

Production Support (PS)

- Continued execution of the Manufacturing Modernization Project (MMP), a multi-year project to transition to digital product acceptance.
- The ELNG Project RT successfully completed the qualification testing of the B83, legacy B61, and B61-12 ELNGs; these are first ELNGs produced at Sandia, ELNGs in the current stockpile were produced at the Pinellas Plant.
- The Neutron Generator Enterprise (NGE) met all its production builds (817 NGs, this includes development and production) and shipments in FY 2018 in accordance with the NIPP and the LLC-PCD.
- Vendor contract field representatives inspected more than 153,000 piece parts at over 90 vendors.
- Analytical labs continued to grow headcount in support of more than 8,000 work orders and 50,000 analytical tests.
- Quality Assurance inspections for all product programs implemented NAP-24A requirements for stamping/marking.
- Completed inventories, process monitoring, and item monitoring to meet Nuclear Material Control & Accountability requirements.
- Completed the Vacuum Pump Replacement Project, which supports the Vacuum Arc Re-melt Furnace and is an important part of the re-establishment of the metal cycle.
- Provided multi-system Engineering support to successfully meet all limited life component exchange (LLCE) production delivery & GTS surveillance deliverables.
- Developed, maintained, and upgraded specialized equipment supporting LLCE Production (Hot Air Decon, Clean Hydroburst system, Digital Radiography, Electron Discharge Machine).
- Provided multi-system operations, maintenance, and Lab support to successfully meet all LLCE production delivery and GTS surveillance deliverables.
- Developed Mass Spec Electronics Upgrade system for field installation in FY 2019 (5 systems to be upgraded during FY 2019-2021).

Research and Development Support (RDS)

- Archived past weapons data and converted sunset technology files to modern data storage/security systems.
- Continued to develop and pursue indexing and search tools to make legacy weapon data accessible by the cleared stockpile stewardship community.
- Enhanced the current assessment of the inventory of the holdings within the archives.
- Provided Production Agency personnel to Design Agencies for on-site support to align design and production decisions early in the technology development process.
- Provided on-site personnel for information exchange with the UK under the 1958 Mutual Defense Agreement.

Research and Development, Certification and Safety (RDCS)

- Developed a more accurate method to ensure nuclear explosives are initiated uniformly.
- Performed analyses in conjunction with the DOD to support key surety decisions for both NNSA and the DOD, and added new capabilities to accommodate cyber and insider threats.
- Successfully fielded and executed 25 hydrodynamic integral weapon tests supporting LEPs, weapons stockpile, science, and global security.
- Completed the Annual Assessment Process and the scheduled Independent Nuclear Weapon Assessment Process (INWAP) activities.
- Provided direct support to Stockpile Systems Program for flight tests and development for new high explosives (HE) for flight test diagnostics and qualification activities.
- Completed the JTD execution phase and transitioned to the system ground testing phase.
- Established the HOT SHOT program as a low-cost demonstration tool to advance the technology readiness of components and subsystems for future weapons activities.
- Progressed the development of new initiation systems and materials to enhance the safety of the detonation train.
- Demonstrated the viability of a bus-based data architecture via an electrical integration test bed.
- Established ANDI to leverage DOD technology maturation & risk reduction flight tests to evaluate advanced ballistic missile technologies.
- Designed and produced a commercial replacement detonator with next-generation chip-slapper initiation technology resulting in significant cost savings for testing activities.

- Developed and tested a prototype to validate a concept for insensitive high explosive (IHE) laser detonation.

Management, Technology, and Production (MTP)
- Delivered WRRs to DOD.
- Completed all WR scope on schedule using a combination of analysis, testing, and expert knowledge.
- Successfully completed a series of tests in support of nuclear safety R&D deflagration/detonation studies.
- Established cold hearth melting capability to support recycling, refinement, and alloying of scrap U6Nb alloy.
- Completed a two-year, Windchill PDMLink redeployment effort, improving audit readiness, sustainability, and extensibility and supporting increased throughput of product definition release.
- Completed the first production release of the LAPS solution. This phase allows the NNSA to author, manage, and coordinate the directive schedules for Directed Stockpile Work across the NNSA Nuclear Security Enterprise.
- Completed 15 flight tests. All tests achieved 100% data capture and all recoveries completed on schedule with no safety or security incidents.
- Completed all stronglink safety testing ahead of schedule at Weapons Evaluation Test Laboratory (WETL).
- Successfully replaced WETL QU2639 centrifuge arm and received delivery of the W88 Alt370 Tester.
- Deployed the Quality Assurance Defect Report/Incidental Defect Report (QADR/IDR) module and the first set of enhancement.

Stockpile Services

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Production Support (PS) $510,000,000	**Production Support (PS) $543,964,000**	**Production Support (PS) +$33,964,000**
• Provide engineering operations for weapon operations including LEP, surveillance, dismantlement, and component production to meet directive schedules and meet DOD delivery schedules. • Equipment investments for detonator and DCA production to support increasing from one to five product lines and improving yield rate. • Perform production capability infrastructure upgrades, including upgrading the Unloading Laser. • Upgrade site specific shop-floor IT hardware and software. • Continuing the MMP in support of digital product acceptance, including implementing upgrades to the pit product line and developing the upgrades for the detonator product lines. • Perform routine maintenance and upgrades to the Automated Reservoir Management System. • Conduct upgrades to Neutron Generator Enterprise shop-floor controls. • Upgrades to increase efficiency supporting the increased LEP workload. • Increase intra-site logistical support required to support weapon and component moves related to production. • Continue engineering and quality assurance preparation for B61-12 non-nuclear component production. • Provide engineering and quality assurance support for internal containers that support production.	• Continue engineering operations for weapon operations including LEP, surveillance, dismantlement, and component production to meet directive schedules and meet DOD delivery schedules. • Equipment investments at LANL for detonator and DCA production to support increased product lines and improving yield rate. • Perform production capability infrastructure upgrades, including upgrading the Unloading Laser at SRS. • Upgrade site specific shop-floor IT hardware and software. • Continue the MMP in support of digital product acceptance, including implementing upgrades to the pit product line and developing the upgrades for the detonator product lines. • Perform routine maintenance and upgrades to the Automated Reservoir Management System at SRS. • Conduct upgrades to Neutron Generator Enterprise shop-floor controls. • Upgrades to increase efficiency supporting the increased LEP workload. • Increase intra-site logistical support required to support weapon and component moves related to production. • Continue engineering and quality assurance preparation for B61-12 non-nuclear component production. • Provide engineering and quality assurance support for internal containers that support production.	• The increase represents the continued growth to support the increased LEP workload as full-scale production rates are reached. • Initiatives to increase responsiveness of production lines to support workload capacity for LEPs and Alts. • Funding will provide the tooling needed to support the Neutron Generator Enterprise and the production schedule through product qualification.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
• Provide increased labor for purchasing, shipping and supply chain management. • Continue expansion of NG production up to five product lines that require increased maintenance and calibration services. • Provide labor and supplies for increased preventative and corrective maintenance, including equipment calibration throughout the enterprise supporting increased LEP and Major Alt workload. • Provide quality assurance and procedural/engineering safety. • Perform product certification (independent evaluation of build records) for auditing purposes.	• Provide increased labor for purchasing, shipping and supply chain management. • Continue Neutron Generator production that require increased maintenance and calibration services. • Continue providing labor and supplies for increased preventative and corrective maintenance, including equipment calibration throughout the enterprise supporting increased LEP and Major Alt workload. • Provide quality assurance and procedural/engineering safety. • Perform product certification (independent evaluation of build records) for auditing purposes.	
Research and Development (R&D) Support $36,150,000	**Research and Development (R&D) Support $39,339,000**	**Research and Development (R&D) Support +$3,189,000**
• Continue supporting the operation and maintenance of the Joint Integrated Lifecycle Surety database at the design laboratories. • Support design and production agency experts serving detail assignments at NNSA HQ to provide technical advice and support. • Continue implementing quality control procedures, methods, and processes in R&D activities. • Support limited infrastructure support activities at the laboratories. • Maintain financial databases, milestone tracking, risk analyses, and R&D support for the POG and Nuclear Weapons Safety Study Group, including overseeing aspects of DSW Program Management, assigning R&D laboratory personnel/assignees to external/offsite federal	• Continue supporting surety assessment tools at the design laboratories. • Support design and production agency detail assignments at NNSA HQ and other external/offsite federal organization to provide technical advice and support. • Continue implementing quality control procedures, methods, and processes in R&D activities. • Support limited infrastructure support activities at the laboratories. • Maintain financial databases, milestone tracking, risk analyses, and R&D support for the POG and Nuclear Weapons Safety Study Group, including overseeing aspects of DSW R&D program management, and executing R&D support service contracts.	• The increase is for preservation of at-risk nuclear test data, sustainment of computer platforms, and NEA implementation within R&D activities. • Increase necessary to mature assessment tools in support of innovative, costs saving technologies in time for insertion in the W78 replacement and future weapon systems.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
organizations, and managing and executing R&D support service contracts. • Perform the laboratory work required to enable the production plants to execute directed R&D work. • Implement NEA and supply chain risk management for R&D activities. • Continue to support contractor staff integration into U.K. work flow to bolster collaboration JTD technology maturation activities. • Continue to build a digital archive of data from the nuclear testing era accessible to researchers to support stockpile stewardship activities. • Continue supporting legacy commitments by maintaining Nuclear Testing Heritage activities.	• Perform the laboratory work and information exchange required to enable production plants to execute directed R&D work. • Expand implementation of NEA for R&D activities. • Continue to integrate contractor staff into the U.K. enterprise to bolster collaboration under JTD. • Continue supporting the digital archiving of data from the nuclear testing era accessible to researchers to support stockpile stewardship activities. • Increase Production Agency residencies at Design Agencies to facilitate design for manufacturability and surveillance activities. • Continue supporting legacy commitments by maintaining Nuclear Testing Heritage activities • Accelerate archiving of records with a priority for at-risk media. • Fund engineering licenses for baseline modeling.	
R&D Certification and Safety (RDCS) $201,840,000	**R&D Certification and Safety (RDCS) $236,235,000**	**R&D Certification and Safety (RDCS) +$34,395,000**
• Continue development efforts for long-life GTS design options. • Increase technology development activities for the development of high energy, low sensitivity energetic components for future systems, as well as additively manufactured high explosives. • Continue executing the JTD project according to given schedule and objectives. • Continue development and testing of conformal thermal batteries, abnormal launch accelerometers, and replacement inertial sensor technologies.	• Execute subsystem development activities for ANDI flight tests in FY 2021 – FY 2022. • Continue development for long-life GTS design options. • Increase technology development activities for high-energy, low-sensitivity energetic components for future systems, as well as additively manufactured high explosives. • Continue executing the JTD project. • Continue development and testing of conformal thermal batteries, abnormal launch accelerometers, and replacement inertial sensor technologies.	• Increases investments in development of agile technologies to meet the goals of the 2018 Nuclear Posture Review. • Increases additional studies and assessments that support the Annual Stockpile Assessment. • Invests in JTD and other lower cost, frequent use technology demonstrations to increase acceptance of new technologies in future modernization programs. • Increases pace of base hydrodynamic and subcritical experimental testing. • Invests in innovative, cost saving technologies to support the W87-1 Modification Program (formerly IW1) and other future insertions.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
• Begin a focused effort on the development of a new warhead bus architecture and ELNG for future system insertion. • Continue development of infrared (IR) rectenna, field programmable gate arrays, non-volatile memory, and radiation hardened microelectronics used to provide arming, firing, fuzing and other functions within nuclear weapons. • Evaluate options for positional aware fuzing. • Continue to evaluate the effectiveness of sounding rockets, Superfuge, and Vibrafuge for the qualification of weapon components. • Initiate integration of embedded sensors capability. • Continue development of the common high energy adaptable firing set. • Begin evaluating integrated data instrumentation capabilities for future telemetry systems. • Leverage and repurpose excess assets at the Kauai Test Facility to explore alternative options to demonstrate technology improvements for future systems. • Continue annually assessing the safety, security, and effectiveness of the enduring weapons systems in the stockpile, reporting weapon system status ultimately to the President, and determine if an underground nuclear test is required to solve a problem. • Address and resolve SFIs and emerging stockpile issues in accordance with the currently approved baseline closure plans.	• Continue development of a new warhead bus architecture and ELNG for future system insertion. • Continue development of IR rectenna, field programmable gate arrays, non-volatile memory, and strategic radiation-hardened microelectronics that provide arming, firing, fuzing and other nuclear weapon functions. • Develop options for a positional aware fuzing. • Expand the Superfuge and Vibrafuge to qualify weapon components and reduce insertion risk. • Establish a technology readiness team to facilitate the development of specific technologies for embedded sensors capabilities. • Continue development of the common high-energy adaptable firing set. • Mature data instrumentation capabilities for future telemetry systems. • Execute four HOT SHOT tests to de-risk and mature technologies for future systems. • Design, prepare, and assemble diagnostic capabilities for multiple system hydrodynamic and subcritical integrated weapon experiments. • Field and execute experiments, provide initial analyses of the experimental results through data reduction, and disposition expended hydrodynamic experiments and subcritical tests. • Support R&D studies, assessments, and analyses supporting weapon certification and safety processes, nuclear and explosives operations, and weapon effects and vulnerabilities. • Support multi-system R&D engineering studies. • Support planned INWAP activities. • Begin development of alternative ground testing capabilities to validate electronic component	

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
• Execute an increasing cadence (25) of hydrodynamic and subcritical integrated weapon experiments. • Support multi-system R&D studies related to technology development, weapon certification, safety processes, weapons effects assessments, and vulnerability studies. • Support planned INWAP activities.	performance, reducing the need for multiple flight tests.	
Management, Technology, and Production (MTP) $300,736,000	**Management, Technology, and Production (MTP) $305,000,000**	**Management, Technology, and Production (MTP) +$4,264,000**
• Increase in Use Control studies and equipment procurements and equipment procurements supporting LEP FPUs, the enduring stockpile, and external deliverables. Increased Use Control training with DOD customers. • Execute surveillance activities in accordance with FY 2019 PCDs, and FY 2019 IWET Plans. Includes increased efforts at Tonopah Test Range and development of surveillance testers including stronglink, environmental, and centrifuges required to support LEP testing requirements. • Add multi-system weapon response and external production resources to provide weapon response services and conduct nuclear safety studies for un-interrupted manufacturing/assembly/disassembly operations at production plants. • Continue the multi-year effort to upgrade and integrate the weapons LAPS system. • Sustainment of critical manufacturing skills in support of LEP production. • Perform operations and maintenance of the Product Realization Integrated Digital Enterprise (PRIDE) to collect, process, store, and transmit	• Continue Use Control studies and equipment procurements and equipment procurements supporting LEP FPUs, the enduring stockpile, and external deliverables. Increased Use Control training with DOD customers. • Execute surveillance activities in accordance with FY 2020 PCDs, and FY 20120 IWET Plans. Includes efforts at Tonopah Test Range and development of surveillance testers including stronglink, environmental, and centrifuges required to support LEP testing requirements. • Add multi-system weapon response and external production resources to provide weapon response services and conduct nuclear safety studies for un-interrupted manufacturing/assembly/disassembly operations at production plants. • Continue the multi-year effort to upgrade and integrate the weapons LAPS system. • Sustainment of critical manufacturing skills in support of LEP production. • Perform operations and maintenance of PRIDE to collect, process, store, and transmit data across the NNSA Nuclear Security Enterprise.	• The increase represents growth in multi-weapon activities needed to support fielding the LEPs following FPU, surveillance activities, and the development of surveillance testers for weapons.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
data across the NNSA Nuclear Security Enterprise. • Respond to DOD URs about issues with the stockpile. • Provide DOD training on weapons maintenance activities in the field. • Perform production and maintenance of test and handling gear, spare parts for DOD, and containers. • Execute production of weapon components for use in multiple weapon systems, for example, batteries, stronglinks, switch tubes, polymers, and containers. • Conduct program management and oversight of weapon sustainment activities. • Continue re-establishing additional uranium processing capabilities.	• Respond to DOD URs about issues with the stockpile. • Provide DOD training on weapons maintenance activities in the field. • Perform production and maintenance of test and handling gear, spare parts for DOD, and containers. • Execute production of weapon components for use in multiple weapon systems, for example, batteries, stronglinks, switch tubes, polymers, and containers. • Conduct program management and oversight of weapon sustainment activities. • Continue re-establishing additional uranium processing capabilities.	

Directed Stockpile Work
Strategic Materials

Description
The Strategic Materials program consolidates management of nuclear material processing capabilities within the NNSA nuclear security enterprise. The program includes Uranium, Plutonium, Tritium, and Lithium Sustainment, Domestic Uranium Enrichment, and Strategic Materials Sustainment.

Uranium Sustainment
The Uranium Sustainment program provides funding to modernize uranium operations to ensure delivery of secondary components needed to sustain the stockpile. Building 9212 at Y-12, much of which is over 70 years old, contains the most hazardous enriched uranium operations and does not meet modern nuclear safety and security standards. The Uranium Sustainment program implements elements of NNSA's Uranium Mission Strategy associated with phasing out mission dependency on Building 9212, which requires sustained resources across a multi-year period to systematically plan and execute all phases of the 9212 Exit Strategy. Uranium Sustainment specifically supports the transition of Building 9212 capabilities into existing and new-build facilities, as well as implementing a coordinated exit strategy to end production operations in Building 9212 and begin post-operations clean out activities. The program sustains existing enriched uranium capabilities through enhanced equipment maintenance and the purchase of critical spare parts to improve the availability and reliability of production systems. Uranium Sustainment enables Area 5 de-inventory activities to reduce safety risks and establishes target working inventory levels for the production facilities, and optimizes the material composition of the inventory. Program funding supports investments to extend the operational life of Y-12's buildings 9215, 9204-2E and 9995. Additional investments critical to the overall Uranium Mission Strategy are funded under the Process Technology Development subprogram within Advanced Manufacturing Development.

Additional work related to phasing out mission dependency on Building 9212 is described in the Process Technology Development line within the Advanced Manufacturing Development program.

Plutonium Sustainment
The Plutonium Sustainment Program provides funding for efforts across the nuclear security enterprise to restore the Nation's ability to produce pits at a rate of 80 pits per year (ppy) by 2030, consistent with the 2018 Nuclear Posture Review. The program has been restructured consistent with direction included in the Conference Report accompanying the Energy and Water Development and Related Agencies Appropriations Act, 2019. NNSA is initiating conceptual design over $5M, pursuant to 50 USC 2746(a)(2).

Plutonium Sustainment activities include the following:

(1) Plutonium Sustainment Operations: Plutonium Sustainment Operations provides for the operational expenses needed to meet pit production requirements, including: hiring, training, qualifying, and retaining required pit production personnel, recapitalizing equipment needed to restore PF-4's ability to produce 10 war reserve (WR) ppy, production activities at LANL and KCNSC, certification activities at LLNL, process engineering and qualification, tooling design and fabrication, and operational expenses for PF-4. The Plutonium Sustainment Operations program also manufactures precision plutonium devices for science-related evaluation. In FY 2020, Los Alamos will produce 5 Process Prove-In (PPI) pits, continue efforts to produce a WR pit in 2023. Kansas City and LLNL will continue to support component fabrication and certification activities respectively. Plutonium Sustainment Operations also funds several efforts to support pit production, including: a radiological control program, facility and equipment maintenance, a criticality safety program, shipping and receiving, authorization basis, work control documentation, training and qualification, spare parts, waste management, storage capability, and facility configuration to maintain plutonium capabilities.

(2) Savannah River Plutonium Processing Facility (SRPPF) Project, SRS: The Savannah River Plutonium Processing Facility (SRPPF) project repurposes the Mixed Oxide Fuel Fabrication Facility (MFFF) to produce 50 ppy consistent with the NNSA Administrator's recommended alternative for pit production announced on May 10, 2018. The FY 2020 funds will be used to finalize conceptual design and support Critical Decision (CD)-1 approval by September 30, 2020; conceptual design efforts began in FY 2019 using Plutonium Sustainment funding and include design support from Los Alamos pit production experts for special facility equipment in addition to the team at SRS.

(3) Plutonium Pit Production Project, LANL: Language contained in the Conference Report accompanying the Energy and Water Development and Related Agencies Appropriations Act, 2019 directed NNSA to budget for capital improvements and equipment installations to meet plutonium pit production targets within this newly established congressional control including analytical chemistry (AC) and materials characterization (MC) equipment scope that was originally part of the Chemistry and Metallurgy Research Replacement (CMRR) PF-4 Equipment Installation, Phase 2 (PEI2) and Recategorization of RLUOB to Hazard Category (RC3) subprojects. In addition, the report language required pit production equipment installation in PF-4 to reach 30 ppy to be included in this project. To minimize risk to ongoing equipment installation activities needed to support production of the first WR pit in 2023, pit production equipment needed to increase PF-4's production capacity from 10 ppy to 30 ppy is included in this new line item. A construction project data sheet for the Plutonium Pit Production Project, as directed by Congress, will be provided after conceptual design is completed per 50 U.S. Code § 2746. FY 2020 funding will be used to develop design documentation and pursue long-lead procurements; out-year funding for this effort will be depicted as a new line item in future budget requests. Current out-year funding estimates reflect only the funding previously associated with PEI2 and RC3 scope and will be updated to reflect pit production equipment scope.

Tritium Sustainment

The Tritium Sustainment program operates the national capability for producing tritium and is building the additional capacity to meet added national security requirements. Since FY 2003, NNSA has been producing tritium by irradiating Tritium-Producing Burnable Absorber Rods (TPBARs) in the Watts Bar Unit 1 (WBN1) nuclear power reactor operated by the Tennessee Valley Authority (TVA), during normal 18-month operating cycles. The tritium inventory is needed to support Limited Life Component exchanges for tritium reservoirs that are deployed in the stockpile. Long-term tritium production schedules, based on detailed computational models and annual inventory reconciliations, are carefully calibrated to provide the required and reserve amounts, and production planning takes into consideration the material that is constantly being recovered and recycled from deployed reservoirs, including those from weapon dismantlements. Based on the updated tritium requirements, certified by the Nuclear Weapons Council, efforts are underway to obtain Nuclear Regulatory Commission (NRC) approval for Watts Bar Unit 2 (WBN2) as the second reactor for tritium production, facilitating TPBAR irradiation in early FY 2021.

Tritium Sustainment activities include the following:

(1) Developing and maintaining the TPBAR design, procurement of TPBAR parts and final TPBAR assembly.
(2) Producing tritium, in TVA's nuclear reactor, in which lithium-aluminate pellets in the TPBAR are bombarded by neutrons over a period of 18 months.
(3) Transporting TPBARs from TVA to the Tritium Extraction Facility (TEF) at SRS.
(4) Extracting and purification processing at the TEF at SRS after being transported from TVA.
(5) Supporting design, surveillance, and science and technology efforts to support irradiation of TPBARs by TVA.

Lithium Sustainment

The Lithium Sustainment program maintains the production of the nation's enriched lithium supply in support of Defense Programs, the DOE Office of Science, the Department of Homeland Security, and other customers. In addition, the program manages technology development that will improve the efficiency and reliability of the existing lithium capability and the Lithium Processing Facility (LPF).

Lithium Sustainment activities includes the following:

(1) Producing and maintaining the lithium material inventory to meet NNSA mission requirements and other customer deliverables.
(2) Purifying and converting lithium chloride (LiCl) to lithium hydride and/or lithium deuteride (LiH/LiD).
(3) Recapitalizing process equipment to sustain process capabilities.
(4) Developing, maturing, and deploying lithium purification and production technologies in support of the LPF.

Domestic Uranium Enrichment

The Domestic Uranium Enrichment (DUE) Program is responsible for establishing a reliable supply of enriched uranium to support U.S. national security and non-proliferation needs. Since the closure of the Paducah Gaseous Diffusion Plant in 2013, the United States has lacked the capability to enrich uranium using a domestic technology. DOE/NNSA requires unobligated enriched uranium to meet stockpile requirements, fuel reactors that produce tritium, and power the nuclear Navy. In addition, DOE/NNSA requires enriched uranium but not necessarily unobligated enriched uranium to fuel research and medical isotope reactors as part of its nonproliferation mission. The DUE Program is implementing a three-pronged strategy to supply current enriched uranium needs and re-establish a domestic uranium enrichment capability for long-term enriched uranium needs. First, the DUE program will down-blend identified HEU from the uranium inventory to extend the need date for unobligated low enriched uranium fuel for tritium production. Second, DUE will work to preserve and advance uranium enrichment expertise and technology to meet current and future U.S. government needs. Third, DUE will execute the acquisition process under DOE Order 413.3B to re-establish a domestic uranium enrichment capability that will support future U.S. national security needs for enriched uranium.

Domestic Uranium Enrichment activities include the following:
(1) Managing down-blending of HEU from the uranium inventory.
(2) Preserving and advancing uranium enrichment expertise.
(3) Executing the acquisition process for a new DUE capability.

Strategic Materials Sustainment
The Strategic Materials Sustainment program is responsible for the planning, prioritizing, and supplying of required quantities of materials by recycling, recovering, and storing nuclear material and select non-nuclear program material. The program develops strategies to maintain the technical base for strategic materials. The program supports the nuclear security missions, which include nuclear weapons, non-proliferation, and naval reactors activities at the eight NNSA sites: three national security laboratories, four nuclear weapons production facilities, and the NNSS. The program is comprised of four subprograms, Material Recycle and Recovery (MRR), Storage, Nuclear Material Integration (NMI), and Strategic Planning Efforts (SPE).

Strategic Materials Sustainment activities include:
(1) Recovering and recycling material streams to maintain the nation's nuclear deterrent.
(2) Providing recapitalization investment to efficiently and effectively sustain processing capabilities and human capital necessary to safely sustain the highest quality operations in an efficient manner.
(3) Storing and managing pits, plutonium, enriched and depleted uranium, lithium, weapons components and other materials.
(4) Long-term planning, forecasting and analysis of materials required for the manufacturing strategy in support of the nuclear weapons stockpile.
(5) Maintaining and operating the Nuclear Materials Management and Safeguards System (NMMSS), which tracks and accounts for nuclear materials at DOE and Nuclear Regulatory Commission-licensed sites, and the Nuclear Materials Inventory Assessment (NMIA) that manages use and demand of accountable nuclear materials by DOE and NNSA laboratories and production plants.
(6) Programmatic planning for the development of infrastructure strategies for high explosives (HE), lithium, micro-electronics, beryllium, tritium, and other capabilities.

Highlights of the FY 2020 Budget Request
Uranium Sustainment
- Phase out mission dependency on Building 9212 by supporting the transition of enriched uranium capabilities into existing and new-build facilities.
- Continue Area 5 de-inventory efforts to reduce safety and security risks; achieve and maintain target working inventory levels, and optimize the material composition of the uranium inventory.
- Develop, sustain, and increase the reliability of uranium scientific and manufacturing capabilities to reduce mission risks.
- Extend the operational lifetime of existing enriched uranium facilities.

Plutonium Sustainment
- Includes funding for activities to support the production of 80 ppy by 2030 in three critical areas under two subprograms:
    - Plutonium Sustainment Operations– Funds the production of pits at Los Alamos, production activities at KCNSC, and certification activities at LLNL. Ensures personnel and capabilities are in place to restore Los Alamos' ability produce 10 pits per year (ppy) in Plutonium Facility (PF)-4.

    - Savannah River Plutonium Processing Facility (SRPPF) Project, which includes funding ($410 million) for conceptual design and pre-Critical Decision (CD)-1 activities for the project to repurpose the Mixed-Oxide Fuel Fabrication Facility (MFFF) to produce 50 ppy.
    - Plutonium Pit Production (P3) Project, LANL – Consistent with FY 2019 Appropriations, provides funding for a future project that includes the following scope: analytical chemistry (AC) and materials characterization (MC) capabilities previously associated with the CMRR PF-4 Equipment Installation Phase 2 (PEI2) and Recategorization of RLUOB as Hazard Category (RC3) subprojects, as well as pit production equipment necessary to increase PF-4's pit production capacity from 10 ppy to 30 ppy.
- Fabricate five Process Prove-In (PPI) W87-like pits.
- Continue hiring personnel to support pit production requirements.
- Perform planned certification tests to support production of the first War Reserve (WR) pit in 2023.
- Continue investments to recapitalize end-of-life equipment for pit production reduce mission risk.

Tritium Sustainment
- Continue irradiation of TPBARs in the Watts Bar Unit 1 (WBN1).
- Continue preparing WBN2 to commence tritium production in early FY 2021.
- Procure a high-capacity TPBAR shipping cask and prepare a competitive procurement for future transportation services.
- Conduct two extractions at the TEF, beginning the ramp-up to full operations mode.

Lithium Sustainment
- Produce and maintain the lithium material supply to meet Defense Programs (DP) mission and other customer deliverables, including the execution of the Material Conversion Equipment Restart project and maintenance of a configuration controlled lithium supply and demand model.
- Continue to pursue options to reestablish conversion and purification capabilities.
- Maintain and recapitalize program equipment to reduce risk of single-point failures.
- Mature and deploy lithium technology alternatives to improve processing efficiencies in support of the LBS and a new Lithium Processing Facility (LPF) design.
- Provide other project support to ensure successful completion of the LPF preliminary design.

Domestic Uranium Enrichment (DUE)
- Manage down-blending of highly enriched uranium (HEU) from the uranium inventory to provide low enriched uranium (LEU) fuel for tritium production.
- Preserve and advance uranium enrichment expertise and technology to meet current and future U.S. Government needs.
- Continue the acquisition process towards Approval of Alternative Selection and Cost Range (Critical Decision 1) for a domestic uranium enrichment capability.

Strategic Materials Sustainment
- Meet the directive schedule for tritium reservoir refills.
- Continue de-inventory of Chemistry and Metallurgy Research (CMR) and improve PF-4 vault facilities efficiency through inventory work off and optimization of footprint to support the transition to plutonium production and improve Material at Risk (MAR) posture.
- Continue increase in purified metal production and the processing and disposition of legacy materials toward the goal to phase out mission dependency on Building 9212.
- Leverage opportunity to improve HEU feedstock quality through effective and efficient exercise of capabilities preceding and during transition to new and enduring facilities.
- Disassemble and treat the Sandia Sodium Bonded Spent Fuel at the Idaho National Laboratory (INL).
- Modernize the Nuclear Materials Management and Safeguard System (NMMSS) to support changes in NNSA IT infrastructure.
- Continue the recovery of Pu-244 through the implementation of the MK-18a Program.

- Sustain effective and efficient processes for recycling and recovery of plutonium, enriched uranium, tritium, and other materials from fabrication, assembly, and dismantlement operations. Invest in capabilities to establish a high purity depleted uranium (HPDU) supply chain that will support sustained procurements of HPDU feedstock to meet the mission requirements.
- Sustain and improve Storage Program processes to meet the process supply chain and mission requirements.
- Provide for receipt, storage, inventory, and management of HEU pits, and other weapon nuclear and non-nuclear materials.
- Improve effectiveness and efficiency of Storage capabilities through the use of recapitalization strategies that utilize a comprehensive assessment of storage system and feedstock health.

FY 2021 - FY 2024 Key Milestones

Uranium Sustainment

- Obtain CD-4 approval for the Uranium Processing Facility by FY 2025.
- Phase out mission dependency on Building 9212 by FY 2025.

Plutonium Sustainment Operations

- Build and certify the W87 like pit design including production of development pits each year to sustain fabrication capability:
    - Produce 1 W87-like war reserve pit per year by FY 2023.
    - Produce 10 W87-like war reserve pits per year by FY 2024.
    - Produce 20 W87-like war reserve pits per year by FY 2025.
    - Produce 30 W87-like war reserve pits per year by FY 2026.
    - Produce 80 W87-like war reserve pits per year by FY 2030.

Tritium Sustainment

- Commence irradiation of TPBARs in a second reactor in early FY 2021.
- Conduct successively increasing TPBAR irradiation cycles at Tennessee Valley Authority (TVA), to begin producing 2,800 grams of tritium per reactor cycle by FY 2025.
- Use unobligated reactor fuel obtained by TVA from Energy Northwest under the Depleted Uranium Project.
- Provide technical production support and surveillance for tritium production operations at TVA by the TPBAR design authority, Pacific Northwest National Laboratory (PNNL), to ensure technical oversight in support of TVA and NRC requirements.
- Obtain NRC approval for an improved reactor safety analysis to reduce on-going reactor fuel requirements.
- Conduct eight extractions per year at the TEF. The program is taking action to reach full extraction operations at the TEF during this time period. Perform infrastructure improvements projects for safety and control systems.

Domestic Uranium Enrichment Program

- Complete Analysis of Alternatives in FY 2020, which will inform program strategy for continued technology development and determine path towards re-establishment of a domestic uranium enrichment capability.
- Achieve Critical Decision 1 (Approve Alternative Selection and Cost Range) for re-establishing a domestic uranium enrichment capability in FY 2024.
- Down-blend identified HEU to extend the need date for LEU fuel for tritium production by FY 2025.

Lithium Sustainment

- Monitor, compute, and communicate dismantlement needs with WDD and other program managers to ensure an adequate lithium salt (LiH/LiD) supply.
- Process LiCl material into additional lithium hydride supply.
- Maintain base lithium processing capabilities and recapitalize lithium processing equipment (acquire, install, configure and authorize for operation).
- Mature lithium technologies that could be inserted in current base capabilities and the future LPF.

Strategic Materials Sustainment

- Optimize utilization of Y-12's Building 9212 resources to support healthy transition of capabilities (e.g., Electrolytic Refining, Calciner, Direct Chip Melt) into new (i.e., Uranium Production Facility) and enduring facilities.
  - Production Microwave use to improve overall quality of metal supply.
  - Aggressive purified metal production to improve overall quality of metal supply.
  - Processing of material forms not ideally suited for new or enduring facility operations.
  - Improve site posture regarding Material at Risk (MAR).
- Accelerate PF-4 vault de-inventory project enabling footprint optimization that effectively and efficiently supports Plutonium Sustainment needs.
- Complete process activities required in unique processing areas enabling the disposition of equipment and optimized utilization of the footprint in PF-4.
- Complete additional storage capacity projects and execute recapitalization plan to support effective and efficient surveillance of items and containers, including continued implementation of container repackaging and new container design efforts as a result of past container surveillance findings.

FY 2018 Accomplishments
Uranium Sustainment

- Completed planning and prioritization efforts to implement the Building 9212 Exit Strategy.
- Continued casting sustainment and machining sustainment investments to increase reliability of existing uranium capabilities.
- Achieved Area 5 De-inventory milestone to remove enriched uranium material and continued enabling efforts to establish and maintain target working inventory levels.
- Established CD-0, Approval of Mission Need, for a domestic uranium enrichment capability.

Plutonium Sustainment Operations

- Successfully produced four development (DEV) W87-like pits.
- Completed Plutonium Pit Production Analysis of Alternatives (AoA), Engineering Assessment (EA), and Workforce Analysis (WA) to support NNSA's selection, and NWC's endorsement, of the recommended alternative to produce 80 pits per year by 2030.

Tritium Sustainment

- Completed irradiation of 1,104 TPBARs in Cycle 15 in the WBN1 reactor and commenced irradiation of 1,584 TPBARs in Cycle 16.
- Completed four TPBAR shipments of 300 TPBARs each from WBN to the extraction facility.
- Conducted two extractions of 300 TPBARs each at the TEF.
- Signed an Interagency Agreement with the Tennessee Valley Authority to manage HEU down-blending campaign to provide unobligated LEU fuel for tritium production.

Lithium Sustainment

- Completed all Lithium material deliverables four months ahead of schedule.
- Updated and validated Lithium supply and demand model.
- Completed building 9204-2 nuclear safety downgrade.
- Completed Lithium Homogenization Technical Readiness Assessment (TRL-4).
- Completed restart of lithium salvage operations.

Domestic Uranium Enrichment Program

- Held an industry day to explore industry interest and contractual possibilities for re-establishing a domestic uranium enrichment capability.

Strategic Materials Sustainment

- Reduced operational risk in the storage program through improving consumables inventory management (e.g., installed 200 additional storage locations at HEUMF, re-containerizing 226 carbon steel cans from long-term storage in HEUMF, and continued improvements in non-enriched uranium storage areas.
- Accomplished work on risk reduction activities and vault material disposition, including reducing Material at Risk (MAR) on the PF-4 main floor by 27% and outside gloveboxes by 52% since the beginning of FY 2016.
- Reduced legacy hazardous material inventory through the Confinement Vessel Disposition project, demonstrating sound integrated safety management and Conduct of Operations performance.
- Installed equipment to better evaluate container performance and support reduced risk in employee exposure, thereby obtaining a realized reduction of operational risk through an accelerated effort to characterize legacy items.
- Demonstrated significant diagnostic capability progress with the installation of the CoLOSSIS II equipment which is a new high-resolution imaging system to scan weapons components.
- Accepted delivery of the on-site shipping cask needed in support of the MK-18a program.
- Used Decision Analysis Framework tool to devise a disposition pathway for U-233 from the CMR facility.
- Processed 150 Y-12 Process Solids for disposition.
- Completed a workforce study, and a workforce and competencies analysis for Strategic Materials programs.
- Conducted a pilot to explore a beryllium oxide production source, and develop a precision beryllium machining capability.
- Began analyses to support development of an enterprise-wide investment strategy for recapitalization of programmatic equipment.
- Completed the recycle and recovery of tritium ahead of schedule in support of DSW requirements and improved operational interface managing tritium production by-products intrinsically valuable to our Nation.

Strategic Materials

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Uranium Sustainment $87,182,000	**Uranium Sustainment $94,146,000**	**Uranium Sustainment +$6,964,000**
• Phase out mission dependency on Building 9212 by supporting the transition of enriched uranium capabilities into existing and new-build facilities. • Develop plans and execute actions to implement the Building 9212 Exit Strategy. • Continue Area 5 de-inventory efforts to reduce safety and security risks and maintain target working inventory levels. • Develop, sustain, and increase the reliability of uranium scientific and manufacturing capabilities to reduce mission risks. • Extend the operational lifetime of existing enriched uranium facilities.	• Phase-out mission dependency on Building 9212 by supporting the relocation of enriched uranium capabilities into existing and new-build facilities. • Implement the 9212 Exit Strategy. • Continue Area 5 de-inventory efforts to reduce safety and security risks, and to establish target working inventories for production. • Establish modern, flexible, and robust uranium manufacturing capabilities through equipment refurbishments and replacements. • Prioritize and execute activities to extend the operational lifetime of key buildings at the Y-12 National Security Complex (i.e. Buildings 9215, 9204-2E, and 9995.	• Increased funding for implementation of the 9212 Exit Strategy. • Ramp-up of activities related to the full-scale equipment prototyping for risk reduction of new technologies. • Extension of the Extended Life Program implementation to Building 9995.
Plutonium Sustainment $361,282,000	**Plutonium Sustainment $712,440,000**	**Plutonium Sustainment +$351,158,000**
• Continue to maintain base personnel while adding additional personnel to ramp up work and sustain pit-manufacturing capability. • Continue to recapitalize end-of-life equipment vital to the pit manufacturing mission. • Invest in personnel and equipment needed to support pit production. • Continue W87-like design developmental (DEV) pit builds. • Continue engineering evaluation of development pits (pit certification). • Continue to fabricate plutonium experimental devices. • Support conceptual design and other costs associated with the SRPPF.	• Continue to maintain base personnel while adding additional personnel to ramp up work and sustain pit-manufacturing capability. • Continue to recapitalize end-of-life equipment vital to the pit manufacturing mission. • Invest in personnel and equipment needed to support pit production. • Transition to W87-like process prove-in (PPI) • Continue engineering evaluation of development pits. • Finalize conceptual design and CD-1 documentation for SRPPF at SRS. • Develop design documentation for the Plutonium Pit Production Project at LANL.	• Funding to support design activities for SRPPF. • Increased Plutonium Sustainment Operations to support increased staffing, certification activities, and equipment installation across three sites (LANL, LLNL, and SRS). • Increases to the Plutonium Pit Production Project.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Tritium Sustainment $290,275,000	**Tritium Sustainment $269,000,000**	**Tritium Sustainment -$21,275,000**
• Load and commence irradiation TPBARs at WBN1; reimburse TVA for uranium fuel price differential and for obligation preservation and fuel storage; continue preparations for tritium production startup in WBN2 and submit LAR to the NRC for safety analysis to improve reactor operating margins and reduce fuel costs in the future. • Conduct two extractions at the TEF, and continue preparations to staff full operations mode with cleared and trained control room operators and associated staff; evaluate options for zinc-65 abatement and replace an obsolete security access system. • Maintain the TPBAR designer of record and address technical issues for increasing TPBAR production and NRC licensing actions; conduct post irradiation examination of pellet performance test samples from INL's ATR; support WBN2 core design and WBN1 improved safety analysis efforts; conduct tritium experiments, analysis, and modeling to reduce tritium production risks; monitor industry developments of future technologies with potential for tritium production to reduce long-term mission risks. • Conduct four TPBAR shipments to the TEF; ship low-level hardware waste to NNSS; evaluate the conceptual design for the high capacity shipping cask, and prepare a competitive procurement for future transportation services. • Begin Execution of down-blending campaign.	• Maintain the TPBAR designer and address technical issues for increasing TPBAR production and NRC licensing actions. Support WBN core design and improved safety analysis efforts. Commence fabrication of 1,792 TPBARs for WBN1 Cycle 16; commence parts procurement and initiate fabrication of 1,104 TPBARs for WBN2 Cycle 4. • Commence Cycle 16 irradiation of 1,584 TPBARs and load 1,792 TPBARs at WBN1 for Cycle 16; reimburse TVA for uranium fuel price differential and obligation preservation and fuel storage; continue preparations for tritium production startup in WBN2. • Conduct three TPBAR shipments to the TEF; ship low-level hardware waste to NNSS; evaluate the conceptual design and award contract for the high capacity shipping cask and prepare a competitive procurement for transportation services. • Conduct four extractions at the TEF and continue preparations to staff full operations mode with cleared and trained staff; procure Waste Cask #7; evaluate options for zinc-65 abatement and replace an obsolete security access system. • Conduct post irradiation examination of pellet performance test samples from INL's ATR; conduct tritium experiments, analysis, and modeling to reduce production risks; monitor industry developments of future technologies with potential for tritium production to reduce long-term mission risks.	• Increase is for additional TPBAR irradiation offset by the movement of $85M for down-blending in DUE.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Lithium Sustainment $29,135,000	**Lithium Sustainment $28,800,000**	**Lithium Sustainment -$335,000**
• Continue to process LiCl to LiH to support the supply. • Continue to process LiH and LiD in support of DSW deliverables. • Continue the recapitalization of process equipment to sustain process capabilities. • Continue the maturation of technologies for near term use and for inclusion into the LPF. • Support the capital acquisition of the LPF. • Continue to pursue options to reestablish conversion and purification capabilities.	• Begin first full year of Wet Chemistry and Material Conversion operations in support of requirements. • Continue to process LiH and LiD in support of deliverables. • Continue the recapitalization of process equipment to sustain process capabilities. • Continue the maturation of technologies for near term use and for inclusion into the LPF. • Support the capital acquisition of the LPF.	• Decrease in funding for recapitalization and technology development support. • Increase in material production operations due to costs being higher than originally anticipated.
Domestic Uranium Enrichment $50,000,000	**Domestic Uranium Enrichment $140,000,000**	**Domestic Uranium Enrichment +$90,000,000**
• Preserve and advance uranium enrichment expertise and technology to meet current and future U.S. government needs.	• Continue to preserve and advance uranium enrichment expertise and technology to meet current and future U.S. government needs. • Continue the acquisition process to approve the alternative selection and cost range (CD-1) for a domestic uranium enrichment capability, including initiation of conceptual design activities if appropriate. • Continue down-blending campaign.	• Increase of cost for down-blending activities to provide unobligated low enriched uranium fuel for tritium production.
Strategic Materials Sustainment $216,196,000	**Strategic Materials Sustainment $256,808,000**	**Strategic Materials Sustainment +$40,612,000**
• Continue to provide for recycling and recovery of plutonium, enriched uranium, tritium, and other materials from fabrication and assembly operations, LLCs, dismantlement of weapons, and nuclear components. • Maintain a purified metal production capability needed for LEPs and Naval Reactors, and process and dispose of legacy materials to meet the goal reducing mission dependency on Building 9212.	• Continue to provide for recycling and recovery of plutonium, enriched uranium, tritium, and other materials from fabrication and assembly operations, LLCs, dismantlement of weapons, and nuclear components. • Maintain a purified metal production capability needed for LEPs and Naval Reactors, and process and dispose of legacy materials to meet the goal reducing mission dependency on Building 9212. • Continue the CMR de-inventory effort, and the Confinement Vessel Disposition project.	• Increase in funding for additional recapitalization efforts, including technology advances to improve equipment designs and reduction in operation risk. • Increase in funding to begin implementation of a corrective action plan related to repackaging and new container design required to support Plutonium Pit Missions. The corrective action plan addresses issues related to the robustness of the Pantex storage container.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
• Continue the CMR de-inventory effort, and the Confinement Vessel Disposition project. • Continue the operations associated with the recovery of tritium supporting LLCs. • Provide for effective storage and management of pits, HEU, and other weapon nuclear and non-nuclear materials. • Continue pit surveillance operations for safe storage, long-term storage of special nuclear materials, and national security inventory thermal monitoring and characterizations. • Provide long-term forecasting, planning and analysis of materials. • Continue to support the emphasis on nuclear material consolidation and de-inventory activities across the NNSA nuclear security enterprise. • Continue partnership with the NRC to operate and maintain NMMSS. • Continue activities to remove plutonium-bearing mixed oxide fuel. • Continue to treat, consolidate, and dispose of NNSA inactive actinides that are no longer required. • Continue the process and disposition of NNSA materials currently stored at non-NNSA sites, including the sodium bonded fuel experiment assemblies. • Continue support of Heavy Isotopes and NNMA LMMOs, including recovery of spent Californium sources. • Continue performing planning studies, research, and analyses relating to the life-cycle management of nuclear materials. • In SPE, continue planning studies, analyses of alternatives, and other activities to support the	• Continue the operations associated with the recovery of tritium supporting LLCs. • Continue effective storage and management of pits, HEU, and other weapon nuclear and non-nuclear materials. • Continue pit surveillance operations for safe storage of special nuclear materials, and monitoring and characterizations. • Provide long-term forecasting, planning and analysis of materials. • Continue to support the emphasis on nuclear material consolidation and de-inventory activities across the NNSA enterprise. • Continue the process and disposition of NNSA materials currently stored at non-NNSA sites. • Continue performing planning studies, research, and analyses relating to the life-cycle management of nuclear materials. • In SPE, continue planning studies, analyses of alternatives, and other activities to support the development of infrastructure strategies for high explosives (HE), lithium, micro-electronics, beryllium, tritium, and other material streams and capabilities. • Provide transition planning for multiple uranium technology and capability changes starting up in support of the Uranium Strategy. • Begin implementation of a corrective action plan related to repackaging and new container design required to support Plutonium Pit missions. • Continue activities to recover Pu-244 and other national asset isotopes from Mk-18a targets in storage. • Continue modernization of nuclear materials storage and inspection techniques.	• Increase in funding to support higher capacity to de-inventory PF-4 and manage transuranic waste to support future Plutonium Mission Program of Record. • Increase in funding for storage optimization efforts at NNSS to afford resilient and responsive capabilities in support of the NNSA Nuclear Security Enterprise. • Increase in funding to support transition planning for multiple uranium technology and capability changes implemented by the Uranium Strategy at Y-12. • Increase in funding for commercial activities to support enriched uranium (EU) processing or depleted uranium (DU) procurements. • Slight increase in funding for Nuclear Materials Integration for modernization of nuclear materials storage and inspection techniques.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
development of infrastructure strategies for high explosives (HE), lithium, micro-electronics, beryllium, tritium, and other material streams and capabilities. • Continue activities to recover Pu-244 and other national asset isotopes from Mk-18a targets in storage. • Consolidation and storage of aliquots for the National Nuclear Material Archive.		

Directed Stockpile Work
Capital Summary[1]

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	126,946	132,712	153,753	126,565	-27,188
Minor Construction	N/A	N/A	0	3,500	4,597	7,558	+2,961
Total, Capital Operating Expenses	N/A	N/A	**126,946**	**136,212**	**156,222**	**136,487**	**-24,227**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	94,289	94,289	96,363	98,483	+2,120
Glove Box Refurbishment Project I, Y-12	4,500	0	0	0	2,500	2,000	-500
Glove Box Refurbishment Project II, Y-12	7,000	0	0	0	0	0	+0
Rolling Mill Controller, Y-12	8,597	0	0	0	315	2,501	+2,186
Multi-Mass Leak Detector, Y-12	7,813	0	2,000	1,500	3,200	3,113	-87
Life Extension Program Project 2, Y-12	30,000	0	0	0	10,000	0	-10,000
Life Extension Program Project 4, Y-12	20,500	0	0	0	5,120	0	-5,120
Life Extension Program Project 6, Y-12	23,400	0	0	0	11,700	0	-11,700
Parts Cleaning for Direct Lithium Material Mtg., Y-12[1]	7,800	7,800	0	0	0	0	+0
Replacement MassSpec System, SRS	8,000	0	0	0	3,000	2,000	-1,000
Service Hood System, Y-12[2]	6,504	0	0	4,238	2,266	0	-2,266
TRU Waste Glovebox Project, LANL	7,700	0	0	0	0	1,950	+1,950
Foundry Upgrades Phase 3 (Foundry Parts Staging), LANL	11,267	0	0	0	0	4,000	+4,000
Hot Inspection Phase 2, LANL	6,335	0	0	0	2,602	2,000	-602
T-Base #1 Upgrades, LANL	11,930	0	0	0	930	4,000	+3,070
Hot Inspection Phase III, LANL	9,002	0	0	0	0	0	+0
Subassembly Installation, LANL	10,134	0	0	0	0	0	+0
Cleaning Line Installation, LANL	18,547	0	0	0	0	0	+0
Cold Assembly Phase I, LANL	8,501	0	0	0	0	0	+0

[1] Prior Year funding of $2,500 and $900 in FY 2018 was funded under CBI for initial design for one technology, and a comprehensive re-design for a different technology. The re-scoped project was executed with $7,800 under Weapons Dismantlement & Disposition.

(2)Project was originally in AMD: Process Technology Development but because potential impacts of slowing Electrorefining, the Hood will support other equipment and operations in the surrounding areas of Building 915

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Immersion Density, LANL	5,710	0	0	0	2,135	1,288	-847
Machining XB (90%), LANL	6,201	0	0	0	0	0	+0
Pyro Staging, LANL	18,000	0	0	0	0	0	+0
LW Expansion Phase II, LANL	5,100	0	0	0	0	0	+0
AQ-Chloride Recovery Upgrades Phase 1, LANL	20,600	0	0	0	1,100	2,000	+900
Metal Recovery System, LANL	21,001	0	0	0	0	0	+0
Disassembly Lathe, LANL	8,500	0	0	0	0	0	+0
Metal Prep Line Phase I-A, LANL	31,504	0	0	0	0	0	+0
Heat Treat (90%), LANL	7,000	0	0	0	0	0	+0
CNC Lathe (90%), LANL	18,501	0	0	0	0	0	+0
Daytime Radiography (90%), LANL	18,000	0	0	0	0	0	+0
Cold Assembly Phase 2, LANL	10,000	0	0	0	0	0	+0
Machining (Parts Staging), LANL	13,502	0	0	0	0	0	+0
Foundry Immersion Density, LANL	5,133	0	0	0	0	1,055	+1,055
Coordinate Measurement Machine #1 , LANL	28,683	19,033	7,150	7,150	2,500	0	-2,500
Coordinate Measurement Machine #2, LANL	23,301	9,443	11,250	11,250	2,608	0	-2,608
Replacement of Electronic Beam Welder #1, LANL	12,889	9,978	2,911	2,911	0	0	+0
Precision Machining , LANL	9,286	8,082	1,204	1,204	0	0	+0
CNC Waist Banding Lathe #1, LANL	5,600	3,958	1,642	1,642	0	0	+0
GEN III MPDV, LANL	6,500	0	6,500	6,500	0	0	+0
Cold Hearth Electron Beam Melting (CHM), LLNL	5,000	0	0	0	5,000	0	-5,000
MES Implementation, SNL	8,090	0		2,028	2,414	2,175	-239
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**126,946**	**132,712**	**153,753**	**126,565**	**-27,188**
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A	0	0	0	0	+0
12-64 Bays 11, 12 & 15 Replacement Facilities, PX	5,283	0	0	0	0	3,058	+3,058
Building 12-44 Cell 8, PX	8,000	0	0	0	1,000	3,500	+2,500
Bldg. 92042E Dry Room Control Upgrades, Y-12	8,147	1,050	0	3,500	3,597	0	-3,597
Establish IT Production Infrastructure @ TA-55, LANL	6,500	0	0	0	0	1,000	+1,000
Total, Minor Construction Projects	**N/A**	**N/A**	**0**	**3,500**	**4,597**	**7,558**	**+2,961**
Total, Capital Summary	**N/A**	**N/A**	**126,946**	**136,212**	**158,350**	**134,123**	**-24,227**

Outyears for Directed Stockpile Work

(Dollars in Thousands)

	FY 2021 Estimate	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	129,070	128,276	136,783	270,314	47,080
Minor Construction	11,589	2,000	2,000	0	0
Total, Capital Operating Expenses	**140,659**	**130,276**	**138,783**	**270,314**	**47,080**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	100,650	102,864	105,127	107440	0
Glove Box Refurbishment Project I, Y-12	0	0	0	0	0
Glove Box Refurbishment Project II, Y-12	0	3,000	4,000	0	0
Rolling Mill Controller, Y-12	5,781	0	0	0	0
Life Extension Program Project 2, Y-12	0	0	0	0	20,000
Life Extension Program Project 4, Y-12	0	0	0	0	15,380
Life Extension Program Project 6, Y-12	0	0	0	0	11,700
TRU Waste Glovebox Project, LANL	2,950	2,800	0	0	0
Replacement MassSpec System, SRS	3,000	0	0	0	0
Foundry Upgrades Phase 3 (Foundry Parts Staging), LANL	3,750	1,517	1,250	750	0
Hot Inspection Phase 2, LANL	1,000	733	0	0	0
T-Base #1 Upgrades, LANL	4,000	3,000	0	0	0
Hot Inspection Phase III, LANL	0	0	563	8,439	0
Subassembly Installation, LANL	0	0	1,689	8,445	0
Cleaning Line Installation, LANL	0	0	2,251	16,296	0
Cold Assembly Phase I, LANL	0	0	563	7,938	0
Immersion Density, LANL	1,000	1,287	0	0	0
Machining XB (90%), LANL	0	0	1,413	4,788	0
Pyro Staging, LANL	0	0	0	18,000	0
LW Expansion Phase II, LANL	0	0	1,700	3,400	0
AQ-Chloride Recovery Upgrades Phase 1, LANL	3,000	4,000	4,000	6,500	0
Metal Recovery System, LANL	0	2,313	2,621	16,067	0
Disassembly Lathe, LANL	0	875	992	6,633	0
Metal Prep Line Phase I-A, LANL	0	0	0	31,504	0
Heat Treat (90%), LANL	0	0	875	6,125	0
CNC Lathe (90%), LANL	0	0	2,313	16,188	0

	(Dollars in Thousands)				
	FY 2021 Estimate	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	Outyears
Cold Assembly Phase 2, LANL	0	3,000	3,000	4,000	0
Machining (Parts Staging), LANL	1,688	1,912	2,926	6,976	0
Foundry Immersion Density, LANL	778	975	1,500	825	0
MES Implementation, SNL	1,473	0	0	0	0
Total, Capital Equipment (including MIE)	**129,070**	**128,276**	**136,783**	**270,314**	**47,080**
Minor Construction Projects (Total Estimated Cost (TEC)					
Total Minor Construction Projects (TEC <$5M)					
12-64 Bays 11, 12 & 15 Replacement Facilities, PX	2,225	0	0	0	0
9212 Decon/ Sort & Seg Facility, Y-12	4,364	0	0	0	0
Establish IT Production Infrastructure @ TA-55, LANL	1,500	2,000	2,000	0	0
Building 12-44 Cell 8, PX	3,500	0	0	0	0
Total, Minor Construction Projects	**11,589**	**2,000**	**2,000**	**0**	**0**
Total, Capital Summary	**140,659**	**130,276**	**138,783**	**270,314**	**47,080**

Plutonium Pit Production Project Construction

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Current	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Plutonium Pit Production Project							
Total Estimated Cost (TEC)	TBD	0	0	0	17,177	TBD	TBD
Other Project Cost (OPC)	TBD	0	0	0	5,000	TBD	TBD
TPC, Plutonium Pit Production Project	**TBD**	**0**	**0**	**0**	**22,177**	**21,156**	**-1,021**

Incorporates subprojects RLUOB to Hazard Category 3 (RC3) Subproject (04-D-125-07)/(RLUOB Reconfiguration Project – 17-D-125), LANL and PF-4 Equipment Installation Phase 2 (PEI2) Subproject (04-D-125-06)/(PF-4 Reconfiguration Project – 17-D-126), LANL from CMRR. In FY 2019, 52,823 of the appropriated dollars were used for Plutonium Sustainment Operations. This project scope is being redefined.

Science

Overview

The Science program provides the knowledge and expertise needed to maintain confidence in the nuclear stockpile without additional explosive nuclear testing. Capabilities developed and maintained in the Science program provide: (1) the scientific underpinnings required to conduct annual assessments of weapon performance and certification of Life Extension Programs (LEPs), (2) the information required to understand the impacts of surveillance findings to assure that the nuclear stockpile continues to remain safe, secure, and effective, and (3) the core technical expertise required to be responsive to technical developments and geopolitical drivers. Science deliverables also facilitate the assessment of current weapon and weapon component lifetimes, development and qualification of modern materials and manufacturing processes, certain concepts for component reuse, and modern safety concepts for sustainment.

Science performs experiments to obtain the materials and nuclear data required to validate and to understand the physics of nuclear weapons performance; these include hydrodynamic and subcritical experiments used to obtain data on the dynamic behavior of plutonium and surrogate materials in integrated geometries. Science program experiments and data analyses also facilitate safety, security, and evaluations of sustainment concepts without the need for additional underground testing. These activities serve to develop, exercise, and maintain the expertise and competence of the nuclear weapon design, engineering, and assessment community that resides at the National Nuclear Security Administration (NNSA) laboratories and production complex. This compendium of weapons-relevant data is acquired using unique, small- and large-scale experimental facilities throughout the Department of Energy (DOE) nuclear security enterprise. The operational funds for these facilities are included in other program budgets such as Inertial Confinement Fusion Ignition and High Yield and Infrastructure and Operations.

The Science program has strong programmatic coupling with the Advanced Simulation and Computing (ASC), Inertial Confinement Fusion Ignition and High Yield (ICF), Engineering, and Directed Stockpile Work (DSW) programs. These program linkages and a number of crucial cross-cutting, scientific pegposts are captured in the Predictive Capability Framework (PCF), a long-range communication, integration, and alignment tool that spans science-based stockpile stewardship activities within NNSA.

Science Funding

	(Dollars in Thousands)			
	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Research, Development, Test and Evaluation (RDT&E)				
Science				
Advanced Certification	57,710	57,710	57,710	+0
Primary Assessment Technologies	89,313	89,313	95,169	+5,856
Dynamic Materials Properties	120,000	120,000	133,800	+13,800
Advanced Radiography	37,600	32,544	32,544	+0
Secondary Assessment Technologies	76,833	77,553	77,553	+0
Academic Alliances and Partnerships	52,963	53,364	44,625	-8,739
Enhanced Capabilities for Subcritical Experiments	40,105	50,000	145,160	+95,160
Total, Science	**474,524**	**480,484**	**586,561**	**+106,077**

Outyears for Science Funding

	(Dollars in Thousands)			
	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Research, Development, Test and Evaluation (RDT&E)				
Science				
Advanced Certification	60,650	64,068	66,062	67,449
Primary Assessment Technologies	106,827	116,951	127,409	130,084
Dynamic Materials Properties	147,767	159,914	134,428	137,251
Advanced Radiography	35,989	37,375	38,789	42,733
Secondary Assessment Technologies	82,104	83,952	85,841	87,644
Academic Alliances and Partnerships	53,052	55,993	56,726	57,917
Enhanced Capabilities for Subcritical Experiments	170,379	172,800	186,500	161,833
Total, Science	**656,768**	**691,053**	**695,755**	**684,911**

Science
Explanation of Major Changes
(Dollars in Thousands)

	FY 2020 Request vs FY 2019 Enacted
Science	
Advanced Certification: No change.	+0
Primary Assessment Technologies: Re-establishes former source of key plutonium data within NNSA complex. This capability at the proton Radiography (pRad) Facility is essential to provide needed dynamic performance data for materials and components (new alloys, new manufacturing and processing, and aging studies). Increase also supports nuclear physics measurement needs: understanding inelastic scattering, utilizing criticality benchmark experiments, and improving (n, 2n) cross-sections.	+5,856
Dynamic Materials Properties: Growth supports an increased annual rate of Subcritical Experiments (SCEs) with improved diagnostics, plutonium characterization including Pu aging science, advanced-manufacturing and new high explosive formulation for future stockpile options. It also continues matching of funds for the NNSA/Department of Defense (DoD) Joint Munitions Program and supports the rise in cost to maintain and develop experiments on many platforms of mutual interest to the NNSA and DoD.	+13,800
Advanced Radiography: No change.	+0
Secondary Assessment Technologies: No change.	+0
Academic Alliances and Partnerships: Decrease reflects reduced activity at Stewardship Science Academic Alliance Centers of Excellence.	-8,739
Enhanced Capabilities for Subcritical Experiments: Increase supports Advanced Sources and Detectors (ASD) activities including preliminary design and long-lead procurements of specialized equipment and design of Neutron-Diagnosed Subcritical Experiments (NDSE) - system prototype.	+95,160
Total, Science	**+106,077**

Science
Advanced Certification

Description

Advanced Certification develops tools and methods to ensure that there is a certification path for stockpile systems and components in the absence of additional explosive nuclear testing by integrating computing, science, technology, and engineering advancements to facilitate certification of future life extensions and other warhead needs. More specifically, Advanced Certification: (1) Develops certification methodologies and integrates new experimental data into common models and assesses any impacts on stockpile performance (2) Develops certification paths for advanced manufacturing and replacement materials, (3) Develops advanced surety solutions and architectures as directed in legislation, (4) Studies the certification challenges and implications of systems proposed under the Stockpile Responsiveness Program (SRP) to meet emerging threats and (5) conducts certification readiness exercises, when needed, to assess whether technologies under consideration for proposed Life Extension programs could be certified for safety and performance.
Advanced Certification establishes the scientific basis for confidence that the designs, materials, and production methods utilized by SRP will be functional.

Highlights of the FY 2020 Budget

- Advanced Certification will pursue methods to certify additively-manufactured components for stockpile use, pursue advanced methods to enhance surety, develop diagnostic capabilities for subcritical experiments, and develop methods to assure the certifiability of systems and components to support future stockpile options.

FY 2021 – FY 2024 Key Milestones

- Develop certification approaches for systems and components responsive to emerging threats.
- Perform hydrodynamic tests to validate the Scaling and Surrogacy methodology, and study characteristics of historical primary anomalies.
- Conduct assessments of comparable nuclear tests, studies of failure modes, and other advanced methods to facilitate their use in certification of upcoming sustainment programs.
- Conduct studies supporting understanding of scaling and surrogacy to support the experimental basis for weapon assessments.
- Conduct experiments in support of product-based certification methods in particular of components made with advanced manufacturing.
- Conduct exercises on the certifiability of reuse, surety, and hardening concepts, as well as concepts incorporating new manufacturing technologies.
- Develop, characterize, and test prototype nuclear explosive package components fabricated using advanced manufacturing methods, including structural components, polymeric components, canned subassembly components, and radiation case components.

FY 2018 Accomplishments

- Completed a hydrotest in support of the Joint Technology Demonstrator (JTD).
- Developed methods for additively-manufactured, structured, high explosives including development of an additively-manufactured plane-wave generator.
- Completed development of diagnostics techniques to improve data collection from subcritical experiments.
- Completed gas-gun experiments in support of advanced surety solutions.

Advanced Certification

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Advanced Certification $57,710,000	**Advanced Certification $57,710,000**	**Advanced Certification +$0**
• Research understanding of critical certification paths and assessment tools for a responsive stockpile • Execute the analysis of hydrotest and subcritical experiments data and other experimental data that inform our ability to certify proposed stockpile systems and components. • Execute predictive capability improvements with common model development and resolution of failure modes.	• Develop certification approaches for systems and components responsive to emerging threats consistent with the 2018 Nuclear Posture Review. • Coordinate with the W80-4 and W87-1 modificaiton program office and laboratory leads to meet the certification needs of the modernization programs. • Evaluate and update common models for assessment of safety and reliability of present and potential stockpile systems against the latest experimental results, including High-Energy Density (HED) experiments, hydrotests, and subcritical experiments. • Develop new diagnostic capabilities to expand the quality and range of data returned from subcritical experiments.	• Maintains scientific basis for certification of the stockpile, development of tools and methods supporting assessments, and development of new technologies used to support ongoing LEP needs.

Description

Primary Assessment Technologies (PAT) provides capabilities essential for annual assessment of stockpile primaries, certification of future sustainment programs, improvements in primary safety and security, and resolution of significant finding investigations (SFIs). Principal focus areas of PAT include improving predictive capabilities for modeling boost and underwriting pit reuse options. PAT also provides science capabilities needed for intelligence community assessments of foreign-state nuclear weapon activities that concomitantly provide critical weapon skills, training, and experimental opportunities and challenges for designers and engineers.

Between 2020 and 2024, there are two PCF pegposts addressing our ability to predict the boost process, seeking to quantify uncertainties in predictions due to data and modeling uncertainties for (1) off-nominal conditions and (2) changes in microstructure. Primary assessments underscore the need to ensure that efforts to improve predictive ability are built upon established and well-validated capabilities. This is accomplished by developing both common models to quantify uncertainties in predictions, as well as models to assess the impact of variabilities caused by engineering, aging, or manufacturing features.

Primary Assessment Technologies. Activities include: (1) design and analysis of hydrodynamic experiments, (2) experiments supporting burn studies for boost science, (3) plutonium aging experiments supporting sustainment programs, (4) nuclear science measurements (e.g., fission cross-sections, fission yield, etc.), and (5) surface science experiments to assess corrosion phenomenon.

Highlights of the FY 2020 Budget

- Supports the re-establishment of plutonium capability at the Los Alamos Neutron Science Center (LANSCE) proton Radiography Facility (pRad), which provides critical dynamic performance data for materials and components (new alloys, new manufacturing and processing, and aging studies).

FY 2021 – FY 2024 Key Milestones

- Provide tools and methods for predicting primary lifetimes that account for initial production defects.
- Re-institute the capability for examining plutonium-bearing material at pRad.
- Conduct HED experiments to measure properties of burning plasmas relevant for weapon operation.
- Provide the ability to resolve SFIs associated with observations made by surveillance.
- Provide the science base that facilitates maturation and certification of future sustainment options associated with primaries.
- Develop updated lifetime assessment of aging based on new, experimental data.
- Conduct experiments and analyses to resolve the principal remaining uncertainties associated with boost. This will facilitate assessments of weapon performance in regimes that differ from those tested due to aging, changes in manufacturing processes, or changes in design.
- Complete PCF milestones on boost to resolve key uncertainties in stockpile assessment.
- Conduct experiments and analyses to address nuclear physics parameter uncertainties.
- Execute ramp-compression experiments, providing equation-of-state (EOS) data for high atomic number materials in a relevant pressure regime.
- Complete several small-scale, focused experiments on ejecta physics using the pRad; experiments that will ultimately inform ejecta physics models used in ASC integrated weapons simulations.
- Measure an x-ray diffraction pattern on a low-atomic number material during a dynamic compression experiment on the Z Facility.
- Expand weapon science capabilities to strengthen intelligence community assessments of specific foreign state nuclear weapon activities, and develop modern capabilities for the science-based Stockpile Stewardship Program (SSP) that are also suitable for use by the counterterrorism and counter-proliferation program mission.
- Develop a comprehensive understanding (e.g., kinetics, surface morphology) of the corrosion process on actinide materials.

FY 2018 Accomplishments

- Completed Primary Assessment Technology (PAT) PCF Level 1 milestone, demonstrating advancements in predictive capabilities for boost initial conditions and in the application of methods to quantify uncertainties, enhancing future Weapons Program design, assessment, and certification activities.
- Executed plutonium material strength experiments at the National Ignition Facility (NIF) and obtained scientifically significant plutonium strength data at pressures relevant to the stockpile.
- Executed theoretical and experimental efforts within the plutonium aging strategy plan, increasing our understanding of aging mechanisms and improved uncertainties bounding the impact of aging on performance.

Primary Assessment Technologies

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Primary Assessment Technologies $89,313,000	**Primary Assessment Technologies $95,169,000**	**Primary Assessment Technologies +$5,856,000**
• Re-institute ability to conduct plutonium experiments at the Los Alamos National Laboratory (LANL) proton Radiography (pRad) Facility for material and component characterization under dynamic conditions. • Complete installation of x-ray diffraction (XRD) capabilities on Sandia National Laboratories' (SNL) Z Facility, enabling time-resolved, XRD on dynamically compressed, polycrystalline matter. • Conduct surface-science theoretical studies and measurements on plutonium specimens to address critical scientific issues. • Advance capability for a combined mix and strength model to improve modern codes that predict the performance of weapon primaries. • Conduct experiments in support of boost science to improve the current understanding of primary performance. • Engineer and fabricate plutonium parts for upcoming SCEs in collaboration with Plutonium Sustainment. • Conduct material aging experiments in support of the B61 LEP, annual assessments, and to support pit reuse options for sustainment programs.	• Re-institute ability to conduct plutonium (Pu) experiments at pRad for material and component characterization under dynamic conditions. • Focus on plutonium aging science to establish the dependence of thermodynamic properties on plutonium aging processes. To this end, samples from a common material set will undergo calorimetry, resonant ultrasound, and diffraction experiments. • Provide data on fission Time Projection Chamber (TPC) Pu-239)/hydrogen (H-1) ratio cross-section measurement conducted at LANSCE. • Advance capability for a combined mix and strength model to improve modern codes that predict the performance of weapon primaries. • Conduct experiments in support of boost science to improve the current understanding of primary performance. • Engineer and fabricate plutonium parts for upcoming SCEs in collaboration with Plutonium Sustainment. • Conduct material aging experiments in support of the B61 LEP, annual assessments, and to support pit reuse options for sustainment programs.	• Increase supports key phase in design and development of inner containment vessel that will contain Pu-bearing material at pRad. • Increase supports expanded experimental efforts addressing component lifetime assessments. • Increase supports nuclear science initiatives expanded based on recent sensitivity and uncertainty quantification findings.

Science
Dynamic Materials Properties

Description

Dynamic Materials Properties (DMP) subprogram develops and maintains the experimental capabilities needed to inform modern, physics-based models that describe and predict the behavior of weapon materials in environments of extreme conditions of pressure, temperature, stress, strain, and strain rates to understand how the behavior impacts nuclear weapon performance. The consideration of pit and secondary component reuse and replacement also requires studies of aging degradation of materials (to include aged plutonium samples) under dynamic conditions to understand potential performance changes. This program provides the experimental data and assessment of special nuclear materials (SNM), insensitive high explosives (IHE), polymers, and foams under dynamic conditions required for annual assessment and certification of the stockpile as well as for future sustainment options.

Research pursued in the Dynamic Materials Properties supports: (1) the annual assessment process, (2) baselining of materials properties for the future determination of aging effects, and (3) consideration of materials replacement and future options for sustainment programs. The characterization of new materials and processes for stockpile applications is an emerging focus for stockpile modernization and responsiveness to enable the use of modern manufacturing techniques. Dynamic Materials Properties is one of the two substantial funding sources (along with Research and Development Certification and Safety within DSW) for subcritical and other plutonium experiments. This subprogram includes the major experimental capabilities devoted specifically to obtaining data on plutonium and other weapons materials under extreme conditions in an integrated assembly. New experimental capabilities are developed as needed to provide the required data for annual assessment and potential future sustainment options. In particular, the following capabilities are being developed to facilitate certification of pit reuse with IHE for upcoming sustainment programs: (1) subcritical experiments at the Nevada National Security Site (NNSS) underground laboratory complex (U1a) using radiography, radiometry, holography, and/or Photon Doppler Velocimetry (PDV) diagnostic, (2) heating and cooling capabilities on dynamic testing platforms, (3) high-pressure Z experiments on plutonium and other relevant materials, and (4) the development of the Phoenix platform, the Joint Actinide Shock Physics Experimental Research (JASPER) gas gun Facility, and other experimental platforms such as Enhanced Capabilities for Subcritical Experiments (ECSE). Additionally, for long-term certification needs, the Dynamic Materials Mesoscale capability is being developed.

Highlights of the FY 2020 Budget

- Supports an accelerated pace for subcritical experiment (SCE) execution at the Nevada National Security Site underground laboratory complex (NNSS U1a).
- Supports slight increase to the number of experiments to further understand properties of aged stockpile materials.

FY 2021-FY 2024 Key Milestones

- Deliver high-pressure plutonium data using the JASPER capability at NNSS.
- Develop advanced platforms for high-pressure materials measurements on the Z-machine.
- Support subcritical experiments at NNSS in support of upcoming sustainment programs, pit-reuse options, evaluating the effects of aging on performance, and annual assessment.
- Develop and field advanced diagnostics for equation-of-state, strength and damage, and hydrodynamic and subcritical experiments, in particular, Multiplexed PDV advances and pyrometry.
- Support sustainment options by executing experiments providing key data at NNSA experimental facilities: JASPER, Technical Area-55 (TA-55), LANSCE, the Z Facility, high-explosive (HE) firing sites, and other laboratory-scale science facilities.
- Support the testing and qualification of uranium, surrogates, high explosives, and other non-nuclear materials for remanufacturing options.
- Evaluate the dynamic response of materials produced by new manufacturing methods for potential stockpile applications.

FY 2018 Accomplishments

- Conducted the Eurydice surrogate experiments in the Lyra SCE series. The data will inform material models used in annual assessments.
- Delivered plutonium data from NIF, JASPER, Z, and small-scale experiments at TA-55 to validate the plutonium equation-of-state (EOS) and plutonium aging models directly relevant to stockpile assessments, stockpile certification, and future stockpile options including the B61-12 LEP.
- Delivered high explosives' data from experiments at the Dynamic Compression Sector (DCS) at the Advanced Photon Source (APS) at Argonne National Laboratory that support the development of more advanced models of the detonation and performance of insensitive high explosives (IHE).

Dynamic Materials Properties

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Dynamic Materials Properties $120,000,000	**Dynamic Materials Properties $133,800,000**	**Dynamic Materials Properties +$13,800,000**
• Conduct the Sierra Nevada SCE (Ediza series) at U1a. • Execute Red Sage/Nightshade confirmatory experiment (Iris series) at U1a. • Implement temperature measurement diagnostics for plutonium experiments to provide data relevant phase transitions, kinetics, and aging. • Development of time-resolved measurements of phase transition dynamics and high fidelity EOS in plutonium and plutonium alloys at low pressure and moderate temperature. • Conduct qualifications of IHE in support of on-going sustainment programs. • Develop and characterize additively manufactured explosives. • Develop and field advanced diagnostics for temperature (pyrometry) and phase change of metals for use under static and dynamic conditions. • Develop a platform on Sandia's Z machine for measuring EOS of gas mixtures and conduct an experiment of a Hydrogen/Helium mixture. • Utilize all SNL facilities (Z, Thor, gas guns) to provide material data in support of PCF pegposts, qualifying high explosives PBX-9502 and LX-21 for the B61-12 and W80-4 LEPs and for maturing materials candidates. • Conduct experiments at the APS Dynamic Compression Sector (DCS) to elucidate the formation of high explosive condensates during initiation to inform reactive burn models.	• Conduct the Red Sage/Nightshade SCE (Nightshade A) at U1a. • Conduct the Red Sage/Nightshade SCE (Nightshade B) at U1a. • Conduct the Red Sage/Nightshade SCE (Nightshade C) at U1a. • Perform experiments and modeling of two multi-phase materials as part of the Tri-lab strength collaboration. • Conduct JASPER experiments on plutonium at weapon-relevant conditions to measure phase transitions, kinetics, and aging-effects using dynamic diagnostics including temperature measurement. • Assess the influences of microstructure and chemistry on dynamic performance from changes in production and processing (Pu, HE). • Implement a temperature diagnostic (pyrometry) at Z-machine and the TA-55 40 millimeter (mm) gun to measure temperature of Pu in dynamic experiments • Execute automated phase mapping and high-fidelity EOS measurements of plutonium and plutonium alloys at High Pressure Collaborative Access Team (HPCAT) Sector at APS at moderate pressures and temperatures. • In support of a PCF pegpost, complete qualification of the performance of legacy and new lots of PBX-9502 and LX-21 in support of the B61 LEP and W80-4 LEP. • Develop experiments to support the qualification of PBX-9502 and LX-17 high	• Increase supports accelerated pace of SCEs (two or three per year) with improved diagnostics, plutonium characterization including Pu aging science, and advanced manufacturing. • Increase supports new high explosive formulation for future stockpile options with continued matching of funds for the NNSA/DoD Joint Munitions Program to align with evolving DoD strategic objectives. • Increase supports the rise in cost to maintain and develop experimental platforms for materials of interests to the NNSA. • Increase supports increased rate of plutonium aging experiments.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
• Authorize the use of a stripline target in the present containment system to achieve higher pressure in plutonium experiments on the Z Facility. • Develop x-ray diffraction as a standard diagnostic on the Z Facility for measuring material structure and phase. • Improve throughput/efficiency of JASPER Facility. • Develop and perform authorization of next-generation containment (NGC) system for the Z Facility. • Test closure dynamics of the next-generation containment system and develop engineering solutions for a system fieldable on the Z Facility.	explosives for the W80-4 LEP and W87-1 Modification Program. • Perform higher pressure stripline experiments on plutonium, supporting plutonium aging. • Execute a key series of plutonium experiments on the 40 mm gun at TA-55, including pre-heated experiments. • Conduct experiments at the APS DCS to elucidate the formation of high explosive condensates during initiation, to inform reactive burn models. • Execute authorization tests of the next-generation containment (NGC) system for the Z Facility.	

Science
Advanced Radiography

Description

The Advanced Radiography (AR) subprogram develops and implements tomorrow's tools for delivering stockpile data by developing x-ray tools to radiographically diagnose hydrodynamic, subcritical, and other experiments that subject materials to strong shocks and high strains at high rates of strain, including those experiments that are designed to determine the properties of plutonium. Requirements for new experimental data are identified by NNSA based on recommendations from the weapons design program elements at Los Alamos National Laboratory (LANL) and Lawrence Livermore National Laboratory (LLNL), by the weapons system stewardship activities, including lifetime extension programs (LEPs), and by other subprograms in ICF and Science.

AR also develops other transformational experimental and diagnostic techniques to support the varying needs of the weapons programs. These transformational technologies motivate new materials models with innovation and design optimization, validate models used in modern design codes, and advance and improve the quality of the scientific results obtained at the experimental facilities. Priority activities across the AR Program include the continued development of the drivers, diagnostics, and methodologies needed by the Weapons Program for intermediate and long-term experiments. The development of advanced drivers include work in: traditional pulsed power engineering, research and development (R&D) for energy storage, power flow and current adder; solid state pulsed power technologies; and application of lasers to produce extreme environments. The development and implementation of new diagnostics for subcritical experiments, and for fundamental and focused experiments include: photon, particle, and neutron detectors; visible light cameras; position, velocity, and temperature ("shock wave") diagnostics; advanced (non-x-ray) radiographic techniques such as proton and neutron radiography, and soft x-ray imaging. The development and implementation of new experimental methodologies for weapons experiments include: new techniques for hydro tests and SCEs, advanced neutron diagnostics such as photo-fission based techniques for assessing criticality, and short-pulse laser driven electron and ion beam sources.

These transformational technologies improve the quality and reliability of scientific results at many NNSA experimental facilities at the national security laboratories and NNSS. These include the Dual-Axis Radiographic Hydrodynamic Test (DARHT) Facility, the Contained Firing Facility (CFF) using Flash X-Ray (FXR) technology, the Z Pulsed-Power Facility, the Cygnus radiography system at the U1a Complex, and the pRad Facility.

Highlights of the FY 2020 Budget

- Developing radiographic system improvements and new diagnostics for U1a Complex Cygnus, DARHT, and FXR in support of hydrodynamic and subcritical experiments.
- Testing new system architectures that include solid-state pulsed power and linear transformer drivers.
- Testing new diagnostic systems such as neutron imaging.
- Researching new imaging system technology that will improve current x-ray technologies.

FY 2021 – FY 2024 Key Milestones

- Research and develop the next-generation DARHT and FXR replacement accelerator architectures.
- Modernize radiographic analysis techniques and models.
- Advance and field hydrodynamic diagnostics for both surrogate and plutonium experiments that support stockpile assessments and LEP developments.
- Provide a technology basis for an N-pulse (movie-like), high-resolution radiographic capability (source and detectors) for future experiments.
- Provide next generation driver technologies to create physical environments needed to answer Weapons Program needs.
- Provide an intense, pulsed neutron source that supports radiographic and reactivity measurements.
- Provide transformational diagnostics to increase learning from dynamic experiments.
- Provide improved tools for design and optimization of diagnostics coupled with efficient data analysis techniques.

FY 2018 Accomplishments

- Finalized designs of advanced diagnostic capabilities such as Broadband Laser Ranging diagnostic, the Multi-Wavelength Extinction diagnostic, and a Neutron Radiographic System at LLNL.
- Started development of Linear Transformer Driver (LTD) technology for next generation pulsed-power applications.
- Started development of bi-polar solid state pulsed power that will inform next generation radiographic system architectures.
- Fielded next generation diagnostics in many of our operational hydrodynamic test facilities.

Advanced Radiography

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Advanced Radiography $32,544,000	**Advanced Radiography $32,544,000**	**Advanced Radiography +$0**
• Develop advanced power flow simulations for current coupling efficiency on the Z Facility. • Deploy power flow and plasma diagnostics on the Z Facility to provide validation data for power flow simulations. • Develop Next Generation Driver Prime Power Energy Storage Technology. • Develop next generation radiographic architectures and techniques in support of the current and future nuclear weapons stockpile. • Test reactivity measurements using photofission. • Improve Radiographic Analysis methods. • Research diagnostics desired by weapon laboratories to reduce uncertainty in weapon codes. • Improve beam line physics models. • Improve imaging capabilities that includes sources, scintillators, and cameras at existing NNSA facilities to increase data fidelity. • Develop Next Generation Source Diagnostics. • Modeling, simulation, and analysis research and development. • Execute Cygnus Source research and development.	• Accept, test, and characterize large channel count Broadband Laser Ranging system. • Develop advanced power flow simulations for current coupling efficiency on the Z Facility. • Deploy power flow and plasma diagnostics on the Z Facility to provide validation data for power flow simulations. • Develop Next Generation Driver Prime Power Energy Storage Technology. • Develop next generation radiographic architectures and techniques in support of the current and future nuclear weapons stockpile. • Test reactivity measurements using photofission. • Improve Radiographic Analysis methods. • Research diagnostics desired by weapon laboratories and validated by NNSA to reduce uncertainty in weapon codes. • Improve beam line physics models. • Improve imaging capabilities that include sources, scintillators, and cameras at existing NNSA facilities to increase data fidelity. • Develop Next Generation Source Diagnostics. • Provide modeling, simulation, and analysis research and development to support diagnostic development. • Execute Cygnus Source research and development.	• Maintains level of activity for this subprogram at FY 2019 enacted level.

Science
Secondary Assessment Technologies

Description

The Secondary Assessment Technologies subprogram provides capabilities that increase confidence in the assessment of stockpile secondaries, enabling a broad range of sustainment options and resolution of SFIs. A principal focus of Secondary Assessment Technologies is to provide the experimental and science capability used to quantify full system performance margins and associated uncertainties. The subprogram uses past underground test (UGT) data and conducts and utilizes a variety of above ground experiments to obtain new data and to develop and validate physical models needed to improve predictive capability. Key elements include primary output, radiation transport, complex hydrodynamics and burn, material properties, and weapons outputs and effects. For stockpile systems, secondary assessment facilitates: (1) the reacceptance of existing secondaries and other nuclear explosive package components for future sustainment options and (2) the development of the science basis for qualification methodology for physics performance of remanufactured canned sub-assembly (CSA) and other components. A major deliverable for Secondary Assessment Technologies is the improved predictive capability for secondary performance for nominal and off-nominal conditions, a level-1 PCF pegpost in FY 2019.

In the outyears, the subprogram will continue to expand the weapon science validation basis in support of LEPs and anticipated stockpile responsiveness needs, develop new experimental platforms, and continue model improvements, including directions identified through the FY 2019 off-nominal performance milestone. Efforts to explore and evaluate new manufacturing methods, new and replacement materials, and aged materials and to evaluate their impact on stockpile performance will expand to support program needs. Understanding the impact of manufacturing processes for the production and restoration of CSA components requires both experimental measurements and modeling techniques to address performance impacts. Efforts will continue in weapon outputs, effects, and performance in hostile environments. Understanding survivability in a hostile environment requires understanding weapon outputs, propagation of outputs, and the subsequent effects coupling into the weapon intended for survival and how the performance of the weapon is impacted. This research includes obtaining experimental data supporting weapon design code validation for more accurate weapon output calculations, improving laboratory radiation sources and diagnostics to support code validation and hardware qualification experiments, and developing platforms for evaluating candidate and evolving stockpile technologies for radiation hardness.

Secondary Assessment Technologies has strong programmatic coupling with other subprograms within Science and the ICF, Engineering, and ASC programs. It relies on experimental target capabilities and on the high-energy density (HED) facilities supported by both the Science and ICF programs, including the NIF at LLNL, the Omega Laser Facility at the University of Rochester, and the Z Facility at SNL to execute HED experiments at conditions relevant to stockpile secondaries. Secondary Assessment Technologies has significant coupling to advanced computing platforms and resources supported by the ASC Program and to the Nuclear Survivability subprogram in the Engineering program.

Highlights of the FY 2020 Budget

- Expand the science validation basis in support of LEPs and anticipated stockpile responsiveness needs, develop new HED platforms and diagnostics, and deliver constraining data using HED experimental facilities.
- Develop new materials and advanced manufacturing processes, evaluate their properties and their impact on performance relevant to weapons secondaries.
- Evaluate and compare weapons outputs capabilities and predictions, and develop x-ray sources for weapons survivability.

FY 2021 – FY 2024 Key Milestones

- Develop physics-based models for key secondary-relevant issues that include SFIs, the sustainment program, and the Annual Assessment Report, validate the models through HED and other experimental efforts, and develop new platforms to obtain necessary experimental data.
- Execute program plans associated with secondary capabilities and design options consistent with the sustainment program schedule. Deliver data on radiation transport to validate models, in support of design assessments and Annual Assessments.
- Execute the program plan to deliver full-system weapon outputs modeling capabilities.

- Advance manufacturing technologies for relevant materials and our understanding of new and aged materials impact on stockpile performance.
- Advance capabilities to assess survivability of nuclear weapons in hostile environments.
- Develop warm x-ray, neutron sources, and system-generated electromagnetic pulse (SGEMP) platforms and common models for outputs and effects studies.
- Develop diagnostic and platform capabilities for HED experiments that study complex hydrodynamics and burn, equation of state of materials, material properties, and opacity.
- Deliver opacity data on multiple materials from the Z Facility and the NIF to improve and validate first-principles opacity models.
- Develop new advanced diagnostics and support calibration of existing diagnostics used for collecting data under the harsh environments of HED experiments.
- Recruit, develop, and retain stockpile stewards to maintain the technical superiority in the nation's nuclear security capabilities.

FY 2018 Accomplishments
- Executed equation of state characterization experiments at the NIF on a replacement material using an HED platform developed and qualified by Secondary Assessment Technologies – work executed with the W80-4 LEP team.
- Developed and fielded an improved backlighting configuration using the Advanced Radiographic Capability (ARC), enabling acquisition of new stockpile-relevant data at the NIF.
- Completed modern performance simulations of an atmospheric test differing substantially from current stockpile devices, stressing our understanding of a specific physical process to support a broader class of design options for future LEP studies.
- Manufactured cast materials with varying impurities to explore future stockpile material specifications, and continued efforts to study reforming aged components to enable alternative techniques for manufacturing future stockpile components.
- Demonstrated the ability to acquire iron opacity measurements on the NIF, providing an independent opacity platform to compare with data from the Z Facility.
- Improved the understanding of cold and warm x-rays and enhanced the capability of the Z Facility to validate models for nuclear survivability, by diagnosing the plasma plume from blow-off impulse tests, obtaining cavity density measurements in system-generated electromagnetic pulse experiments, and demonstrating the ability to expose >70 cm^2 areas for cold x-ray material tests.

Secondary Assessment Technologies

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Secondary Assessment Technologies $77,553,000	**Secondary Assessment Technologies $77,553,000**	**Secondary Assessment Technologies +$0**
• Complete the PCF pegpost for FY 2019, delivering advances in understanding of secondary performance in nominal and off-nominal conditions. • Deliver datasets from HED platforms for use in informing simulation methodology and in support of the FY 2019 PCF pegpost. • Assess current capability to perform weapon effects output simulations and the fidelity of this class of simulations. • Demonstrate an advanced imaging diagnostic to assess the dynamics of >15 kiloelectron volt (keV) x-ray sources on the Z Facility. • Complete experiments on materials produced using two different manufacturing methods and with variations in impurities. • Assess methods for increasing warm x-ray source output on the Z Facility for radiation effects. • Complete measurements and analyses of opacity of multiple elements on the NIF and begin comparisons to theoretical models and Z Facility data. • Obtain time-gated absorption spectra from opacity experiments on the Z Facility. • Acquire data from ORION opacity experiments to contribute to resolution of Model-data discrepancies. • Transition to normal operations of the soft x-ray beamline at the Stanford Synchrotron Radiation Lightsource (SSRL) while continuing optimization of beamline performance and develop testing infrastructure.	• Develop new HED platforms and deliver constraining data using existing platforms and facilities in support of stockpile stewardship. • Expand the science validation basis in support of LEPs and anticipated stockpile responsiveness needs. • Deliver a new qualified HED platform to address a key issue in secondary performance modeling. • Investigate additional non-stockpile secondary devices to broaden validation of common modeling techniques and support design options. • Advance manufacturing technologies for alloys and assess impacts on stockpile performance. • Develop warm x-ray sources to support model validation for survivability and produce data at higher fluences to evaluate thermomechanical shock response to inform LEP options. • Extend the systematic study of high-Z opacity measurements on the Z Facility and continue comparisons of data from the Z and NIF platforms at similar plasma conditions. • Measure the emission opacity of a high-Z material over a range of temperatures. • Support nuclear cross-section measurement activities in support of integrated design efforts and initiate modern look at radiochemistry in analysis of legacy samples. • Compare weapons outputs capabilities and predictions between current codes and alternate code.	• Maintains level of activity for this subprogram at FY 2019 enacted level.

Science
Academic Alliances and Partnerships

Description

(dollars in thousands)

Budget Category	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request
Science			
Academic Alliances and Partnerships	**52,963**	**53,364**	**44,625**
Minority Serving Institution Partnership Program	19,832	20,000	20,000
Stewardship Science Academic Alliance (SSAA) Grants and Cooperative Agreements	33,131	33,364	24,625

NNSA funds scientific academic programs to develop the next generation of highly trained technical workers able to support its core mission and to ensure there is a strong community of technical peers, external to the NNSA national laboratories, capable of providing peer review and scientific competition to strengthen the basic fields of research relevant to the NNSA. Within Science, the Academic Alliances and Partnerships subprogram supports the following academic programs: (1) Stewardship Science Academic Alliance (SSAA) and (2) Minority Serving Institutions Partnership Program (MSIPP).

The SSAA Program funds research projects at universities to conduct fundamental science and technology research of relevance to stockpile stewardship (materials under extreme conditions, low-energy nuclear science, high energy density physics, and radiochemistry). Launched in 2002, the SSAA Program enables advanced experimental activities through program-supported Centers of Excellence and research grants at over 40 universities. The program supports students in the aforementioned fields critical to stewardship science including opportunities to conduct research at NNSA's laboratories, building a field of talented and committed doctoral students sharing a common desire to advance science while impacting national security. The SSAA Program funds the Stewardship Science Graduate Fellowship (SSGF) and the Laboratory Residency Graduate Fellowship (LRGF) to train scientists to meet U.S. workforce needs by providing financial support and professional development opportunities to students pursuing a Ph.D. in fields of study that solve complex science and engineering problems critical to stewardship science.

NNSA MSIPP's goal is to increase participation of women and minorities in NNSA's nuclear security enterprise, developing individuals, building core competencies for NNSA, and improving institutional capacity in Minority Serving Institutions (MSI). MSIPP supports MSI efforts including Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs), and Tribal Colleges and Universities (TCUs).

MSIPP aligns investments in university capacity and workforce development with the NNSA mission to develop the needed skills and talent for NNSA's enduring technical workforce at the laboratories and production plants, and to enhance research and education at under-represented colleges and universities. This alignment is defined by the following goals: 1) strengthen and expand MSI capacity and research experience in NNSA/DOE mission areas of interest, 2) increase visible participation of MSI faculty in NNSA/DOE technical engagements and activities, such as collaborative research, technical workshops, expert panel reviews and studies, and competitive processes, 3) target collaborations between MSIs and NNSA/DOE laboratories and plants that increase scientist-to-scientist interactions, applied research and engineering application collaborations and/or implementation of research results, and provide MSI access to NNSA/DOE facilities, 4) increase the number of MSI students who graduate with Science, Technology, Engineering, and Mathematics (STEM) degrees relevant to DOE mission areas and who have had exposure to career opportunities at DOE, and 5) increase the number of minority graduates and post-doctoral students hired into NNSA/DOE's technical and scientific workforce.

Highlights of the FY 2020 Budget

- Pursue consortium-based STEM grants that specifically target TCUs and HSIs and provide them the opportunity to build their STEM capacity and academic infrastructure in STEM. As a result TCUs and HSIs will be in a sound position to become an intricate part of the STEM pipeline that addresses the STEM needs of the Tribal and Hispanic community respectively.

- Confirm the hiring of various minority students into the NNSA/DOE and Federal workforce that have matriculated through various STEM consortium pipelines.
- Partner with other Federal agencies and private organizations to broaden the reach of the MSIPP and to co-fund various minority STEM projects that are of mutual interest to the partnering agencies/organizations.
- Place the 14th and 3rd annual cohorts of fellows into the SSGF and LRGF graduate fellowship programs, respectively.
- Seek approval to release a funding opportunity announcement for SSAA university research grants and begin conducting midterm reviews of its SSAA Centers of Excellence, to conclude in FY 2021.

FY 2021 – FY 2024 Key Milestones

- Provide advanced experimental measurement techniques in areas of Condensed Matter Physics and Materials Science, Hydrodynamics, Fluid Dynamics, Low-Energy Nuclear Science, and Radiochemistry via the SSAA program.
- Provide opportunities for intellectual challenge and collaboration by promoting scientific interactions between the academic community and scientists at the NNSA laboratories, via the SSAA program.
- Increase availability of unique experimental facilities sited at NNSA laboratories to the broader academic community, particularly for collaborations in areas of relevance to Stockpile Stewardship.
- Develop and maintain a long-term, recruiting pipeline to NNSA laboratories by increasing visibility of NNSA scientific activities to U.S. faculty and student communities.
- Pursue consortium-based STEM grants that specifically target TCU's that provide TCU's the opportunity to build their STEM capacity and academic infrastructure in STEM. As a result TCUs will be in a sound position to become an intricate part of a STEM pipeline that addresses the STEM needs of the Tribal community.
- Document the hiring of various students into the NNSA/DOE and Federal workforce that have matriculated through various STEM consortium pipelines.
- Partner with other Federal agencies specifically the National Aeronautics and Space Administration (NASA) to broaden the reach of our MSIPP and to co-fund various minority STEM projects that are of mutual interest to the partnering agencies.
- Strengthen and expand the MSI program through the five-year cybersecurity consortium investment between the HBCUs, Charleston County School District and the NNSA/DOE laboratories.

FY 2018 Accomplishments

- Conducted the first competitive solicitation for new consortia, awarding three new MSIPP grants for strategic partnerships between Minority Serving Institutions and the NNSA.
- Awarded six SSAA Centers of Excellence, twenty-five continuation applications for SSAA grants and cooperative agreements, and competitively selected thirty proposals for SSAA grants.

Academic Alliances and Partnerships

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Academic Alliances and Partnerships $53,364,000	**Academic Alliances and Partnerships $44,625,000**	**Academic Alliances and Partnerships -$8,739,000**
• Support the MSIPP with new and continued support to the HBCU, HSI, TCU and community-based grants. Supports the MSIPP consortium based model focused on research and internships in STEM. Supports building educational/institutional infrastructure and enhancing the pipeline of diverse, high-quality talent in STEM academic disciplines and careers. • Support the SSAA Program to develop the next generation of highly-trained technical workers able to support the NNSA core mission and to ensure there is a strong community of technical peers.	• Support the MSIPP with new and continued support to the HBCU, HSI, TCU and community-based grants. Supports the MSIPP consortium based model focused on research and internships in STEM. Supports building educational/institutional infrastructure and enhancing the pipeline of diverse, high-quality talent in STEM academic disciplines and careers. • Support the SSAA Program to develop the next generation of highly-trained technical workers able to support the NNSA core mission and to ensure there is a strong community of technical peers.	• Decrease reflects the shift to higher priority NNSA efforts. The MSIPP Program, the SSAA Graduate fellowships, and SSAA Grants will be prioritized over the nine SSAA Centers of Excellence.

Science
Enhanced Capabilities for Subcritical Experiments

Description

The stockpile is inherently moving away from the Underground Test (UGT) database through aggregate influences of aging, modern manufacturing techniques, modern materials, and evolving design philosophies. In 2014, the national security laboratories LANL and LLNL jointly identified that a capability gap exists to enable certification of these changes, which involves the evaluation of plutonium response. In 2016, the JASON Defense Advisory Group identified the same gap in current U.S. capability to carry out and diagnose such experiments; Enhanced Capabilities for Subcritical Experiments (ECSE) will close this gap. Data from ECSE will help the certification of the W80-4 LEP and the W87-1 Modification Program. ECSE delivery in the mid-2020s supports these efforts.

Science efforts have advanced the understanding of plutonium in the early evolution of an imploding system and identified the need to similarly improve understanding of plutonium performance during the extreme physical conditions reached later in an implosion. This improved understanding will inform the evaluation of various components of stockpile transformation and certification of planned LEPs not possible given the current limitations of existing facilities and diagnostic methods. In addition to the physics gap, the national laboratories have identified a gap in experimental capabilities needed to develop the next generation of weapon designers in the absence of underground explosive nuclear testing. NNSA has validated this gap via the aforementioned 2016 JASON study. To fill these gaps and to support the program plan documented in the 2018 Stockpile Stewardship and Management Plan (SSMP), NNSA places a high priority on developing ECSE at NNSS's underground laboratory, the U1a Complex. Other project costs (OPCs) for UCEP are funded from the ECSE subprogram.

The ECSE subprogram consolidates a portfolio of work that includes (1) the Major Item of Equipment (MIE) titled Advanced Sources and Detectors (ASD), (2) a developing reactivity measurement technology named Neutron-Diagnosed Subcritical Experiments (NDSE), and (3) subcritical experiment entombment activities. Though managed by the ECSE subprogram, the construction project 17-D-640, U1a Complex Enhancements Project, is funded under Infrastructure and Operations.

ASD, managed under DOE O 413.3B, designs and installs a large radiographic system that will be generating the x-ray energies and multi-pulse capability necessary to diagnose late-time dynamics in plutonium implosion experiments. ASD is scheduled to complete by the mid-2020s. NDSE is a measurement concept that NNSA will apply to dynamic plutonium experiments that will measure the negative reactivity of a subcritical assembly. Since neutron multiplication is sensitive to the material properties of fissile material, the data will provide a new constraint on the codes and models used to simulate the performance of nuclear weapon primaries, improving our stockpile assessment capability. Entombment activities provides a disposition area in the U1a Complex for expended subcritical experiments.

As outlined in the NNSA SSMP, NNSA plans long-term investments supporting plutonium science at the NNSS. NNSS is the only site in the United States with the capability to perform experiments combining high explosives and plutonium in significant quantities, a core capability for NNSA's Stockpile Stewardship Program, as per 50 U.S. Code § 2521.

Highlights of the FY 2020 Budget

- Continue maturing technical design of the Advanced Sources and Detectors MIE.
- Prepare long lead item procurement packages for the accelerator and injector hardware.
- Design the NDSE prototype system for dynamic testing.

FY 2021-FY 2024 Key Milestones

- Begin long lead procurements specialized equipment.
- Submit Critical Decision-2 (Approve Performance Baseline) for the accelerator.
- Submit Critical Decision-3 (Approve Start of Construction) for the accelerator.
- Begin accelerator module procurement.
- Start injector test at the Integrated Test Stand.
- Begin detector procurement.
- Begin installation of Special Equipment in UCEP.

FY 2018 Accomplishments

- Completed DOE Order 413.3B project reviews of the Advanced Sources and Detectors MIE in preparation for FY 2019 Critical Decision-1 (CD-1) approval.

Enhanced Capabilities for Subcritical Experiments

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Enhanced Capabilities for Subcritical Experiments $50,000,000	**Enhanced Capabilities for Subcritical Experiments $145,160,000**	**Enhanced Capabilities for Subcritical Experiments +$95,160,000**
• Achieve ASD CD-1. • Develop injector needed for the ASD project. • Execute NDSE simulations and assess constraints. • Perform additional static experiments to assess modeling and response capability. • Improve Dense Plasma Focus (DPF) performance and reliability. • Evaluate photo-fission as an alternative (neutron source) to DPF.	• Progress ASD technology maturation in accordance with DOE O 413.3B. • Prepare U1a Complex for dynamic NDSE testing. • Begin design of NDSE system prototype.	• Increase supports ASD activities including preliminary design and long lead procurement of specialized equipment and design of NDSE system prototype.

Science
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	47,104	47,199	63,086	128,374	+65,288
Minor Construction	N/A	N/A	0	0	0	0	0
Total, Capital Operating Expenses	N/A	N/A	**47,104**	**47,199**	**63,086**	**128,374**	**+65,288**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	12,804	12,804	13,086	13,374	+288
Advanced Sources and Detector, LANL	791,600	28,500	34,300	34,395	50,000	115,000	+65,000
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**47,104**	**47,199**	**63,086**	**128,374**	**65,288**
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A	0	0	0	0	+0
Total, Minor Construction Projects	**N/A**	**N/A**	**0**	**0**	**0**	**0**	**0**
Total, Capital Summary	**N/A**	**N/A**	**47,104**	**47,199**	**63,086**	**128,374**	**+65,288**

Outyears for Science

	(Dollars in Thousands)				
	FY 2021 Estimate	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	168,668	178,969	164,276	108,295	0
Minor Construction	0	0	0	0	0
Total, Capital Operating Expenses	**168,668**	**178,969**	**164,276**	**108,295**	**0**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	13,668	13,969	14,276	14,590	0
Advanced Sources and Detector, LANL	155,000	165,000	150,000	93,705	0
Total, Capital Equipment (including MIE)	**168,668**	**178,969**	**164,276**	**108,295**	**0**
Minor Construction Projects (Total Estimated Cost (TEC)					
Total Minor Construction Projects (TEC <$5M)	0	0	0	0	0
Total, Minor Construction Projects	**0**	**0**	**0**	**0**	**0**
Total, Capital Summary	**168,668**	**178,969**	**164,276**	**108,295**	**0**

Advanced Sources and Detectors (ASD) Major Item of Equipment (MIE)
LANL Lead (SNL, LLNL, NNSS, NRL support)
Project Data Sheet

1. Summary, Significant Changes, and Schedule and Cost History

Summary: Consistent with direction included in the Conference Report accompanying the Energy and Water Development and Related Agencies Appropriations Act, 2019, a project data sheet is being provided for this Major Item of Equipment (MIE). The FY 2020 Request for the ASD MIE as currently envisioned is $115,000,000. The Rough Order of Magnitude cost range for this project is $500,000,000 - $1,100,000,000,[1] with Critical Decision 4 (CD-4) projected for FY 2025, based on an Independent Cost Review that includes a 50% estimate of uncertainty on the to go estimate plus Management Reserve and Contingency of $228,300,000. The most recent Department of Energy (DOE) approved CD for the project is CD-1, Approve Alternative Selection and Cost Range, which was approved on February 6, 2019, as part of the "Enhanced Capabilities for Subcritical Experiments (ECSE) at the Nevada National Security Site (NNSS), U1a Complex." The ASD is a large programmatic diagnostic that will be used for subcritical experiments through application of a multi-pulse, single axis, linear induction accelerator (LIA)-based radiographic system.

Significant Changes:
This is the first Project Data Sheet (PDS) for the ASD MIE.

Project Dates:

1. ASD MIE Analysis of Alternatives completed February 6, 2018
2. ASD MIE Independent Cost Review completed May 17, 2018 resulting in ASD MIE being labeled as a Major Systems Project
3. ASD MIE Independent Project Review completed June 8, 2018

The project is requesting funds in FY 2020 to support activities including preliminary design and long-lead procurements (CD-3A). In order to mitigate risks and ensure assembly, testing, installation, and commissioning are completed on schedule to support the 2025 subcritical experiment schedule, the project necessitates receipt and testing of long lead procurements early as well as completion of ongoing Technology Maturation efforts.

A Federal Project Director (FPD) at the appropriate level has been assigned to this project.

As required by DOE Order 413.3B, an independent Analysis of Alternatives (AoA) was conducted and approved in February 2018. The Four-Pulse alternative was chosen which supports the efforts to design, build, install, and commission a radiographic system capable of generating four radiographic pulses and meeting all Requirements as identified in the ECSE Program Requirements Document (PRD). The AoA was validated with issuance of the Cost Estimating and Program Evaluation (CEPE) Sufficiency memo, on March 29, 2018.

The FY 2020 work scope continues with the completion of the project definition phase and the preliminary design. In FY 2020, the project will complete all required project management documentation, and a baseline estimate and schedule for the early fabrication activities required to support a CD-3A, Approve Long Lead Procurements. The long lead procurements are for specialized engineered equipment. The approval process will include all requisite project reviews and an Independent Cost Estimate (ICE) as required by DOE Order 413.3B.

The funding profile for future years will be updated when the estimates are validated and a baseline has been approved as part of the critical decision process.

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[1]The four pulse, single axis radiograph proposed here is similar to the four pulse, single axis of the DARHT II project, built in 1998 – 2008. With more stringent environmental constraints, DARHT II adjusted for inflation brings DARHT II's costs (on the ECSE schedule) in at about half those proposed here.

Critical Milestone History

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	CD-4
FY 2020	9/25/2014	6/7/2018	2/6/2019	2Q FY 2022	4Q FY 2021	2Q FY 2022	4Q FY 2025

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-3A – Approve Long Lead Procurements
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete (d)
CD-3 – Approve Start of Fabrication
CD-4 – Approve Start of Operations or Project Closeout

Fiscal Quarter or Date

Fiscal Year	Performance Baseline Validation	CD-3A
FY 2020	4Q FY 2021	3Q FY 2021

CD-3A – Long Lead procurement specialized engineered equipment.

Project Cost History

(Dollars in Thousands)

Fiscal Year	Total Cost
FY 2020	791,600

2. Project Scope and Justification

Scope

ECSE is a portfolio of work that constructs a new underground laboratory in Nevada and installs large modern diagnostic systems to evaluate plutonium implosion system experiments in support of the current and future stockpile. The ASD MIE is one of these diagnostic systems that will install a linear induction accelerator into the U1a Complex. The ASD MIE will provide the capability to conduct weapons-scale, radiographically diagnosed subcritical experiments using special nuclear material (SNM). The radiographic data would be used to refine the modern predictive physics models used to certify the present and future stockpile. Radiography (x-ray imaging of dense objects) is the principal tool for diagnosing dynamic weapons-scale experiments and is the key diagnostic for the National Hydrodynamic Test Program at both Los Alamos National Laboratory (LANL) and Lawrence Livermore National Laboratory (LLNL). Hydrodynamic tests are conducted at the Dual Axis Radiographic Hydrodynamic Test Facility (DARHT) at LANL and at LLNL's Contained Firing Facility using the Flash X-Ray machine; in these tests, surrogate materials replace SNM in the experimental assembly. The surrogate tests explore many significant aspects of primary implosion physics, but cannot explore the unique behavior of plutonium. The ASD MIE Project, funded within the ECSE sub-program, addresses this need and complements other diagnostics already supporting the subcritical, scaled experiments program.

Justification

The stockpile is inherently moving away from the Underground Test (UGT) database through aggregate influences of aging, modern manufacturing techniques, modern materials, and evolving design philosophies. In 2014, LANL and LLNL jointly identified that a capability gap is building to enable certification of these changes, which involves the evaluation of plutonium response. In 2016, the JASONs Defense Advisory Group identified the same gap in U.S. capability to carry out and diagnose such experiments. The ASD MIE, as part of ECSE, is designed to narrow this gap. Data from ECSE will help the certification of the W80-4 LEP and the W87-1 Program. ECSE delivery in the mid-2020s supports these efforts.

Key Performance Parameters (KPPs)

The KPPs and Initial Operational Capability (IOC) represent the minimum acceptable performance that the project must achieve. Achievement of the KPPs will be a prerequisite for approval of CD-4, Project Completion. KPPs will be included upon approval of the project baseline.

3. Project Cost and Schedule

Financial Schedule

ASD MIE Current Point Estimate

(Dollars in Thousands)

	Budget	Obligations	Costs
Funding			
FY 2015	10,500	10,500	3,130
FY 2016	10,500	10,500	6,463
FY 2017	7,500	7,500	14,207
FY 2018	34,395	34,395	32,531
FY 2019	50,000	50,000	50,669
FY 2020	115,000	115,000	84,000
FY 2021	155,000	155,000	142,000
FY 2022	165,000	165,000	190,300
FY 2023	150,000	150,000	131,000
FY 2024	93,705	93,705	107,300
FY 2025	0	0	30,000
Grand Total	**791,600**	**791,600**	**791,600**

Details of Project Cost Estimate

Advanced Sources and Detectors: Current Point Estimate

Work Breakdown Structure Estimated Cost (Dollars in Thousands)

WBS #	WBS Title	Budget
	Total Project Cost (TPC)	
1.01	Project Management	76,000
1.02	Radiographic System	418,300
1.03	System Engineering and Requirements	37,000
1.04	System Integration at U1a	17,000
1.05	System Testing and Qualification at U1a	10,000
	Management Reserve/Contingency	233,300
	Total Project Cost (TPC)	**791,600**

4. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	4Q FY 2025
Expected Useful Life	30 years
Expected Future Start of D&D of this capital asset	4Q FY 2055

5. Acquisition Approach

The four Management and Operations contractors at the Laboratories and sites (LANL, LLNL, SNL, and NNSS) will form a multi-site team to execute the Project.

Engineering

Overview

The Engineering Program is responsible for creating and maturing advanced toolsets and capabilities necessary to maintain a safe, secure, and effective nuclear weapons stockpile and enhance nuclear weapon safety, security, and use-control. This program supports four key mission areas: (1) strengthening the science, technology, and engineering base by maturing advanced technologies to improve weapon surety, (2) providing tools for qualifying weapon components and certifying weapons without underground testing, (3) supporting annual stockpile assessments through improved weapons surveillance technologies and warhead component aging assessments, and (4) providing capabilities that accelerate the nuclear weapons acquisition process and strengthen the ability of the United States to respond to unexpected developments that could threaten nuclear security.

Primary responsibilities of this program include:

- Assessing nuclear and non-nuclear components without underground testing;
- Providing fundamental, sustained engineering research and development for stockpile assessment and certification throughout the lifecycle of each weapon;
- Providing the ability to predict the response of weapon components and subsystems to aging and normal, abnormal, and hostile environments;
- Advancing components and materials testing processes to minimize destructive effects while ensuring high-level weapon reliability and certification;
- Developing enhanced technologies that both minimize probability of unauthorized use and maximize reliability for authorized use;
- Maintaining the capabilities to assess and evaluate new materials for insertion opportunities into life extension programs (LEPs) and major alterations (Alts); and
- Developing and demonstrating capabilities to shorten design, certification, and manufacturing cycles to minimize time and costs leading to engineering prototype and production.

The Engineering Program is comprised of five subprograms:

1. **Enhanced Surety** funds safety, use-control, and security solutions for insertion into stockpile weapon systems.

2. **Delivery Environments (formerly Weapons Systems Engineering Assessment Technology (WSEAT)** funds the development and application of experimental and modeling capabilities, diagnostics, and data used to asses and qualify a weapon and its components in normal and abnormal environments.

3. **Nuclear Survivability** funds tools and technologies to ensure U.S. weapons will penetrate current and future enemy defenses.

4. **Enhanced Surveillance** funds scientific research to understand and mitigate the impacts of aging on materials and components in the stockpile, and develops diagnostic used to assess age-induced impacts on weapon systems.

5. **Stockpile Responsiveness** provides efforts that sustain, enhance, and exercise capabilities required to conceptualize, study, design, develop, engineer, certify, produce, and deploy nuclear weapons. This effort does not include the actual production or deployment of a stockpile weapon system.

Engineering Funding

	(Dollars in Thousands)			
	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Research, Development, Test and Evaluation				
Engineering				
Enhanced Surety	39,717	39,717	46,500	+6,783
Delivery Environments (formerly Weapon Systems Engineering Assessment Technology)	23,029	23,029	35,945	+12,916
Nuclear Survivability	45,230	48,230	53,932	+5,702
Enhanced Surveillance	45,147	45,147	57,747	+12,600
Stockpile Responsiveness	30,000	34,000	39,830	+5,830
Total, Engineering	**183,123**	**190,123**	**233,954**	**+43,831**

Outyears for Engineering Funding

	(Dollars in Thousands)			
	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Research, Development, Test and Evaluation				
Engineering				
Enhanced Surety	52,626	53,710	54,585	60,177
Delivery Environments (formerly Weapon Systems Engineering Assessment Technology)	39,235	39,485	42,552	44,055
Nuclear Survivability	59,500	61,000	63,650	66,655
Enhanced Surveillance	62,260	63,546	64,860	66,222
Stockpile Responsiveness	43,827	46,053	47,709	52,752
Total, Engineering	**257,448**	**263,794**	**273,356**	**289,861**

Engineering
Explanation of Major Changes
(Dollars in Thousands)

	FY 2020 Request vs FY 2019 Enacted
Engineering	
Enhanced Surety: Increase supports the production of flight test hardware needed to validate and qualify system performance, small-scale qualification of materials and components selected for the next generation of a key technology and Multi-Point Safety (MPS) initial design concepts ahead of final prove-in design, and the development of production capabilities for NextGen and MPS components and subsystems.	+6,783
Delivery Environments: Increase supports Nuclear Posture Review (NPR) implementation with joint NNSA/DoD interagency projects on delivery environments; provides diagnostics for sounding rocket experiments; and develops a combined/complex environments capability. This program was previously called **Weapon Systems Engineering Assessment Technology (WSEAT).**	+12,916
Nuclear Survivability: Increase supports research and development and engineering for Saturn recapitalization, development of cold x-ray surrogate test capability, development of warm x-ray radiation sources, and continued R&D of strategic radiation-hardened microelectronics and radiation transport in novel materials.	+5,702
Enhanced Surveillance: Increase maintains characterization of high-risk stockpile components/materials along with prioritized lifetime assessments, predictive modeling effects, and additional support for non-destructive evaluation.	+12,600
Stockpile Responsiveness: Increase supports preliminary work at the production plants to explore new manufacturing technology concepts.	+5,830
Total, Engineering	**+43,831**

Engineering
Enhanced Surety

Description

The Enhanced Surety subprogram is dedicated to simultaneously minimizing the probability of unauthorized use and maximizing the reliability of authorized use of a U.S. nuclear weapon while maintaining the highest levels of safety. Enhanced Surety creates, develops, and matures advanced safety, security, and use-control or denial technologies to minimize the probability of an accidental nuclear explosion and, in the unlikely event that security fails and unauthorized access is gained, reduces the risk of an unauthorized nuclear yield to the lowest possible level.

Enhanced Surety seeks advances in leading-edge technologies in two timeframes:

- Maturing near-term surety concepts and technologies to offer the most effective surety solutions for the enduring stockpile and future insertion opportunities achievable within the timelines of known LEPs or other improvements in weapon functionality; and
- Creating and evolving highly advanced surety technologies, independent of specific weapon types or insertion opportunities that can result in major surety improvements.

Enhanced Surety incorporates national security guidance as outlined in the Presidential Policy Directive (PPD)–35; Department of Energy Order 452.1D, *Nuclear Explosive and Weapon Surety Program*; the NNSA Defense Programs surety strategy; and the 2010 JASON Surety Study findings and recommendations; in conjunction with the Joint Integrated Lifecycle Surety (JILS) risk assessment capability to identify the most cost-effective surety technologies. This enables program and weapon system managers to make better-informed implementation decisions on stockpile surety improvement options.

Enhanced Surety activities include:

Advanced Safety – Minimizes the probability of accidental nuclear yield or dispersion of fissile material. Develops improved control over warhead initiation including improved stronglinks, weaklinks, firing systems, and high explosive initiation systems, in order to provide nuclear weapon safety.

Advanced Use Control/Denial – Creates and matures options, internal and/or external to the warhead, to minimize the potential for deliberate unauthorized use of a U.S. nuclear weapon.

Advanced Security Systems – Develops and demonstrates system concepts and associated enabling technologies that could integrate weapon capabilities with physical security.

Highlights of the FY 2020 Budget Request

- Develop and deploy solutions designed for the immediate needs of the Directed Stockpile Work (DSW) program.
- Test and evaluate technologies for integrated security solutions for use within multiple U.S. Air Force weapon storage systems (a.k.a., multi-venue).
- Provide early confidence testing for MPS subsystem for future weapons.

FY 2021 - FY 2024 Key Milestones

- Ensure advanced surety options are available for the W87-1 Modification Program by FY 2022 to meet threshold and objective surety requirements.
- Develop integrated use control and physical security subsystems for U.S. Air Force weapon storage by FY 2022.
- Develop enhanced capability shipping configurations for all legacy stockpile systems by FY 2023.
- Ensure advanced surety options are available for the next Navy ballistic missile warhead by FY 2024 to meet threshold and objective surety requirements.

FY 2018 Accomplishments

- Completed the electrical and mechanical systems activities and transitioned these technologies to a life extension program for final development and insertion.
- Defined critical design interfaces and fabricated a system assembly fixture to support the production of NextGen.
- Evaluated commercial off-the-shelf materials needed to produce NextGen that led to the in-house development of a new cost-effective, environmentally-friendly and worker-safe formulation.
- Developed initial plans and process for full-scale production and manufacturing of NextGen components.
- Designed and fabricated full-scale functional hardware sets and delivered them to the U.S.-UK Joint Technology Demonstrator project for their ground test unit.
- Completed the modification of an existing MPS design concept to address manufacturing and effectiveness concerns.
- Collected nine months of data from the full-scale MPS experiment; evaluated the full-scale aging samples against the accelerated small test samples and found no deviation between the two experiments.
- Developed the initial path forward on MPS production.
- Developed a comprehensive qualification plan to address the requirements on use-control surety technology.
- Integrated memory into the use-control surety design that allows for microelectronics fabrication.
- Completed the printed circuit board design, fabrication, and component testing for the integration of intrinsic use-control technology in future flight testing.

Enhanced Surety

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Enhanced Surety $39,717,000	**Enhanced Surety $46,500,000**	**Enhanced Surety +$6,783,000**
• Perform accelerated aging and reaction investigation of test coupons, and continue second year of the MPS full-scale compatibility experiment in order to validate aging of test coupons to full-scale experiment. • Accelerate development of the highest priority NextGen components for future weapon systems. • Slow development of a multi-venue system architecture for U.S. Air Force applications.	• Design and fabricate flight test hardware for surety use-control options. • Conduct coupon and component material qualification for NextGen. • Prove-in production capabilities of two main NextGen components. • Conduct residual MPS material effects analysis. • Initiate studies to evaluate potential MPS materials against aging effects experiments and their efficacy to finalize MPS material compositions. • Resume development of the multi-venue system architecture for U.S. Air Force applications.	• The increase will: o Support increased costs of required validation testing and systems integration of surety components in order to mature and de-risk in time for the next insertion opportunity. o Support the simultaneous development of technologies at the design and production agencies. o Complete delayed development and testing of the multi-venue system architecture for U.S. Air Force applications.

Engineering
Delivery Environments (formerly Weapon Systems Engineering Assessment Technology)

Description
The Delivery Environments Program (formerly WSEAT) is responsible for ensuring current and future weapon systems and related platforms survive Stockpile-to-Target Sequences (STSs) in *normal* and *abnormal* environments. Future delivery systems and platforms will also be characterized by STSs different from those for the present stockpile. The Delivery Environments Program is a cornerstone in advancing testing facilities designed to reproduce weapon-relevant environments, as well as developing the necessary computational tools (e.g., models, simulations, predictive methods) to qualify the performance of delivery systems in mission environments.

Delivery Environments activities include:

Reentry Body/Reentry Vehicle (RB/RV) Flight – Supports design and qualification of delivery systems to perform correctly during environments unique to flight. This includes weather conditions and effects, as well as a broad range of atmospheric conditions. Reentry body/reentry vehicle flight environments are distinct due to the environments imparted by the initial missile launch and flight as well as the exo-atmospheric trajectories and shocks imparted during final deployment.

Cruise Missiles and Gravity Systems - Supports design and qualification of systems to perform correctly during environments unique to bomb and cruise missile flight. This includes weather conditions and effects, as well as a broad range of atmospheric conditions.

Accidents – Ensures weapon systems remain safe in accidents, including drops during handling, bunker fires, aircraft crashes, and fuel fires. This effort requires engineers to simulate extreme temperatures, impacts, or other conditions to test the stockpile.

Storage and Transportation - Delivers capabilities that ensure weapon systems are not damaged by transportation or conditions of prolonged storage.

Highlights of the FY 2020 Budget Request
- Invest in experimental test facilities that focus on the relationship between the delivery environment and the response of the nuclear explosive package (NEP).
- Begin joint experimental ground tests and develop computational models to assess combined environment scenarios.
- Advance environmental testing and engineering tools informed by DoD requirements associated with evolving threats and corresponding delivery platforms.

FY 2021 - FY 2024 Key Milestones
- Develop and apply experimental modeling capabilities and diagnostics to assess impacts of delivery environments and accidents.
- Increase the fidelity of simulated weapons environments in predictive models using validation data from scaled experiments. Initiate test capabilities for coupled environments and progressive methodologies for measuring engineering performance of materials, components, and systems needed for future qualification.
- Perform ground testing and model validation for reentry environments and flight test diagnostics.
- Establish official partnerships between NNSA and interagency partners to ensure informed priorities and mission objectives.

FY 2018 Accomplishments
- Conducted a preliminary test related to combined environments. This test combined acceleration, spin, and vibration on non-nuclear weapon components related to the W87 Alt Fuze program.
- Early-stage data assessments from fluid-structure interaction measurements relevant to uncertainty quantification for component vibration responses to re-entry environments.
- Constructed boundary conditions for uncertainty quantification and performed proof-of-concept in the hypersonic wind tunnel.

- Advancing multi-system / multi-platform scrimmage studies and reentry computational predictive methods supporting prioritization of future delivery environment research.
- Quantified the damage and failure of high explosives at the crystal-binder length scale using a micro-digital correlation diagnostic; this work increases the fidelity of mock high explosives.
- Exercised existing contact thermal conductivity models and performed pre- and post-test surface roughness measurements to inform the contact thermal conductivity model selection.
- Executed intermediate strain rate tensile tests on steel, aluminum, and Teflon specimens to provide calibration and validation data for current and future weapon simulation.
- Improved the Livermore Insensitive High Explosives damage model to investigate the effects of tensile-shear damage coupling.
- Advancing reentry computational predictive methods for future platforms and environments.

Delivery Environments

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Weapon Systems Engineering Assessment Technology $23,029,000	**Delivery Environments (formerly WSEAT) $35,945,000**	**Delivery Environments (formerly WSEAT) +$12,916,000**

• Support the Predictive Capability Framework (PCF) Pegpost Re-Entry Milestone.
• Perform 3 preliminary Sounding Rocket (HOT SHOT) experiments for environmental responses.
• Advance future platform flight tests.
• Steward facility operations supporting *normal* and *abnormal* environments experiments.
• Develop predictive integrated delivery environments in ground-base capabilities with comparable analytic capabilities for design and qualification.
• Validate stress state characterization of high explosives for relevant STS environments.
• Incorporate insensitive high explosive failure predictions into material models.
• Quantify uncertainties and assess margins for a reentry system in normal and abnormal environments.
	• Complete PCF Pegpost Re-Entry Milestone.
	• Establish a joint Delivery Environments/Stockpile Responsiveness Program (SRP) Milestone to study prototyping on future delivery environment platform.
	• Establish strategy for coupled computational/ experimental validation for future environments.
	• Research aging effects as initial condition perturbations on NEP in joint effort with Enhanced Surveillance.
	• Perform Sounding Rocket experiments in preparation for a hydrodynamic flight test in 2023.
	• Advance Sounding Rocket capabilities to begin replicating future environments.
	• Mature special projects to Stage 2.
	• Invest in ground test abilities for coupled environments.
	• Combine thermal, fluid, electromagnetic, and structural dynamic environments for qualification across all mission STS.
	• Identify impact of abnormal environments on weapon safety.
		• The increase will:
		  ○ Support the joint effort between Delivery Environments and SRP to lead a study relevant to future environments and platforms.
		  ○ Support preparations for a planned hydrodynamic flight test in FY 2023.
		  ○ Support experiments and tests for computational verification and validation activities in FY 2020-2023
		  ○ Identify common objectives and priorities with DoD and the Intelligence Community.
		  ○ Support development of test facilities and predictive methods for evaluating coupled environments beginning in FY 2020.
		  ○ Support advanced delivery environments and platforms for non-nuclear components.

Engineering
Nuclear Survivability

Description

Nuclear Survivability provides the tools and technologies necessary for ensuring that U.S. nuclear weapons will penetrate enemy defenses. Since weapons entering the stockpile are expected to be fielded for decades, Nuclear Survivability includes projections for the evolution of defensive technologies.

Nuclear Survivability scope includes: (1) developing scientific and engineering models for understanding radiation effects; (2) improving laboratory radiation sources and diagnostics to support code validation and hardware qualification experiments; (3) generating experimental data to validate scientific and engineering models; (4) understanding radiation-hardened design strategies; and (5) evaluating candidate and evolving stockpile technologies for radiation hardness capabilities in a generalized, weapon-relevant configuration.

Nuclear Survivability activities include:

System-Generated Electro-Magnetic Pulse (SGEMP) and Electro-Magnetic Pulse (EMP) effects – Develops experimental capabilities and obtains validation data for modeling, increasing understanding of electromagnetic effects on weapon systems, and enabling qualification of hardened components.

Effects of X-Rays and Air Blast on Materials – Supports activities related to material and structural effects in response to x-rays and air blast. This includes direct testing of materials and components at high-energy density (HED) radiation-generating facilities; development of diagnostics and platforms to increase the usefulness test facilities; development of surrogate testing capabilities; and development and validation of modeling and simulation capabilities based on modern codes.

Neutron Effects – Provides direct testing of materials and components and develops validated modeling and simulation tools for all neutron-related survivability activities. Some specific activities include modeling and experiments to investigate fission heating, modeling to quantify the initiation response to external neutron fields, experiments and modeling to investigate displacement damage in semiconductors and other electronic effects, facility and diagnostic development, material aging effects on neutron environment survivability, and radiation transport modeling capability development.

Weapon Outputs – Provides validation of new tools in combination with underground test data and above ground experiments to better understand and improve the calculated uncertainties associated with weapon output modeling. This includes developing a comprehensive understanding of required modeling fidelity, developing more transparent and functional databases, and improving visualization software for weapon output modeling that will enhance the development of new computational tools. The weapon outputs activity in the Nuclear Survivability program is related to, but does not overlap with, activities in the Advanced Simulation and Computing (ASC) program. Nuclear Survivability provides weapon physics, effects, and scientific knowledge and expertise to guide and enable prioritized code development by ASC that supports weapon outputs calculations. ASC provides the capability to perform calculations, but the content of the calculation (the problem posed) and the application of the results (weapon outputs) of a calculation are performed and determined by the Nuclear Survivability program.

Integrated Assessments – Performs computational analyses for combined environments against hostile environments. In addition, data generated with integrated survivability assessments can be utilized to better understand terminal flight dynamics of warheads after a hostile engagement.

Highlights of the FY 2020 Budget Request

- Develop experimental test facilities for future delivery systems, focusing on the relationship between the delivery environment and the response of the nuclear explosive package.
- Begin joint experimental ground tests and computational models to assess combined environments, encompassing normal, abnormal, and hostile environments. Investigate non-nuclear survivability options and capabilities with the DoD and the United Kingdom.

- Develop laboratory weapon qualification platforms that reproduce the extreme environments characteristics of hostile nuclear encounters.
- Release validation data on required weapon systems internal and external intrinsic radiation environments.
- Provide experimental tools and advances in simulation capabilities to qualify the behavior of new electronics in radiation environments.

FY 2021 - FY 2024 Key Milestones

- Maintain and extend nuclear environment test capabilities at the Z machine, Hermes, Saturn, Annular Core Research Reactor (ACRR), and the National Ignition Facility (NIF).
- Provide tools and technologies necessary to design and qualify components and subsystems to meet requirements to withstand radiation environments associated with hostile encounters.
- Evaluate performance damage to non-nuclear components and evaluate damage modes to the nuclear explosive package yield.
- Enable Quantification of Margins and Uncertainty (QMU)-based assessments for key survivability failure modes.

FY 2018 Accomplishments

- Completed relevant program dependencies for the W88 Alt 370 program, including uncertainty quantification threat assessment of electronics, device and component photocurrent and photoconductivity tests, and cable and terminal protection device evidence.
- Obtained cold x-ray impulse and shock data to examine effects of accelerated aging in composites.
- Completed five shots on Z pulsed power facility simulating the response of materials to hostile environments.
- Calculated initial threat response for the latest builds of four integrated circuits in the W88 Alt 370.
- Conducted first 14 MeV neutron experiments at NIF delivering a record neutron fluence on the experimental target.
- Completed data reduction and documentation from the Hostile Impulse Multi-Physics shot at Z pulsed power facility.
- Performed a neutron environment survivability analysis for an advanced concept study.
- Conducted an ACRR experiment on uranium test objects with the United Kingdom.
- Performed experimental campaigns on NIF and Omega Laser Facility for the hot uranium experiment for Output Uncertainty Quantification effort.
- Published a new version of eRedbook and eBluebook that includes new models, bug fixes, improved documentation, and additional features.

Nuclear Survivability

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Nuclear Survivability $48,230,000	**Nuclear Survivability $53,932,000**	**Nuclear Survivability +$5,702,000**
• Provide capabilities to determine margin-to-failure for key components in hostile environments. • In cooperation with Defense Threat Reduction Agency (DTRA), deliver operational capability in SREMP/SGEMP to U.S. Strategic Command in Cooperation through the Weapons Effects Strategic Collaboration. • Develop experimentally validated models for thermal and blast phenomena. • Acquire SGEMP experimental data for model validation. • Development of experimentally validated impulse and blowoff models. • Updates to eRedbook with added suite of threat models relevant to future sustainment program studies. Include all stockpile weapon outputs in the eBluebook. • Develop an analysis and testing process for qualifying detonators and detonator cable assemblies to hostile environments. • Develop techniques and experimental platforms for in-situ characterization process monitoring for materials subject to radiation environments. • Development of reproducible warm x-ray sources. • Additional diagnostics necessary for generating validation data for x-rays. • Platform development at ACRR and other neutron facilities to generate validation data for a neutron damage assessment capability.	• Research, development, and engineering for x-ray radiation environment testing (Saturn) recapitalization. • Research, development, modeling, and testing to evaluate new strategic radiation-hardened microelectronics. • Development of cold x-ray surrogate test capability. • Enable quantification of margin and uncertainty (QMU)-based assessments for key survivability failure modes.	• Increase will support research and development and engineering for Saturn recapitalization, development of cold x-ray surrogate test capability, continued and enhanced development of warm x-ray radiation sources, continued strategic rad-hard microelectronics in support, and radiation transport in novel materials.

Engineering
Enhanced Surveillance

Description

Enhanced Surveillance (ES) develops diagnostics and funds the research related to weapon aging needed to ensure that aging will not harm the nuclear weapons stockpile. ES contributes to weapon safety, performance, and reliability by providing the tools needed to predict material, component, and subsystem lifetimes, and detect the precursors of potential age-induced defects. These efforts are dedicated to understanding aging phenomena and how they affect weapon lifetime assessments.

The ES program provides insight on the chemical compatibility of reused legacy materials and components with new materials introduced to LEPs. In addition to lifetime predictions, new diagnostic tools are being developed and deployed to support conventional surveillance efforts and to provide additional data needed to validate predictive aging models. ES enables a more robust stockpile surveillance program with the overarching goal of identifying problems as early as possible in order to minimize their impact on the effectiveness of the deterrent.

Enhanced Surveillance activities include:

Non-Nuclear Components and Materials – Addresses potential aging problems of components and materials and identifies highest risk aging concerns that cross-cut multiple weapon systems.

High Explosives in the NEP – Determines when main charges and boosters need to be replaced based on new predictive methods and non-destructive evaluation tools and examines early detection of potential changes in behavior related to safety, performance, and reliability.

Plutonium for Pits – Develops and delivers new analytical methods, tools, modeling, and diagnostics, including non-destructive evaluation techniques, to achieve timely, less invasive, and more cost-effective component surveillance.

Canned Subassemblies (CSAs) and Cases – Provides material aging models and integrated materials chemistry simulations needed to determine when, or if, CSAs or cases will need to be refurbished or replaced.

Polymers and Adhesives in the NEP – Assesses aging of polymeric materials used throughout the stockpile (i.e., potting materials, cushions, pads, adhesives, structural supports, containment vessels for explosives, and detonator cable assemblies).

Systems – Provides improved confidence in future weapons reliability, safety, and performance by augmenting the existing surveillance program with system-level evaluation diagnostics that include new capabilities to measure component-level parameters during system testing.

Highlights of the FY 2020 Budget Request

- Develop advanced imaging systems for detecting the precursors of harmful weapon aging.
- Provide predictive capabilities for extrapolating the effects of corrosion and other aging phenomena.

FY 2021 - FY 2024 Key Milestones

- Develop and refine understanding of stockpile aging and age-aware models for weapon materials, components, and subsystems. Provide assessments of aging model status for highest-risk materials.
- Complete an Enhanced Surveillance stockpile aging and lifetime assessment report to support the annual assessment process.
- Provide timely warning of aging phenomena that threaten the effectiveness of the nuclear deterrent.
- Develop and plan capabilities needed to enable certification of new materials for incorporation into LEPs, warhead modifications (Mods), and Alts.
- Publish lifetime estimates for all current weapon systems.
- Develop and test neutron imaging and x-ray graded collimation technologies, and continue scintillator development.

FY 2018 Accomplishments

- Developed new acoustic/vibration diagnostic technique that non-destructively provides detailed information on timing, aging trends, and performance of stronglinks and launch accelerometers in both lab and flight tests.
- Completed destructive and non-destructive thermal battery component and materials aging tests and accelerated aging studies of lithium/iron sulfide-chemistry batteries.
- Quantified aging effects of different moisture levels on the degradation of energetic materials in detonators to provide guidance for design specifications on new energetic components.
- Developed a new code, DRACO, for simulation of integrated aging effects in LANL life extension program components.
- Performed neutron imaging experiments at the Los Alamos Neutron Science Center (LANSCE) to test performance of various scintillators.
- Performed a significant number of material aging studies to identify aging signatures in weapons materials with the development of material aging models.
- Received an R&D 100 award for an advanced x-ray scintillator.
- Qualified new production stream for silicone polymers.
- Completed installation of key components of the neutron imaging infrastructure and completed calculations of neutron dose rates within the facility.
- Completed an aging study comparing legacy and new silicone materials.
- Advanced the mass leak detector prototype to technology readiness level 6, enabling the deployment of the system.
- Extended the database of aging properties to include age-induced structural effects in a tritium reservoir.

Enhanced Surveillance

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Enhanced Surveillance $45,147,000	**Enhanced Surveillance $57,747,000**	**Enhanced Surveillance +$12,600,000**
• Develop and test neutron imaging and x-ray graded collimation technologies. • Support scintillator development and diagnostics. • Develop and validate accelerated aging techniques for non-nuclear components. • Complete an Enhanced Surveillance stockpile aging and lifetime assessment report to support the annual assessment process. • Develop and refine understanding of stockpile aging and age aware models for weapon materials, components, and subsystems. • Provide timely warning of aging phenomenon that threaten the effectiveness of the nuclear deterrent. • Develop new diagnostics to fill surveillance and data needs for improved aging models. • Develop and plan capabilities needed to enable certification of new materials for incorporation into LEPs, Mods, and Alts. • Validate corrosion resistant coating options for replacement in modernization program applications. • Quantify the rate and extent of degradation of lubricants due to oxygen and moisture. • Determine failure mechanisms for aging of glass to metal seals. • Determine mechanisms governing epoxy and adhesive off-gassing, curing and degradation with age. • Quantify extent of corrosion in energetic components in sealed environments.	• Complete a gas transport code / model for predictive aging within the nuclear explosive package. • Execute the neutron imaging project with accelerator advancement and scale-up for all systems along with x-ray graded collimation computed tomography. • Increase characterization and predictive modelling for age-related impacts to microelectronics and other sub-systems. • Accelerate diagnostic development, validation, and transition for core surveillance of legacy stockpile.	• The increase supports characterization of high-risk stockpile components and materials along with prioritized lifetime assessments and predictive modeling effects. Support to non-destructive evaluation also increases.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
• Deliver spectrally encoded imaging as a next-generation tool for the interrogation of high explosive performance. • Complete study to simulate and measure irradiation effects from x-ray computed tomography. • Complete phenomenological models of compression set and load retention in high-risk polymers. • Demonstrate weapon gas analysis capabilities to enable identification of aging environments.		

Engineering
Stockpile Responsiveness

Description
The FY 2016 National Defense Authorization Act (NDAA), Section 3112 established the need for NNSA to develop a Stockpile Responsiveness Program (SRP). NNSA executes this program in consultation with DoD. The Stockpile Responsiveness Program has developed an initial two scenarios to drive a response to representative future threats, challenges, and opportunities, and to explore concepts jointly with the DoD including prototyping, flight testing, non-nuclear component qualification, and methods for NEP certification. This program is intended to exercise the capabilities required to support all phases of the joint nuclear weapons life cycle process, transfer knowledge and skills to the newer generation of nuclear weapon designers and engineers, and strengthen integration between DoD and NNSA. NNSA currently accommodates the 2016 NDAA direction on SRP as an activity in NNSA's Engineering project.

Stockpile Responsiveness activities include:

Design, Qualification, and Certification Studies – The Stockpile Responsiveness Program develops and demonstrates capabilities to shorten design, certification, and manufacturing cycles to minimize time and costs leading to engineering prototype and production. These efforts will include both non-material (procedures) and material improvements (manufacturing, improved design, new testing capabilities) and will be conducted in coordination with DoD.

Responsive Experiments to Inform Concepts – The Stockpile Responsiveness Program pursues relatively short timeline experiments in order to inform design concepts. For example, the program developed and executed a hydrodynamic experiment in a few months at a reduced cost relative to the average hydrodynamic experiment.

Highlights of the FY 2020 Budget Request
- Establish collaborative initiatives between Delivery Environments, Stockpile Responsiveness, Advanced Simulation and Computing, and Stockpile Management to address joint endeavors in cohesive, efficient, and informed manners.
- Conduct a design competition associated with potential future strategic missile warheads exploring different manufacturing approaches and potentially different STS environments compared to today's systems.

FY 2021 - FY 2024 Key Milestones
- Conceptualize, study, develop, and engineer systems and/or operational concepts to offset future geopolitical or technical challenges.
- Identify shortfalls in the design, test, and production processes necessary to bring systems into production.
- Develop scenarios to respond to future threats, challenges, and opportunities.
- Exercise the ability to execute system design options that may have significantly different characteristics and requirements than current stockpile systems.

FY 2018 Accomplishments
- Provided nuclear system options to the Hardened and Deeply Buried Targets Defeat team.
- Developed several design options to inform future strategic programs for the Navy.
- Executed experiments to support concept development focusing on responsive timescales.

Stockpile Responsiveness

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Stockpile Responsiveness $34,000,000	**Stockpile Responsiveness $39,830,000**	**Stockpile Responsiveness +$5,830,000**
• Execute joint DOE/DoD working group that will oversee Stockpile Responsiveness. • In coordination with DoD and the Intelligence Community, study evolving threats to the deterrent. • Conduct competitive studies and execute challenge scenario that includes qualification, engineering, hydrodynamic tests, flight testing, and prototyping. • Develop and test small-scale hardware to validate concepts. • Provide engineering expertise to enable agile qualification with hydrodynamic tests and sounding rocket tests. • Support the implementation of the 2018 Nuclear Posture Review.	• Focus on design for manufacturability and certification, establishing partnerships with production plants. • Execute threat studies with the Intelligence Community and DoD to inform design requirements. • Execute reduced time and cost experiments in support of design concepts.	• The increase will allow the program to start work with the production plants without halting progress on the design studies and experimental campaigns.

Engineering
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	4,667	4,667	7,970	6,675	-1,295
Minor Construction	N/A	N/A	0	0	0	0	0
Total, Capital Operating Expenses	N/A	N/A	**4,667**	**4,667**	**7,970**	**6,675**	**-1,295**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	4,667	4,667	4,770	4,875	+105
Mass Properties Machine, LANL	5,000	0	0	0	3,200	1,800	-1,400
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**4,667**	**4,667**	**7,970**	**6,675**	**-1,295**
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A	0	0	0	0	+0
Total, Minor Construction Projects	**N/A**	**N/A**	**0**	**0**	**0**	**0**	**0**
Total, Capital Summary	**N/A**	**N/A**	**4,667**	**4,667**	**7,970**	**6,675**	**-1,295**

Outyears for Engineering

(Dollars in Thousands)

	FY 2021 Estimate	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	4,982	5,092	5,204	5,318	0
Minor Construction	0	0	0	0	0
Total, Capital Operating Expenses	**4,982**	**5,092**	**5,204**	**5,318**	**0**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	4,982	5,092	5,204	5,318	0
Total, Capital Equipment (including MIE)	**4,982**	**5,092**	**5,204**	**5,318**	**0**
Minor Construction Projects (Total Estimated Cost (TEC)					
Total Minor Construction Projects (TEC <$5M)	0	0	0	0	0
Total, Minor Construction Projects	**0**	**0**	**0**	**0**	**0**
Total, Capital Summary	**4,982**	**5,092**	**5,204**	**5,318**	**0**

Inertial Confinement Fusion Ignition and High Yield

Overview

The Inertial Confinement Fusion Ignition and High Yield (ICF) Program provides data, experimental tools, and supporting expertise required for the ongoing assessment and certification of the nuclear weapon stockpile. As our warheads proceed through their life extension program (LEP) process, new materials and components must be qualified and accepted. The ICF Program supports the assessment of legacy stockpile systems, and qualification and certification of the LEPs by providing experimental and computational scientific capabilities that deliver a credible knowledge basis for the behavior of both existing materials and components residing in our enduring stockpile systems and new materials and components relevant to life-extended systems.

The ICF Program provides the nation's expertise and capabilities in high energy density (HED) science, a core technical competency of the NNSA Stockpile Stewardship Program (SSP). ICF does this through (1) the design and execution of complex experiments to improve our underpinning science understanding, (2) the development and operation of experimental facilities capable of generating HED conditions, and (3) the development of instrumentation to assess extreme temperature, pressure, and density regimes relevant to nuclear weapons performance. As the majority of the energy released from a nuclear weapon is generated by matter in the HED state, understanding the behavior of matter in the HED regime is critical to predicting the performance of nuclear weapons and understanding both primary and secondary nuclear weapon physics. The ICF Program provides access to data necessary to validate the physics models upon which our integrated simulation capability is built. This includes the study of dynamic material behavior in extreme conditions, radiation transport, radiation-hydrodynamics, thermonuclear burn, and outputs and effects. The experimental science basis provided by the program, combined with archived legacy data from the underground test program, gives confidence in the codes and models used to support the annual assessments and certifications, execute LEPs, and resolve Significant Finding Investigations (SFIs). Further, the development of diagnostics in this program also supports test readiness through both workforce (recruitment and training) and instrument development.

The capabilities provided by the ICF Program for Stockpile Stewardship include experimental diagnostics, computational models, national HED facilities, experimental platforms, and target engineering and production. Achieving the requisite conditions for HED experiments is only possible at facilities specifically designed to create such environments. The three national HED facilities are the National Ignition Facility (NIF) at Lawrence Livermore National Laboratory (LLNL), the Z Pulsed Power Facility (Z) at Sandia National Laboratories (SNL), and the Omega Laser Facility (Omega) at the University of Rochester's Laboratory for Laser Energetics (LLE). Outside of underground nuclear explosive testing, these national facilities provide the only platforms that can be used to experimentally validate the simulation codes that couple transport processes with hydrodynamics models. These HED platforms also provide a vital capability for the study of radiation effects sciences, used to determine weapon survivability in hostile environments.

The ICF Program supports long-term stockpile research and development (R&D) efforts in ignition science, with the goal of developing a self-sustained, thermonuclear, burning plasma (i.e., ignition) platform, as well as ignition-generated fusion yields, for SSP applications. Such a platform represents the next-generation of scientific capability to provide direct access to weapon-relevant regimes and nuclear environments for the study of high-yield, weapon-relevant conditions. The achievement of laboratory-scale thermonuclear ignition is an important objective of the SSP and is a scientific problem that tests our codes, our people, our facilities, and our integrated capabilities. To this end, the scientific pursuit of laboratory ignition and subsequent generation of high fusion yields not only opens the door to addressing an expanded suite of weapons-relevant questions without explosive nuclear testing, it places the program at the leading edge of science and technology in the field of HED science. Acknowledging the challenge of achieving fusion ignition in the laboratory, a seminal event for the ICF program will be the delivery of the ICF 2020 Report, an FY 2020 assessment of (1) the efficacy of ignition at NIF and (2) the scientific credibility of scaling arguments for all ignition approaches.

To accomplish these missions, the ICF Program coordinates closely with several other NNSA program elements within the Office of Research, Development, Test, and Evaluation (RDT&E) and routinely interacts with external partners to collaborate on experiments in the interest of national security. Priorities and requirements for these programs are documented in the Stockpile Stewardship and Management Plan (SSMP) and captured in the Predictive Capability Framework (PCF).

Activities conducted by the ICF Program to advance our understanding of HED stockpile science include:

- Investigating material behaviors in HED regimes presently inaccessible via other experimental techniques;
- Improving the predictive capability of our science and engineering models in high-pressure, high-energy, high-density regimes;
- Developing high-fidelity diagnostics, advanced experimental platforms, and predictive capabilities and simulations;
- Characterizing and understanding perturbations prevalent in plasmas and thermonuclear environments;
- Maintaining the scientific leadership necessary to recruit, train, and retain the highest caliber scientists and engineers to engage in stockpile stewardship; and
- Making progress towards the achievement and application of multi-megajoule fusion yields.

The FY 2020 Request supports continued research and operations at NNSA's preeminent HED facilities, with research efforts focusing on HED stockpile science supporting the broader NNSA portfolio. Emphasis on improving operational efficiencies at the NIF, Z, and Omega will continue. Pulsed-power based HED research and operations are supported at levels necessary to maintain base SSP capabilities and advance new fusion concepts. A study will be completed to meet the ICF 2020 Goal of determining the efficacy of NIF for achieving ignition and credible physics-scaling to multi-megajoule yields for all ignition approaches. Program planning will continue to ensure priorities are aligned with SSP requirements.

The FY 2020 Request includes approximately $91,866,000 for SNL for the operation and utilization of the Z Pulsed Power Facility. This includes $66,931,000 from the ICF Program budget and approximately $24,935,000 under the Science Program. The ICF budget includes approximately $278,316,000 for LLNL to fund operation of the NIF for all users, and $17,348,000 for ICF Program research activities. Additionally, this budget includes $50,653,000 for the University of Rochester for the operations of the Omega Laser Facility for all users, and $29,347,000 for ICF Program research activities.

	(Dollars in Thousands)			
	LLNL (NIF)	**LANL**	**SNL (Z Facility)**	**LLE (OMEGA)**
Site/Facility				
Research	17,348	7,525	10,000	29,347
Ignition and Other Stockpile Programs	17,348	7,525	1,429	29,347
Pulsed Power ICF	0	0	8,571	0
Operations	278,316	7,475	56,931	50,653
Diagnostics, Cryogenics, and Experimental Support	38,000	3,475	6,500	11,386
Facility Operations and Target Production	240,316	4,000	50,431	39,267
Total Operation and Utilization	**295,664**	**15,000**	**66,931**	**80,000**

At present, the demand for facility use for HED stockpile science at each HED facility typically exceeds the available experimental time by a factor of two.

Inertial Confinement Fusion Ignition and High Yield
Funding

(Dollars in Thousands)

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Research, Development, Test and Evaluation				
Inertial Confinement Fusion Ignition and High Yield				
Ignition	79,575	0	0	+0
Support of Other Stockpile Programs	23,565	0	0	+0
Ignition and Other Stockpile Programs	0	101,140	55,649	-45,491
Diagnostics, Cryogenics and Experimental Support	77,915	77,915	66,128	-11,787
Pulsed Power Inertial Confinement Fusion	7,596	6,596	8,571	+1,975
Joint Program in High Energy Density Laboratory Plasmas	9,492	8,492	12,000	+3,508
Facility Operations and Target Production	346,791	350,791	338,247	-12,544
Total, Inertial Confinement Fusion Ignition and High Yield	**544,934**	**544,934**	**480,595**	**-64,339**

Outyears for Inertial Confinement Fusion Ignition and High Yield
Funding

(Dollars in Thousands)

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Research, Development, Test and Evaluation				
Inertial Confinement Fusion Ignition and High Yield				
Ignition and Other Stockpile Programs	57,040	58,306	59,513	61,600
Diagnostics, Cryogenics and Experimental Support	67,197	69,477	71,210	72,993
Pulsed Power Inertial Confinement Fusion	8,785	9,004	9,231	9,461
Joint Program in High Energy Density Laboratory Plasmas	12,300	12,607	12,923	13,246
Facility Operations and Target Production	346,703	355,370	364,256	373,362
Total, Inertial Confinement Fusion Ignition and High Yield	**492,025**	**504,764**	**517,133**	**530,662**

Inertial Confinement Fusion Ignition and High Yield
Explanation of Major Changes
(Dollars in Thousands)

	FY 2020 Request vs FY 2019 Enacted
Inertial Confinement Fusion Ignition and High Yield	**-45,491**
Ignition and Other Stockpile Programs: Decrease reflects the shift to higher priority NNSA efforts. Will support highest priority non-ignition HED stockpile experiments, the delivery of the ICF 2020 Report, and its associated reviews.	
Diagnostics, Cryogenics, and Experimental Support: Decrease reflects the shift to higher priority NNSA efforts. Execution of the National Diagnostics Plan will continue with a focus on diagnostics needed for key materials and radiation effects platforms.	**-11,787**
Pulsed Power Inertial Confinement Fusion: Increase allows for comprehensive experimental investigation of Magnetic Direct Drive (MDD) – this approach to ignition has a greater energy delivery to target; a current challenge for other approaches.	**+1,975**
Joint Program in High Energy Density Laboratory Plasmas: Increase enables expanded national participation in high energy density science research, strengthens partnership with the Office of Science's Fusion Energy Science Program's High Energy Density Laboratory Plasmas activity, and maintains existing cohort of academic grants and cooperative agreements, including support for several HED research centers and the National Laser Users Facility (NLUF) activity at the University of Rochester's Omega Laser Facility.	**+3,508**
Facility Operations and Target Production: Decrease in funding to support higher NNSA priorities. Reduction is consistent with proposed reduction in ignition science work scope. Operations at the Omega Laser Facility and Z Pulsed Power Facility are unaffected.	**-12,544**
Total, Inertial Confinement Fusion Ignition and High Yield	**-64,339**

Inertial Confinement Fusion Ignition and High Yield
Ignition and Other Stockpile Programs

Description

In the high energy density (HED) state, materials experience pressures greater than one million Earth atmospheres and reach temperatures and densities far exceeding those of normal or condensed matter, generating complicated behaviors predominantly described by plasma physics. This complex and dynamic state dominates energy generation in nuclear weapons, making its study a key component of the SSP. Specifically, the research supported in this subprogram addresses dynamic material properties, fluid and plasma hydrodynamics, low-energy nuclear physics, hydrodynamic instability-induced mix, burn, boost, radiation transport and opacities, and yield applications relevant to outputs, environments, and effects. This subprogram coordinates closely with the Science program to develop and implement the experimental infrastructure and capabilities required to execute necessary experiments at all of the national HED facilities.

This subprogram also supports R&D to advance experimental platforms to achieve thermonuclear burn onset, ignition, and ultimately multi-megajoule fusion yield in the laboratory. When realized, these provide a set of capabilities critical to the long-term viability of the Stockpile Stewardship Program—particularly, the future qualification of nuclear components and the assessment and certification of nuclear weapons in the full range of relevant HED regimes. The Ignition subprogram pursues these capabilities through theory, experiments, modeling, design, and engineering. The near-term emphasis of this subprogram is to improve understanding of the key physics and engineering features that limit performance of integrated implosion experiments. A study will be completed to meet the ICF 2020 Goal of determining the efficacy of NIF for achieving ignition and credible physics-scaling to multi-megajoule yields for all ignition approaches. The results of this study will serve as a springboard for in-depth reviews of (a) the FY 2020 state of scientific understanding of ignition scaling to multi-megajoule yields and (b) the merits of the pursuit of ignition for stockpile applications.

The long-term goals of this subprogram include generating necessary yields to conduct nuclear survivability tests and using burning plasma outputs to study previously inaccessible regimes relevant to nuclear weapons in a laboratory setting. The core requirements for this subprogram are described in the FY 2019 SSMP, the PCF, the 10-year Boost Plan, the Ten-Year HED Strategic Plan, the National Diagnostics Strategy, and the ICF Program Framework.

Activities in Science, Advanced Simulation and Computing (ASC), Directed Stockpile Work (DSW), and other stockpile programs use data and platforms developed in this subprogram's pursuit of thermonuclear ignition to successfully execute their respective SSP responsibilities – as reflected in the SSMP.

Highlights of the FY 2020 Budget Request

- Providing key data that reduces uncertainty in calculations of nuclear weapons performance;
- Obtaining data on the properties of high-atomic-weight materials, such as uranium and plutonium, in new weapon-relevant HED regimes using the Z Facility at SNL and the NIF at LLNL; and
- Supporting the production and submittal of the ICF 2020 Report.

FY 2021 – FY 2024 Key Milestones

Provide capabilities to:

- Study impact of aging on material response in HED regime and behavior of materials from new production science;
- Execute thermonuclear burn experiments that inform understanding of boost;
- Generate intense sources of x-rays and neutrons for survivability studies;
- Measure temperature of stockpile relevant materials at high pressures in the solid phase to improve fidelity of materials characterization;
- Increase energy coupled from the driver to the fusion fuel; and
- Establish modern mission requirements for a high fusion yield capability.

FY 2018 Accomplishments

- **High-impact stockpile stewardship experiments:**
  - SNL/LANL obtained data on a Z experiment to constrain aging models by comparing the response of new and naturally aged (52.5 years old) plutonium in regimes not previously attained for this material.

- LLNL began a series of experiments that will provide data needed to validate radiation transport understanding for legacy and future design options for the W80-4 LEP.
- LLNL performed five plutonium experiments on NIF to measure plutonium strength and plutonium atomic structure at stockpile-stewardship relevant conditions in support of all weapons systems.

- **New or improved capabilities developed on HED facilities this fiscal year:**
  - NIF achieved the highest fusion yield to date on NIF of $2x10^{16}$ neutrons or 55kJ approaching the burning plasma threshold (defined by alpha-heating exceeding mechanical work).
  - The Omega Laser Facility improved direct-drive implosion performance, establishing a new direct-drive yield record of $1.6x10^{14}$ neutrons.
- **Lab Accomplishments:**
  - LLNL experiments on NIF enable assessment of potential replacement materials for W80-4 applications.
  - SNL executed chamber-confined tritium experiments on Z; with 5 times more concentration of tritium than before which enable new diagnostics that will provide critical data for ICF and weapon physics.
  - LANL opacity-on-NIF team successfully obtained iron opacity data at weapons relevant conditions and began capability development for higher temperature/density conditions.

Ignition and Other Stockpile Programs

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Ignition and Other Stockpile Programs $101,140,000	**Ignition and Other Stockpile Programs $55,649,000**	**Ignition and Other Stockpile Programs -$45,491,000**
• Implement the Ten-Year HED Strategic Plan to support the requirements of the SSMP, including development of an experimental platform coupled to thermonuclear outputs. • Develop platforms for experiments supporting the validation of models in support of the FY 2020 Hostile Survivability PCF pegpost. • Conduct research to understand and control hydrodynamic instability and mix, drive symmetry, and target compression for the laser indirect-drive ignition concept. • Execute research efforts into capsule support engineering, improved modeling of uncertainty and performance scaling, and more detailed hohlraum studies.	• Implement the Ten-Year HED Strategic Plan to support the requirements of the SSMP, including development of an experimental platform coupled to thermonuclear outputs. • Determine the efficacy of NIF for ignition and credible physics-scaling to multi-megajoule yields for all ignition approaches.	• Decrease reflects the shift to higher priority NNSA efforts. • Will support highest priority non-ignition HED stockpile experiments, the delivery of the ICF 2020 Report, and its associated reviews. • Reduces the number of institutions participating in ignition research.

Inertial Confinement Fusion Ignition and High Yield
Diagnostics, Cryogenics, and Experimental Support

Description

Advanced experimental facilities that reproduce the extreme HED conditions present in nuclear detonations require parallel investments in diagnostic, target, and experimental platform capabilities. The Diagnostics, Cryogenics, and Experimental Support subprogram conducts the R&D for new specialized technologies necessary to execute and determine the results of HED experiments. It supports the development of experimental platforms that expand the performance range of the advanced laser- and pulsed-power facilities. The subprogram is responsible for the design and engineering of a complex array of diagnostic and measurement systems, along with associated information technology subsystems to automate data acquisition. This subprogram provides general support for the deployment of technologies for the experimental study of matter under extreme HED conditions to meet programmatic deliverables. The central requirements for this subprogram are presented in the SSMP, the Ten-Year HED Strategic Plan, the National Diagnostics Plan, and the ICF Program Framework.

Science, ASC, DSW, and other stockpile programs are informed by and benefit from the capabilities developed by this subprogram to successfully execute respective SSMP responsibilities.

Highlights of the FY 2020 Budget Request

- Providing key data that reduces uncertainty in calculations of nuclear weapons performance;
- Obtaining data on the properties of high-atomic-weight materials, such as uranium and plutonium, in new weapon-relevant HED regimes using the Z Facility at SNL and the NIF at LLNL;
- Fielding platforms at NIF to measure the complex hydrodynamic behavior of materials; and
- Progressing with the implementation of the National Diagnostic Plan to develop new transformative diagnostics and to optimize the cost-effective development of diagnostics for NNSA's HED facilities.

FY 2021 – FY 2024 Key Milestones

- Research, develop, and deploy diagnostics and their associated analysis packages that can operate in harsh HED environments on NIF and Z that are necessary in understanding radiation physics and the behavior of matter in the HED regime that are critical to predicting the performance of nuclear weapons and understanding both primary and secondary nuclear weapon physics.
- In partnership with France's CEA, deploy high-energy, high-spatial-resolution toroidal x-ray imaging system on the NIF.

FY 2018 Accomplishments

- **High-impact stockpile stewardship experiments:**
  - SNL/LANL obtained data on a Z experiment to constrain aging models by comparing the response of new and naturally aged (52.5 years old) plutonium in regimes not previously attained for this material.
  - LLNL began a series of experiments that will provide data needed to validate radiation transport understanding for legacy and future design options for the W80-4 LEP.
  - LLNL performed five plutonium experiments on NIF to measure plutonium strength and plutonium atomic structure at stockpile-stewardship relevant conditions in support of all weapons systems.
- **Lab Accomplishments:**
  - LLNL experiments on NIF enable assessment of potential replacement materials for W80-4 applications.
  - SNL executed chamber-confined tritium experiments on Z; with 5 times more concentration of tritium than before which enable new diagnostics that will provide critical data for ICF and weapon physics.
  - LANL opacity-on-NIF team successfully obtained iron opacity data at weapons relevant conditions and began capability development for higher temperature/density conditions.

Diagnostics, Cryogenics, and Experimental Support

Activities and Explanation of Changes

<table>
<tr><th>FY 2019 Enacted</th><th>FY 2020 Request</th><th>Explanation of Changes
FY 2020 Request vs FY 2019 Enacted</th></tr>
<tr><td>Diagnostics, Cryogenics and Experimental Support $77,915,000</td><td>Diagnostics, Cryogenics and Experimental Support $66,128,000</td><td>Diagnostics, Cryogenics and Experimental Support -$11,787,000</td></tr>
<tr><td>• Implement the National Diagnostic Plan.
• Prioritizes development and implementation of diagnostics and associated analysis packages that can operate in the challenging HED environments on the NIF and Z, including:
○ Development of hybrid CMOS detectors for x-ray diffraction diagnostics.
○ Techniques for detecting hard x-rays (>20 keV) with less than 1 nanosecond resolution.
• Time-resolved neutron spectrum for determination of the rho-r and ion temperature evolution during the burn in ICF capsules.
• Development of new tri-particle mono-energetic backlighting platform allowing for radiography to distinguish between the 3 unique “effects” of the electric field, magnetic field, and plasma matter.</td><td>• Implement the National Diagnostic Plan at a reduced level.
• Prioritizes development and implementation of diagnostics and associated analysis packages that can operate in the challenging HED environments on the NIF, Z, and Omega facilities including:
○ Development of hybrid CMOS detectors for x-ray diffraction diagnostics.
○ Techniques for detecting hard x-rays (>20 keV) with less than 1 nanosecond resolution.
○ Reflective x-ray optics with multi-layer coatings for improved efficiency and higher spatial resolution at hard x-ray energies.</td><td>• Decrease reflects the shift to higher priority NNSA efforts.
• Continues development of transformational diagnostics with a focus on diagnostics needed for key materials and radiation effects platforms.
• Continues development and support of general diagnostic capabilities, cryogenic systems, user optics, laser, and pulsed-power capabilities at all national HED facilities to a pace commensurate with program requirements.</td></tr>
</table>

Inertial Confinement Fusion Ignition and High Yield
Pulsed Power Inertial Confinement Fusion

Description

This subprogram advances the science and technology associated with pulsed-power-driven implosions and corresponding platforms. The subprogram supports focused-physics and integrated experiments aimed at improving understanding of the magnetic direct-drive (MDD) ignition concept, and experiments addressing uncertainties in x-ray driven platforms, such as double-ended and dynamic hohlraum platforms. Support for this major technical effort includes pulsed-power experimental design and simulation, research and development, fielding of experiments, and improvements in pulsed-power capabilities and tools. As part of an ICF Program goal, this subprogram supports the determination of requirements for an advanced pulsed-power driver capable of achieving high-yield fusion. The core requirements for this subprogram are described in the SSMP, the PCF, the Ten-Year HED Strategic Plan, the National Diagnostics Plan, and the ICF Program Framework.

Science, ASC, DSW, and other stockpile program elements are informed by the capabilities developed by this subprogram to successfully execute respective SSMP responsibilities.

Highlights of the FY 2020 Budget Request

- Building on successes demonstrated by pulsed power fusion concepts.

FY 2021 – FY 2024 Key Milestones

- Study impact of aging on material response in HED regime and behavior of materials from new production science;
- Generate intense sources of x-rays and neutrons for survivability studies;
- Increase energy coupled from the driver to the fusion fuel;
- Reduce uncertainties in yield scaling based on the 2020 ICF assessment; and
- Establish the basis for modern mission requirements for a high fusion yield capability.

FY 2018 Accomplishments

- **New or improved capabilities developed on HED facilities this fiscal year:**
  - Z achieved record performance on multiple ICF platforms: tripled the neutron yield for the Magnetized Liner Inertial Fusion approach and achieved a record neutron yield for a novel advanced magnetic direct drive target.

Pulsed Power Inertial Confinement Fusion

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Pulsed Power Inertial Confinement Fusion $6,596,000	**Pulsed Power Inertial Confinement Fusion $8,571,000**	**Pulsed Power Inertial Confinement Fusion +$1,975,000**
• Develop platforms to provide Radiation Effects Science capabilities to support the FY 2020 Hostile Survivability PCF pegpost. • Support fusion concept exploration on the Z facility, including physics scaling studies. • Compare accumulated data from magnetically-driven fusion experiments on Z with 3-D radiation magneto-hydrodynamic simulations.	• Determine credible physics-scaling to multi-megajoule yields for magnetic direct drive ignition approach.	• Capitalize on recent advances in pulsed-power fusion concept development. • Maintains a base capability for radiation effects platform development.

Inertial Confinement Fusion Ignition and High Yield
Joint Program in High Energy Density Laboratory Plasmas

Description

The Joint Program in High Energy Density Laboratory Plasmas (HEDLP) is a joint effort with the DOE's Office of Science to support basic HED research that strengthens the science, technology, and engineering base of the SSP. This subprogram provides support for external users at the Omega Laser Facility through the National Laser Users' Facility (NLUF) Program and also supports joint solicitation with the Office of Science for HEDLP research to be performed at universities and DOE laboratories. It includes HED-related Stockpile Stewardship Academic Alliances (SSAA) funding and other ICF-funded university programs designed to steward the study of laboratory HED plasma physics, maintain a cadre of qualified HED researchers outside of the national laboratories, and ensure the development of the next generation of specialized HED scientists to support future Stockpile Stewardship efforts.

Highlights of the FY 2020 Budget Request

- Expanding opportunities for national collaboration in high energy density science research through the enhancement of existing grants and cooperative agreements as well as the establishment of new financial assistance awards.

FY 2021 – FY 2024 Key Milestones

- Provide research grants and cooperative agreements to fund individual investigators as well as research centers.

FY 2018 Accomplishments

- Executed a solicitation for new research grants, jointly managed with the Office of Science's Fusion Energy Science Program's High Energy Density Laboratory Plasmas sub-program, leading to 15 new awards. A 30% increase in the number of individual awards.
- Delivered world-leading scientific discoveries, published in preeminent scientific journals and media outlets.

Joint Program in High Energy Density Laboratory Plasmas

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Joint Program in High Energy Density Laboratory Plasmas $8,492,000	**Joint Program in High Energy Density Laboratory Plasmas $12,000,000**	**Joint Program in High Energy Density Laboratory Plasmas +$3,508,000**
• Conduct High Energy Density Laboratory Plasma research through solicitations to fund individual investigator and research centers activities. Conduct solicitation for the National Laser Users' Facility (NLUF) Program. • Support existing basic science research grants that are enabling academic participation in HED physics and increasing the cadre of qualified HED researchers who can comprise the future laboratory workforce.	• Supports cohort of academic grants and cooperative agreements, including support for several research Centers of Excellence in HED science and the National Laser Users Facility (NLUF) activity at the University of Rochester's Omega Laser Facility.	• Enables expanded national participation in high energy density science research through the enhancement of existing grants and cooperative agreements as well as the establishment of new financial assistance awards. • Strengthens partnership with the Office of Science's Fusion Energy Science Program's High Energy Density Laboratory Plasmas activity.

Inertial Confinement Fusion Ignition and High Yield
Facility Operations and Target Production

Description

This subprogram supports the safe and efficient operations of the national HED facilities, including research, design, and engineering. The Facility Operations and Target Production subprogram principally supports operational and target fabrication costs for the NIF, the Z Pulsed Power Facility, and the Omega Laser Facility. This funding also supports access to the HED facilities for external mission partners including Defense Threat Reduction Agency and the Atomic Weapons Establishment. Additionally, facility user meetings such as the Omega Laser Facility Users Group (OLUG) and the NIF Users Group are supported by this subprogram. These meetings provide a venue for receiving feedback regarding future facility improvements and an opportunity for user-collaborators to exchange ideas and best-practices for use of the facilities. This subprogram also provides funding for a limited number of targeted cooperative agreements with external private-industry and academic partners, facilitating technology transfer out of the laboratories and into society and promote development of potential future staff. The core requirements for this subprogram are described in the Ten Year HED Strategic Plan, the National Diagnostics Plan, and the ICF Program Framework.

Science, ASC, DSW, and other stockpile program elements are informed by and benefit from the capabilities developed by this subprogram to successfully execute the NNSA SSMP.

Highlights of the FY 2020 Budget Request

- Providing key data that reduces uncertainty in calculations of nuclear weapons performance;
- Obtaining data on the properties of high-atomic-weight materials, such as uranium and plutonium, in new weapon-relevant HED regimes using the Z Facility at SNL and the NIF at LLNL;
- Fielding platforms at NIF to measure the complex hydrodynamic behavior of materials; and
- Continuing safe and efficient operation of all NNSA-funded national HED facilities in accordance with their Governance Plans.

FY 2021 – FY 2024 Key Milestones

- Maintain safe and efficient facility operations at NIF, Z, and Omega which work in concert to provide data contributing to knowledge necessary for future physics design and certification capability as required to anticipate and respond to technological changes.

FY 2018 Accomplishments

- **High-impact stockpile stewardship experiments:**
  - SNL/LANL obtained data on a Z experiment to constrain aging models by comparing the response of new and naturally aged (52.5 years old) plutonium in regimes not previously attained for this material.
  - LLNL began a series of experiments that will provide data needed to validate radiation transport understanding for legacy and future design options for the W80-4 LEP.
  - LLNL performed five plutonium experiments on NIF to measure plutonium strength and plutonium atomic structure at stockpile-stewardship relevant conditions in support of all weapons systems.
- **Experiments executed on the NNSA's HED facilities:**
  - NIF Experiments: 393; Z Facility Experiments: 158; Omega Experiments: 2319.
- **New or improved capabilities developed on HED facilities this fiscal year:**
  - NIF achieved the highest fusion yield to date on NIF of 2×10^{16} neutrons or 55kJ approaching the burning plasma threshold (defined by alpha-heating exceeding mechanical work).
  - Z achieved record performance on multiple ICF platforms: tripled the neutron yield for the Magnetized Liner approach and achieved a record neutron yield for a novel advanced magnetic direct drive target.
  - The Omega Laser Facility improved direct-drive implosion performance, establishing a new direct-drive yield record of 1.6×10^{14} neutrons.

- **Lab Accomplishments:**
  - LLNL experiments on NIF enabled assessment of potential replacement materials for W80-4 applications.
  - SNL executed chamber-confined tritium experiments on Z; with 5 times more concentration of tritium than before

which enable new diagnostics that will provide critical data for ICF and weapon physics.

- LANL opacity-on-NIF team successfully obtained iron opacity data at weapons relevant conditions and began capability development for higher temperature/density conditions.

Facility Operations and Target Production

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Facility Operations and Target Production $350,791,000	**Facility Operations and Target Production $338,247,000**	**Facility Operations and Target Production - $12,544,000**
• Maintain facility operations at all of the national HED facilities: NIF, Z-facility, and Omega. • Emphasize experiments in support of the stockpile. • Improve operational efficiency at all facilities. • Conduct annual assessment of infrastructure and mission needs and recommend following fiscal year investments across all HED facilities.	• Maintain required operational experimental capacity at all of the national HED facilities: NIF, Z, and Omega. • Emphasize experiments in support of the stockpile.	• Decrease reflects the shift to higher priority NNSA efforts. • Reduction in NIF shot capacity is consistent with proposed reduction in ignition work scope. Operations at the Omega Laser Facility and Z Pulsed Power Facility are unaffected. • Modest increase in the number of experiments fielded at the Z Pulsed Power Facility, enhancing data acquisition for HED stockpile science.

Inertial Confinement Fusion Ignition and High Yield
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	11,497	11,497	16,494	19,970	3,476
Minor Construction	N/A	N/A	0	0	0	0	0
Total, Capital Operating Expenses	N/A	N/A	**11,497**	**11,497**	**16,494**	**19,970**	**+3,476**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	7,822	7,822	7,994	8,170	+176
NIF High Resolution VISAR, LLNL	5,700	0	0	0	1,200	2,500	+1,300
Energy upgrade to OTS Laser, LLNL	5,100	0	0	0	900	3,500	+2,600
Magnetized Targets, LLNL	7,500	0	1,500	1,500	3,600	900	-2,700
Time Resolved Magnetic Recoil Spectrometer,LLNL	6,575	0	175	175	500	1,500	+1,000
NIS Equator 90-213, LLNL[a]	6,700	0	2,000	2,000	1,900	1,900	+0
Target LRU, LLNL	6,900	0	0	0	400	1,500	+1,100
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**11,497**	**11,497**	**16,494**	**19,970**	**3,476**
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A	0	0	0	0	+0
Total, Minor Construction Projects	**N/A**	**N/A**	**0**	**0**	**0**	**0**	**0**
Total, Capital Summary	**N/A**	**N/A**	**11,497**	**11,497**	**16,494**	**19,970**	**+3,476**

[a] Project title updated to reflect correct name. FY19 President's Budget Request stated 90-214.

Outyears for Inertial Confinement Fusion Ignition and High Yield

(Dollars in Thousands)

	FY 2021 Estimate	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	17,250	12,234	10,622	8,914	0
Minor Construction	0	0	0	0	0
Total, Capital Operating Expenses	**17,250**	**12,234**	**10,622**	**8,914**	**0**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	8,350	8,534	8,722	8,914	0
NIF High Resolution VISAR, LLNL	2,000	0	0	0	0
Energy upgrade to OTS Laser, LLNL	700	0	0	0	0
Magnetized Targets, LLNL	800	700	0	0	0
Time Resolved Magnetic Recoil Spectrometer, LLNL	2,000	1,500	900	0	0
NIS Equator 90-213, LLNL	900	0	0	0	0
Target LRU, LLNL	2,500	1,500	1,000	0	0
Total, Capital Equipment (including MIE)	**17,250**	**12,234**	**10,622**	**8,914**	**0**
Minor Construction Projects (Total Estimated Cost (TEC)					
Total Minor Construction Projects (TEC <$5M)	0	0	0	0	0
Total, Minor Construction Projects	**0**	**0**	**0**	**0**	**0**
Total, Capital Summary	**17,250**	**12,234**	**10,622**	**8,914**	**0**

Advanced Simulation and Computing

Overview

The Advanced Simulation and Computing (ASC) program provides high-end simulation capabilities (e.g. modeling codes, computing platforms, and supporting infrastructure) to meet the requirements of the Stockpile Stewardship Program (SSP). Modeling the complexity of nuclear weapons systems is essential to maintaining confidence in the performance of our stockpile without additional underground nuclear explosive testing. The ASC program provides the weapon codes that provide the integrated assessment capability supporting annual assessment and future sustainment program qualification and certification of the stockpile. ASC is an integral element of the Predictive Capability Framework, as described in the FY 2020 Stockpile Stewardship and Management Plan (SSMP). ASC provides critical capabilities that help inform decision-making related to the sustainment of the nuclear stockpile in support of U.S. national security objectives. The program also coordinates with the NNSA and other Government agencies, including the intelligence community, to support nonproliferation, emergency response, nuclear forensics, and attribution activities.

The ASC computing capabilities are the key integrating mechanism across the nuclear weapons program through the Integrated Design Codes (IDCs), commonly referred to as "bomb codes," which contain mathematical descriptions of the physical processes of nuclear weapons systems and functions. Combined with weapon-specific data, these IDCs support high-fidelity physical models used to carry out design studies, maintenance analyses, the Annual Assessment Reports, sustainment programs, significant finding investigations (SFIs), and weapons dismantlement activities all without additional explosive nuclear testing. The IDCs currently perform well for general mission-related activities. However, issues such as aging, potential new threats, and new manufacturing techniques require IDCs with enhanced fidelity physical models that use high-performance computing (HPC) resources more effectively. ASC capabilities that support the Directed Stockpile Work (DSW) mission were built on the computing technology available for the past two decades. In order to continue to increase computing power, industry has evolved beyond that technology. ASC must maintain currency with the commercial computer sector to ensure the high-fidelity physics modeling capabilities required to maintain a credible deterrent and address additional mission needs in non-proliferation, emergency response, nuclear forensics, and attribution programs.

In addition to these capabilities, the ASC Program is advancing several initiatives to leverage developing technologies and capabilities to support the sustainment of the nuclear stockpile. The Large-Scale Calculations Initiative (LSCI), currently underway, was initiated to determine the limitations of our current assessment capabilities. The LSCI is assessing what is achievable with current platforms, codes, and qualified personnel and what cannot be achieved with those capabilities. "Large-scale calculations" as defined by this initiative are impractical to perform on available capacity computing platforms due to size, run length, or a combination of the two, and the initiative directs the national security laboratories to look beyond current computing abilities and ask how calculations on this scale will enhance delivery of our mission. In essence, LSCI will make Science Based Stockpile Stewardship a reality by making today's hero calculations routine business. The ASC Program has also introduced a Cognitive Simulation Initiative to expand the use of machine learning algorithms to manage complexity in physics simulations in the scientific computing ecosystem. This program can significantly increase efficiency, improve models to better match experimental data, and improve the integration of multi-scale and multi-dimensional models, while addressing concerns with validation of these techniques and better understand when new errors are introduced. To drive efficiency and productivity, the ASC program through the Production Simulation Initiative (PSI) which includes efforts such as the Simulation First or "SimFirst" initiative at Kansas City National Security Campus (KCNSC), that uses physics-based simulation for production operations prior to actually "bending any metal" in order to find optimum solutions.

Advanced Simulation and Computing
Funding

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
	(Dollars in Thousands)			
Research, Development, Test and Evaluation				
Advanced Simulation and Computing				
Integrated Codes	151,848	149,214	149,714	+500
Physics and Engineering Models	66,851	66,650	69,650	+3,000
Verification and Validation	51,074	55,114	58,114	+3,000
Advanced Technology Development and Mitigation	170,000	89,072	174,825	+85,753
Computational Systems and Software Environment	121,490	146,645	156,828	+10,183
Facility Operations and User Support	159,981	163,424	180,718	+17,294
Construction	25,000	47,000	50,000	+3,000
Total, Advanced Simulation and Computing	**746,244**	**717,119**	**839,849**	**+122,730**

Outyears for Advanced Simulation and Computing
Funding

	(Dollars in Thousands)			
	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Research, Development, Test and Evaluation				
Advanced Simulation and Computing				
Integrated Codes	152,708	155,762	158,877	165,232
Physics and Engineering Models	71,043	72,464	73,913	76,870
Verification and Validation	59,276	60,462	61,671	64,138
Advanced Technology Development and Mitigation	92,000	88,000	80,000	81,000
Computational Systems and Software Environment	192,546	229,786	227,811	226,760
Facility Operations and User Support	180,000	180,000	180,000	180,000
Construction	27,000	13,000		
Total, Advanced Simulation and Computing	**774,574**	**799,474**	**782,272**	**794,000**

Advanced Simulation and Computing
Explanation of Major Changes
(Dollars in Thousands)

	FY 2020 Request vs FY 2019 Enacted
Advanced Simulation and Computing	
Integrated Codes (IC): The slight increase reflects the transition of the integrated design codes to new architectures and preparations for the exascale system in FY 2023.	**+500**
Physics and Engineering Models (PEM): The increase reflects the renewed investment into Defense Applications and Modeling that is necessary for the transition of integrated design codes to new architectures and preparations for the exascale system in FY 2023.	**+3,000**
Verification and Validation (V&V): The increase reflects the renewed investment into Defense Applications and Modeling that is necessary for the transition of integrated design codes to new architectures and preparations for the exascale system in FY 2023.	**+3,000**
Advanced Technology Development and Mitigation (ATDM): The increase is in-line with development and evaluation of new computing technologies and algorithms against advanced prototype hardware. Pursues technologies critical to an exascale capability for the nation on a schedule that accommodates an exascale-class system in FY 2023.	**+85,753**
Computational Systems and Software Environment (CSSE): The increase reflects the change in platform procurement budget profile.	**+10,183**
Facility Operations and User Support (FOUS): The increase reflects additional computing center costs in preparation for exascale-class computing.	**+17,294**
Construction: Increase for 18-D-620, Exascale Computing Facility Modernization Project largely offset by a decrease for 18-D-670, Exascale Class Computer Cooling Equipment, consistent with project profiles. The total does not include other project costs.	**+3,000**
Total, Advanced Simulation and Computing	**+122,730**

Advanced Simulation and Computing
Integrated Codes

Description
Integrated Codes (IC) subprogram produces large-scale, integrated design codes (IDCs) that allow the performance of detailed nuclear weapons assessments without the need for additional underground explosive nuclear testing. They are the codes used for physics and engineering stockpile assessments to support concept studies, certification, maintenance analyses, life extension program (LEPs), alterations (Alts), SFIs, and weapons dismantlement activities. The IDCs represent a repository of knowledge gained from experiments on NNSA's wide range of facilities, legacy underground nuclear explosive tests (UGTs), enhancements made to support the DSW program, and a variety of other critical national security missions. The codes enable nuclear forensics, foreign assessments, and device disablement techniques related to nuclear counter-terrorism efforts and the study of nuclear weapons behavior in normal, abnormal, and hostile environments, as well as outputs to enable effects estimates.

The IC subprogram also maintains selected legacy codes and is responsible for ancillary tools that support the weapons mission. These specialized codes enable simulation workflow, generate models or information used by the IDCs, and validate the IDCs by comparison with experiments performed at facilities such as the Z pulsed power facility and National Ignition Facility (NIF). In this way, IC integrates activities across all of RDT&E.

Long-term technical goals for the IC subprogram are to provide credible simulation capabilities that cover all the relevant physics and maximize performance on existing and future computing architectures. These goals are achieved through collaborative activities with the Physics and Engineering Models (PEM), Verification and Validation (V&V), and Computational Systems and Software Environment (CSSE) subprograms and experimental programs in RDT&E. The IC subprogram will prepare for the emergence of heterogeneous exascale computing platforms through the advancements made by the ATDM subprogram. Another long-term goal is to cultivate the next generation of scientists and engineers to support the ASC and DSW missions through ASC's academic alliance activities. These efforts establish academic programs for multidisciplinary simulation science and provide students the relevant experience for weapons code development through open science applications. Efforts are conducted through the DOE Computational Science Graduate Fellowships jointly with the DOE Office of Science Advanced Scientific Computing Research.

Highlights of the FY 2020 Budget Request
- Continue to provide weapons code capabilities to the NNSA Nuclear Security Enterprise (NSE) for annual assessments, SFI investigations, LEP qualification and certification, and related nuclear security assessments.
- Transition current integrated design codes to the exascale system architecture.
- Deliver analysis on LSCI phase I activities which will identify system requirements for today's hero-scale simulations and resource requirements for supporting these calculations.

FY 2021 - FY 2024 Key Milestones
- Simulation capability for hostile environments with a goal of completing production capability for hostile environment simulation.
- Enhanced modeling of High Energy Density Physics relevant validation experiments, which will permit training designers and engineers for environments that were traditionally associated with nuclear tests.
- Demonstrate performance portability for all IDCs on ATS-3, Crossroads in FY 2022, and DSW applications in FY 2023.
- Quantify the value proposition of PSI in production cycle resources for DSW components in FY 2024.

FY 2018 Accomplishments
- Advanced nuclear performance assessment codes for boost and secondary performance; safety codes to address multi-point safety issues; and engineering assessment codes for hostile, normal, and abnormal environments.
- Adapted existing codes to new architectures, and migrate current design and safety codes to run efficiently on hybrid computer architectures.

Integrated Codes

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Integrated Codes $149,214,000	**Integrated Codes $149,714,000**	**Integrated Codes +$500,000**
• Code builds and ports. • As needed, user training and assistance. • Regularly scheduled testing and bug fixes. • Further develop nuclear performance assessment codes for boost and secondary performance, safety codes to address multi-point safety issues, engineering assessment codes for hostile environments, and engineering assessment codes for normal and abnormal environments. • Adapt existing codes to new architectures. • Migrate current design and safety codes to run efficiently on hybrid computer architectures. • Support KCNSC in the use of ASC codes and computing resources to solve production manufacturing problems. • Maintain mentoring program for early career staff. • Collaborate with academic alliance centers on technical topics and staff recruitment.	• Further develop nuclear performance assessment codes for boost and secondary performance, safety codes to address multi-point safety issues, engineering assessment codes for hostile environments, and engineering assessment codes for normal and abnormal environments. • Adapt existing codes to new architectures. • Migrate current design and safety codes to run efficiently on hybrid computer architectures. • Support KCNSC in the use of ASC codes and computing resources to solve production manufacturing problems. • Code builds and ports. • As needed, user training and assistance. • Regularly scheduled testing and bug fixes. • Maintain mentoring program for early career staff. • Collaborate with Predictive Science Academic Alliance Program centers on technical topics and staff recruitment.	• The slight increase reflects the transition of the integrated design codes to new architectures and preparations for the exascale system in FY 2023.

Advanced Simulation and Computing
Physics and Engineering Models

Description

The Physics and Engineering Models (PEM) subprogram provides the models and databases used in simulations supporting the U.S. stockpile. These models and databases describe a wide variety of physical and engineering processes occurring in a nuclear weapon life-cycle. The capability to accurately simulate these processes is required for annual assessment; design, qualification, and certification of warheads undergoing sustainment programs; resolution (and in some cases generation) of SFIs; and the development of future stockpile technologies. The PEM subprogram is closely linked to the Science program within the Office of Defense Programs, Research, Development, Test, and Evaluation, which provides the experimental data that informs development of new models used in simulation codes.

The PEM subprogram's responsibilities are threefold: 1) To provide mathematical models and databases to represent physical behavior and physical data (for example, Equation of State (EOS), strength parameters, radiation opacities and nuclear cross sections) for use in the IDCs; 2) To collaborate with the IC subprogram to implement these models and data in the IDCs; and 3) To collaborate with the V&V subprogram to ensure the models have been implemented correctly (verified) and have been compared to experimental data (validated).

Highlights of the FY 2020 Budget Request

- Support survivability and hostile environment modeling.

FY 2021 - FY 2024 Key Milestones

- Apply machine learning techniques to discover computationally efficient models for turbulent multiphase flow as part of CSI.
- Assess current capabilities and deliver improved capability to assure survivability in hostile environments.
- Provide initial modeling capabilities for aging and manufacturing assessments that capture structure features in new and aged materials
- Revamp foundational materials modeling infrastructure to fully support and utilize next-generation architectures.
- Develop Uncertainty Qualification (UQ)/machine learning toolkits to enable physics models and holistic data assessments. This encompasses projects by several different subcomponents, such as strength and damage and nuclear data.
- Improve physics models relevant to full range of applications. This includes improved modeling of multiphysics response to combined abnormal environments, expanding current inline opacity capabilities to support modeling certification efforts and hostile environments, and implementing phase aware material models for strength and ejecta.

FY 2018 Accomplishments

- Developed methods to characterize explosives in support of the W80-4 Life Extension Program.
- Quantified sensitivity of yield and criticality to a wide range of primary design parameters.
- Developed and deployed new higher-fidelity models to improve predictions of poor-performing UGTs and legacy systems in support of FY 2019 milestone on Secondary Performance.
- Concluded the 3rd Sandia Fracture Challenge, with a focus on reliability of additively manufactured metals. The challenge elicited responses from 22 international teams using a variety of computational approaches to link material structure to performance of an additively manufactured component loaded to failure.
- Developed and implemented models of common circuit failure mechanisms to aid in the qualification of commercial off-the-shelf parts and can be used to predict deterioration on performance and ultimate failure of application-specific integrated circuits as a function of aging.

Physics and Engineering Models

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Physics and Engineering Models $66,650,000	**Physics and Engineering Models $69,650,000**	**Physics and Engineering Models +$3,000,000**
• Further develop reactive flow models for HE detonation and burn that capture grain scale material heterogeneity and are computationally efficient. • Develop additional models for complex hydrodynamic processes that are sufficiently predictive to help the design and assessment of various stockpile options. • Further refinement of models needed for certification on new safety options. • Adapt/develop models for components built by advanced/adaptive manufacturing techniques.	• Further develop reactive flow models for HE detonation and burn that capture grain scale material heterogeneity and are computationally efficient. • Develop additional models for complex hydrodynamic processes that are sufficiently predictive to help the design and assessment of various stockpile options. • Further refinement of models needed for certification on new safety options. • Adapt/develop models for components built by advanced/adaptive manufacturing techniques.	• The increase reflects the renewed investment into Defense Applications and Modeling that is necessary for the transition of integrated design codes to new architectures and preparations for the exascale system in FY 2023.

Advanced Simulation and Computing
Verification and Validation

Description

The Verification and Validation (V&V) subprogram brings the IC and PEM subprograms and the DSW program together to evaluate the capability of IDCs. Verification activities demonstrate that the IDCs and PEM models are correctly solving their respective governing equations. Validation activities ensure that both science codes and IDCs are solving the equations accurately, and that the models themselves are sufficiently precise for the intended application. Together, these subprogram activities provide a technically rigorous, credible, and sensible foundation for computational science and engineering calculations by developing, exercising, and implementing tools that provide confidence in simulations of high-consequence nuclear stockpile problems.

The V&V subprogram funds the critical skills needed to apply systematic measurement, documentation, and demonstration of the ability of the models and codes to predict physical behavior. The V&V subprogram is developing and implementing UQ methodologies as part of the foundation for the Quantification of Margins and Uncertainties (QMU) process of weapons assessment and certification. The V&V subprogram also drives software engineering practices to improve the quality, robustness, reliability, and maintainability of the codes that evaluate and address the unique complexities of the stockpile. As the stockpile ages, and as weapons designers and engineers with weapon development and test experience leave the NNSA nuclear security enterprise, it has become increasingly important that the codes are verified and validated, so that future generations of designers display high levels of confidence in the use of these foundational tools.

During the planning period, V&V efforts will enhance NNSA's abilities to handle complex safety and engineering issues within the nuclear weapons stockpile. With major modifications to adapt existing codes to future hardware a primary focus of the IC subprogram, and development of new codes a primary focus of the ATDM subprogram, the primary focus for the V&V subprogram will be ensuring the modifications and new codes are subjected to thorough verification and validation methodologies.

The V&V subprogram provides the capabilities to assess the fidelity of the simulation tools in collaboration with the code, model development, and weapon application communities, as follows:

- Comprehensive assessments of new models and code features. The V&V subprogram will provide the tools and methods necessary for evaluation of new PEM models and IDC versions. Where possible, the V&V subprogram will coordinate with the PEM and IC communities to perform these assessments together and provide feedback to PEM and IC on potential improvements or insufficiencies.
- Improved simulation uncertainty treatment. The V&V subprogram will provide the tools and methodologies for estimating the uncertainty in weapon simulation results from the IDCs. Part of the uncertainty estimate will help analysts connect the physical processes in the models to the relevant experimental data.

Highlights of the FY 2020 Budget Request

- Begin developing V&V techniques for the new ATDM codes and models.

FY 2021 - FY 2024 Key Milestones

- Assessment and comparison of advanced adaptive sampling methodologies to support development of a fully probabilistic UQ methodology that couples both discrepancy and model parameter uncertainty.
- Achieve code verification of the thermo-structural response of a simplified warhead to a hostile neutron assault though code comparisons.
- Exercise ASC codes and linking tools and develop the analytical process used to perform combined hostile analysis to support future weapons certification.
- Develop and demonstrate multiscale electrical UQ/QMU for analysis of digital bus-based communication performance under electrical noise and EM/radiation environments.

FY 2018 Accomplishments

- Completed the assessment of primary performance sensitivity to uncertainties in equation of state and nuclear data.
- Developed and applied a new statistical approach for discrepancy based on a fully Bayesian framework in uncertainty analysis. Applied newly developed methodologies to perform initial quantification of margins and uncertainties assessment of the W87 in support of the FY 2018 Annual Assessment Review process.
- For the first time, used a 3D physics simulation capability to address and successfully close a SFI.
- Performed validation and uncertainty quantification of the surface loading models used to predict re-entry random vibration environments, and applied said models to the W87 and W78 stockpile systems.

Verification and Validation

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Verification and Validation $55,114,000	**Verification and Validation $58,114,000**	**Verification and Validation +$3,000,000**
• Verify improvements in nuclear performance codes. • Verify improvement in safety codes to address multi-point safety issues. • Validate improvements to physics and material models. • Validate improvements in engineering codes for normal, abnormal, and hostile environments. • Broaden development of V&V protocols for algorithms running on hybrid HPC architectures. • Assess predictive capability as improvements to codes and models, including new nuclear material data, are made available. • Development of the primary and secondary common models. • Provide training on the use of UQ tools. • Implement quality assurance controls to ensure material and nuclear databases are correctly updated and maintained.	• Verify improvements in nuclear performance codes. • Verify improvement in safety codes to address multi-point safety issues. • Validate improvements to physics and material models. • Validate improvements in engineering codes for normal, abnormal, and hostile environments. • Develop V&V protocols for algorithms running on hybrid HPC architectures. • Assess predictive capability as improvements to codes and models, including new nuclear material data, are made available. • Refine the primary and secondary common models. • Provide training on the use of UQ tools. • Implement quality assurance controls to ensure material and nuclear databases are correctly updated and maintained.	• The increase reflects the renewed investment into Defense Applications and Modeling that is necessary for the transition of integrated design codes to new architectures and preparations for the exascale system in FY 2023.

Advanced Simulation and Computing
Advanced Technology Development and Mitigation

Description

The Advanced Technology Development and Mitigation (ATDM) subprogram includes laboratory code and computer engineering and computer science projects that support long-term simulation and computing goals relevant to both exascale computing and the broad national security missions of the NNSA. This subprogram addresses the need to build new IDCs that are more aligned with emerging technologies, to engage in co-design ventures with industry to evolve operating systems and other support software, and to work with HPC vendors to deploy technologies that are useful for stockpile stewardship.

The ASC capabilities that support the DSW mission are challenged as HPC technologies evolve to radically different and more complex (many-core or heterogeneous) architectures. The efficiency of the current generation of IDCs is deteriorating as these codes are migrated to the latest HPC platforms, and this trend is expected to continue and accelerate on future platforms unless mitigated. The subprogram must address three major challenges: 1) the radical shift in computer architectures; 2) maintaining current IDCs that took more than a decade to develop and validate; and 3) adapting current capabilities as evolving computer technologies become increasingly disruptive to the broad national security missions of NNSA.

The ATDM subprogram is prioritized to tackle the most critical subset of issues that are occurring during this period of disruptive change in HPC architectures in order to continue the current level of support to the DSW mission. There are three focus areas for investment. Next Generation Code Development and Application is focused on long-term investigation of how future code development must address new HPC challenges of massive, heterogeneous parallelism using new programming models and data management techniques developed through co-design of applications and systems with industry. Next Generation Architecture and Software Development is focused on computing technology research of extreme, heterogeneous architectures, mitigating its impact and advancing its capabilities for ASC simulation codes. Inter-agency Co-Design will leverage NNSA HPC advanced architecture activities and software technologies to address the sponsor agencies' mission needs. Sponsor agencies will also have the opportunity to participate in co-design activities with vendors and academia, in addition to workforce development and training opportunities.

Highlights of the FY 2020 Budget Request

- Transition ATDM research and development (R&D) from platform-agnostic to platform-specific along with acquisition of testbeds/prototypes to address scaling and technology impacts.

FY 2021 - FY 2024 Key Advanced Technology Development and Mitigation Milestones

- Demonstrate next-gen IDC and hostile environment initial capabilities.
- Develop new IDCs for the stockpile missions (one at each laboratory) that will ensure mission continuity on future computing architectures. Lessons learned, developed codes, and code infrastructure will be shared with the IC subprogram when appropriate.
- Develop next-generation codes and computing infrastructure.
- Develop technologies for simulation at scale and share those technologies with the CSSE and IC subprograms.

FY 2018 Accomplishments

- Expanded the portfolio of the ATDM subprogram to include new simulation capabilities to evaluate hostile environment response, accelerated development of next-generation IDCs, and increased R&D investment with the computer industry to address exascale technical challenges.

Advanced Technology Development and Mitigation

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Advanced Technology Development and Mitigation $89,072,000	**Advanced Technology Development and Mitigation $174,825,000**	**Advanced Technology Development and Mitigation +$85,753,000**

• Sustain development of next-generation programming models and ASC physics & engineering codes.
• Development of hostile environment simulation capabilities for next-generation weapons codes.
• Initiate the ASC El Capitan Application Center of Excellence collaboration with system vendor.
• Deploy initial peta-FLOPS-class, Arm-based prototype system, named Astra, with software stack to evaluate feasibility of architecture for ATDM codes.
	• Sustain development of next-generation programming models and ASC physics & engineering codes.
	• Develop hostile environment simulation capabilities for next-generation weapons codes.
	• Initiate new PEM and V&V activities to strengthen the next-generation codes.
	• Initiate new advanced machine learning and next-generation hardware research activities
	• Maintain Laboratory and vendor personnel participation in the ASC El Capitan Application Center of Excellence collaboration.
	• Jointly manage Exascale PathForward projects with DOE Office of Science. Transition Astra system to classified computing service.
	• Sustain Interagency CoDesign activities with National Cancer Institute and biomedical industry
		• The increase is in-line with development and evaluation of next-generation computing technologies:
		  ◦ Pursuit of technologies critical to an exascale capability for the nation on a schedule that accommodates an exascale-class system delivery in FY 2023.
		  ◦ Finish obligations of the DOE Exascale PathForward contracts.
		  ◦ Continued work on next-gen code development and evaluation of new computing technologies and algorithms against advanced prototype hardware.

Advanced Simulation and Computing
Computational Systems and Software Environment

Description

The Computational Systems and Software Environment (CSSE) subprogram builds integrated, balanced, and scalable computational capabilities. The complexity and scale of weapons simulations require the ASC Program to lead the mainstream HPC community by investing in and influencing the evolution of computing environments. This subprogram provides the stability to ensure productive system use and protect NNSA's investment in IDCs.

Along with the powerful Commodity Technology (CT) and Advanced Technology (AT) systems that the program fields, the supporting software infrastructure that is deployed on these platforms include many critical components, from system software to input/output (I/O), storage and networking, and post-processing visualization and data analysis tools. CSSE also examines possible future technologies beyond exascale, such as quantum, neuromorphic, and non-complementary metal-oxide-semiconductor (CMOS)-based computing techniques.

The CSSE subprogram provides the computational infrastructure, both hardware and software, necessary to support weapon applications, as follows:

- Design and develop usable computing systems. The CSSE subprogram will design and procure the computer systems required to support stockpile stewardship and broader nuclear security issues. These systems will include test beds for system development, CT systems for most stockpile computing work, and AT systems for large-scale computing requirements and future technology readiness.
- Comprehensive, stable computing and development environments. The CSSE subprogram will also provide the system software and code development environments necessary for code development and simulation using the computing hardware.

Highlights of the FY 2020 Budget

- Support the development of exascale computing and associated software and applications, including non-recurring engineering development for the exascale system, ATS-4/El Capitan.

FY 2021 - FY 2024 Key Computational Systems and Software Environment Milestones

- ATS-3/Crossroads acceptance, FY 2021
- Exascale computing environment, FY 2022
- ATS-4/El Capitan acceptance, FY 2023
- Develop advanced machine learning techniques for nuclear weapons complex applications.

FY 2018 Accomplishments

- Deployed ASC Sierra platform at Lawrence Livermore National Laboratory (LLNL), with system acceptance in Quarter 4 FY 2018, to address stockpile stewardship issues and to advance predictive science.
- Completed the Trinity-Knight's Landing (Phase 2) system for the tri-labs' production computing environment to address stockpile stewardship issues and to advance predictive science.

Computational Systems and Software Environment

Activities and Explanation of Changes

<table>
<tr><th>FY 2019 Enacted</th><th>FY 2020 Request</th><th>Explanation of Changes
FY 2020 Request vs FY 2019 Enacted</th></tr>
<tr><td>Computational Systems and Software Environment $146,645,000</td><td>Computational Systems and Software Environment $156,828,000</td><td>Computational Systems and Software Environment +$10,183,000</td></tr>
<tr><td>• Operate CTS1 systems at tri-labs
• Initiate operation of ASC Sierra system in the classified environment.
• ASC Crossroads procurement activity.
• Initiate ASC El Capitan (ATS-4)’s non-recurring engineering work with system vendor.
• Perform ASC application porting and scaling on Sierra system.
• Further development of tri-lab computing environment consisting of user tools, networks, file system, archival storage, and visualization and data analysis.
• Fund and evaluate the suitability of various post-CMOS technologies, such as quantum (D-Wave system) and neuromorphic computing (TrueNorth system), to NNSA’s national security mission.</td><td>• Perform ASC application porting and scaling on Sierra system.
• Further development of tri-lab computing environment consisting of user tools, networks, file system, archival storage, and visualization and data analysis.
• Fund and evaluate the suitability of various post-CMOS technologies, such as quantum (D-Wave system) and neuromorphic computing (TrueNorth system), to NNSA’s national security mission.
• Operate of CTS1 systems at tri-labs.
• Initiate planning for CTS2 procurement.
• Operate ASC Sierra system in the classified environment.
• Deploy ASC Crossroads hardware.
• ASC El Capitan (ATS-4)’s non-recurring engineering work with system vendor.</td><td>• Reflects the change in the platform procurement budget profiles.</td></tr>
</table>

Advanced Simulation and Computing
Facility Operations and User Support

Description

The Facility Operations and User Support (FOUS) subprogram provides the facilities and services required to provide nuclear weapons simulations. Facility Operations includes physical space, power, and other utility infrastructure, and Local Area/Wide Area Networking for local and remote access, as well as system administration, cyber-security, and operations services for ongoing support. User Support includes computer center hotline and help-desk services, account management, web-based system documentation, system status information tools, user training, trouble-ticketing systems, common computing environment, and application analyst support.

The FOUS subprogram is responsible for management of the computer operations and maintenance, and for system administration and user support. This includes:

- Effective management of computing hardware infrastructure. The FOUS subprogram will provide adequate power, cooling, and integrated facilities to support the computing system hardware, and it will provide the requisite networking and storage infrastructure.
- Responsive system administration, maintenance, and user support. The FOUS subprogram will administer the computational systems, manage the job scheduling capability, and provide responsive support to the user community.

Highlights of the FY 2020 Budget

- Prepare the ASC facilities at the NNSA National Security Laboratories for the next-generation platforms.

FY 2021 - FY 2024 Key Facility Operations and User Support-Construction Milestones

- Complete ECFM in FY 2022.

FY 2018 Accomplishments

- Brought to production readiness the new CT systems for the DSW community.

Facility Operations and User Support

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Facility Operations and User Support $163,424,000	**Facility Operations and User Support $180,718,000**	**Facility Operations and User Support +$17,294,000**
• Maintain full operation of CTS1 systems. • Pursue a common computing environment for users. • Maintain maximum availability of computer cycles to end users. Implement best practices. • Provide operational support for reliable and secure production computing environment. • Prepare for incorporation of next generation architectures. • Implement contingency response plans, as necessary. • Deploy the needed file system and archival storage technologies. • Conduct facility assessment for future operations.	• Maintain full operation of CTS1 systems. • Pursue a common computing environment for users. • Maintain maximum availability of computer cycles to end users. Implement best practices. • Provide operational support for reliable and secure production computing environment. • Prepare for incorporation of next generation architectures. • Implement contingency response plans, as necessary. • Deploy the needed file system and archival storage technologies. • Conduct facility assessment for future operations. • Prepare for the installation of next-generation systems, including El Capitan, into the Nuclear Security Enterprise.	• The increase reflects the additional computing center costs (e.g. storage, networking, software environment, security) in preparation for exascale-class computing.

Advanced Simulation and Computing
Construction

Description

Line item construction projects play a critical role in NNSA's Exascale Initiative. Other Project Cost funding is requested for the Exascale Class Computer Cooling Equipment (EC3E) project at the Los Alamos National Laboratory Nicholas C. Metropolis Center for Modeling and Simulation, also known as the Strategic Computing Complex (SCC). This project is an expansion of the SCC's existing warm water cooling system. The EC3E project will use open-cell cooling towers that cool the water via evaporation, and will provide needed cooling capability for future computers on the path to exascale at LANL. This project will provide 5,200 tons (18MW) of additional warm water cooling capacity at the SCC by installing five open-celled cooling towers to the north of the existing towers, extending the process loop piping to the east of the existing piping loop, adding six process water pumps and four heat exchangers, and adding the associated large diameter piping. The project will also include the installation of supporting electrical equipment and components necessary for the function of the mechanical equipment as well as additions to the building's automated control system.

Additionally, line item construction funding is requested for the Exascale Computing Facility Modernization (ECFM) project. The purpose of the ECFM project is to provide capable facilities and infrastructure to site an exascale-class system at the Lawrence Livermore National Laboratory in FY 2023. The project will modify the existing high performance computing center (Building 453) at LLNL to accommodate the increased infrastructure demands of exascale computing platforms, to include upgrades to the electrical and mechanical capabilities of the facility. The existing cooling tower complex would be expanded by 13,700 tons of capacity, including required piping and pumps. The existing electrical system will be upgraded to allow for an additional 40 MW of power for high performance computing, including the required feeders for mechanical and data systems, secondary electrical panels and feeders, and substation transformers, switchgear, switches and bussing.

FY 2018 Accomplishments

- Stewarded two major facility modernization efforts, one at LANL and another at LLNL, through the initial stage of the acquisition process. These two facilities will support deployment of advanced architecture systems on the path to exascale and at exascale, respectively.

Construction

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Construction $47,000,000	**Construction $50,000,000**	**Construction +$3,000,000**
• Executed construction plan for both EC3E. • Completed final design and initiate long-lead procurements for ECFM.	• Execute construction plans for ECFM project, with construction beginning in FY 2020. • Begin commissioning on the EC3E project, take beneficial occupancy, and transition to operations.	• The increase supports the construction line item 18-D-620 (ECFM) project. An increase of $27M for ECFM is largely offset by a decrease of $24.0M for EC3E. The total does not include other project costs.

Advanced Simulation and Computing
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	151,634	163,634	168,752	198,615	29,863
Minor Construction	N/A	N/A	0	0	0	0	0
Total, Capital Operating Expenses	N/A	N/A	**151,634**	**163,634**	**168,752**	**198,615**	**+29,863**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	91,734	91,734	93,752	95,815	+2,063
Trinity (ATS-1) System, LANL	187,000	171,600	5,400	5,400	5,000	5000	+0
Crossroads (ATS-3) System, LANL	127,000	4,000	0	0	20,000	24,000	+4,000
ATS-5 Acquisition & Installation, LANL	300,000	0	0	0	0	0	+0
Sierra (ATS-2) System, LLNL	170,500	96,000	54,500	54,500	11,000	6,800	-4,200
CTS-1, LLNL	42,550	25,550		11,000	6,000	0	-6,000
El Capitan (ATS-4), LLNL	600,000	0	0	1,000	33,000	58,000	+25,000
CTS-2, LLNL	40,000	0	0	0	0	0	+0
Commodity Technology System (CTS) 1+, SNL	9,000	0	0	0	0	9,000	+9,000
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**151,634**	**163,634**	**168,752**	**198,615**	**29,863**
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A	0	0	0	0	+0
SCC Mechanical Upgrades, LANL	6,000	0	0	0	0	0	+0
SCC Structural Upgrades, LANL	9,000	0	0	0	0	0	+0
SCC Electrical Upgrades, LANL	15,000	0	0	0	0	0	+0
Total, Minor Construction Projects	**N/A**	**N/A**	**0**	**0**	**0**	**0**	**0**
Total, Capital Summary	**N/A**	**N/A**	**151,634**	**163,634**	**168,752**	**198,615**	**+29,863**

Outyears for Advanced Simulation and Computing

(Dollars in Thousands)

	FY 2021 Estimate	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	255,123	244,077	255,279	182,529	397,000
Minor Construction	500	6,500	11,000	7,000	5,000
Total, Capital Operating Expenses	**255,623**	**250,577**	**266,279**	**189,529**	**402,000**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	97,923	100,077	102,279	104,529	0
Trinity (ATS-1) System, LANL	0	0	0	0	0
Crossroads (ATS-3) System, LANL	45,000	14,000	8,000	8,000	4,000
ATS-5 Acquisition & Installation, LANL	0	0	0	10,000	290,000
Sierra (ATS-2) System, LLNL	2,200	0	0	0	0
CTS-1, LLNL	0	0	0	0	0
El Capitan (ATS-4), LLNL	100,000	120,000	135,000	50,000	103,000
CTS-2, LLNL	10,000	10,000	10,000	10,000	0
Commodity Technology System (CTS) 1+, SNL	0	0	0	0	0
Total, Capital Equipment (including MIE)	**255,123**	**244,077**	**255,279**	**182,529**	**397,000**
Minor Construction Projects (Total Estimated Cost (TEC)					
Total Minor Construction Projects (TEC <$5M)	0	0	0	0	0
SCC Mechanical Upgrades, LANL	500	5,500	0	0	0
SCC Structural Upgrades, LANL	0	0	1,000	3,000	5,000
SCC Electrical Upgrades, LANL	0	1,000	10,000	4,000	0
Total, Minor Construction Projects	**500**	**6,500**	**11,000**	**7,000**	**5,000**
Total, Capital Summary	**255,623**	**250,577**	**266,279**	**189,529**	**402,000**

Location/ Site	Project Description	TPC ($k)	Project Milestones		
			Project Start	Design Complete	Construction Complete
LANL	This project supports the High Performance Computing (HPC) Division in facility upgrades at the Nicholas C Metropolis Center of Modeling and Simulation, other-wise known as the Strategic Computing Complex (SCC), to support increased power distribution in the building. The future mission need of the National Nuclear Security Administration (NNSA) Advanced Simulation and Computing (ASC) Program projects the SCC will need to be equipped with increased power to support future supercomputer platforms. This project includes the installation of new secondary unit substations, switchboards and electrical bus duct as well as modifications within the existing electrical equipment to increase the power within the SCC to approximately 60 MVA.	15,000	FY 2022	FY 2022	FY 2024

Construction Projects Summary

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
18-D-670, Exascale Class Computer Cooling Equipment, LANL							
Total Estimated Cost (TEC)	49,887	1,882	22,000	22,000	24,000	0	-24,000
Other Project Cost (OPC)	5,905	2,875	118	118	1,000	1,305	+305
Total Project Cost, 18-D-670, Exascale Class Computer Cooling Equipment, LANL	**55,792**	**4,757**	**22,118**	**22,118**	**25,000**	**1,305**	**-23,695**
18-D-620, Exascale Computing Facility Modernization Project, LLNL							
TEC	116,000	0	3,000	3,000	23,000	50,000	+27,000
OPC	9,000	2,000	2,000	2,000	0	0	+0
Total Project Cost, 18-D-620, Exascale Computing Facility Modernization Project, LLNL	**125,000**	**2,000**	**5,000**	**5,000**	**23,000**	**50,000**	**+27,000**
Total All Construction Projects							
TEC	165,887	1,882	25,000	25,000	47,000	50,000	+3,000
OPC	14,905	4,875	2,118	2,118	1,000	1,305	+305
Total Project Cost (TPC) All Construction Projects	**180,792**	**6,757**	**27,118**	**27,118**	**48,000**	**51,305**	**+3,305**

Outyears to Completion for Advanced Simulation and Computing

	(Dollars in Thousands)			
	FY 2021 Estimate	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate
18-D-670, Exascale Class Computer Cooling Equipment, LANL				
TEC	0	0	0	0
OPC	607	0	0	0
Total Project Cost, 18-D-670, Exascale Class Computer Cooling Equipment, LANL	**607**	**0**	**0**	**0**
18-D-620, Exascale Computing Facility Modernization Project, LLNL				
TEC	27,000	13,000	0	0
OPC	0	3,000	2,000	0
Total Project Cost, 18-D-620, Exascale Computing Facility Modernization Project, LLNL	**27,000**	**16,000**	**2,000**	**0**
Total All Construction Projects				
TEC	27,000	13,000	0	0
OPC	607	3,000	2,000	0
Total Project Cost (TPC) All Construction Projects	**27,607**	**16,000**	**2,000**	**0**

18-D-620, Exascale Computing Facility Modernization (ECFM)
Lawrence Livermore National Laboratory, Livermore, California
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2020 Request for the Exascale Computing Facility Modernization (ECFM) Project at the Terascale Simulation Facility (B453) at the Lawrence Livermore National Laboratory (LLNL) in Livermore, California, is $50,000K. At Critical Decision (CD) -1, the Total Project Cost (TPC) range of the project was $57,000K to $125,000K with a projected CD-4 approval of 4Q FY 2022.

Significant Changes:
This Construction Project Data Sheet (CPDS) is an update of the FY 2019 CPDS and does not include a new start for the budget year. The most recent DOE Order 413.3B Critical Decision for the project was CD-1, Approve Alternative Selection and Cost Range, which was signed by the Project Management Executive on May 29, 2018. To ensure the project continues to be executed on schedule, a CD-3A, Long-Lead Item Procurements, package will be submitted for approval in 3Q FY2019. The long-lead procurement items include, but are not limited to, high voltage transformers, switchgear, and protective relay equipment all of which require additional time for fabrication, testing, and delivery. After CD-1, the next major milestone for the project is CD-2/3, Approve Performance Baseline and Initiate Construction, which is projected in 1Q FY 2020. The CPDS has been updated to reflect the approval of CD-1, the receipt of FY18 funding, and schedule updates. No other significant changes have been made. The project has not yet been approved for CD-2 and therefore has not yet been baselined. Outyear funding for the project may be revised in future budget requests once NNSA baselines the project.

This project is linked to the Exascale Computing Project and the Advanced Simulation and Computing (ASC) Program is working to ensure that LLNL will have a facility capable of housing an anticipated future machine of this class.

A Federal Project Director has been assigned to this Project.

Critical Milestone History

Fiscal Quarter or Date[a]

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2018	4/28/2017	5/10/2017	1QFY2018	4QFY2018	4QFY2018	1QFY2019	N/A	3QFY2021
FY 2019	4/28/2017	5/10/2017	2QFY2018	2QFY2019	2QFY2019	2QFY2019	N/A	4QFY2022
FY 2020	4/28/2017	5/10/2017	5/29/2018	1QFY2020	3QFY2019	1QFY2020	N/A	4QFY2022

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete (d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

[a] The schedules are only estimates until the project baseline is approved.

Fiscal Quarter or Date

Fiscal Year	CD-3A
FY 2018	N/A
FY 2019	N/A
FY 2020	3QFY2019

CD-3A – Long Lead Procurements

Project Cost History[b]

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2018	3,000	92,000	95,000	12,000	0	12,000	107,000
FY 2019	15,000	101,000	116,000	9,000	0	9,000	125,000
FY 2020	15,000	101,000	116,000	9,000	0	9,000	125,000

2. Project Scope and Justification

Scope

The proposed project will modify Building 453 (B453) at LLNL to accommodate the increased infrastructure demands of exascale computing platforms. Commissioned in 2004, B453 has been capable of housing the largest, most advanced classified systems to date but requires upgrades to the electrical, mechanical, and structural capabilities for the new systems. The project alters approximately 20,000 ft^2 of floor space in the facility. Load bearing steel columns and foundation and wall improvements will be added to increase the floor load limits to handle computing racks up to 7,500 lbs. The existing cooling tower complex will be expanded by 13,700 tons of capacity, including required piping and pumps. Lastly, the existing electrical system will be upgraded to allow for an additional 40 MW of power for High Performance Computing, including the required feeders for mechanical and data systems; secondary electrical panels and feeders; and substation transformers, switchgear, switches, and bussing.

Justification

The NNSA requires vastly more powerful computers to address increasingly challenging certification requirements associated with meeting the Stockpile Stewardship Program mission as the nuclear weapons stockpile ages. These next-generation computers will require unprecedented electrical power and cooling. In addition, compact architectures will demand higher rack densities that will exert floor weights substantially beyond current systems. Supporting future generations of computing systems will therefore impose requirements on NNSA facilities that exceed their current thresholds in terms of power, water, and structural floor loads.

The ASC has a mission need to acquire infrastructure capable of meeting the projected structural, electrical, and mechanical requirements for the new generation of computers. Along with the necessity of expanding system capacity prior to the delivery of next generation computing systems, prudent risk management calls for an infrastructure necessary to accommodate new computer designs having increased requirements across an array of factors, including number of processors per system, density of processors per rack, and new approaches to power and cooling.

Funds appropriated under this data sheet may be used for contracted support services to the Federal Program Manager and the Federal Project Director to conduct independent assessments of the planning and execution of this Project required by DOE O 413.3B and to conduct technical reviews of design and construction documents.

[b] The costs are estimates only until approval of the project baseline.

The Project is being conducted in accordance with the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets. As allowed by DOE O 413.3B, work will be phased to improve overall efficiency. NNSA is planning to use a Design-Bid-Build approach for this project. OPCs are included in the ASC program within RDT&E.

Key Performance Parameters (KPPs)
The KPPs represent the minimum acceptable performance that the project must achieve. Achievement of the KPPs will be a prerequisite for approval of CD-4, Project Completion. The KPPs represent the desired project performance.

Performance Measure	Objective
Provide adequate square footage to site exascale class computers systems and related systems.	20,000 square feet
Increase power capacity to meet exascale systems demand.	85 MW
Increase mechanical liquid-cooling water capacity to meet exascale systems demand.	18,000 tons
Increase the load carrying capability of the computer floor to accommodate heavier computer racks.	315 lbs./ft2

3. Project Cost and Schedule[c]

Financial Schedule

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2018	3,000	3,000	670
FY 2019	12,000	12,000	12,000
FY 2020	0	0	2,330
Total, Design	**15,000**	**15,000**	**15,000**
Construction			
FY 2019	11,000	11,000	10,500
FY 2020	50,000	50,000	47,500
FY 2021	27,000	27,000	27,500
FY 2022	13,000	13,000	15,500
FY 2023	0	0	0
FY 2024	0	0	0
FY 2025	0	0	0
Total, Construction	**101,000**	**101,000**	**101,000**
Total Estimated Costs			
FY 2018	3,000	3,000	670
FY 2019	23,000	23,000	22,500
FY 2020	50,000	50,000	49,830

[c] The costs are estimates only until approval of the project baseline.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2021	27,000	27,000	27,500
FY 2022	13,000	13,000	15,500
Total, TEC	**116,000**	**116,000**	**116,000**
Other Project Costs (OPC)			
OPC, except D&D			
FY 2017*	2,000	2,000	1,350
FY 2018*	2,000	2,000	1,732
FY 2019*	0	0	650
FY 2020	0	0	0
FY 2021	3,000	3,000	3,268
FY 2022	2,000	2,000	2,000
Total OPC, except D&D	**9,000**	**9,000**	**9,000**
OPC D&D			
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
Total, OPC D&D	**0**	**0**	**0**
Total Other Project Costs			
FY 2017	2,000	2,000	1,350
FY 2018	2,000	2,000	1,732
FY 2019	0	0	650
FY 2020	0	0	0
FY 2021	3,000	3,000	3,268
FY 2022	2,000	2,000	2,000
Total, OPC	**9,000**	**9,000**	**9,000**
Total Project Costs (TPC)			
FY 2017	2,000	2,000	1,350
FY 2018	5,000	5,000	2,402
FY 2019	23,000	23,000	23,150
FY 2020	50,000	50,000	49,830
FY 2021	30,000	30,000	30,768
FY 2022	15,000	15,000	17,500
Grand Total	**125,000**	**125,000**	**125,000**

* Retroactively adding the Actuals for FY 2017.

Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	7,000	7,000	N/A
Project Management	4,300	4,300	N/A
Federal Support	500	500	N/A
Contingency	3,200	3,200	N/A
Total, Design	15,000	15,000	N/A
Construction			
Site Work	0	0	N/A
Equipment	0	0	N/A
Construction	75,800	75,800	N/A
Construction Management	3,600	3,600	N/A
Federal Support	1,600	1,600	N/A
Contingency	20,000	20,000	N/A
Total, Construction	101,000	101,000	N/A
Other TEC (if any)			
Cold Startup	0	0	N/A
Contingency	0	0	N/A
Total, Other TEC	0	0	N/A
Total, TEC	**116,000**	**116,000**	**N/A**
Contingency, TEC	23,200	23,200	N/A
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	N/A
Conceptual Planning	3,500	3,500	N/A
Conceptual Design	1,500	1,500	N/A
Federal Support	500	500	N/A
Contractor Support	2,200	2,200	N/A
Security	0	0	N/A
Other OPC Costs	0	0	N/A
Contingency	1,300	1,300	N/A
Total, OPC	9,000	9,000	N/A
Contingency, OPC	1,300	1,300	N/A
Total Project Cost	**125,000**	**125,000**	**N/A**
Total Contingency (TEC+OPC)	**24,500**	**24,500**	**N/A**

Schedule of Appropriations Requests

(Dollars in Thousands)[d]

Request Year	Type	Prior Years	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	Total
FY 2018	TEC	0	3,000	40,000	44,000	8,000	0	0	95,000
	OPC	2,000	2,000	3,000	3,000	2,000	0	0	12,000
	TPC	2,000	5,000	43,000	47,000	10,000	0	0	107,000
FY 2019	TEC	0	3,000	23,000	50,000	27,000	13,000	0	116,000
	OPC	2,000	2,000	0	0	3,000	2,000	0	9,000
	TPC	2,000	5,000	23,000	50,000	30,000	15,000	0	125,000
FY 2020	TEC	0	3,000	23,000	50,000	27,000	13,000	0	116,000
	OPC	2,000	2,000	0	0	3,000	2,000	0	9,000
	TPC	2,000	5,000	23,000	50,000	30,000	15,000	0	125,000

4. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	4Q FY2022
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	N/A

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	28.1	28.1	1,405	1,405

5. D&D Information

There is no new square footage being constructed with this Project.

6. Acquisition Approach

The ASC Program has completed an analysis to determine the best value for the government in terms of the Acquisition Strategy. The Program worked with the U.S. Army Corps of Engineers and the LLNL Management & Operating (M&O) contractor to determine which strategy provides the best value at the least risk for the execution, design and construction management of this project. The selected Acquisition Strategy will be to execute a design-bid-build contract on firm-fixed base that will be awarded by the M&O Contractor.

[d] Outyear funding for the project may be revised in future budget requests once NNSA baselines the project.

Advanced Manufacturing Development

Overview

The Advanced Manufacturing Development (AMD) program will directly affect the future agility and responsiveness of the National Nuclear Security Administration's (NNSA) manufacturing infrastructure by providing capable, efficient, and effective manufacturing solutions to address technical challenges and respond to a changing geopolitical environment. A long-term advanced manufacturing roadmap has been created for the Additive Manufacturing (AM) and Component Manufacturing Development (CMD) subprograms that is linked to the 2018 Nuclear Posture Review objectives, the Nuclear Weapons Council strategic guidance, and the Technology Development Strategic Plan. This roadmap is focused on developing needed improvements to impact future stockpile insertion opportunities. AMD conducts development in areas such as AM, automation, intelligent production systems, and high-precision manufacturing processes to reduce production time, waste, and floor space requirements. In accomplishing its mission, the AMD program enables the NNSA to accelerate the development of manufacturing technologies prior to Phase 6.3 of a future weapon program, driving schedule and cost confidence, as well as enhancing NNSA's overall production capabilities.

The AMD program is composed of the following three subprograms:

Additive Manufacturing: AM capitalizes on three-dimensional printing of polymers and metals that shorten production schedules and design cycles, leading to lower life-cycle costs. The NNSA has demonstrated an approximate $125 million dollar cost avoidance since 2013 in utilizing AM for tools, fixtures, and molds.[a] Additionally, all current major modernization programs have baselined an AM process for a limited number of components. As part of the implementation strategy across the nuclear weapons enterprise, when this subprogram demonstrates the feasibility and value of AM for a weapons application, future weapon programs, like the W87-1 Modification Program (formerly IW1), can then use AM for critical applications with confidence.

Component Manufacturing Development: CMD accelerates the development of new manufacturing science and engineering capabilities that will replace hazardous, inefficient, and obsolete process prior to Phase 6.3 of a future weapon system. In pursuing the long-term advanced manufacturing strategy, this subprogram prioritizes developing improvements that will demonstrate viability for a particular application, which allows future weapon modernization efforts to incorporate those production methods with confidence to meet program requirements, costs and schedule. Replacing specific processes by Phase 6.3 of the W87-1 Modification Program (formerly IW1) will allow the NNSA to reduce future demand on the supply of a strategic material by minimizing efforts needed to recover, recycle and/or produce the material, reduce production floor space for certain processes by over fifty percent, and manufacture with replacement materials that are less hazardous and costly to produce.

Process Technology Development (PTD): PTD develops, demonstrates, and applies new production technologies to reduce costs and improve manufacturing processes for nuclear weapon materials. This subprogram ensures dedicated funding for new technologies with the potential to shorten production schedules, reduce risks, or enhance personnel safety. Presently, the subprogram is focused on uranium processing technologies that will replace a subset of enriched uranium capabilities in Building 9212 at the Y-12 National Security Complex. The installation and operation of these systems in existing facilities will allow for the current aqueous-based chemical recovery and high-hazard metal conversion processes to be shut down. This effort entails continuing to support the three current major items of equipment (MIE) and associated technology development efforts:

- Electrorefining – an electrochemical metal purification system designed to provide a replacement capability for the current metal purification process.

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[a] The basis of the cost avoidance assessment was generated by a KCNSC Advanced Manufacturing (AM) team and the NNSA Cost Tracking team that assessed a large number of scenarios, comparing costs of producing different tools/fixtures/molds with AM versus traditional methods. Average cost savings/avoidance per part per category was determined and applied to calculate the total cost avoidance. Using this methodology, the $125M cost avoidance is the result of additive manufacturing used in day-to-day production operations, not just new capability demonstrated by AM investments.

- Calciner – a dry thermal treatment process to recover low equity enriched uranium. A rotary drum calciner will replace aqueous recovery of low equity enriched uranium from materials by segregating salvage and accountability functions.
- Direct Chip Melt – the recovery of enriched uranium machine tool chips/turning by collecting and melting them in furnaces installed near the machines where the chips are generated. This will replace current practices of transferring, cleaning, briquetting, and storing in another facility.

Advanced Manufacturing Development
Funding

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
	(Dollars in Thousands)			
Research, Development, Test and Evaluation				
Advanced Manufacturing Development				
Additive Manufacturing	12,000	12,000	18,500	+6,500
Component Manufacturing Development	38,644	38,644	48,410	+9,766
Process Technology Development	34,896	30,914	69,998	+39,084
Total, Advanced Manufacturing Development	**85,540**	**81,558**	**136,908**	**+55,350**

Outyears for Advanced Manufacturing Development
Funding

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
	(Dollars in Thousands)			
Research, Development, Test and Evaluation				
Advanced Manufacturing Development				
Additive Manufacturing	19,761	19,761	20,205	20,629
Component Manufacturing Development	63,566	67,552	70,828	78,129
Process Technology Development	31,714	29,835	31,043	32,190
Total, Advanced Manufacturing Development	**115,041**	**117,148**	**122,076**	**130,948**

Advanced Manufacturing Development
Explanation of Major Changes
(Dollars in Thousands)

	FY 2020 Request vs FY 2019 Enacted
Advanced Manufacturing Development	
Additive Manufacturing: The increase supports expansion of AM for specific stockpile components; development of a qualified AM process for metal components; replacement of timely and inefficient conventional polymer processes with more agile and responsive AM methods; development of innovative, cost-saving technologies for insertion in the W87-1 Modification Program (formerly IW1); and investment in advanced technologies for future weapon systems.	**+6,500**
Component Manufacturing Development: The increase will accelerate development of new manufacturing processes to replace hazardous and obsolescent processes and other critical technologies by FY 2023 to support the W87-1 Modification Program (formerly IW1); and invest in transforming NNSA's manufacturing infrastructure by introducing new manufacturing technologies for future major modernization programs (e.g., the Navy Ballistic Missile Warhead).	**+9,766**
Process Technology Development: The increase represents peak execution of several uranium metal processing projects at Y-12.	**+39,084**
Total, Additive Manufacturing Development	**+55,350**

Advanced Manufacturing Development
Additive Manufacturing

Description

The Additive Manufacturing (AM) subprogram capitalizes on three-dimensional printing of polymers and metals that shorten production schedules and design cycles, leading to lower life-cycle costs. The NNSA has demonstrated an approximate $125 million dollar cost avoidance since 2013 in utilizing AM for tools, fixtures, and molds. Additionally, all current major modernization programs have baselined an AM process for a limited number of components. As part of the implementation strategy across the nuclear weapons enterprise, when this subprogram demonstrates the feasibility and value of AM for a weapons application, future weapon programs, like the W87-1 Modification Program (formerly IW1), can then use AM for critical applications with confidence.

When deploying any new technology, ensuring that it is sufficiently safe and reliable for stockpile applications is a major challenge. The NNSA is overcoming this challenge by making specific investments and leveraging existing programmatic work, to not only realize the near-term benefits of additive manufacturing, but to assess the technology's feasibility for more challenging applications by making long-term investments.

Highlights of the FY 2020 Budget Request

- Advance qualification and certification methods to use AM-produced parts in the active stockpile.
- Transition AM machine capabilities to a production environment to deliver AM parts to the stockpile.
- Leverage scientific knowledge for new qualification and certification methods to enable delivery of AM components intended for the W87-1 Modification Program (formerly IW1).
- Conduct testing to confirm AM components will improve performance margins.

FY 2021 – FY 2024 Key Milestones

- Place filled AM gas bottles into long-term storage by FY 2021 to gather material and component performance data that will assist in determining the viability for future systems.
- Investigate the applicability and viability of additively manufactured energetics and new types of plastics by FY 2022.
- Develop AM thermoset materials that may have advantages in performance, cost, manufacturability, reliability, and/or supply chain security.
- Develop the methodologies required to qualify and certify AM for metal lattices by FY 2023.

FY 2018 Accomplishments

- Matured AM processes for stochastic coatings, specifically the Controlled Atmospheric Plasma Spray.
- Initiated a project execution plan to shift from conventional to AM polymers that by 2025 will result in a ninety percent reduction in polymer production footprint at half the cost per part.
- Advanced metal AM and lattice technology readiness levels.
- Developed advanced high explosives (HE) with improved safety margins over conventional HE and better performance than insensitive HE.

Additive Manufacturing

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Additive Manufacturing $12,000,000	**Additive Manufacturing $18,500,000**	**Additive Manufacturing +$6,500,000**
• Develop manufacturing processes and prototypes for potential stockpile applications, such as energetics, metal and polymer lattices, and gas bottles. • Improve understanding of the science behind additive manufacturing through material performance and process controls. • Explore methodologies to improve AM process reliability and repeatability. • Leverage qualification / certification methods to enable delivery of AM components intended for the W87-1 Modification Program (formerly IW1).	• Advance qualification and certification methods to use AM-produced parts in the active stockpile. • Transition AM machine capabilities to a production environment to deliver AM parts to the stockpile. • Leverage scientific knowledge for new qualification and certification methods to enable delivery of AM components intended for the W87-1 Modification Program (formerly IW1). • Conduct testing to confirm AM components will improve performance margins.	• The increase represents expansion of AM for specific stockpile components; development of a qualified AM process for metal components; replacement of timely and costly conventional polymer processes with more agile and responsive AM methods; development of innovative, cost-saving technologies for insertion in the W87-1 Modification Program (formerly IW1); and investment in advanced technologies for future weapon systems.

Advanced Manufacturing Development
Component Manufacturing Development

Description
CMD accelerates the development of new manufacturing science and engineering capabilities that will replace hazardous, inefficient, and obsolete process prior to Phase 6.3 of a future weapon system. In pursuing the long-term advanced manufacturing strategy, this subprogram prioritizes developing improvements that demonstrate viability for a particular application, which allows future weapon modernization efforts to incorporate those production methods with confidence to meet program requirements, costs and schedule. Replacing specific processes by Phase 6.3 of the W87-1 Modification Program (formerly IW1) will allow the NNSA to reduce future demand on the supply of a strategic material by minimizing efforts needed to recover, recycle and/or produce the material, reduce production floor space for certain processes by over fifty percent, and manufacture with replacement materials that are less hazardous and costly to produce.

Highlights of the FY 2020 Budget Request
- Accelerate development of new manufacturing processes to replace hazardous and obsolescent processes by Phase 6.3 of the W87-1 Modification Program (formerly IW1) (FY 2023).
- Transition direct casting technology from prototype facilities to the production facility, a process that will reduce waste of a strategic material by over forty percent, curtailing long-term demands on its supply and avoiding material recycling efforts and costs.
- Initiate manufacturing readiness studies for certain production processes using replacement materials, where traditional materials required hazardous, inefficient, and costly production techniques.
- Execute multiple uranium metal processing and production activities at Y-12.

FY 2021 – FY 2024 Key Milestones
- Develop and implement solutions to produce useable magnesium oxide for thermal batteries by FY 2021.
- Introduce several new manufacturing process control diagnostics by FY 2023 to mitigate supply chain risks (e.g., counterfeit and defect detection capabilities).
- Mature advanced special material component manufacturing and microelectronics development for insertion into future weapon and demonstrator programs.

FY 2018 Accomplishments
- Established a Technology Readiness Team to plan and oversee the transition of direct casting to the production environment by FY 2023.
- Demonstrated a limited ability to deploy direct casting for the next program of record, and procured a developmental multi-zone Vacuum Induction Melt furnace for the production site.
- Refined magnesium oxide material specifications, evaluated material performance, and matured the manufacturing capability for the W87-1 Modification Program (formerly IW1).
- Advanced improved microelectronics production capabilities for optical performance and other metallization processes, improving the ability to package microchips.
- Initiated cold hearth melting testing and material formulation to inform production needs and define qualification and certification requirements.
- Delivered the Hydrogen Processing Demonstration System which enables research and development for tritium processing and storage.

Component Manufacturing Development

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Component Manufacturing Development $38,644,000	**Component Manufacturing Development $48,410,000**	**Component Manufacturing Development +$9,766,000**
• Develop associated technologies with advanced additive manufacturing, advanced materials, and digital manufacturing. • Accelerate AM prototype development for one of the Integrated Surety Architecture technologies, the Multi- Application Transportation Attachment Device. • Leverage LANL production development work for components at Y-12. • Accelerate development of manufacturing process control diagnostics to mitigate supply chain risks. • Complete CNS evaluation and implementation of additive manufacturing methods in unexplored tooling and engineering applications.	• Install and establish operational parameters for a multi-zone Vacuum Induction Melt furnace at the production facility. • Complete and transfer results from studies supporting fabrication of binary components for next program of record. • Refine process parameters and new material performance specifications for fabrication of binary components. • Mature magnesium oxide development and manufacturing parameters, and conduct performance testing. • Complete evaluation of the cold hearth melting process and define process requirements for deployment at the production facility. • Develop and evaluate production processes for pressure generating materials and evaluate a future NNSA production capability.	• The increase represents accelerated development of new manufacturing processes to replace hazardous and obsolete processes by FY 2023 to support the W87-1 Modification Program (formerly IW1), support development of critical technologies required for the W87-1 Modification Program (formerly IW1), and invest in new manufacturing technologies to support future modernization programs.

Advanced Manufacturing Development
Process Technology Development

Description

The Process Technology Development subprogram supports the development, demonstration, and utilization of new production technologies to reduce costs and enhance nuclear manufacturing capabilities for nuclear weapon materials. PTD ensures that new technologies with the potential to shorten production schedules, reduce risks, or enhance personnel safety have a dedicated funding source to reach more optimal levels. Presently, the subprogram is focused on uranium processing technology, including the development and acquisition of MIEs for Y-12.

Highlights of the FY 2020 Budget Request

PTD is relocating and deploying critical uranium metal processing capabilities at Y-12. Projects include:

- Continue the installation of a calciner in Building 9212 to process uranium solutions and an electro-refining capability in Building 9215 to purify uranium metal.
- Procurement and installation of direct chip melt furnaces in Building 9215.
- Conceptual Design activities to reestablish a uranium oxide to metal capability.

FY 2021 – FY 2024 Key Milestones

- Complete installation and start-up of the calciner in 2022 to phase out mission dependency on Building 9212.
- Complete installation and start-up of the electro-refiner process line in 2022 to replace metal purification production activities currently being performed in Building 9212.
- Install and start-up direct chip melt furnaces in Building 9215 to replace the current inefficient process.
- Relocate the capability to convert uranium oxide to metal.
- Mature additional technologies to enhance manufacturing capabilities and meet emerging production needs.

FY 2018 Accomplishments

- Completed the Critical decision (CD) 2/3 package for the Electrorefining project.
- Advanced the design for the Calciner project.

Process Technology Development

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Process Technology Development $30,914,000	**Process Technology Development $69,998,000**	**Process Technology Development +$39,084,000**
• Continue to execute the calciner, electro-refiner, and direct chip melt furnace(s) MIE and associated technology development efforts and refine the scope for the direct electrolytic reduction MIE.	• PTD is relocating and deploying critical uranium metal processing capabilities at Y-12. In FY 2020, NNSA will continue installation of a calciner in Building 9212 to process uranium solutions, and an electro-refining capability in Building 9215 to purify uranium metal. FY 2020 also reflects procurement and installation of direct chip melt furnaces in Building 9215, and conceptual design activities to reestablish a uranium oxide to metal capability.	• The increase represents peak execution of the 9212 calciner and electro-refiner projects, both of which will be baselined by FY 2020; procurement and installation of direct chip melt furnaces; and activities to replace the uranium oxide to metal capability.

Advanced Manufacturing Development
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	73,710	73,710	74,590	82,004	7,414
Minor Construction	N/A	N/A	0	0	0	0	0
Total, Capital Operating Expenses	N/A	N/A	**73,710**	**73,710**	**74,590**	**82,004**	**+7,414**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	34,882	34,882	35,649	36,433	+784
Calciner, Y-12	61,188	17,515	12,652	12,652	14,335	15,486	+1,151
Machine Chip Processing Furnace 1, Y-12	9,750	5,240	4,510	4,510	0	0	+0
Machine Chip Processing Furnace 2, Y-12	9,750	0	9,750	9,750	0	0	+0
Electrorefining, Y-12	101,000	34,934	11,916	11,916	19,746	22,845	+3,099
Bottom Loading Furnace , Y-12	19,500	0	0	0	4,860	7,240	+2,380
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**73,710**	**73,710**	**74,590**	**82,004**	**7,414**
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A	0	0	0	0	+0
Thermal Spray Research Lab (TSRL) Replacement, SNL	13,550	0	0	0	0	0	+0
Total, Minor Construction Projects	**N/A**	**N/A**	**0**	**0**	**0**	**0**	**0**
Total, Capital Summary	**N/A**	**N/A**	**73,710**	**73,710**	**74,590**	**82,004**	**+7,414**

Outyears for Advanced Manufacturing Development

(Dollars in Thousands)

	FY 2021 Estimate	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	56,256	39,192	38,891	39,747	0
Minor Construction	0	0	1,060	12,490	0
Total, Capital Operating Expenses	**56,256**	**39,192**	**39,951**	**52,237**	**0**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	37,235	38,054	38,891	39,747	0
Calciner, Y-12	1,200	0	0	0	0
Electrorefining, Y-12	10,421	1,138	0	0	0
Bottom Loading Furnace, Y-12	7,400	0	0	0	0
Total, Capital Equipment (including MIE)	**56,256**	**39,192**	**38,891**	**39,747**	**0**
Minor Construction Projects (Total Estimated Cost (TEC)					
Total Minor Construction Projects (TEC <$5M)	0	0	0	0	0
Thermal Spray Research Lab (TSRL) Replacement, SNL	0	0	1,060	12,490	0
Total, Minor Construction Projects	**0**	**0**	**1,060**	**12,490**	**0**
Total, Capital Summary	**56,256**	**39,192**	**39,951**	**52,237**	**0**

Project	Location/ Site	Project Description	TPC ($k)	Project Milestones		
				Project Start	Design Complete	Construction Complete
Thermal Spray Research Lab (TSRL) Replacement, SNL	LANL	A TSRL replacement facility supports technology maturation and production activities on a timeline that aligns to the current FY18 Stockpile Stewardship and Management Plan Baseline Life Extension Plan.	13,550	FY 2023	FY 2023	FY 2024

Infrastructure and Operations

Overview
The Infrastructure and Operations program maintains, operates, and modernizes the National Nuclear Security Administration (NNSA) infrastructure in a safe, secure, and cost-effective manner to support all NNSA program results. Infrastructure and Operations efforts provide a comprehensive approach to modernizing NNSA infrastructure while maximizing return on investment, enabling program results, and reducing enterprise risk. The program also plans, prioritizes, and constructs state-of-the-art facilities, infrastructure, and scientific tools.

Operations of Facilities
The Operations of Facilities program provides the funding required to operate NNSA facilities in a safe and secure manner and is fundamental to achieving NNSA's plutonium, uranium, tritium, lithium, high explosives, and other mission objectives. This program includes essential support such as water and electrical utilities; safety systems; lease agreements; and activities associated with Federal, state, and local environmental, worker safety, and health regulations.

Safety and Environmental Operations
The Safety and Environmental Operations program provides for the Department's Nuclear Criticality Safety Program (NCSP), Nuclear Safety Research and Development (NSR&D), Packaging subprogram, and Long Term Stewardship (LTS) subprogram. These activities support safe, efficient operation of the nuclear security enterprise through the provision of safety data, environmental monitoring, and nuclear material packaging.

Maintenance and Repair of Facilities
The Maintenance and Repair of Facilities program (Maintenance) provides direct-funded maintenance activities across the NNSA enterprise for the recurring day-to-day work required to sustain and preserve NNSA facilities and equipment in a condition suitable for their designated purpose. These efforts include predictive, preventive, and corrective maintenance activities to maintain facilities, property, assets, systems, roads, equipment, and vital safety systems.

Recapitalization
The Recapitalization program, comprised of the Infrastructure and Safety subprogram and the Capability Based Investments subprogram, is key to modernizing NNSA's infrastructure. A sustained investment in Recapitalization is needed to address numerous obsolete support and safety systems; revitalize facilities that are beyond the end of their design life; and improve the reliability, efficiency, and capability of core infrastructure to meet mission requirements. The Recapitalization program modernizes NNSA infrastructure by prioritizing investments to improve the condition and extend the life of structures, capabilities, and systems thereby improving the safety and quality of the workplace. Recapitalization investments help achieve operational efficiencies and reduce safety, security, environmental, and program risk.

The Recapitalization program includes minor construction projects, capital equipment, Other Project Costs (OPC) for Infrastructure and Operations funded mission enabling infrastructure and several programmatic line item construction projects, and deactivation and disposal of excess infrastructure.

Line Item Construction
Infrastructure and Operations line item construction projects are critical to revitalizing the infrastructure and program-specific capabilities that directly support the nuclear weapons programs. These projects will replace obsolete, unreliable facilities and infrastructure to reduce safety and program risk while improving responsiveness, capacity, and capabilities.

Highlights of the FY 2020 Budget Request
The FY 2020 Infrastructure and Operations Budget Request totals $3,208,442,000, which represents the continuation of a long-term effort to modernize NNSA infrastructure. This request includes increases to Operations of Facilities to support programmatic tempo increases, and Capability Based Investments to support Other Project Cost (OPC) activities for four programmatic line item projects and growth in programmatic equipment recapitalization requirements. The decrease to Maintenance and Repair of Facilities allows the sites to absorb the significant increases in FY 2018 and FY 2019 funding by increasing staffing levels to address the long-standing deficiency of a robust maintenance program. Overall funding for maintenance has grown significantly but appropriately over the last several budget cycles. This will address carryover balances and support growing maintenance staffing levels to maintain and preserve facilities in a condition suitable to meet

an increasing mission demand. The request also supports an increase in funding for the Uranium Processing Facility (UPF) per the project execution plan and efforts to phase out mission dependency in the existing aged facilities. Funding is also provided for the Chemistry and Metallurgy Research Replacement (CMRR) project, the U1a Complex Enhancements Project, the Lithium Processing Facility, the Tritium Finishing Facility, the High Explosive Science & Engineering Facility, the 138kV Power Transmission System Replacement project, and the Emergency Operations Centers at Sandia National Laboratories (SNL) and Lawrence Livermore National Laboratory (LLNL).

Infrastructure Modernization Initiative

The FY 2018 National Defense Authorization Act (NDAA) directed the creation of the Infrastructure Modernization Initiative (IMI) program, which the NNSA Administrator created in December 2017. The goal of the IMI is to reduce deferred maintenance (DM) and repair needs (RN) by not less than 30 percent by 2025. The IMI will be carried out under the current budget structure via the Recapitalization: Infrastructure and Safety and Maintenance and Repair of Facilities programs. The initial plan was transmitted to Congress in September 2018.

Major Outyear Priorities and Assumptions

Outyear funding levels for Infrastructure and Operations total $11,904,999,000 for FY 2021 through FY 2024. Outyear priorities will focus on the IMI goal of reducing DM and RN and continuing to modernize NNSA's infrastructure to reduce mission and safety risks through the application of an enterprise risk management methodology, with line item construction investments largely directed to uranium, tritium, lithium, and high explosives infrastructure. NNSA will seek operational efficiencies by deactivating and dispositioning facilities that are no longer needed, thereby reducing operations, maintenance, and recapitalization requirements.

In response to GAO recommendations, the following information is provided to improve transparency in the budget. Table 1 below lists total DM at NNSA sites as well as the subset of DM on excess facilities and facilities to be excessed in 10 years.

Table 1

NNSA Deferred Maintenance (DM) as of FY 2018 (dollars in thousands)	
Total DM	2,546,326
DM on excess facilities	42,071
DM on facilities to be excessed in 10 years	149,022

Approximately 6 percent of NNSA DM is associated with facilities that are or will be excess in the next 10 years. As part of a prudent investment strategy, NNSA will intentionally not perform some of the maintenance and repair on facilities that are or soon will become excess. In addition, NNSA will eliminate DM on excess facilities via disposition.

NNSA annually screens excess facilities to identify the highest risks to mission, workers, the public, and the environment to support risk-informed decision making. Table 2 lists the highest-risk facilities.

Table 2

NNSA's Highest-Risk Excess Facilities			
Site	Facility	Year Built	Year Shut Down
Y-12	Alpha 5, Building 9201-05	1944	1983
Y-12	Beta 4, Building 9204-04	1945	2007
Y-12	Building 9206	1944	1993
Y-12	Storage, Building 9720-22	1966	2012
Y-12	Warehouse/Industrial, Building 9720-17[a]	1956	2016
LLNL	Heavy Elements Facility, Building 251	1956	1995
LLNL	Livermore Pool-Type Reactor, Building 280	1956	1980
LLNL	MARS-E Beam, Building 175	1980	1999
LLNL	Rotating Target Neutron Source Facility, Building 292	1979	1987
LLNL	Pluto Project Testing and Fabrication Facility, Building 241	1960	2008

LANL	Ion Beam Facility, Building TA-3-0016	1953	1999
LANL	Lab/Office, Building 46-0001[a]	1956	2009

[a] Facility contains radiological and/or hazardous contamination based on historical use.

Infrastructure and Operations
Funding

(Dollars in Thousands)

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Infrastructure and Operations				
Operating				
Operations of Facilities	848,470	870,000	905,000	+35,000
Safety and Environmental Operations	110,000	110,000	119,000	+9,000
Maintenance and Repair of Facilities	515,138	515,000	456,000	-59,000
Recapitalization				
Infrastructure and Safety	482,661	450,000	447,657	-2,343
Capability Based Investments	130,000	109,057	135,341	+26,284
Subtotal, Recapitalization	**612,661**	**559,057**	**582,998**	**+23,941**
Total, Operating	**2,086,269**	**2,054,057**	**2,062,998**	**+8,941**
Construction	1,031,534	1,033,795	1,145,444	+111,649
Total, Infrastructure and Operations	**3,117,803**	**3,087,852**	**3,208,442**	**+120,590**

Outyears for Infrastructure and Operations
Funding

(Dollars in Thousands)

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Infrastructure and Operations				
Operating				
Operations of Facilities	915,000	925,000	935,000	960,000
Safety and Environmental Operations	124,000	125,000	127,000	127,000
Maintenance and Repair of Facilities	480,000	490,000	510,000	525,000
Recapitalization				
Infrastructure and Safety	378,905	401,236	404,654	412,628
Capability Based Investments	127,930	126,066	128,504	131,203
Subtotal, Recapitalization	**506,835**	**527,302**	**533,158**	**543,831**
Total, Operating	**2,025,835**	**2,067,302**	**2,105,158**	**2,155,831**
Construction	1,007,427	871,500	662,509	1,009,437
Total, Infrastructure and Operations	**3,033,262**	**2,938,802**	**2,767,667**	**3,165,268**

Infrastructure and Operations
Explanation of Major Changes
(Dollars in Thousands)

	FY 2020 Request vs FY 2019 Enacted
Infrastructure and Operations	
Operating	
Operations of Facilities: The increase reflects increasing workload supporting the W80-4 LEP at SNL-California, and B61-12 and W88 flight tests at Tonopah Test Range; hiring of critical skill employees at LLNL; increased resources at nuclear and high hazard facilities to meet increased mission needs at the Nevada National Security Site (NNSS) and Y-12; and additional resources to support safe and effective execution in tritium and other facilities at the Savannah River Site (SRS).	**+35,000**
Safety and Environmental Operations: The increase reflects the transfer of scope from Operations of Facilities for five facilities at Y-12 that treat waste streams associated with the Long Term Stewardship (LTS) program, and funds LTS performance of required retained obligations scope at the Bannister Federal Complex in Kansas City.	**+9,000**
Maintenance and Repair of Facilities: The decrease allows the sites to absorb the significant increases in FY 2018 and FY 2019 funding by increasing staffing levels to address the long-standing deficiency of a robust maintenance program. Overall funding for maintenance has grown significantly but appropriately over the last several budget cycles. This will address carryover balances, and allow for increased maintenance staffing levels to maintain and preserve facilities in a condition suitable to meet an increasing mission demand.	**-59,000**
Recapitalization	
Infrastructure and Safety: No significant changes	**-2,343**
Capability Based Investments (CBI): The change reflects an increase of $19 million of OPC funding to develop new programmatic line item projects (High Explosives Synthesis, Formulation and Production, the Combined Radiation Effects Survivability Testing Facility, and Power Sources Revitalization), and an additional $4 million to continue the conceptual design for the Material Staging Facility. It also supports growth in programmatic equipment recapitalization requirements as CBI ramps up to support the W80-4 LEP, while continuing to support B61-12 LEP and W88 Alteration 370 interface commitments.	**+26,284**
Total, Recapitalization	**+23,941**
Total, Operating	**+8,941**
Construction: The increase primarily reflects funding for construction of the UPF at Y-12, the High Explosive Science & Engineering Facility at Pantex, and the U1a Complex Enhancements Project at NNSS. These increases are slightly offset by a reduction in funding requested for the CMRR project and the Material Staging Facility, as well as the completion of funding requests for the Albuquerque Complex Project.	**+111,649**
Total, Infrastructure and Operations	**+120,590**

Infrastructure and Operations
Operations of Facilities

Description

The Operations of Facilities program provides the funding required to operate NNSA facilities in a safe manner. Operations of Facilities is fundamental to achieving NNSA's plutonium, uranium, tritium, lithium, high explosives, and other mission objectives. It includes essential support such as water and electrical utilities, safety systems, lease agreements for facilities and land, emergency response services, and other critical systems. This program also provides resources for environment, safety, health, and quality (ESH&Q) costs associated with ensuring compliance with Federal; state; and local environmental, worker safety, and health regulations as well as applicable DOE Orders and Directives.

The Operations of Facilities program also funds waste management activities, including treatment, storage, and waste disposition of both hazardous and newly generated radiological wastes. It provides for the daily operations and staffing to ensure facilities, systems, equipment, and capabilities are available to meet mission requirements. FY 2018-FY 2024 site allocations for the Operations of Facilities program are provided in Table 3 below.

Table 3

National Nuclear Security Administration Operations of Facilities Allocations by Site (Dollars in Thousands)							
Site	**FY 2018 Enacted**	**FY 2019 Enacted**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**
Kansas City National Security Campus	80,000	82,000	79,000	80,000	82,000	85,000	87,000
Lawrence Livermore National Laboratory	88,470	77,000	81,000	81,000	82,000	83,000	86,000
Los Alamos National Laboratory	207,000	227,000	231,000	233,000	234,000	235,000	242,000
Nevada National Security Site	93,000	95,000	100,000	101,000	102,000	103,000	105,000
Pantex Plant	59,000	65,000	69,000	71,000	72,000	73,000	75,000
Sandia National Laboratories	118,000	119,000	128,000	129,000	130,000	131,000	133,000
Savannah River Site	99,000	92,000	96,000	98,000	100,000	101,000	106,000
Y-12 National Security Complex	104,000	104,000	109,000	110,000	111,000	112,000	114,000
Headquarters	0	9,000	12,000	12,000	12,000	12,000	12,000
TOTAL	**848,470**	**870,000**	**905,000**	**915,000**	**925,000**	**935,000**	**960,000**

Operations of Facilities

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Operations of Facilities $870,000,000	**Operations of Facilities $905,000,000**	**Operations of Facilities +$35,000,000**
Supports base facility operations at: • KC in support of non-nuclear production. • LLNL to support plutonium, tritium and high explosive nuclear security enterprise missions. • LANL in support of plutonium production, research, and development; chemistry and metallurgy research; weapons engineering and tritium capability; and beryllium operations. • NNSS, including experimental capabilities. • Pantex, including industrial and high explosives to support weapon assembly, disassembly, and surveillance in support of the LEPs. • SNL, including environmental testing and microelectronics technologies facilities. • SRS, including tritium and other capabilities. • Y-12 for enriched and depleted uranium, lithium, and other special material operations.	Funding supports base facility operations at: • KC, supporting non-nuclear production. • LLNL, supporting plutonium, tritium and high explosive nuclear security enterprise missions. • LANL, supporting plutonium production, research, and development; chemistry and metallurgy research; weapons engineering and tritium capability; and beryllium operations. • NNSS, including experimental capabilities. • Pantex, including industrial and high explosives to support weapon assembly, disassembly, and surveillance in support of the LEPs. • SNL, including environmental testing and microelectronics technologies facilities. • SRS, including tritium and other capabilities. • Y-12, for enriched and depleted uranium, lithium, and other special material operations.	• The increase reflects increasing workload supporting the W80-4 LEP at SNL-CA, and B61-12 and W88 flight tests at Tonopah Test Range; hiring of critical skill employees at LLNL; increased resources at nuclear and high hazard facilities to meet increased mission needs at NNSS and Y-12; and needed resources to support safe and effective execution in tritium and other facilities at SRS. • The increase is partially offset by a transfer of scope to the LTS program for five facilities at Y-12 that treat waste streams.

Infrastructure and Operations
Safety and Environmental Operations

Description

The Safety and Environmental Operations program provides for the NNSA's Nuclear Safety Research and Development (NSR&D) subprogram, Packaging subprogram, Long Term Stewardship (LTS) subprogram, and the Department's Nuclear Criticality Safety Program (NCSP). Table 4 provides the funding breakout for these subprograms.

NCSP develops, maintains and disseminates the essential technical tools, training and data required to support safe, efficient fissionable material operations within DOE. This includes maintaining and operating the National Criticality Experiments Research Center (NCERC) at NNSS where critical and sub-critical experiments are conducted to provide tests of nuclear data, analytical codes, and to develop new measurement methods.

The NSR&D subprogram provides the technical foundation for safety analyses and controls as well as authorization basis decision making for DOE/NNSA nuclear facilities and associated operations. The Safety Analytics, Forecasting, Evaluation, and Reporting (SAFER) platform is being developed as a data management capability to enable the conversion of currently available data (predominantly narrative reports) into useful information and visualizations for NNSA decision maker support. A prototype platform is being pursued with an industry leading data analytics firm that can then be scaled and operationalized for enterprise-wide risk management applications. The NCSP and NSR&D subprograms are vital to ensuring nuclear safety is achieved across the NNSA enterprise.

The Packaging subprogram ensures safe transport of nuclear and radiological materials by providing off-site shipping container research and development, design, certification, recertification, test and evaluation, production and procurement, fielding and maintenance, decontamination, and disposal. It also provides off-site transportation authorization of shipping containers for nuclear materials and components supporting both the nuclear weapons program and nuclear nonproliferation and other mission objectives.

The LTS subprogram ensures environmental safety at remediated sites with residual contamination by conducting activities necessary to meet Federal and state environmental regulatory requirements identified in legally enforceable records of decision, cleanup agreements, and consent orders. The LTS subprogram operates and maintains remediation systems and monitoring of contaminant levels in the soil and groundwater. LTS is required to meet environmental requirements associated with corrective actions at sites that are subject to the Resource Conservation and Recovery Act (RCRA) or cleanup requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Table 4

National Nuclear Security Administration
Safety and Environmental Operations Subprograms
(Dollars in Thousands)

Subprogram	FY 2018 Enacted	FY 2019 Enacted	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Nuclear Criticality Safety Program	27,623	26,887	28,474	28,776	29,298	29,576	29,968
Nuclear Safety Research and Development	3,838	6,003	4,704	5,204	5,314	5,425	5,539
Packaging	28,690	26,857	23,713	31,412	30,180	30,785	31,004
Long Term Stewardship	49,849	50,253	62,109	58,608	60,208	61,214	60,489
TOTAL	**110,000**	**110,000**	**119,000**	**124,000**	**125,000**	**127,000**	**127,000**

Safety and Environmental Operations

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Safety and Environmental Operations $110,000,000	**Safety and Environmental Operations $119,000,000**	**Safety and Environmental Operations +$9,000,000**
Nuclear Criticality Safety Program $26,887,000	**Nuclear Criticality Safety Program $28,474,000**	**Nuclear Criticality Safety Program +$1,587,000**
• Provides technical infrastructure, expertise, and experimentation capabilities for the DOE encompassing the following technical elements: Nuclear Data, Analytical Methods, Training & Education, Information Preservation and Dissemination, and Integral Experiments. Integral experiments included the NCSP's NCERC to ensure criticality safety capabilities are adequate for the DOE mission.	• Provides technical infrastructure, expertise, and experimentation capabilities for the DOE encompassing the following technical elements: Nuclear Data, Analytical Methods, Training & Education, Information Preservation and Dissemination, and Integral Experiments. Integral experiments included the NCSP's NCERC to ensure criticality safety capabilities are adequate for the DOE mission.	• No significant changes.
Nuclear Safety Research and Development $6,003,000	**Nuclear Safety Research and Development $4,704,000**	**Nuclear Safety Research and Development -$1,299,000**
• Conducts projects to provide the technical foundation for safety analyses and controls as well as authorization basis decision making for DOE/NNSA nuclear facilities and associated operations.	• Conduct projects to provide the technical foundation for safety analyses and controls as well as authorization basis decision making for DOE/NNSA nuclear facilities and associated operations.	• Decrease reflects additional funding provided in FY 2019 to fund the SAFER pilot.
Packaging $26,857,000	**Packaging $23,713,000**	**Packaging -$3,114,000**
• Refurbishes, reconditions, maintains, and certifies containers to ensure availability to support the nuclear weapons mission.	• Refurbish, recondition, maintain, and certify containers to ensure availability to support the nuclear weapons mission.	• Reduction will be covered by using uncosted carryover balances.
Long Term Stewardship $50,253,000	**Long Term Stewardship $62,109,000**	**Long Term Stewardship +$11,856,000**
• Supports LTS regulatory required activities at the KC National Security Campus (Bannister site), LLNL (Main Site and Site 300), Pantex Plant, SNL, and Y-12. • LTS required activities include: treating contaminated ground water; monitoring surface/ground water and soils; maintaining landfill remedies; performed CERCLA and RCRA 5-year remedy reviews of selected cleanup remedies; worked with the Environmental	• Continues to support LTS regulatory required activities at the KC National Security Campus (Bannister site), LLNL (Main Site and Site 300), Pantex Plant, SNL, and Y-12. • LTS required activities include: treating contaminated ground water; monitoring surface/ground water and soils; maintaining landfill remedies; performing CERCLA and RCRA 5-year remedy reviews of selected cleanup remedies; working with the Environmental	• The increase reflects the transfer of scope from Operations of Facilities for five facilities at Y-12 that treat waste streams associated with the LTS program, and funds LTS performance of required retained obligations scope at the Bannister Federal Complex in Kansas City.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Protection Agency regions and various states to meet post-completion regulatory cleanup and reporting requirements; and worked in concert with other federal agencies, states, and affected stakeholders to execute LTS activities in a cost effective, compliant, and safe manner consistent with end states.	Protection Agency regions and various states to meet post-completion regulatory cleanup and reporting requirements; and working in concert with other federal agencies, states, and affected stakeholders to execute LTS activities in a cost effective, compliant, and safe manner consistent with end states.	

Infrastructure and Operations
Maintenance and Repair of Facilities

Description

The Maintenance and Repair of Facilities program provides direct-funded maintenance activities across the NNSA enterprise for the recurring day-to-day work required to sustain and preserve NNSA facilities and equipment in a condition suitable for their designated purpose. These efforts include predictive, preventive, and corrective maintenance activities to maintain facilities, property, assets, systems, roads, equipment, and vital safety systems. This program also funds maintenance of excess facilities (including high-risk excess facilities) necessary to minimize the risk posed by those facilities prior to disposition.

Maintenance and Repair of Facilities is prioritized within an enterprise risk management framework based on mission needs; probability of failure of a system or a component; and risk determination with regard to safety, security, and environmental requirements. Investments focus on those structures, systems, and components that are considered essential to the national security mission. FY 2018-FY 2024 Infrastructure and Operations site allocations for direct-funded maintenance are provided in Table 5 below.

This program also funds the Roof Asset Management Program (RAMP) and the Cooling and Heating Asset Management Program (CHAMP). RAMP provides a dedicated approach to managing roofing assets through a single prioritized list of roofing needs across the nuclear security enterprise. The benefits of this approach enable the implementation of standard industry processes and best practices in the management of the roofing portfolio at a corporate level. Efficiencies are achieved by centralized procurement through leveraged buying power and long-term solutions instead of short-term repairs. The successful RAMP methodology has been expanded to other common components/systems under the Asset Management Program (AMP). NNSA implemented CHAMP pilots in FY 2016, with full implementation of the program in FY 2017. Other systems will be analyzed as possible AMPs to achieve additional efficiencies.

Table 5

National Nuclear Security Administration
Infrastructure and Operations Direct Funded Maintenance and Repair of Facilities Allocations by Site
(Dollars in Thousands)

Site	FY 2018 Enacted	FY 2019 Enacted	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Kansas City National Security Campus	25,000	29,000	27,000	25,000	25,000	26,000	27,000
Lawrence Livermore National Laboratory	22,000	24,000	22,000	25,000	26,000	28,000	28,000
Los Alamos National Laboratory	91,000	97,000	73,000	85,000	88,000	92,000	92,000
Nevada National Security Site	33,000	34,000	34,000	34,000	35,000	38,000	38,000
Pantex Plant	95,000	96,000	76,000	78,000	78,000	82,000	85,000
Sandia National Laboratories	11,000	11,000	19,000	25,000	28,000	30,000	31,000
Savannah River Site	35,000	34,500	31,000	28,000	28,000	30,000	32,000
Y-12 National Security Complex	99,000	100,000	87,000	88,000	90,000	92,000	95,000
Enterprise Acquisitions*	104,138	89,500	87,000	92,000	92,000	92,000	97,000
TOTAL	**515,138**	**515,000**	**456,000**	**480,000**	**490,000**	**510,000**	**525,000**

* The Maintenance and Repair of Facilities allocation under “Enterprise Acquisitions” includes funding for Asset Management Programs, which achieve economies of scale and maintenance standardization for critical building systems that are common across the enterprise (e.g. roofs, HVAC) and to quickly respond to emergent unforeseeable issues. Funding is distributed to the sites during execution, which is consistent with industry best practices.

Maintenance and Repair of Facilities

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Maintenance and Repair of Facilities $515,000,000	**Maintenance and Repair of Facilities $456,000,000**	**Maintenance and Repair of Facilities -$59,000,000**
• KC: maintenance of equipment and tenant improvement equipment. • LLNL: maintenance activities at Contained Firing Facility, Superblock, HEAF, machine shops, and waste management facilities. • LANL: maintenance activities at PF-4, CMR, DARHT, LANSCE, Beryllium, waste management, radiological laboratory, and tritium facilities. • NNSS: funded maintenance of JASPER, BEEF, DAF, and U1a. • Pantex: Bays and Cell maintenance, emerging requirements, and support for high explosives activities. • SNL: maintenance activities at MESA, METF, and Tonopah. • SRS: maintenance on NNSA mission facilities and equipment and activities associated with gas transfer systems. • Y-12: maintenance for uranium and lithium operations. • Enterprise-wide: RAMP and CHAMP centralized procurement activities to increase buying power and accelerate repairs of systems/components that are common across the NNSA enterprise. • Provides for enterprise-wide activities to stabilize the condition of excess facilities to minimize risk to mission prior to disposition.	• KC: maintenance of equipment and tenant improvement equipment. • LLNL: maintenance activities at Contained Firing Facility, Superblock, HEAF, machine shops, and waste management facilities. • LANL: maintenance activities at PF-4, CMR, DARHT, LANSCE, Beryllium, waste management, radiological laboratory, and tritium facilities. • NNSS: funded maintenance of JASPER, BEEF, DAF, and U1a. • Pantex: Bays and Cell maintenance, emerging requirements, and support for high explosives activities. • SNL: maintenance activities at MESA, METF, and Tonopah. • SRS: maintenance on NNSA mission facilities and equipment and activities associated with gas transfer systems. • Y-12: maintenance for uranium and lithium operations. • Enterprise-wide: RAMP and CHAMP centralized procurement activities to increase buying power and accelerate repairs of systems/components that are common across the NNSA enterprise. • Provides for enterprise-wide activities to stabilize the condition of excess facilities to minimize risk to mission prior to disposition.	• The decrease allows the sites to absorb the significant increases in FY 2018 and FY 2019 funding by increasing staffing levels to address the long-standing deficiency of a robust maintenance program. Overall funding for maintenance has grown significantly but appropriately over the last several budget cycles and this will address carryover balances and support growing maintenance staffing levels to maintain and preserve facilities in a condition suitable to meet an increasing mission demand.

Infrastructure and Operations
Recapitalization

Description

The Recapitalization program, key to modernizing NNSA infrastructure, prioritizes investments to improve the condition and extend the design life of the structures, capabilities, and/or systems. The Infrastructure and Safety (I&S) subprogram improves the reliability, sustainability, productivity, and efficiency of NNSA's infrastructure to reduce overall operating costs. It also reduces safety, environmental, and program risk associated with facilities and systems that are often well beyond their design life. The Capability Based Investments (CBI) subprogram is an investment strategy for managing risks in existing capabilities by prioritizing investments to upgrade and improve the reliability, efficiency, and capability of programmatic equipment and associated infrastructure to meet mission requirements.

The I&S subprogram includes costs for minor construction projects, capital equipment, projects that are expensed, and Other Project Costs (OPC) for mission enabling infrastructure line item construction projects. I&S also funds deactivation and disposal of excess infrastructure, including stabilization and risk reduction activities at high-risk excess facilities, resulting in surveillance and maintenance cost avoidance and reduced risk to workers, the public, the environment, and programs. Recapitalization projects incorporate energy conservation measures to the greatest extent practicable in support of sustainability and energy performance improvements.

The CBI subprogram implements multi-year projects and strategies to sustain, enhance, or replace key programmatic capabilities through focused investments supporting core programmatic requirements across the enterprise. These investments address needs beyond any single facility, campaign, or weapon system and are essential to achieving program mission objectives. Over the years, these science and manufacturing capabilities have been lost or degraded due to aging, broken, or outdated equipment and supporting systems. To support ongoing and future DP weapons activities, CBI invests in projects to reduce risk to the mission and ensure needed capabilities are available for LEPs and other mission work.

CBI projects include minor construction projects, capital equipment projects, and some projects that are expensed. The CBI subprogram also funds OPCs. In addition to existing OPC investments, the FY 2020 request includes OPCs to develop three new programmatic line item projects (High Explosives Synthesis, Formulation and Production, the Combined Radiation Effects Survivability Testing facility, and Power Sources Revitalization) and continue the conceptual design for the Material Staging Facility.

Tables 6 and 7 show the plans for Recapitalization projects to be executed with FY 2020 funding based on the status of enterprise infrastructure as of February 2019. This plan may need to be updated before the FY 2020 execution year to respond to changing infrastructure conditions and requirements.

Table 6

National Nuclear Security Administration Infrastructure and Safety Planned FY 2020 Recapitalization Projects - As of March 2019		
Site	**Project Name**	**FY 2020 Allocation ($K)**
KC	Building 2 M50 Machining & Inspection Equipment Addition & Upgrade	3,248
	Buildings 2 & 3 Assembly, Electrical & Fabrication & Environmental Testing Area Revitalizations	2,290
Subtotal, Kansas City National Security Campus		**5,538**
LLNL	New Nondestructive Evaluation Building - Design (Minor Construction)	1,500
	Building 321 Air Handling Unit & Electrical Upgrade (Minor Construction)	5,800
	Site 300 Utility Substation U865D Transformer Replacement	3,625
	Site 200 & Site 300 Low Pressure Air System Upgrade – Design (Minor Construction)	500
	New AME Joining Capabilities & Vapor Deposition Facility (Minor Construction)	16,100
	Building 151 High Level Radiochemistry Laboratories Capabilities Revitalization Portfolio (Minor Construction)	6,800
	Building 235 and Ancillary Synthesis Chemistry Laboratories Revitalization Portfolio (Minor Construction)	9,775
	Building 239 High Energy X-ray Radiography Capability Revitalization – Design (Minor Construction)	750
	Building 321 Chiller Reliability & Safety Exhaust System Redundancy Revitalization – Design (Minor Construction)	800
	Building 439 Classified Computing Revitalization (Minor Construction)	4,000
	Building 175 Disposition	15,500
Subtotal, Lawrence Livermore National Laboratory		**65,150**
LANL	PF-4 Secondary Lift Installation – Design (Minor Construction)	220
	TA-15-0534 DARHT Vessel Prep Facility HVAC Upgrade – Design (Minor Construction)	510
	TA-16 New HE Shipping & Receiving Transfer Facility (Minor Construction)	7,932
	TA-11-30 (K-Site) Environmental & Vibration Test Facility Fire Suppression Upgrade (Minor Construction)	3,700
	LANSCE 805 Industrial Controls Replacement	7,235
	PF-4 Fire Suppression System Criticality Safety (2 Over 1) Upgrades (Minor Construction)	10,400
	TA-55 Building 400 RLUOB Secondary Fire Pump Installation (Minor Construction)	6,143
	TA-16-260 Pressing, Machining & Testing Facility Upgrade (Minor Construction)	13,740
	TA-53-0003 (LANSCE) Fire Suppression System in Accelerator Tunnel Installation Portfolio (Minor Construction)	1,960
	PF-4 Power and Communications Systems Upgrade (Minor Construction)	16,000
	CMR Initial Projects to Prepare for Closure Portfolio	4,160
	TA-16-0306 Disposition	4,000
	TA-16-0460 Complex Disposition of 3 Facilities	5,500
	TA-41-0004 Disconnect and Refeed Utilities	1,550
	TA-22 & TA-3719 High Explosives Magazines Characterization	250
Subtotal, Los Alamos National Laboratory		**83,300**
NNSS	DAF UPS 400-2 Replacement (Minor Construction)	3,700
	HEF - BEEF Power Cable & Fiber Upgrade (Minor Construction)	1,500
	Site wide Fire Alarm System Replacement (Minor Construction)	3,750
	Mission Corridor Power Distribution System Upgrades - U1a Distribution (Minor Construction)	4,000
	U1a Electrical & Communications Upgrades (Minor Construction)	3,500
	U1a Mining Power Center Replacement (Minor Construction)	5,000

National Nuclear Security Administration Infrastructure and Safety Planned FY 2020 Recapitalization Projects - As of March 2019		
Site	**Project Name**	**FY 2020 Allocation ($K)**
	New U1a Mission Technical Support Facility - Design (Minor Construction)	900
	U1a Potable Water System Upgrade (Minor Construction)	2,000
	U1a Utility Water System Upgrade (Minor Construction)	3,000
	New Mercury Building 23-461 (Minor Construction)	12,000
	New Mercury Building 23-462 - Design (Minor Construction)	950
	Disposition of 10 Mercury Dormitories	2,200
Subtotal, Nevada National Security Site		**42,500**
PX	Bay & Cell RAMS, FDS, & Lead-In Improvements Portfolio	25,800
	Lightning Protection System Upgrade, 10 Material Access Area Facilities	10,100
	Southwest Circuit Sectional Switches Installation (Minor Construction)	4,500
	New Advanced Fabrication Facility - Design (Minor Construction)	1,000
	Buildings 12-108 & 4-147 Fuel Storage Tank Replacement	7,200
	Utility Building Disposition	3,200
Subtotal, Pantex Plant		**51,800**
SNL	Building 858N SiFAB UPS System Upgrade (Minor Construction)	4,000
	New Radiation Protection Instrumentation Calibration Facility (Minor Construction)	8,000
	Building 894 Thermal Battery Lab 132 Exhaust Ventilation System Upgrades (Minor Construction)	850
	Building 858N SiFab Bulk Chemical Distribution System Upgrade (Minor Construction)	5,300
	Building 858N SiFab HEPA Filter Replacements	8,650
	High Voltage Power System - Meter Installation & Switch Replacement (Minor Construction)	300
	High Voltage Power System 5kV Overhead Feeder Replacement (6923, 9965, & 506)	4,500
	SNL/CA Potable Water Distribution System Revitalization (Minor Construction)	9,900
	Thermal Spray Research Laboratory Facilities Systems Revitalization (Minor Construction)	3,500
	New Explosives Manufacturing Science and Technology (EMSAT) Facility – Design (Minor Construction)	1,500
Subtotal, Sandia National Laboratories		**46,500**
SRS	HANM Obsolete Oxygen Monitor Replacement Portfolio	6,000
	HAOM Tritium Grab Sample Capability Relocation to TEF – Design (Minor Construction)	490
	234-H Replacement Motor Control Center Installation	8,000
Subtotal, Savannah River Site		**14,490**
Y-12	50 Year Sprinkler head Replacements Portfolio (Minor Construction)	3,300
	Nuclear Facility Criticality Accident Alarm System (CAAS) Replacement Portfolio	13,900
	Building 9215 Switchgear & Transformer 253 Replacement	5,886
	Building 9202 Tower Water Replacement (Minor Construction)	4,731
	Building 9201-5N Elevator #12 Cylinder Replacement (Minor Construction)	3,050
	Failed Utility Pole Replacements (Portal 24 East)	3,000
	Nuclear Facility Electrical Modernization (NFEM) Portfolio (Minor Construction)	18,150
	Building 9998 H2 Supply Fans H2-3 & H2-4 Revitalization (Minor Construction)	3,636
	Building 9995 Fans EF 42, EF 43 & SF 46 Replacement/Revitalization	3,033
	Building 9204-04 Ancillary Facility Disposition	5,000
	Building 9401-03 Ancillary Facility Disposition	7,000
	Building 9727-04 Disposition	2,450
Subtotal, Y-12 National Security Complex		**73,136**

National Nuclear Security Administration Infrastructure and Safety Planned FY 2020 Recapitalization Projects - As of March 2019		
Site	**Project Name**	**FY 2020 Allocation ($K)**
	Planning, Assessments, & Infrastructure Management Tools	**61,349**
	Construction Other Project Costs (OPC)	**3,894**
Grand Total, Infrastructure and Safety		**447,657**

Table 7

Capabilities Based Investments Planned FY 2020 Recapitalization Projects - As of February 2019		
Site	**Project Name**	**FY 2020 Allocation ($K)**
KC	Development Laboratory Modernization	300
	Special Application Machining Modernization	3,500
	Gas Transfer Systems Production Modernization	800
	Rubber & Plastics Production Modernization	1,400
Subtotal, Kansas City National Security Campus		**6,000**
LLNL	Insensitive High Explosives Qualification Capabilities Recapitalization	2,700
	Applied Material Engineering Consolidation	4,300
	Site 300 OFF Firing & Control System Modernization	1,000
	Detonation and Dynamic Diagnostic Deployment	700
	Expanded Flash X-Ray System (MIE)	3,000
	LEP Equipment Capability Replacement	4,300
	Stockpile to Target Sequence Environmental Capabilities	2,500
Subtotal, Lawrence Livermore National Laboratory		**18,500**
LANL	DARHT Reliability/Capability Upgrades	1,600
	DARHT Vessel Support	1,000
	PF-4 Trolley PLC Controls Replacement	4,300
	Uranium Foundry Modernization (Minor Construction)	3,200
	Fabricate pRad Outer Vessel (MIE)	3,900
Subtotal, Los Alamos National Laboratory		**14,000**
NNSS	Neutron Diagnostics for Subcritical Experiments (NDSE) Detection Systems	2,500
	Area 6 High Bay Reconfiguration Support	1,000
	Downdraft Table Upgrades	1,300
	Dense Plasma Focus Facility Upgrade	450
	DAF Classified Network Expansion	1,750
Subtotal, Nevada National Security Site		**7,000**
PX	Mock High Explosives Mixer	750
	LINAC Replacement, Bays 1 and 10	650
	Install Coordinate Measuring Machines (CMMs), 12-86/12-116	500
	Install CMMs for HE Technology and Metrology	500
	Provide Six Vertical Turning Lathes	4,200
	CoLOSSIS Camera Replacement	1,500
	Refresh SNM Component Requalification Facility	2,500
	Install Pellet Press	1,000

Capabilities Based Investments Planned FY 2020 Recapitalization Projects - As of February 2019		
Site	**Project Name**	**FY 2020 Allocation ($K)**
	Provide Computer Numerically Controlled Saw, 11-50	1,500
	Replace Three 5-Axis Mills (MIE)	3,000
	Provide Two Computer Numerically Controlled Saws, 12-121	900
Subtotal, Pantex Plant		**17,000**
SNL	SiFab Tool Recapitalization	4,800
	Packaging Capability	600
	Environmental Test Capabilities	9,600
Subtotal, Sandia National Laboratories		**15,000**
SRS	Load Line 6 Upgrades to Support Loading LEPs and New Major ALTs (Minor Construction)	1,000
	Modify Unloading Station 'B'	1,000
Subtotal, Savannah River Site		**2,000**
Y-12	Deploy Wet Chemistry Process Capability	300
	New CMM Capability	1,700
	New Shaker Table (MIE)	4,000
	Ultrasonic Mill	4,500
Subtotal, Y-12 National Security Complex		**10,500**
	Programmatic Line Item Other Project Costs (OPCs)	28,710
	Corporate Taxes and Assessments	3,384
	CBI Planning, Design, Program Management	13,247
Grand Total, Capability Based Investments		**135,341**

Recapitalization

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Infrastructure and Safety $450,000,000	**Infrastructure and Safety $447,657,000**	**Infrastructure and Safety -$2,343,000**
• Provides funds for needed investments in obsolete/aging facilities and infrastructure to improve safety, reliability, and working conditions.	• Table 6 contains the current FY 2020 project plan as of February 2019. The table includes advanced funding for design of several complex, high priority projects for future year execution. Recapitalization funds are allocated in accordance with planned priorities but retain the flexibility to adjust efforts to address emerging changes in priorities and unplanned failures.	• No significant changes.
Capability Based Investments $109,057,000	**Capability Based Investments $135,341,000**	**Capability Based Investments +$26,284,000**
• CBI continues to provide targeted, strategic investments for life-extension and modernization of enduring requirements needed to sustain mission capabilities. • CBI continues funding OPCs for several programmatic line item construction projects.	• CBI continues to provide targeted, strategic investments for life-extension and modernization of enduring requirements needed to sustain Defense Program's capabilities. • Table 7 contains the current FY 2020 CBI project plan as of February 2019. Recapitalization funds are allocated in accordance with planned priorities but DP retains the flexibility to adjust resources to address emerging changes in priorities. • CBI will fund OPCs for several ongoing line item construction projects, and for development of several new programmatic line item projects.	• The request includes a $19,000 increase in OPC funding to develop new programmatic line item construction projects and an additional $4,000 to continue the conceptual design for the Material Staging Facility. • The request also addresses growth in programmatic equipment recapitalization requirements as CBI ramps up to support the W80-4 LEP, while continuing to support B61-12 LEP and W88 Alteration 370 interface commitments.

Infrastructure and Operations
Construction

Description

The Construction subprogram plays a critical role in revitalizing the nuclear security enterprise including the nuclear weapons manufacturing and research and development infrastructure. Investments from this subprogram will improve the responsiveness and utility of the infrastructure and its technology base. The subprogram is focused on two primary objectives: (1) identification, planning, and prioritization of the projects supporting national security objectives, particularly the weapons programs, and (2) development and execution of these projects within approved cost and schedule baselines. Table 8 shows the breakout of funding by line item.

The UPF at Y-12 consists of processing capabilities for enriched uranium casting, oxide production, and salvage and accountability operations. The UPF project includes a Main Process Building (MPB), a Salvage and Accountability Building (SAB), a Mechanical Electrical Building (MEB), Process Support Facilities (PSF), and various other support facilities. Constructing multiple facilities allows each facility to be designed and constructed with a level of safety and security appropriate for the hazards of each operation. FY 2020 funding will be used for construction of the MPB, SAB, and PSF subprojects. The Department is committed to complete UPF by 2025 for no more than $6,500,000,000. This commitment is predicated on receiving consistent and stable funding as requested to support the approved project baseline.

Under the CMRR project, FY 2020 construction funding supports the RLUOB Equipment Installation Phase 2 (REI2) and PF-4 Equipment Installation Phase 1 (PEI1) subprojects, which both received baseline approval in FY 2017. Scope and funding to support design activities for the other two subprojects, PF-4 Equipment Installation, Phase 2 (PEI2) and the Re-categorization of RLUOB to Hazard Category 3 (RC3) has been moved to the Plutonium Pit Production Project within the Plutonium Sustainment program per direction from the Energy and Water Development and Related Agencies Appropriations Act, 2019.

FY 2020 funding for the Tritium Finishing Facility (TFF) project, formerly known as the Tritium Production Capability, at the Savannah River Site will be used to start the preliminary design and prepare the safety basis documents. The TFF project is planned to relocate critical processes and operations currently performed in the 60-year old H-Area Old Manufacturing (HAOM) facility to new facilities that will be built to new and more stringent safety standards currently in effect throughout the DOE and NNSA complex. The infrastructure of the building has deteriorated and is well beyond expected end-of-life. Critical capabilities are now housed in areas that create a substantial risk to the enduring Tritium Mission. Infrastructure failures have increased the frequency of production delays and led to increased safety, security, maintenance and operating costs.

FY 2020 funding is requested for the Lithium Processing Facility (LPF) project, formerly known as the Lithium Production Capability, at the Y-12 National Security Complex to continue the preliminary design. The LPF project is planned to relocate lithium operations currently conducted in Building 9204-2, which was built in 1943. The facility, at approximately 325,000 square feet, is oversized for today's mission, was not built in accordance with the current codes and standards, is costly to operate, has many operating issues, and has exceeded its expected life. This facility has concrete deterioration, both internal and external, in areas where the roofs, walls, and ceilings have been exposed to decades of corrosive liquids and processing fumes, requiring restricted access and protective equipment (e.g., hard hats) in some processing areas.

FY 2020 funding is requested to continue construction of the U1a Complex Enhancements Project (UCEP) at NNSS. This project will deliver a new underground laboratory that will enable new experimental and diagnostic capabilities and an increased operational cadence of subcritical weapons experiments using plutonium.

FY 2020 funding is requested to support the construction of the High Explosive Science and Engineering (HE S&E) Facility at Pantex. The current HE S&E personnel, as well as laboratory operations, are located in 15 separate facilities which are an average of more than 60 years old. They are not constructed for today's operations or HE limits, are spread out and do not provide for efficient work processes. Distance between facilities increases travel time for personnel and materials back and forth which adds additional cost to operations. In addition, safety, security, and environmental issues associated with these aging facilities are mounting, as are the costs of addressing them. Current HE capacity limits, that prohibit quantities greater than a small amount, create inefficient operations in several of the laboratories. The HE capacity limitations are primarily due to the original design and structure of the old facilities. The numerous HE handling activities required to load, unload and move the HE increase potential safety hazards. This facility will consolidate operations in new facilities thereby increasing operational efficiency and reduce personnel safety hazards.

FY 2020 funding supports the 138kV Power Transmission System Replacement project at NNSS. The existing 138kV Power Transmission System was originally constructed in 1963 of wooden creosote poles and cross members and aerial conductors in a loop configuration, which is approximately 100 miles in length. The power transmission system is well beyond the useful design life. The impact of the high desert environment has severely degraded the reliability of the system. As a result, the system will continue to be a liability to mission focus due to continued deterioration and unscheduled outages. In January 2017, NNSA replaced the most vulnerable mile section of this system only weeks before a storm destroyed portions of the old section, avoiding impacts to the mission. This project replaces and upgrades the highest risk 23-mile segment of the system from Mercury to near U1a to provide the NNSS with highly reliable power and communications to the mission corridor. This project will support current and ongoing critical national security mission activities conducted by not only DOE and NNSA, but the Department of Defense, Homeland Security, and other Federal partners. DOE and NNSA specific activities supported by this project are: defense experimentation and stockpile stewardship; environmental and waste management; nuclear nonproliferation; nuclear emergency response; and the National Criticality Experiments Research Center.

Requested FY 2020 funding also supports the design of two Emergency Operations Centers (EOCs), one at Lawrence Livermore National Laboratory and the other at Sandia National Laboratories in New Mexico. Both EOCs will provide modern, centrally located facilities outside the proximity of potential hazard areas in order to protect NNSA sites and the surrounding communities during an emergency situation.

50 US Code 2746 requires that if the estimated cost of completing a conceptual design for a construction project exceeds $5,000,000, the Secretary shall submit to Congress a request for funds for the conceptual design before submitting a request for funds for the construction project. NNSA anticipates that the estimated cost to complete the conceptual design for the Material Staging Facility and High Explosive Synthesis, Formulation, and Production at Pantex and Combined Radiation Effects Survivability Testing (CREST) Complex at Sandia will exceed the $5,000,000 threshold:

Material Staging Facility at Pantex:

The rough-order of magnitude cost estimate to complete the conceptual design is between $10,000,000 and $20,000,000 for the project.

High Explosive Synthesis, Formulation, and Production at Pantex:

The rough-order of magnitude cost estimate to complete the conceptual design is between $3,000,000 and $6,000,000 for the project.

Combined Radiation Effects Survivability Testing Complex at Sandia:

The rough-order of magnitude cost estimate to complete the conceptual design is between $3,000,000 and $6,000,000 for the project.

Table 8

National Nuclear Security Administration Infrastructure and Operations Construction by Line-item (dollars in thousands)							
Project	**FY 2018 Enacted**	**FY 2019 Enacted**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**
23-D-xxx, Mission Corridor Water Upgrade, NNSS	0	0	0	0	0	6,000	25,000
22-D-xxx, Network Communication Center, LLNL	0	0	0	0	4,000	40,000	0
21-D-xxx, Electrical Power Capacity Upgrade, LANL	0	0	0	15,000	0	50,000	50,000
19-D-670, 138kV Power Transmission System Replacement, NNSS	0	0	6,000	59,000	0	0	0
18-D-690, Lithium Production Capability, Y-12	5,000	19,000	0	0	0	0	0
18-D-690, Lithium Processing Facility, Y-12	0	0	32,000	26,200	125,900	191,600	217,728
18-D-680, Material Staging Facility, PX	5,200	24,000	0	0	0	0	355,620
18-D-660, Fire Station, Y-12	28,000	0	0	0	0	0	0
18-D-650, Tritium Finishing Facility, SRS	0	0	27,000	13,000	30,000	44,909	166,500
17-D-640, U1a Complex Enhancements Project, NNSS	22,100	20,000	35,000	48,800	25,600	0	0
17-D-630, Expand Electrical Distribution System, LLNL	6,000	0	0	0	0	0	0
16-D-515, Albuquerque Complex Project	98,000	47,953	0	0	0	0	0
15-D-613, Emergency Operations Center, Y-12	7,000	0	0	0	0	0	0
15-D-612, Emergency Operations Center, LLNL	0	0	5,000	27,000	0	0	0
15-D-611, Emergency Operations Center, SNL	0	0	4,000	0	36,000	0	0
15-D-302, TA-55 Reinvestment Project, Phase 3, LANL	0	0	0	30,000	30,000	30,000	30,000
15-D-301, HE Science & Engineering Facility, PX	0	0	123,000	0	0	0	0
07-D-220, Radioactive Liquid Waste Treatment Facility Upgrade Project, LANL	2,100	0	0	0	0	0	0
07-D-220-04, Transuranic Liquid Waste Facility, LANL	17,895	0	0	0	0	0	0
06-D-141, Uranium Processing Facility, Y-12	663,000	703,000	745,000	750,000	620,000	300,000	164,589
Chemistry and Metallurgy Replacement (CMRR)							
04-D-125, Chemistry and Metallurgy Research Replacement Project, LANL	0	219,842	168,444	38,427	0	0	0
04-D-125-04, RLUOB Equipment Installation, Phase 2	127,025	0	0	0	0	0	0
04-D-125-05, PF-4 Equipment Installation	50,214	0	0	0	0	0	0
Subtotal, 04-D-125, CMRR Project, LANL	177,239	219,842	168,444	38,427	0	0	0

National Nuclear Security Administration Infrastructure and Operations Construction by Line-item (dollars in thousands)							
Project	**FY 2018 Enacted**	**FY 2019 Enacted**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**
Total, Infrastructure and Operations: Construction	**1,031,534**	**1,033,795**	**1,145,444**	**1,007,427**	**871,500**	**662,509**	**1,009,437**

Construction

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Construction $1,033,795,000	**Construction $1,145,444,000**	**Construction +$111,649,000**
• Continued execution of CMRR subprojects (REI2 and PEI1). • Continues construction of UPF at Y-12. • Continues construction of the Albuquerque Complex Project. • Continues design and construction of the UCEP at NNSS.	• Initiate design of the 138kV Power Transmission System Replacement project at NNSS and the EOCs at LLNL and SNL. • Continues the preliminary design of the LPF at Y-12 and the TFF at SRS. • Start construction of the HE S&E Facility at Pantex. • Continue construction of the UCEP at NNSS, UPF at Y-12, and CMRR at LANL.	• The increase primarily reflects funding for construction of the UPF at Y-12, HE S&E Facility at Pantex, and UCEP at NNSS. The increase also supports the design efforts of the TFF at SRS, LPF at Y-12, 138kV Power Transmission System Replacement at NNSS, and the EOCs at LLNL and SNL. These increases are slightly offset by a reduction in funding requested for the CMRR project and the Material Staging Facility, as well as the completion of funding requests for the Albuquerque Complex Project.

Infrastructure and Operations
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	79,335	79,335	57,200	58,850	+1,650
Minor Construction	N/A	N/A	274,459	278,069	216,903	230,812	+13,909
Total, Capital Operating Expenses	**N/A**	**N/A**	**353,794**	**357,404**	**274,103**	**289,662**	**+15,559**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	63,967	59,447	49,770	44,950	-4,820
HE Synthesis Pilot Plant, LLNL	15,682	11,194	4,488	4,488	0	0	+0
Parts Cleaning for Direct Lithium Material Manufacturing, Y-12[a]	3,400	2,500	900	900	0	0	+0
Reestablish HE Development Machining Capabilities, PX	5,938	3,148	2,180	2,180	610	0	-610
Replace Lujan Target, LANL	8,000	1,500	2,800	2,800	3,700	0	-3,700
Expanded Flash X-Ray System , LLNL	5,200	0	0	0	0	3,000	+3,000
Wafer Bonding System, SNL	5,000	0	5,000	5,000	0	0	+0
Slurry Coating System, LLNL	5,140	0	0	4,520	620	0	-620
New Shaker Table, Y-12	6,500	0	0	0	2,500	4,000	+1,500
Fabricate pRad Outer Vessel, LANL	9,050	0	0	0	0	3,900	+3,900
Replace Three 5-Axis Mills, PX	16,110	0	0	0	0	3,000	+3,000
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**79,335**	**79,335**	**57,200**	**58,850**	**+1,650**

[a] Prior Year and FY 2018 actuals show Capability Based Investments (CBI) funding only. CBI funded an initial design for one technology, and a comprehensive re-design for a different technology. The re-scoped project was executed with $7,800 under the Weapons Dismantlement & Disposition program.

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Minor Construction Projects							
Total Minor Construction Projects (Total Estimated Cost (TEC) <$5M)	N/A	N/A	82,940	85,550	75,346	67,887	-7,459
PF-4 Fire Suppression System Crit Safety (2 Over 1) Upgrade, LANL	10,400	0	0	0	0	10,400	+10,400
TA-16 New HE Shipping and Receiving Transfer Facility, LANL	7,932	0	0	0	0	7,932	+7,932
TA-55 Bldg LANL RLUOB Secondary Fire Pump Installation, LANL	6,143	0	0	0	0	6,143	+6,143
PF-4 Fire Wall Upgrades, LANL	7,000	0	7,000	7,000	0	0	+0
TA-16 Fire Suppression Upgrades, LANL	5,000	0	1,400	1,400	3,600	0	-3,600
TA-40-23 Electrical, Mechanical Revitalization, LANL	5,100	0	1,100	1,100	4,000	0	-4,000
SM-39 Classified Machine Shop Upgrade, LANL	8,400	4,400	4,000	4,000	0	0	+0
PF-4 Power and Communications Systems Upgrade, LANL	16,000	0	0	0	0	16,000	+16,000
TA-16-0303 Crystal Lab Revitalization Portfolio, LANL	12,200	0	12,200	12,200	0	0	+0
TA-16-260 Pressing, Machining and Testing Facility Upgrades, LANL	15,700	0	0	0	1,960	13,740	+11,780
Bldg. 806/Bldg. 810 High Explosives Machining/Assembly HVAC and Electrical Upgrades, LLNL	6,773	0	6,773	6,773	0	0	+0
Bldg. 321C Facility LEP New Material Capability Revitalization, LLNL	9,100	0	9,100	9,100	0	0	+0
B239 High Energy X-ray Radiography Capability Revitalization, LLNL	7,500	0	0	0	0	750	+750
B321 Chiller Reliability and Safety Exhaust System Redundancy Revitalization, LLNL	9,000	0	0	0	0	800	+800
B321 Air Handling Unit (AHU) & Electrical Replacement and Upgrade, LLNL	5,800	0	0	0	0	5,800	+5,800
New Polymers and Engineering Facility, LLNL	14,500	0	14,500	14,500	0	0	+0
B341 Mechanical Test Capability Consolidation Revitalization, LLNL	12,500	0	0	0	12,500	0	-12,500
New AME Joining Capabilities and Vapor Deposition Facility, LLNL	18,000	0	0	0	1,900	16,100	+14,200
B235 and Ancillary Synthesis Chemistry Laboratories Revitalization Portfolio, LLNL	11,400	0	1,625	1,625	0	9,775	+9,775
B151 High Level Radiochemistry Laboratories Revitalization Portfolio, LLNL	14,600	0	700	700	7,100	6,800	-300
New Nondestructive Evaluation Building, LLNL	15,000	0	0	0	0	1,500	+1,500
S200 & S300 Low Pressure Air System Upgrade, LLNL	5,100	0	0	0	0	500	+500
Mercury Modernization Utility Upgrades-Campus, NNSS	7,000	0	0	1,000	6,000	0	-6,000
DAF Electrical Substations Upgrade, NNSS	5,500	0	5,500	5,500	0	0	+0
Area 6 to U1a Water Supply Line Replacement, NNSS	5,000	0	0	0	5,000	0	-5,000
U1a New Air Supply Borehole, NNSS	8,500	0	5,700	5,700	2,800	0	-2,800
U1a Mining Power Center Replacement, NNSS	5,000	0	0	0	0	5,000	+5,000
Mercury New Building 23-460, NNSS	13,600	0	13,600	13,600	0	0	+0
Mercury New Building 23-461, NNSS	15,000	0	0	0	3,000	12,000	+9,000

	(Dollars in Thousands)						
	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Minor Construction Projects							
New U1a Mission Technical Support Facility, NNSS	13,500	0	0	0	0	900	+900
New Mercury Building 23-462, NNSS	13,800	0	0	0	0	950	+950
Bldg. 12-44 Equipment Room Expansion, PX	9,200	0	9,200	9,200	0	0	+0
New Gas Analysis Laboratory, PX	15,040	40	15,000	15,000	0	0	+0
Bldg. 12-37 Secondary Electrical Feed Installation, PX	16,300	0	2,000	2,000	14,300	0	-14,300
New Advanced Fabrication Facility, PX	17,000	0	0	0	0	1,000	+1,000
SRS-HAOM Tritium Grab Sample Capability move to TEF, SRS	5,140	0	0	0	0	490	+490
234-7H New Utility Support Building and Exhaust Ventilation System Installation, SRS	11,900	0	0	0	1,700	0	-1,700
234-7H Room 109 Process Area Expansion, SRS	7,200	0	0	0	7,200	0	-7,200
20th Street & G Avenue Intersection Relocation, SNL	9,400	750	7,700	7,700	950	0	-950
Building C914 High Bay Seismic Upgrades, SNL	9,800	0	1,100	1,100	8,700	0	-8,700
B878 (Process Development Lab) Renovation, SNL	9,200	0	9,200	9,200	0	0	+0
SNL/CA Sanitary Sewer Replacements, SNL	7,000	0	7,000	7,000	0	0	+0
Building 894 Air Handling Unit (AHU)/Exhaust System Upgrade, SNL	6,290	4,990	1,300	1,300	0	0	+0
High Voltage System, 5kV Overhead Feeder Replacement (Bldg 6923, Bldg 9965, and Feeder 506), SNL	5,000	0	500	500	4,500	0	-4,500
B858N SiFab Bulk Chemical Distribution System Upgrade, SNL	5,300	0	0	0	0	5,300	+5,300
CA Potable Water Distribution System Revitalization, SNL	9,900	0	0	0	0	9,900	+9,900
New Radiation Protection Instrumentation Calibration Facility, SNL	8,000	0	0	0	0	8,000	+8,000
New SNL/CA Data Center Replacement Facility, SNL	14,700	0	1,300	1,300	13,400	0	-13,400
Technical Area-IV District Chilled Water System Upgrades, SNL	16,000	0	1,900	1,900	14,100	0	-14,100
New Z & TA-IV Missions Support Facility, SNL	13,700	0	13,700	13,700	0	0	+0
New Explosive Manufacturing Science and Technology (EMSAT) Facility, SNL	17,500	0	0	0	0	1,500	+1,500
Bear Creek Road 13.8kV Electrical Power Distribution Installation, Y-12	8,600	0	8,600	8,600	0	0	+0
Bldg. 9215 North Fire Water Laterals Replacement, Y-12	5,629	0	0	0	5,629	0	-5,629
9215 O-Area MCC Replacements (NFEM), Y-12	6,730	0	3,300	3,300	3,430	0	-3,430
9215 P-Wing MCC Replacement (NFEM), Y-12	6,728	0	2,300	2,300	4,428	0	-4,428
9204-2E 816 MCC Replacement/Revitalization (NFEM), Y-12	7,506	0	2,521	2,521	4,985	0	-4,985
9204-2E 815 MCC Replacement/Revitalization (NFEM), Y-12	7,000	0	0	0	175	6,825	+6,650

	(Dollars in Thousands)						
	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Minor Construction Projects							
9215 L-Wing MCC Replacement (NFEM), Y-12	7,000	0	0	0	0	7,000	+7,000
Bldg. 9212 50-Year Sprinkler Head Replacement (Wet Pipe System 007), Y-12	12,700	0	12,700	12,700	0	0	+0
9998 South Fire and Potable Water Lateral Replacement, Y-12	5,300	0	0	0	5,300	0	-5,300
Modify Unloading Station B, SRS	6,780	4,630	1,150	1,150	0	1,000	+1,000
Reconfigure Production Bay for Non-Destructive Laser Gas Sampling (CSA Certification), PX	6,910	5,210	1,700	1,700	0	0	+0
Detonator Test Fire Upgrades (Indoor Firing Site TA-40-0015), LANL	7,500	3,300	4,200	4,200	0	0	+0
Load Line 6 Upgrades, SRS	8,900	3,150	1,950	1,950	2,800	1,000	-1,800
Uranium Foundry Modernization, LANL	9,300	0	0	0	1,000	3,200	+2,200
Reliable Dry Room Installation and Li Battery Pack Rapid Prototyping Lab Installation, SNL	12,000	0	0	0	1,100	0	-1,100
Function Test Station (FTS) Programmable Controller System Upgrade, SRS	5,730	0	0	0	0	920	+920
High G Surveillance Testing Capability Refurbishment (WETL, Pantex), SNL	18,000	0	0	0	0	1,700	+1,700
Replace Film Radiography in Finishing Gloveboxes, FL 4/5 Glovebox, SRS	7,010	0	0	0	0	0	+0
Total, Minor Construction Projects	**N/A**	**N/A**	**274,459**	**278,069**	**216,903**	**230,812**	**+13,909**
Total, Capital Summary	**N/A**	**N/A**	**353,794**	**357,404**	**274,103**	**289,662**	**+15,559**

Infrastructure and Operations
Outyears

(Dollars in Thousands)

	FY 2021 Estimate	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate
Capital Operating Expenses Summary (including MIE)				
Capital Equipment >$500K (including MIE)	55,450	66,550	67,650	69,300
Minor Construction	132,170	22,300	12,300	12,600
Total, Capital Operating Expenses	**187,620**	**88,850**	**79,950**	**81,900**
Capital Equipment > $500K (including MIE)				
Total Non-MIE Capital Equipment (>$500K)	45,650	64,000	59,540	69,300
Expanded Flash X-Ray System , LLNL	2,200	0	0	0
Fabricate pRad Outer Vessel, LANL	4,100	1,050	0	0
Replace Three 5-Axis Mills, PX	3,500	1,500	8,110	0
Total, Capital Equipment (including MIE)	**55,450**	**66,550**	**67,650**	**69,300**
Minor Construction Projects				
Total Minor Construction Projects (TEC <$5M)	1,000	6,310	9,990	12,600
B239 High Energy X-ray Radiography Capability Revitalization, LLNL	6,750	0	0	0
B321 Chiller Reliability and Safety Exhaust System Redundancy Revitalization, LLNL	8,200	0	0	0
234-7H New Utility Support Building and Exhaust Ventilation System Installation, SRS	0	10,200	0	0
SRS-HAOM Tritium Grab Sample Capability move to TEF, SRS	4,650	0	0	0
New Nondestructive Evaluation Building, LLNL	13,500	0	0	0
S200 & S300 Low Pressure Air System Upgrade, LLNL	4,600	0	0	0
New U1a Mission Technical Support Facility, NNSS	12,600	0	0	0
New Mercury Building 23-462, NNSS	12,850	0	0	0
New Advanced Fabrication Facility, PX	16,000	0	0	0
Uranium Foundry Modernization, LANL	4,200	900	0	0
New Explosive Manufacturing Science and Technology (EMSAT) Facility, SNL	16,000	0	0	0
Reliable Dry Room Installation and Li Battery Pack Rapid Prototyping Lab Installation, SNL	10,900	0	0	0
Function Test Station (FTS) Programmable Controller System Upgrade, SRS	2,820	1,990	0	0
High G Surveillance Testing Capability Refurbishment (WETL, Pantex), SNL	16,300	0	0	0
Replace Film Radiography in Finishing Gloveboxes, FL 4/5 Glovebox, SRS	1,800	2,900	2,310	0
Total, Minor Construction Projects	**132,170**	**22,300**	**12,300**	**12,600**
Total, Capital Summary	**187,620**	**88,850**	**79,950**	**81,900**

Minor Construction Projects over $10 million

As directed in the FY 2018 National Defense Authorization Act, this section provides the requested project information for projects with a total project cost (TPC) over $10 million.

Project	Site	Project Description	Program	TPC	Construction Design Estimate	Project Milestones		
						Project Start	Design Complete	Construction Complete
PF-4 Fire Suppression System Crit Safety (2 Over 1) Upgrades	LANL	Project will correct approximately 16 seismic risks that could adversely affect the safety class PF-4 basement fire suppression system (FSS). The scope includes: relocating existing HVAC fans above FSS piping and several sprinklers too close to facility equipment (column capitals and electrical equipment such as conduit, lighting and cable trays) The scope will also include bracing FSS piping supported with eccentric beam supports, that may be impacted by the equipment during a seismic event.	Infrastructure and Operations: Infrastructure and Safety	10,400,000	1,561,000	FY 2020	FY 2021	FY 2022
PF-4 Power and Communications Systems Upgrade	LANL	Design and construct redundant fiber optic communication pathways to the Central Alarm Station (CAS) and Secondary Alarm Station (SAS) and back-up power through Building 142. The project will provide Uninterruptible Power Supply (UPS) and dual telecommunication services to a central location in TA-55 PF-4 to afford a point of connection for future security system renovations projects. UPS services will be distributed from TA-55 PF-142; telecommunication services will be extended from the CAS and SAS backbones to locations within PF-4.	Infrastructure and Operations: Infrastructure and Safety	16,000,000	5,287,000	FY 2020	FY 2020	FY 2021

Project	Site	Project Description	Program	TPC	Construction Design Estimate	Project Milestones		
						Project Start	Design Complete	Construction Complete
New Nondestructive Evaluation (NDE) Building	LLNL	The project relocates NDE inspection capabilities to a modern above-ground facility of approximately 13,000 GSF. The new facility will provide modern, flexible open laboratory workspace for x-ray systems.	Infrastructure and Operations: Infrastructure and Safety	15,000,000	1,500,000	FY 2020	FY 2020	FY 2022
New Mercury Building 23-462	Nevada	This project includes design and construction scope for the third building in the Mercury Campus. The project will provide 10,000 sq ft of new enduring office space supporting the National Laboratories and replaces aging and failing infrastructure at the NNSS Mercury complex.	Infrastructure and Operations: Infrastructure and Safety	13,800,000	950,000	FY 2020	FY 2020	FY 2022
New U1a Mission Technical Support Facility	Nevada	Existing support structures at the U1a Complex consist of a series of aging trailers and temporary buildings that were consistent with the complex's original experimental purpose. These facilities are increasingly unfit to support the evolution of the Sub Critital Experiments (SCE) mission. This project will provide approximately 10,000 sq ft of new space for SCE support functions for NNSS and national laboratory personnel. This project will leverage off the experience gained at Mercury in developing new buildings.	Infrastructure and Operations: Infrastructure and Safety	13,500,000	950,000	FY 2019	FY 2019	FY 2021
New Advanced Fabrication Facility	Pantex	The project will construct a new 20,000 sq ft. Advanced Fabrication Facility in Zone 11 at Pantex. This new facility will relocate the inert machining operations from Buildings 11-20 and 11-50 which allows high explosives machining capacity to be restored at 11-50 for Life Extension Programs, Enhanced Surveillance Campaign, Plant Directed Research and Development, and other programs. In addition, this project eliminates the need for costly investments in Building 11-20 (plumbing, flooring, electrical system, Heating, Ventilation, and Air Conditioning (HVAC) system and other safety systems investments) which are estimated to cost at least $12M.	Infrastructure and Operations: Infrastructure and Safety	17,000,000	1,000,000	FY 2020	FY 2020	FY 2021

Project	Site	Project Description	Program	TPC	Construction Design Estimate	Project Milestones		
						Project Start	Design Complete	Construction Complete
Reliable Dry Room Installation and Li Battery Pack Rapid Prototyping Lab Installation	SNL	Tenant improvements to the new "Agile High Bay Facility" to stand up backup power sources production operations, reducing risk in the operations currently located in Building 894. The shell of the Agile High Bay Facility is currently being designed with about 10,000 NSF of temporary lab space. To use the facility, tenants must fund all design and construction costs for their uses. Power Sources intends to be the first tenant to occupy the Agile High Bay facility, requiring a significant portion of its lab space, until a permanent Power Sources facility is identified and ready for occupancy. To support production, Sandia will implement a thermal battery production dry room and Li-primary cell and power assembly production area.	Infrastructure and Operations: Capability Based Investments	12,000,000	1,100,000	FY 2019	FY 2019	FY 2020
High G Surveillance Testing Capability Refurbishment (Pantex)	SNL	The high G surveillance testing capability is provided by two centrifuges at WETL (Pantex) which are aging and will be past their useful lives in the 2023 timeframe. This capability must be recapitalized in a manner that allows operation of two centrifuges at all times. This project will procure a third centrifuge and construct a facility to house it (either a stand alone building, or a WETL addition).	Infrastructure and Operations: Capability Based Investments	18,000,000	1,700,000	FY 2020	FY 2021	FY 2022
New Explosive Manufacturing Science and Technology (EMSAT) Facility	SNL	The proposed new explosives manufacturing facility will provide an in-house capability for the receipt, processing, production, assembly, testing and qualifying, storage, and shipping of classified and non-classified explosive components and materials in relatively small quantities. The proposed facility will be approximately 18,000 sq ft.	Infrastructure and Operations: Infrastructure and Safety	17,500,000	1,500,000	FY 2020	FY 2020	FY 2023

Project	Site	Project Description	Program	TPC	Construction Design Estimate	Project Milestones		
						Project Start	Design Complete	Construction Complete
234-7H New Utility Support Building and Exhaust Ventilation System Installation	SRS	This project will construct a small utility support building including installation of a dedicated exhaust ventilation system for 234-7H. The current exhaust system for 234-7H is part of 234-H and the capability must be separated in order to facilitate the overall plan to shutdown 234-H.	Infrastructure and Operations: Infrastructure and Safety	11,900,000	1,700,000	FY 2019	FY 2020	FY 2022

Construction Projects Summary

(Dollars in Thousands)

	Total	Prior Years[a]	FY 2018 Enacted	FY 2018 Current	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
23-D-xxx, Mission Corridor Water Upgrade, NNSS[b]							
Total Estimated Cost (TEC)	TBD	0	0	0	0	0	0
Other Project Cost (OPC)	TBD	0	200	200	0	100	+100
TPC, 23-D-xxx, Mission Corridor Water Upgrade, NNSS	**0**	**0**	**200**	**200**	**0**	**100**	**+100**
22-D-xxx, Network Communication Center, LLNL[c]							
TEC	TBD	0	0	0	0	0	0
OPC	TBD	0	210	210	0	400	+400
TPC, 22-D-xxx, Network Communication Center, LLNL	**0**	**0**	**210**	**210**	**0**	**400**	**+400**
21-D-xxx, Electrical Power Capacity Upgrade, LANL[d]							
TEC	TBD	0	0	0	0	0	0
OPC	TBD	0	1,000	1,000	600	800	+200
TPC, 21-D-xxx, Electrical Power Capacity Upgrade, LANL	**0**	**0**	**1,000**	**1,000**	**600**	**800**	**+200**
19-D-670, 138kV Power Transmission System Replacement, NNSS							
TEC	65,000	0	0	0	0	6,000	+6,000
OPC	4,700	550	980	980	500	60	-440
TPC, 19-D-670, 138kV Power Transmission System Replacement, NNSS	**69,700**	**550**	**980**	**980**	**500**	**6,060**	**+5,560**

[a] Prior Year OPCs have been updated from the FY 2019 I&O justification to reflect actuals.
[b] CD-0 is planned for the 4th quarter of FY 2019; therefore, the funding profile is notional and no TPC has been established.
[c] CD-0 is planned for the 4th quarter of FY 2019; therefore, the funding profile is notional and no TPC has been established.
[d] This project obtained CD-0 in August 2018 and is 75% through the Independent AoA process. The ROM is $100M to $300M.

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Current	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
18-D-690, Lithium Processing Facility, Y-12							
TEC	650,000	0	5,000	5,000	19,000	32,000	+13,000
OPC[b]	70,000	5,424	400	400	3,250	1,000	-2,250
TPC, 18-D-690, Lithium Processing Facility, Y-12	**720,000**	**5,424**	**5,400**	**5,400**	**22,250**	**33,000**	**+10,750**
18-D-680, Material Staging Facility, PX							
TEC	1,339,400	0	5,200	5,200	24,000	0	-24,000
OPC	69,600	0	0	0	0	4,000	+4,000
TPC, 18-D-680, Material Staging Facility, PX	**1,409,000**	**0**	**5,200**	**5,200**	**24,000**	**4,000**	**-20,000**
18-D-660, Fire Station, Y-12							
TEC	28,000	0	28,000	28,000	0	0	0
OPC	5,861	3,739	1,084	1,084	400	0	-400
TPC, 18-D-660, Fire Station, Y-12	**33,861**	**3,739**	**29,084**	**29,084**	**400**	**0**	**-400**
18-D-650, Tritium Finishing Facility, SRS							
TEC	543,829	0	0	0	0	27,000	+27,000
OPC[c]	75,000	7,100	500	500	3,000	2,000	-1,000
TPC, 18-D-650, Tritium Finishing Facility, SRS	**618,829**	**7,100**	**500**	**500**	**3,000**	**29,000**	**+26,000**
17-D-640, U1a Complex Enhancements Project, NNSS							
TEC	163,000	11,500	22,100	22,100	20,000	35,000	+15,000
OPC[d]	11,809	5,309	1,000	1,000	0	0	0
TPC, 17-D-640, U1a Complex Enhancements Project, NNSS	**174,809**	**16,809**	**23,100**	**23,100**	**20,000**	**35,000**	**+15,000**

[b]Lithium Processing Facility OPCs are funded under Lithium Sustainment in FY 2019 and the outyears.
[c] Tritium Finishing Facility OPCs are funded under Tritium Sustainment in FY 2020 and the outyears.
[d] U1a Complex Enhancements Project OPCs are funded under Enhanced Capabilities for Subcritical Experiments within the Science Program.

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Current	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
17-D-630, Expand Electrical Distribution System, LLNL							
TEC	31,000	25,000	6,000	6,000	0	0	0
OPC	2,800	1,350	400	400	450	200	-250
TPC, 17-D-630, Expand Electrical Distribution System, LLNL	**33,800**	**26,350**	**6,400**	**6,400**	**450**	**200**	**-250**
16-D-515, Albuquerque Complex Project							
TEC	169,000	23,047	98,000	98,000	47,953	0	-47,953
OPC[e]	5,700	2,646	800	800	600	600	0
TPC, 16-D-515, Albuquerque Complex Project	**174,700**	**25,693**	**98,800**	**98,800**	**48,553**	**600**	**-47,953**
15-D-613, Emergency Operations Center, Y-12							
TEC	28,919	21,919	7,000	7,000	0	0	0
OPC	4,985	2,550	666	666	928	0	-928
TPC, 15-D-613, Emergency Operations Center, Y-12	**33,904**	**24,469**	**7,666**	**7,666**	**928**	**0**	**-928**
15-D-612, Emergency Operations Center, LLNL							
TEC	32,000	0	0	0	0	5,000	+5,000
OPC	3,200	1,600	600	600	200	0	-200
TPC, 15-D-612, Emergency Operations Center, LLNL	**35,200**	**1,600**	**600**	**600**	**200**	**5,000**	**+4,800**
15-D-611, Emergency Operations Center, SNL							
TEC	40,000	0	0	0	0	4,000	+4,000
OPC	2,500	800	355	355	345	200	-145
TPC, 15-D-611, Emergency Operations Center, SNL	**42,500**	**800**	**355**	**355**	**345**	**4,200**	**+3,855**

[e] In FY 2015, $190,000 in OPCs for the Albuquerque Complex Project were funded within the NNSA Federal Salaries and Expenses appropriation.

	(Dollars in Thousands)						
	Total	Prior Years	FY 2018 Enacted	FY 2018 Current	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
15-D-302, TA-55 Reinvestment Project Phase III, LANL							
TEC	207,400	36,257	0	0	0	0	0
OPC	42,600	13,500	2,000	2,000	2,000	2,000	0
TPC, 15-D-302, TA-55 Reinvestment Project Phase III, LANL	**250,000**	**49,757**	**2,000**	**2,000**	**2,000**	**2,000**	**0**
15-D-301, HE Science & Engineering Facility, PX							
TEC[f]	135,272	11,772	0	500	0	123,000	+123,000
OPC	60,225	2,740	0	0	0	130	+130
TPC, 15-D-301, HE Science & Engineering Facility, PX	**195,497**	**14,512**	**0**	**500**	**0**	**123,130**	**+123,130**
07-D-220, Radioactive Liquid Waste Treatment Facility Upgrade, LANL							
TEC[g]	106,306	104,206	2,100	2,100	0	0	0
OPC	19,945	16,945	2,700	2,700	300	0	-300
TPC, 07-D-220, Radioactive Liquid Waste Treatment Facility Upgrade, LANL	**126,251**	**121,151**	**4,800**	**4,800**	**300**	**0**	**-300**
07-D-220-04, Transuranic Liquid Waste Facility, LANL							
TEC[h]	131,100	74,954	17,895	17,895	0	0	0
OPC	15,800	4,218	1,500	1,500	2,000	1,000	-1,000
TPC, 07-D-220-04, Transuranic Liquid Waste Facility, LANL	**146,900**	**79,172**	**19,395**	**19,395**	**2,000**	**1,000**	**0**

[f] Reflects rescission of $28,013 in FY 2017; In FY 2018, reflects an internal reprogramming from 12-D-301, Transuranic Waste Facilities, LANL project to this project for continued design activities conducted by the U.S. Army Corps of Engineers.
[g] In FY 2017, $2,669,265.19 of prior year funding was reprogrammed into Radioactive Liquid Waste Treatment Facility to support the Low Level Liquid Waste Facility subproject.
[h] In FY 2017, FY 2016 funding of $1,153,000 was reprogrammed from Transuranic Liquid Waste Facility project into Radioactive Liquid Waste Treatment Facility to support the Low Level Liquid Waste Facility subproject.

	(Dollars in Thousands)						
	Total	Prior Years[a]	FY 2018 Enacted	FY 2018 Current	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
06-D-141, Uranium Processing Facility, Y-12							
TEC	6,121,337	2,459,768	663,000	663,000	701,980	740,000	+38,020
OPC	378,663	94,643	0	0	1,020	5,000	+3,980
TPC, 06-D-141, Uranium Processing Facility, Y-12	**6,500,000**	**2,554,411**	**663,000**	**663,000**	**703,000**	**745,000**	**+42,000**
04-D-125, Chemistry and Metallurgy Research Replacement, LANL[a]							
TEC	1,555,664	1,148,917	140,190	140,190	144,842	114,844	-29,998
OPC	336,089	138,884	37,049	37,049	75,000	53,600	-21,400
TPC, 04-D-125, Chemistry and Metallurgy Research Replacement, LANL	**1,891,753**	**1,287,801**	**177,239**	**177,239**	**219,842**	**168,444**	**-51,398**
Total All Construction Projects							
TEC	11,347,227	3,917,340	994,485	994,985	957,775	1,086,844	+129,069
OPC	1,109,477	301,998	51,444	51,444	90,593	71,090	-19,503
TPC All Construction Projects	**12,456,704**	**4,219,338**	**1,045,929**	**1,046,429**	**1,048,368**	**1,157,934**	**+109,566**

[a] As directed in the Energy and Water Development and Related Agencies Appropriations Act, 2019, this data sheet reflects the removal of PF-4 Equipment Installation Phase 2 (PEI2) and Re-categorizing RLUOB to Hazard Category 3 (RC3).

Outyears to Completion for Infrastructure and Operations Construction

	(Dollars in Thousands)				
	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request	Outyears to Completion
23-D-xxx, Mission Corridor Water Upgrade, NNSS					
Total Estimated Cost (TEC)	0	0	6,000	25,000	TBD
Other Project Cost (OPC)	150	0	0	0	TBD
TPC, 23-D-xxx, Mission Corridor Water Upgrade, NNSS	**150**	**0**	**6,000**	**25,000**	**TBD**
22-D-xxx, Network Communication Center, LLNL					
TEC	0	4,000	40,000	0	TBD
OPC	0	0	400	1,000	TBD
TPC, 22-D-xxx, Network Communication Center, LLNL	**0**	**4,000**	**40,400**	**1,000**	**TBD**
21-D-xxx, Electrical Power Capacity Upgrade, LANL					
TEC	15,000	0	50,000	50,000	TBD
OPC	800	400	400	0	TBD
21-D-xxx, Electrical Power Capacity Upgrade, LANL	**15,800**	**400**	**50,400**	**50,000**	**TBD**
19-D-670, 138kV Power Transmission System Replacement, NNSS					
TEC	59,000	0	0	0	0
OPC	60	60	2,490	0	0
TPC, 19-D-670, 138kV Power Transmission System Replacement, NNSS	**59,060**	**60**	**2,490**	**0**	**0**
18-D-690, Lithium Processing Facility, Y-12					
TEC	26,200	125,900	191,600	217,728	32,572
OPC	1,000	1,000	1,000	12,236	44,690
TPC, 18-D-690, Lithium Processing Facility, Y-12	**27,200**	**126,900**	**192,600**	**229,964**	**77,262**

(Dollars in Thousands)

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request	Outyears to Completion
18-D-680, Material Staging Facility, PX					
TEC	0	0	0	355,620	TBD
OPC	0	0	0	15,000	TBD
TPC, 18-D-680, Material Staging Facility, PX	**0**	**0**	**0**	**370,620**	**TBD**
18-D-660, Fire Station, Y-12					
TEC	0	0	0	0	0
OPC	638	0	0	0	0
TPC, 18-D-660, Fire Station, Y-12	**638**	**0**	**0**	**0**	**0**
18-D-650, Tritium Finishing Facility, SRS					
TEC	13,000	30,000	44,909	166,500	262,420
OPC	2,000	2,000	3,000	3,000	52,400
TPC, 18-D-650, Tritium Finishing Facility, SRS	**15,000**	**32,000**	**47,909**	**169,500**	**314,820**
17-D-640, U1a Complex Enhancements Project, NNSS					
TEC	48,800	25,600	0	0	0
OPC	0	1,000	4,500	0	0
TPC, 17-D-640, U1a Complex Enhancements Project, NNSS	**48,800**	**26,600**	**4,500**	**0**	**0**
17-D-630, Expand Electrical Distribution System, LLNL					
TEC	0	0	0	0	0
OPC	400	0	0	0	0
TPC, 17-D-630, Expand Electrical Distribution System, LLNL	**400**	**0**	**0**	**0**	**0**
16-D-515, Albuquerque Complex Project, ABQ					
TEC	0	0	0	0	0
OPC	700	544	0	0	0
TPC, 16-D-515, Albuquerque Complex Project, ABQ	**700**	**544**	**0**	**0**	**0**

	(Dollars in Thousands)				
	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request	Outyears to Completion
15-D-613, Emergency Operations Center, Y-12					
TEC	0	0	0	0	0
OPC	841	0	0	0	0
TPC, 15-D-613, Emergency Operations Center, Y-12	**841**	**0**	**0**	**0**	**0**
15-D-612, Emergency Operations Center, LLNL					
TEC	27,000	0	0	0	0
OPC	0	0	800	0	0
TPC, 15-D-612, Emergency Operations Center, LLNL	**27,000**	**0**	**800**	**0**	**0**
15-D-611, Emergency Operations Center, SNL					
TEC	0	36,000	0	0	0
OPC	0	0	800	0	0
TPC, 15-D-611, Emergency Operations Center, SNL	**0**	**36,000**	**800**	**0**	**0**
15-D-302, TA-55 Reinvestment Project Phase III, LANL					
TEC	30,000	30,000	30,000	30,000	51,143
OPC	2,000	1,000	1,000	3,100	16,000
TPC, 15-D-302, TA-55 Reinvestment Project Phase III, LANL	**32,000**	**31,000**	**31,000**	**33,100**	**67,143**
15-D-301, HE Science & Engineering Facility, PX					
TEC	0	0	0	0	0
OPC	3,750	3,750	19,655	30,200	0
TPC, 15-D-301, HE Science & Engineering Facility, PX	**3,750**	**3,750**	**19,655**	**30,200**	**0**

	(Dollars in Thousands)				
	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request	Outyears to Completion
07-D-220-04, Transuranic Liquid Waste Facility, LANL					
TEC	0	0	0	0	38,251
OPC	0	0	0	0	7,082
TPC, 07-D-220-04, Transuranic Liquid Waste Facility, LANL	**0**	**0**	**0**	**0**	**45,333**
06-D-141, Uranium Processing Facility, Y-12					
TEC	718,500	566,500	203,000	68,589	0
OPC	31,500	53,500	97,000	96,000	0
TPC, 06-D-141, Uranium Processing Facility, Y-12	**750,000**	**620,000**	**300,000**	**164,589**	**0**
04-D-125, Chemistry and Metallurgy Research Replacement, LANL					
TEC	6,871	0	0	0	0
OPC	31,556	0	0	0	0
TPC, 04-D-125, Chemistry and Metallurgy Research Replacement, LANL	**38,427**	**0**	**0**	**0**	**0**
Total All Construction Projects					
TEC	944,371	818,000	565,509	913,437	384,386
OPC	75,395	63,254	131,045	160,536	120,172
TPC All Construction Projects	**1,019,766**	**881,254**	**696,554**	**1,073,973**	**504,558**

19-D-670, 138 kV Power Transmission System Replacement
Nevada National Security Site (NNSS), Nevada
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2020 Request for the 19-D-670, 138 kV Power Transmission System Replacement project is $6,000K. The current Total Project Cost (TPC) range is $42,000K to $90,000K. The project is not currently funded at the high-end range of the Critical Decision-1 (CD-1) estimate because the recently completed Hill 200 power transmission line replacement project cost history provides confidence in the point estimate. Outyear funding amounts may be revised in future budget requests as NNSA baselines the project in accordance with DOE Order 413.3B.

Significant Changes:
This project is a new start in FY 2020.

The most recent DOE Order 413.3B approved critical decision (CD) is CD-1, Approve Alternative Selection and Cost Range, approved on September 28, 2018, with a preliminary cost range of $42,000K to $90,000K and a projected CD-4 of 4Q FY 2023. The $69,700K request is based upon the CD-1 reconciled point estimate and is consistent with the power transmission line cost experience of the recently completed Hill 200 project.

A Federal Project Director has been assigned to this project.

The project will design and construct a 138 kV Power Transmission System (PTS) in the NNSS Mission Corridor, Mercury, Nevada. The PTS will replace and upgrade approximately 23 miles of the degraded existing PTS and upgrade the co-located fiber optic lines to meet the mission requirements for reliable power and communications distribution in the NNSS Mission Corridor. The proposed PTS project will be executed to allow continued operations of current mission critical facilities. This project supports current and ongoing critical national security mission activities conducted by not only DOE and NNSA, but the Department of Defense, Homeland Security, and other Federal partners.

The FY 2019 request for funding was not supported in the final appropriations bill. The project will experience a one year slip in schedule and funding is now being requested in FY 2020. Because further progress requires design development, the project will be paused in FY 2019. Some OPC activity will occur in FY 2019.

Critical Milestone History[a]

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	Final Design Complete	CD-2/3	D&D Complete	CD-4
FY 2019	1/18/2017	12/21/2017	4Q FY2018	4Q FY2019	1Q FY2020	4Q FY2022	4Q FY2022
FY 2020	1/18/2017	12/21/2017	9/28/2018	4Q FY2020	2Q FY2021	4Q FY2023	4Q FY2023

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete(d)
CD-3 – Approve Start of Construction

[a]The schedules are only estimates and consistent with the high end of the schedule ranges.

D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

Project Cost History[a b]

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2019	6,000	59,000	65,000	4,000	6,000	10,000	75,000
FY 2020	6,000	79,300	85,300	2,300	2,400	4,700	90,000

2. Project Scope and Justification

Scope

The project scope is to design and build a new PTS for the Mission Corridor at the NNSS. This segment of the system traverses approximately 23 miles between the Mercury Switching Center and the Tweezer Substation. The project includes replacement of the existing power transmission line, installation of a new higher-capacity fiber optic cable, new taller support poles, and the demolition of the existing power line and poles. The final scope, schedule, and cost will be baselined when CD-2/3 is approved.

Justification

This project supports current and ongoing critical national security mission activities conducted by not only DOE and NNSA, but the Department of Defense, Homeland Security, and other Federal partners. DOE and NNSA specific activities supported by this project are: defense experimentation and stockpile stewardship; environmental and waste management; nuclear nonproliferation; nuclear emergency response; and the National Criticality Experiments Research Center.
Replacement of the 138 kV Power Transmission System will provide the NNSS with highly reliable power and communications to mission critical facilities such as the Device Assembly Facility. The existing system was originally constructed in 1963 (55 years of age) and is well beyond its useful design life. The reliability of the system will continue to be a risk to mission as system components continue to deteriorate, resulting in unscheduled outages that will impact the mission of Stockpile Stewardship operations. The system carries the site's fiber optic backbone, which enables vital communications and data transmission across the NNSS. Therefore, replacement of the system will provide the NNSS with highly reliable power and communications, enabling continued success at executing the site's vital national security mission.
This project provides the following benefits:

- Mitigates the risk of losing mission critical data from Stockpile Stewardship experiments; this data represents significant federal investment of dollars, man-hours, and special nuclear material
- Improves the reliability and capability of security, safety, and emergency management/response systems
- Provides uninterrupted communications and data transmission in support of normal site operations

An Independent Analysis of Alternatives was conducted after CD-0 in accordance with the requirements of Office of Management and Budget (OMB) Circular A-11. Multiple alternatives were analyzed; the highest ranked alternative was to construct a new 138 kV Power Transmission System.
The project is being conducted in accordance with the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets.
Funds appropriated under this data sheet may be used for contracted support services to the Federal Project Director and to conduct reviews of design and construction.

[a] No construction will be performed until the project performance baseline has been validated and CD-3 has been approved.
[b] The FY 2020 numbers are only estimates and are consistent with the high end values of the cost ranges.

Key Performance Parameters (KPPs)
The Threshold KPPs represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The Objective KPPs represent the desired project performance.

In accordance with DOE Order 413.3B, KPPs will be finalized at approval of CD-2, *Approve Performance Baseline*.

Performance Measure	Threshold	Objective
Component Service Life	New components shall have the following minimum service life: Conductors - 35 years, Insulators - 50 years, Poles - 60 years	N/A
Prevent Single Failure	The new Power Transmission System will maintain the current loop configuration that incorporates three interconnection points from the off-site utility grid. The NNSS Power Transmission System will be sectionalized such that no single failure of the system will result in a loss of load	N/A
Natural Phenomenon	In accordance ASCE/SEI 7-10, the design will meet the following design categories for essential structures: Seismic Design Category 2; Extreme Wind Design Category 2; Flood Design Category 2; Extreme Precipitation (includes ice) Design Category 2	N/A
Electrical	The Power Transmission System configuration will support: Voltage - 138 kV, Power capacity of at least 35 MW.	N/A
Fiber Optic Cabling - communications requirements	The fiber optic system co-located with the Power Transmission System conductor shall provide single mode 144 strand fiber optic cable compatible with all 1510 nm wave length equipment.	N/A

3. Project Cost and Schedule

Financial Schedule[a]

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2020	6,000	6,000	6,000
FY 2021	0	0	0
Total Design	6,000	6,000	6,000
Construction			
FY 2021	59,000	59,000	11,800
FY 2022	0	0	23,600
FY 2023	0	0	23,600
Total Construction	59,000	59,000	59,000
Total Estimated Costs (TEC)			
FY 2020	6,000	6,000	6,000

[a] The project has not yet been approved for CD-2, and therefore has not been baselined. Outyear funding amounts may be revised in future budget requests as NNSA baselines the project in accordance with DOE Order 413.3B.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2021	59,000	59,000	11,800
FY 2022	0	0	23,600
FY 2023	0	0	23,600
Total TEC	65,000	65,000	65,000
Other Project Costs			
FY 2017	550	550	158[a]
FY 2018	980	903	1,201
FY 2019	500	577	151
FY 2020	60	60	80
FY 2021	60	60	80
FY 2022	60	60	80
FY 2023	90	90	550
Total OPC, except D&D	2,300	2,300	2,300
OPC D&D			
FY 2023	2,400	2,400	2,400
Total, OPC	4,700	4,700	4,700
Total Project Costs (TPC)			
FY 2017	550	550	158
FY 2018	980	903	1,201
FY 2019	500	577	151
FY 2020	6,060	6,060	6,080
FY 2021	59,060	59,060	11,880
FY 2022	60	60	23,680
FY 2023	2,490	2,490	26,550
Grand Total	69,700	69,700	69,700

[a] The FY 2019 PDS reflected $175k costed in FY 2017. This number was incorrect and has been updated to reflect the correct amount costed in FY 2017.

Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	4,800	4,800	N/A
Contingency	1,200	1,200	N/A
Total, Design	6,000	6,000	N/A
Construction			
Site Work	900	0	N/A
Equipment	0	0	N/A
Construction	49,100	48,425	N/A
Federal Support	800	1,000	N/A
Contingency	8,200	9,575	N/A
Total, Construction	59,000	59,000	N/A
Total Estimated Cost	65,000	65,000	N/A
Contingency, TEC	9,400	10,775	N/A
Other Project Cost (OPC)			
OPC except D&D			
Conceptual Planning	550	N/A	N/A
Analysis of Alternatives	175	175	N/A
Conceptual Design	265	265	N/A
Other OPC Costs	860	N/A	N/A
Start-up	0	1,100	N/A
Contingency	450	2,460	N/A
Total, OPC except D&D	2,300	4,000	N/A
OPC D&D			
Demolition	1,900	4,800	N/A
Contingency	500	1,200	N/A
Total, OPC D&D	2,400	6,000	N/A
Total OPC	4,700	10,000	N/A
Contingency, OPC	950	3,660	N/A
Total Project Cost	69,700	75,000	N/A
Total Contingency (TEC+OPC)	10,350	14,435	N/A

Schedule of Appropriations Requests[a]

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Total
FY 2019	TEC	0	6,000	54,000	0	0	0	0	60,000
	OPC	1,400	500	500	500	7,100	0	0	10,000
	TPC	1,400	6,500	54,500	500	7,100	0	0	70,000
FY 2020	TEC	0	0	6,000	59,000	0	0	0	65,000
	OPC	1,530	500	60	60	60	2,490	0	4,700
	TPC	1,530	500	6,060	59,060	60	2,490	0	69,700

4. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	4QFY 2023
Expected Useful Life	50
Expected Future Start of D&D of this capital asset	2073

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	4.5	4.5	180.9	180.9

5. D&D Information

Portions of the existing 23 mile PTS section will be demolished after the replacement power line is energized and accepted. Some poles will remain in place for environmental reasons as indigenous animals have nested on these structures.

6. Acquisition Approach

The design of the PTS will be led by the M&O contractor using a subcontracted Architectural and Engineering Firm under a firm fixed price contract.

Construction will be led by the M&O contractor using a subcontracted Construction firm under a firm fixed price contract.

[a] The project has not yet been approved for CD-2, and therefore has not been baselined. Outyear funding amounts may be revised in future budget requests as NNSA baselines the project in accordance with DOE Order 413.3B.

18-D-690, Lithium Processing Facility[a]
Y-12 National Security Complex, Oak Ridge, Tennessee
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

<u>Summary</u>: The FY 2020 Request for the Lithium Processing Facility project (formerly known as the Lithium Production Capability) is $32,000K. The current Total Estimated Cost (TEC) range is $230,000K to $650,000K.

<u>Significant Changes</u>:
This project is not a new start.

- The most recent Critical Design (CD) is CD-0, Approve Mission Need, approved 06/10/2015.
- The project continues developing all other documents needed for CD-1 approval to complete the definition phase as defined by DOE Order 413.3B, Change 5. The CD-1 approval is rescheduled to 3Q FY 2019 to allow sufficient time for reviews. NNSA will provide updated cost and footprint information after CD-1.
- A Federal Project Director will be assigned prior to CD-1 approval.
- The initial conceptual design was completed January 19, 2018. However, a necessary increase in the process area space requirements realized when the preliminary equipment layout was drafted required additional iterations of the conceptual facility and process design. This CPDS reflects the new conceptual design completion date.
- The project no longer includes new electrical substations and underground containment tanks. The new facility will use existing Y-12 utilities.

<u>Critical Milestone History</u>

Fiscal Quarter or Date[b]

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2019	06/10/2015	01/19/2018	2Q FY 2019	1Q FY 2021	2Q FY 2022	1Q FY 2021	N/A	2Q FY 2027
FY 2020	06/10/2015	02/28/ 2019	3Q FY 2019	2Q FY 2022	2Q FY 2022	2Q FY 2022	N/A	3Q FY 2027

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – The conceptual design is scheduled to be completed by February 2019.
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete/d
CD-3 – Approve Start of Construction
D&D Complete –Completion of D&D work (see Section 9)
CD-4 – Approve Start of Operations or Project Complete

Fiscal Year	Performance Baseline Validation	CD-3A
FY 2019	N/A	N/A
FY 2020	N/A	4Q FY 2021

CD-3A – Site Preparation –engineered fill, access roads, warehouse space, and utilities to prepare the site for new construction or refurbishment of existing buildings and procuring critical equipment.

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[a] The project, formerly known as the Lithium Production Capability project, has been renamed to better reflect planned activities within the facility.

[b] The schedules are only estimates until the project baseline is approved.

Project Cost History[a]

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC Except D&D	OPC, D&D	OPC, Total	TPC
FY 2019	120,000	530,000	650,000	70,000	0	70,000	720,000
FY 2020	125,000	525,000	650,000	70,000	0	70,000	720,000

No construction, excluding long-lead procurement, if deemed necessary, will be performed until the project baseline (CD-2) and CD-3 are approved.

2. Project Scope and Justification

Scope

The Project will construct a new facility to relocate lithium operations and processes currently in Y-12's Building 9204-2 into a safe, reliable, modern building. The new Lithium Processing Facility (LPF) will be 90,000 to 110,000 square feet in size. It will be designed with space for lithium process equipment, shipping and receiving areas, a storage area, and technical and administrative support areas. The scope includes long-lead site preparation activities.

Justification

Lithium is an essential element for the refurbishment and modernization of the nuclear weapons stockpile. To support Directed Stockpile Work (DSW) missions, Y-12 maintains capabilities and facilities for the production of lithium components. In addition to supporting DSW, lithium capabilities support international agreements, the NNSA Nuclear Smuggling Detection and Deterrence program, the Department of Homeland Security Countering Weapons of Mass Destruction Office, and the Department of Energy (DOE) Office of Science Isotope Business Office.

Production work for lithium and related nonnuclear special materials vital to canned subassemblies is performed in Building 9204-2, which was built in 1943. The facility is oversized for today's mission, is costly to operate, has many operating issues, and has exceeded its expected life. Conditions in Building 9204-2 continue to degrade caused in part due to a significant amount of deferred maintenance. In addition, the Senate Armed Service Committee in the National Defense Authorization Act of Fiscal Year 2015, acknowledged that: "Portions of the concrete ceiling above equipment that supplies components to the stockpile are spalling as the rebar inside the 60-plus-year-old concrete has corroded due to a desiccant used in the air handling system. Such working conditions are unacceptable if not dangerous." In order to ensure continuity of lithium capabilities, reduce annual operating costs, and increase process efficiencies using safer, more modern, agile, and responsive processes, a new facility must be built.

The project funding profile may be revised in future budget requests prior to CD-2 to account for improved definition of the design, schedule, and risks.

The project is being conducted in accordance with the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets.

Funds appropriated under this data sheet may be used to provide independent assessments of the planning and execution of this project and for contracted support services to the federal project team for oversight and support.

[a] The costs are estimates only until approval of the project baseline.

Preliminary Key Performance Parameters (KPPs)
The Threshold KPPs, represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The Objective KPPs represent the desired project performance.

Performance Measure[a]	Threshold	Objective
Demonstrate capacity to process and produce sufficient lithium material to meet projected weapons program demands	N/A	N/A
Demonstrate capacity to manufacture sufficient lithium components to meet projected weapons program demands	N/A	N/A

3. Project Cost and Schedule

Financial Schedule

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2018	5,000[b]	3,661	0
FY 2019	19,000	20,339	10,000
FY 2020	32,000	32,000	36,000
FY 2021	26,200	26,200	36,200
FY 2022	42,800	42,800	42,800
Total Design	125,000	125,000	125,000
Construction			
FY 2021	0	0	0
FY 2022	83,100	83,100	83,100
FY 2023	191,600	191,600	191,600
FY 2024	217,728	217,728	152,900
FY 2025	32,572	32,572	80,000
FY 2026	0	0	17,400
Total Construction	525,000	525,000	525,000
Total Estimated Costs (TEC)			
FY 2018	5,000	3,661	0
FY 2019	19,000	20,339	10,000
FY 2020	32,000	32,000	36,000
FY 2021	26,200	26,200	36,200

[a] Key Performance Parameters will be approved upon approval of the project baseline.
[b] Congress appropriated $5 million under the 18-D-690, Lithium Production Capability, Y-12 project in FY 2018. NNSA General Counsel reviewed the appropriation language and approved using the funding appropriated under the line item for OPCs. Funding is shown under design in order to account for funding appropriated for the line item.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2022	125,900	125,900	125,900
FY 2023	191,600	191,600	191,600
FY 2024	217,728	217,728	152,900
FY 2025	32,572	32,572	80,000
FY 2026	0	0	17,400
Total TEC	**650,000**	**650,000**	**650,000**
Other Project Costs			
FY 2015[a]	497	497	88
FY 2016[a]	247	247	637
FY 2017[a]	4,680	4,680	572
FY 2018[a]	400	400	4,527
FY 2019	3,250	3,250	3,250
FY 2020	1,000	1,000	1,000
FY 2021	1,000	1,000	1,000
FY 2022	1,000	1,000	1,000
FY 2023	1,000	1,000	1,000
FY 2024	12,236	12,236	12,236
FY 2025	16,563	16,563	16,563
FY 2026	18,132	18,132	18,132
FY 2027	9,995	9,995	9,995
Total OPC	70,000	70,000	70,000
Total Project Costs (TPC)			
FY 2015	497	497	88
FY 2016	247	247	637
FY 2017	4,680	4,680	572
FY 2018	5,400	4,061	4,527
FY 2019	22,250	23,589	13,250
FY 2020	33,000	33,000	37,000
FY 2021	27,200	27,200	37,200
FY 2022	126,900	126,900	126,900
FY 2023	192,600	192,600	192,600
FY 2024	229,964	229,964	165,136
FY 2025	49,135	49,135	96,563
FY 2026	18,132	18,132	35,532
FY 2027	9,995	9,995	9,995
Grand Total	**720,000**	**720,000**	**720,000**

[a] LPF Other Project Costs were funded through Capability Based Investments (CBI) program in FY 2015-2018. Changes reflect a reconciliation of activities during those years.

Details of Project Cost Estimate

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	97,085	97,085	0
Federal Support	5,000	5,000	0
Other Costs	16,203	11,203	0
Contingency	6,712	6,712	0
Total, Design	125,000	120,000	0
Construction			
Site Work	10,300	10,300	0
Equipment	200,000	200,000	0
Construction	270,560	270,560	0
Federal Support	15,000	10,000	0
Project Management	10,000	20,000	0
Contingency	19,140	19,140	0
Total, Construction	525,000	530,000	0
Other TEC (if any)			
Cold Startup	0	0	0
Contingency	0	0	0
Total, Other TEC	0	0	0
Total Estimated Cost	650,000	650,000	0
Contingency, TEC	25,852	25,852	0
Other Project Cost (OPC)			
OPC except D&D			
Conceptual Planning	3,250	7,774	0
Conceptual Design	5,824	4,119	0
Federal Support	5,000	5,000	0
Other OPC Costs (Startup, ES&H, etc)	45,319	42,500	0
Contingency	10,607	10,607	0
Total, OPC	**70,000**	**70,000**	**0**
Contingency, OPC	*10,607*	*10,607*	*0*
Total Project Cost	**720,000**	**720,000**	0
Total Contingency (TEC+OPC)	**36,459**	**36,459**	0

Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Future Year	Total
FY 2019	TEC	0		19,000	32,000	26,200	125,900	201,600	150,000	95,300	650,000
	OPC	3,254[a]	3,865	3,250	1,000	1,000	1,000	1,000	9,000	46,631	70,000
	TPC	3,254	3,865	22,250	33,000	27,200	126,900	202,600	159,000	141,931	720,000
FY 2020[b]	TEC	0	5,000	19,000	32,000	26,200	125,900	191,600	212,728	32,572	650,000
	OPC	5,424	400	3,250	1,000	1,000	1,000	1,000	12,236	44,690	70,000
	TPC	5,424	5,400	22,250	33,000	27,200	126,900	192,600	229,964	77,262	720,000

4. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	FY 2030
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	FY 2080

Related Funding requirements

(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	37	37	1,855	1,855

5. Required D&D Information

The new area being constructed in this project is replacing the existing biology complex; however, the costs of D&D of the facilities that are being replaced are not included in the costs of this construction project. Building 9204-2 houses operations in addition to lithium production, and the plan for the continued operation and follow-on capability for those operations is yet to be decided. Once all capabilities have been moved out of Building 9204-2, the facility will be demolished.

	Square Feet
New area being constructed by this project at Y-12	106,000
Area of D&D in this project at Y-12	0
Area at Y-12 to be transferred, sold, and/or D&D outside the project, including area previously “banked”	0
Area of D&D in this project at other sites	0
Area at other sites to be transferred, sold, and/or D&D outside the project, including area previously “banked”	0
Total area eliminated	0

[a] LPF Other Project Costs were funded in the CBI program in FY 2015-2018.

[b] FY2018 and prior OPCs account for CD-1 activities not included in FY2019 data sheet.

6. Acquisition Approach

The design and construction management contract could be awarded by the site Management and Operating contractor or directly by a Federal entity upon approval of the Acquisition Strategy by the Deputy Administrator for Defense Programs. Design and construction may be acquired through a design-build firm-fixed price contract. As allowed by Order 413.3B, Change 5, the project scope may be phased into smaller usable projects with phased CD-2/3 approvals after approval of CD-1.

18-D-650, Tritium Finishing Facility[a]
Savannah River Site, Aiken, South Carolina
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2020 Request for the Tritium Finishing Facility (TFF) Project (formerly known as the Tritium Production Capability) is $27,000K. The current Total Estimated Cost (TEC) range is $280,000K to $543,829K.

Significant Changes:
The TFF Project at the NNSA Savannah River Site requested line item funding in FY 2018 and FY 2019. Congress did not fund the project in FY 2018, but did provide $10,000K within the Infrastructure and Operations, Recapitalization program in FY 2019 to "advance plans" for the project. The $10,000K is not included in the TFF project, but will be used to perform two small preparatory upgrade projects in Building 234-7H that advance the plans for TFF. The FY 2020 milestone dates and costs have been adjusted to account for these decisions.

The most recent Critical Decision (CD) is CD-0, Approve Mission Need. The critical milestone dates and project costs have been adjusted to account for the delayed CD-1 milestone; costs have been escalated at 4% for two years and the CD-4 date has been moved to 4Q FY 2031. These adjustments will be reviewed and validated during the Independent Cost Review by the Department of Energy Office of Project Management prior to CD-1 approval.

A Federal Project Director has not been appointed.

Critical Milestone History

Fiscal Quarter or Date[b]

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2018	06/10/2015	01/28/2017	2Q FY 2018	4Q FY 2022	2Q FY 2022	4Q FY 2022	N/A	4Q FY 2027
FY 2019	06/10/2015	01/28/2017	3Q FY 2018	2Q FY 2023	2Q FY 2022	2Q FY 2023	N/A	4Q FY 2029
FY 2020	06/10/2015	01/28/2017	4Q FY 2019	2Q FY 2024	4Q FY 2023	2Q FY 2024	N/A	4Q FY 2031

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete (d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Complete

Fiscal Quarter or Date

Fiscal Year	Performance Baseline Validation	CD-3A
FY 2018	N/A	1Q FY 2020
FY 2019	N/A	1Q FY 2020
FY 2020	N/A	1Q FY 2022

CD-3A – Site Preparation – demolishing existing structures, relocating fence, access roads, warehouse space, and utilities to clear and prepare the site for new construction or refurbishment of existing buildings and procuring critical equipment.

[a] The former Tritium Production Capability has been renamed to the Tritium Finishing Facility that better defines the facilities activities.
[b] The schedules are only estimates until the project baseline is approved.

Project Cost History

(Dollars in Thousands)[c]

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2018	76,000	349,000	425,000	74,000	0	74,000	499,000
FY 2019	76,000	425,042	501,042	74,000	0	74,000	575,042
FY 2020	79,000	464,829	543,829	75,000	0	75,000	618,829

With the exception of CD-3A, no construction of process facilities will be performed until the project performance baseline has been validated and CD-3 has been approved. A CD-3A request will be made for long-lead procurement, dismantlement and removal of structures, systems and components, re-establishing warehouse space and site preparation to reduce project schedule and subsequent cost.

2. Project Scope and Justification

Scope

The TFF project will construct two new facilities to relocate tritium and deuterium processes currently in H-Area Old Manufacturing into safe, reliable, modern buildings. The first, hardened facility (estimated at 15,000 +/-10% square feet) will house nuclear equipment processes, and the second (estimated at 5,000 +/-10% square feet) will house non-nuclear process equipment. To make room for the new buildings, existing warehouses will be demolished and replaced. Additional scope for the project includes project design, safety basis development, and relocation of utilities, fences, and an access road.

Justification

The NNSA Stockpile Stewardship mission and the Tritium-related missions require the specific capability of providing tritium and deuterium-filled reservoirs to the Department of Defense, a capability that must be ensured well into the foreseeable future. These capabilities include, but are not limited to, receipt, inspection, surveillance, packaging, and shipping. These critical capabilities are currently housed in a 60-year-old building, H Area Old Manufacturing. The infrastructure of the building has deteriorated and is well beyond expected end-of-life. Critical capabilities are now housed in areas that create a substantial risk to the enduring Tritium mission. Infrastructure failures have increased, leading to increased safety, security, maintenance and operating costs.

The project is being conducted in accordance with the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets, and all appropriate project management requirements for CD-1 will be met before authorizing use of appropriated funds. The project funding profile may be revised in future budget requests prior to CD-2 to account for improved definition of the design, schedule, and risks.

Funds appropriated under this data sheet may be used to provide independent assessments of the planning and execution of this project and for contracted support services to the federal project team for oversight and support. Funding specifically appropriated for this line item will be used only for Total Estimated Cost (TEC) work.

[c] The costs are only estimates until the project performance baseline is approved.

Preliminary Key Performance Parameters (KPPs)

The threshold KPPs represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The Objective KPPs represent the desired project performance.

Performance Measure[d]	Threshold	Objective
Flow of reservoirs through all processes should be completed by the scheduled shipping date as verified using surrogate materials.	Flow of reservoirs through all processes should be completed within 60 days of the scheduled shipping date using surrogate materials.	N/A

3. Project Cost and Schedule

Financial Schedule

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	27,000	27,000	10,000
FY 2021	13,000	13,000	21,000
FY 2022	19,000	19,000	21,000
FY 2023	20,000	20,000	17,000
FY 2024	0	0	10,000
Total, Design	79,000	79,000	79,000
Construction			
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	11,000	11,000	10,000
FY 2023	24,909	24,909	23,909
FY 2024	166,500	166,500	92,800
FY 2025	152,242	152,242	123,800
FY 2026	110,178	110,178	120,000
FY 2027	0	0	94,320
FY 2028	0	0	0
FY 2029	0	0	0

[d] Key Performance Parameter (KPP) will be approved upon approval of the project baseline.

	Budget Authority (Appropriations)	Obligations	Costs
Total, Construction	464,829	464,829	464,829
Total Estimated Cost			
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	27,000	27,000	10,000
FY 2021	13,000	13,000	21,000
FY 2022	30,000	30,000	31,000
FY 2023	44,909	44,909	40,909
FY 2024	166,500	166,500	102,800
FY 2025	152,242	152,242	123,800
FY 2026	110,178	110,178	120,000
FY 2027	0	0	94,320
FY 2028	0	0	0
FY 2029	0	0	0
Total, TEC	543,829	543,829	543,829
Other Project Cost (OPC)			
FY 2015	2,000	2,000	2,000
FY 2016	2,100	2,100	2,100
FY 2017	3,000	3,000	3,000
FY 2018	500	500	500
FY 2019	3,000	3,000	3,000
FY 2020	2,000	2,000	2,000
FY 2021	2,000	2,000	2,000
FY 2022	2,000	2,000	2,000
FY 2023	3,000	3,000	3,000
FY 2024	3,000	3,000	3,000
FY 2025	3,000	3,000	3,000
FY 2026	5,000	5,000	5,000
FY 2027	7,000	7,000	7,000
FY 2028	14,000	14,000	14,000
FY 2029	11,400	11,400	11,400
FY 2030	9,000	9,000	9,000
FY 2031	3,000	3,000	3,000
Total, OPC	75,000	75,000	75,000
Total Project Cost (TPC)			

	Budget Authority (Appropriations)	Obligations	Costs
FY 2015	2,000	2,000	2,000
FY 2016	2,100	2,100	2,100
FY 2017	3,000	3,000	3,000
FY 2018	500	500	500
FY 2019	3,000	3,000	3,000
FY 2020	29,000	29,000	12,000
FY 2021	15,000	15,000	23,000
FY 2022	32,000	32,000	33,000
FY 2023	47,909	47,909	43,909
FY 2024	169,500	169,500	105,800
FY 2025	155,242	155,242	126,800
FY 2026	115,178	115,178	125,000
FY 2027	7,000	7,000	101,320
FY 2028	14,000	14,000	14,000
FY 2029	11,400	11,400	11,400
FY 2030	9,000	9,000	9,000
FY 2031	3,000	3,000	3,000
Total, TPC	618,829	618,829	618,829

Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	48,000	50,000	N/A
Safety Basis	4,000	4,000	N/A
Federal Support	3,000	3,000	N/A
Project and Design Management	9,500	9,500	N/A
Contingency	14,500	9,500	N/A
Total, Design	79,000	76,000	N/A
Construction			
Site Work	12,500	8,500	N/A
Facility Demolition	4,000	2,000	N/A
Construction	363,635	345,000	N/A
Safety Basis Documents	6,000	6,000	N/A
Federal Support	8,000	8,000	N/A
M&O Support	5,000	5,000	N/A
Contingency	65,694	50,542	N/A
Total, Construction	464,829	425,042	N/A
Total Estimated Cost	543,829	501,042	N/A
Contingency, TEC	80,194	60,042	N/A
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	N/A
Conceptual Planning	4,900	4,900	N/A
Analysis of Alternative	832	832	N/A
Conceptual Design	3,200	3,200	N/A
NEPA & Permit	500	500	N/A
Federal Support	3,000	3,000	N/A
Safeguard & Security	1,000	1,000	N/A
ES&H	12,500	12,500	N/A
Contractor Support	3,000	3,000	N/A
Startup	36,500	36,500	N/A
Contingency	9,568	8,568	N/A
Total, OPC except D&D	**75,000**	**74,000**	**N/A**
Contingency, OPC	9,568	8,568	N/A
Total Project Cost	618,829	575,042	N/A
Total Contingency (TEC +OPC)	89,762	68,610	N/A

Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Outyears	Total
FY 2018	TEC	0	6,800	25,505	49,500	13,000	22,000	0	0	308,195	425,000
	OPC	7,100	3,000	3,000	3,000	3,000	3,000	0	0	51,900	74,000
	TPC	7,100	9,800	28,505	52,500	16,000	25,000	0	0	360,095	499,000
FY 2019	TEC	0	6,800	27,000	27,000	13,000	30,000	45,000	200,000	152,242	501,042
	OPC	7,100	3,000	3,000	3,000	3,000	3,000	3,000	3,000	45,900	74,000
	TPC	7,100	9,800	30,000	30,000	16,000	33,000	48,000	203,000	198,142	575,042
FY 2020	TEC	0	0	0	27,000	13,000	30,000	44,909	166,500	262,420	543,829
	OPC	7,100	500	3,000	2,000	2,000	2,000	3,000	3,000	52,400	75,000
	TPC	7,100	500	3,000	29,000	15,000	32,000	47,909	169,500	314,820	618,829

4. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	4Q FY 2031
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	1Q FY 2082

Related Funding Requirements

(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	4.9	4.9	2,478	2,478

5. D&D Information

Because the existing facility contains tritium, the facility cannot be decommissioned and demolished for another 70 years. The approximate area of warehouses to be demolished to clear the site for the new building is listed here.

D&D Description	Square Feet
1. New area being constructed by this project on the Savannah River Site	20,000 – 30,000
2. Area on the Savannah River Site to be D&D by this project	10,000
3. Area on the Savannah River Site to be transferred, sold, and/or D&D outside the project including area previously "banked"	0
4. Area on other sites to be D&D by this project	0
5. Area on other sites to be transferred, sold, and/or D&D outside the project including area previously "banked"	0
6. Total area eliminated (add boxes 2, 3, 4, and 5)	10,000

6. Acquisition Approach

The design and construction, including developing the safety basis documents, could be awarded by the site Management & Operating contractor or directly by Federal Government upon approval of the Acquisition Strategy by the Deputy Administrator for Defense Programs.

17-D-640, U1a Complex Enhancements Project (UCEP)
Nevada National Security Site (NNSS), Mercury, Nevada
Construction Project Data Sheet

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2020 Request for the U1a Complex Enhancements Project (UCEP) is $35,000K. UCEP has a Total Project Cost (TPC) range of $110.7M to $174.8M, and a CD-4 *Approve Start of Operations or Project Completion* scheduled for 1QFY 2024. This estimate/schedule is subject to change when design is completed and CD-2 is obtained for each of the two subprojects.

Significant Changes:
This Construction Project Data Sheet (CPDS) is an update of the Fiscal Year (FY) 2019 CPDS and does not include a new start for the budget year. DOE Order 413.3B Critical Decision (CD), *CD-0 Approve Mission Need* was approved on September 25, 2014, for the "Enhanced Capabilities for Subcritical Experiments (ECSE) at the Nevada National Security Site, U1a Complex." On November 4, 2015, the intersection of the U1a.100 and U1a.104 Drifts within the U1a Complex at the Nevada National Security Site was determined to be the only viable location for ECSE. CD-1 was approved on August 9, 2017. Following are the changes from the previous version:

1. Refinement of design resulted in elimination of the U1a.107 Drift.
2. Refinement of design resulted in addition of the U1a.108 Drift and U1a.104 Drift extension.
3. Projected CD-4 for the ECSE Access and Life Safety Infrastructure subproject slipped from 2Q FY 2021 to 4Q FY 2023. The initial CD-4 date was established based on conceptual design. As the design matured, the U1a.108 Drift, U1a.104 Drift extension, and additional demolition were added to the scope of work. The increased scope imposed approximately 270 feet of additional mining. The slip of CD-4 has no impact on 17-D-640-020-ECSE Laboratory and Support Infrastructure, and no overall impact to UCEP completion.
4. Refuge Station capacity has been set at 125 persons.
5. As a result of appropriations below the requested budget in FY 2019, the CD dates for ECSE Laboratory and Support Infrastructure and the Total Project, as well as the project's funding profile, were adjusted.
6. Additional Construction Costs were included for safety basis, project reviews, and federal support services.
7. Additional Other Project Costs were included to account for commissioning and readiness activities.
8. Total Project Cost increased from $158.6M to $174.8M.
9. Project Cost and Schedule was adjusted to reflect FY 2017 and FY 2018 actual costs.

A Federal Project Director at the appropriate level has been assigned to this project and has approved the CPDS.

Critical Milestone History
17-D-640: Total Project

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2017	9/25/2014	8/13/2015	1Q FY 2017	1Q FY 2019	2Q FY 2019	3Q FY 2019	N/A	3Q FY 2022
FY 2018	9/25/2014	8/13/2015	3Q FY 2017	4Q FY 2019	2Q FY 2019	4Q FY 2019	N/A	2Q FY 2023
FY 2019	9/25/2014	8/13/2015	08/09/2017	4Q FY 2019	2Q FY 2019	4Q FY 2019	N/A	2Q FY 2023
FY 2020	9/25/2014	8/13/2015	08/09/2017	2Q FY 2020	4Q FY 2019	2Q FY 2020	N/A	4Q FY 2025

17-D-640-010: ECSE Access and Life Safety Infrastructure

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2017	9/25/2014	8/13/2015	1Q FY 2017	3Q FY 2017	4Q FY 2017	4Q FY 2017	N/A	2Q FY 2019
FY 2018	9/25/2014	8/13/2015	3Q FY 2017	2Q FY 2018	1Q FY 2018	2Q FY 2018	N/A	3Q FY 2020
FY 2019	9/25/2014	8/13/2015	08/09/2017	2Q FY 2019	3Q FY 2018	2Q FY 2019	N/A	2Q FY 2021
FY 2020	9/25/2014	8/13/2015	08/09/2017	2Q FY 2019	7/11/2018	2Q FY 2019	N/A	4Q FY 2023

17-D-640-020: ECSE Laboratory and Support Infrastructure

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2017	9/25/2014	8/13/2015	1Q FY 2017	1Q FY 2019	2Q FY 2019	3Q FY 2019	N/A	3Q FY 2022
FY 2018	9/25/2014	8/13/2015	3Q FY 2017	4Q FY 2019	2Q FY 2019	4Q FY 2019	N/A	2Q FY 2023
FY 2019	9/25/2014	8/13/2015	08/09/2017	4Q FY 2019	2Q FY 2019	4Q FY 2019	N/A	2Q FY 2023
FY 2020	9/25/2014	8/13/2015	08/09/2017	2Q FY 2020	4Q FY 2019	2Q FY 2020	N/A	4Q FY 2025

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete (d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout
Separate documentation will be submitted for combined CD-2/3 for each subproject. The dates listed above do not include schedule contingency.

Project Cost History

17-D-640: Total Project

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2017	14,200	137,300	151,500	7,109	N/A	7,109	158,609
FY 2018	14,200	137,300	151,500	7,109	N/A	7,109	158,609
FY 2019	19,900	131,600	151,500	7,109	N/A	7,109	158,609
FY 2020	14,856	148,144	163,000	11,809	N/A	11,809	174,809

17-D-640-010: ECSE Access and Life Safety Infrastructure

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2017	2,700	23,940	26,640	981	N/A	981	27,621
FY 2018	2,700	23,940	26,640	981	N/A	981	27,621
FY 2019	8,400	38,240	46,640	981	N/A	981	47,621
FY 2020	3,356	44,784	48,140	1,981	N/A	1,981	50,121

17-D-640-020: ECSE Laboratory and Support Infrastructure

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2017	11,500	113,360	124,860	6,128	N/A	6,128	130,988
FY 2018	11,500	113,360	124,860	6,128	N/A	6,128	130,988
FY 2019	11,500	93,360	104,860	6,128	N/A	6,128	110,988
FY 2020	11,500	103,360	114,860	9,828	N/A	9,828	124,688

2. Project Scope and Justification

Scope

UCEP will perform mining and provide the supporting structures, systems and components necessary to deploy the large Major Items of Equipment (MIE) diagnostic systems and experiments. Existing U1a Complex orthogonal U1a.100 and U1a.104 drifts will be used to minimize the need for new mining.

17-D-640-010 includes the design, mining, fabrication, construction, installation, and commissioning of the underground areas and systems in the U1a Complex to provide accessibility, a refuge station, adequate ventilation, and construction power for the ensuing subproject 17-D-640-020. This subproject is required to support any significant construction activity in the eastern portion of the U1a Complex. While driven by the same mission in the ECSE subprogram, it is a subproject that can be designed and completed separately from the other subproject.

17-D-640-020 includes the design, fabrication, construction, installation and commissioning of the ECSE Area and systems to provide MIE diagnostic/detector alcove drifts and mechanical equipment drifts. Also included are safety basis and readiness activities. The project underground scope includes an experimental room with containment plugs for experiment execution, process control system, safety interlock system, diagnostic clean rooms and diagnostic infrastructure, and ancillary systems (overhead handling systems, power, cooling, ventilation, process water and oil, instrument air, spill mitigation, and shielding).

Justification

The enhancements to the U1a Complex included in this Line Item will provide the drifts and the supporting structures, systems, and components necessary for the deployment of the MIEs to diagnose the subcritical hydrodynamic integrated weapons experiments using plutonium.

NNSA plans long-term investments supporting plutonium science at the NNSS. NNSS is the only site in the United States for experiments combining high explosives and plutonium, a core capability for NNSA's Stockpile Stewardship Program.

Funds appropriated under this data sheet may be used for contracted support services to the Federal Program Manager and the Federal Project Director to conduct independent assessments of the planning and execution of this project required by DOE O 413.3B and to conduct technical reviews of design and construction documents.

The project is being conducted in accordance with the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets. As allowed by DOE O 413.3B, work will be phased to improve overall efficiency.

OPCs are funded out of the Enhanced Capabilities for Subcritical Experiments subprogram.

Key Performance Parameters (KPPs)

The KPPs represent the minimum acceptable performance that the project must achieve.

Performance Measure	Completion Criteria
17-D-640-010: Ventilation and power sufficient to allow concurrent excavation for two headings east of the U1a.01 Drift	Documented in UCEP Subproject 010 Ventilation Plan; UCEP Electrical Load Calculation; Temporary Power Plan
17-D-640-010: An invert suitable for transport of ASD accelerator equipment between the U1h shaft station and U1a.104 Drift	Documented in Building Code Requirements for Structural Concrete; Invert Plan; Invert Sections; Cast-In-Place Concrete Specification
17-D-640-010: Direct access from the U1a.01 Drift to the U1a.104 Drift for equipment and personnel	Documented in General Arrangement Plan
17-D-640-010: Multiple egress pathways from the U1a.100 Drift and U1a.104 Drift to the U1a.01 Drift	Documented in General Arrangement Plan
O17-D-640-010: Operational Refuge Station east of the U1a.01 Drift to accommodate the number of individuals anticipated to normally work in that area	Documented in NNSS Underground Facility Safety and Health Program Description; U1a.102D Drift Refuge Shelter Equipment
17-D-640-020: An invert suitable for installation of the ASD accelerator in the U1a.104 Drift	To be documented in the final design for UCEP Subproject 020 and associated drawings, calculations, or other documents
17-D-640-020: Utilities and mechanical systems sufficient to support operation and maintenance of the ASD accelerator in the U1a.104 Drift	To be documented in the final design for UCEP Subproject 020 and associated drawings, calculations, or other documents
17-D-640-020: A zero room structure and mechanical systems that meet requirements for conducting subcritical experiments in the U1a.100 Drift	To be documented in the final design for UCEP Subproject 020 and associated drawings, calculations, or other documents
17-D-640-020: Infrastructure that supports installation of a centralized control of operation system of the ASD accelerator and NDSE source	To be documented in the final design for UCEP Subproject 020 and associated drawings, calculations, or other documents
17-D-640-020: Infrastructure that supports acquisition of experiment diagnostic data	To be documented in the final design for UCEP Subproject 020 and associated drawings, calculations, or other documents

3. Project Cost and Schedule

Financial Schedule

17-D-640-010: ECSE Access and Life Safety Infrastructure

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2017[a]	2,675	2,675	330
FY 2018	681	681	3,026
Total, Design	**3,356**	**3,356**	**3,356**
Construction			
FY 2017	8,800	8,800	0
FY 2018	14,484	14,484	0
FY 2019	10,000	10,000	12,000
FY 2020	10,000	10,000	16,000
FY 2021	1,500	1,500	12,900
FY 2022	0	0	3,884
Total, Construction	**44,784**	**44,784**	**44,784**
Total Estimated Costs			
FY 2017	11,475	11,475	330
FY 2018	15,165	15,165	3,026
FY 2019	10,000	10,000	12,000
FY 2020	10,000	10,000	16,000
FY 2021	1,500	1,500	12,900
FY 2022	0	0	3,884
Total, TEC	**48,140**	**48,140**	**48,140**
Other Project Costs (OPC)			
OPC, except D&D			
FY 2015	281	281	281
FY 2016	700	700	700
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	1,000	1,000	1,000
Total OPC, except D&D	**1,981**	**1,981**	**1,981**
OPC D&D			
FY 2015	0	0	0
FY 2016	0	0	0
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0

[a] Adjusted from the FY 2019 submittal to correctly capture actuals.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
Total, OPC D&D	**0**	**0**	**0**
Total Other Project Costs			
FY 2015	281	281	281
FY 2016	700	700	700
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	1,000	1,000	1,000
Total, OPC	**1,981**	**1,981**	**1,981**
Total Project Costs (TPC)			
FY 2015	281	281	281
FY 2016	700	700	700
FY 2017	11,475	11,475	330
FY 2018	15,165	15,165	3,026
FY 2019	10,000	10,000	12,000
FY 2020	10,000	10,000	16,000
FY 2021	1,500	1,500	12,900
FY 2022	1,000	1,000	4,884
Grand Total	**50,121**	**50,121**	**50,121**

17-D-640-020: ECSE Laboratory and Support Infrastructure

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2017[a]	25	25	25
FY 2018	6,935	6,935	1,045
FY 2019	4,540	4,540	10,430
Total, Design	**11,500**	**11,500**	**11,500**
Construction			
FY 2019	5,460	5,460	0
FY 2020	25,000	25,000	28,000
FY 2021	47,300	47,300	31,060
FY 2022	25,600	25,600	28,000
FY 2023	0	0	16,300
Total, Construction	**103,360**	**103,360**	**103,360**
Total Estimated Costs			

[a] Adjusted from the FY 2019 submittal to correctly capture actuals.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2017	25	25	25
FY 2018	6,935	6,935	1,045
FY 2019	10,000	10,000	10,430
FY 2020	25,000	25,000	28,000
FY 2021	47,300	47,300	31,060
FY 2022	25,600	25,600	28,000
FY 2023	0	0	16,300
Total, TEC	**114,860**	**114,860**	**114,860**
Other Project Costs (OPC)			
OPC, except D&D			
FY 2016	2,628	2,628	2,128
FY 2017	1,700	1,700	1,700
FY 2018	1,000	1,000	1,000
FY 2019	0	0	500
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
FY 2023	0	0	0
FY 2024	4,500	4,500	3,300
FY 2025	0	0	1,200
Total OPC, except D&D	**9,828**	**9,828**	**9,828**
OPC D&D			
FY 2016	0	0	0
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
FY 2023	0	0	0
FY 2024	0	0	0
Total, OPC D&D	**0**	**0**	**0**
Total Other Project Costs			
FY 2016	2,628	2,628	2,128
FY 2017	1,700	1,700	1,700
FY 2018	1,000	1,000	1,000
FY 2019	0	0	500
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
FY 2023	0	0	0
FY 2024	4,500	4,500	3,300
FY 2025	0	0	1,200
Total, OPC	**9,828**	**9,828**	**9,828**

	Budget Authority (Appropriations)	Obligations	Costs
Total Project Costs (TPC)			
FY 2016	2,628	2,628	2,128
FY 2017	1,725	1,725	1,725
FY 2018	7,935	7,935	2,045
FY 2019	10,000	10,000	10,930
FY 2020	25,000	25,000	28,000
FY 2021	47,300	47,300	31,060
FY 2022	25,600	25,600	28,000
FY 2023	0	0	16,300
FY 2024	4,500	4,500	3,300
FY 2025	0	0	1,200
Grand Total	**124,688**	**124,688**	**124,688**

17-D-640: Total Project

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2017	2,700	2,700	355
FY 2018	7,616	7,616	4,071
FY 2019	4,540	4,540	10,430
Total, Design	**14,856**	**14,856**	**14,856**
Construction			
FY 2017	8,800	8,800	0
FY 2018	14,484	14,484	0
FY 2019	15,460	15,460	12,000
FY 2020	35,000	35,000	44,000
FY 2021	48,800	48,800	43,960
FY 2022	25,600	25,600	31,884
FY 2023	0	0	16,300
Total, Construction	**148,144**	**148,144**	**148,144**
Total Estimated Costs			
FY 2017	11,500	11,500	355
FY 2018	22,100	22,100	4,071
FY 2019	20,000	20,000	22,430
FY 2020	35,000	35,000	44,000
FY 2021	48,800	48,800	43,960
FY 2022	25,600	25,600	31,884
FY 2023	0	0	16,300
Total, TEC	**163,000**	**163,000**	**163,000**
Other Project Costs (OPC)			
OPC, except D&D			
FY 2015	281	281	281
FY 2016	3,328	3,328	2,828

	Budget Authority (Appropriations)	Obligations	Costs
FY 2017	1,700	1,700	1,700
FY 2018	1,000	1,000	1,000
FY 2019	0	0	500
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	1,000	1,000	1,000
FY 2023	0	0	0
FY 2024	4,500	4,500	3,300
FY 2025	0	0	1,200
Total OPC, except D&D	**11,809**	**11,809**	**11,809**
OPC D&D			
FY 2015	0	0	0
FY 2016	0	0	0
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
FY 2023	0	0	0
FY 2024	0	0	0
Total, OPC D&D	**0**	**0**	**0**
Total Other Project Costs			
FY 2015	281	281	281
FY 2016	3,328	3,328	2,828
FY 2017	1,700	1,700	1,700
FY 2018	1,000	1,000	1,000
FY 2019	0	0	500
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	1,000	1,000	1,000
FY 2023	0	0	0
FY 2024	4,500	4,500	3,300
FY 2025	0	0	1,200
Total, OPC	**11,809**	**11,809**	**11,809**
Total Project Costs (TPC)			
FY 2015	281	281	281
FY 2016	3,328	3,328	2,828
FY 2017	13,200	13,200	2,055
FY 2018	23,100	23,100	5,071
FY 2019	20,000	20,000	22,930
FY 2020	35,000	35,000	44,000
FY 2021	48,800	48,800	43,960
FY 2022	26,600	26,600	32,884
FY 2023	0	0	16,300
FY 2024	4,500	4,500	3,300

	Budget Authority (Appropriations)	Obligations	Costs
FY 2025	0	0	1,200
Grand Total	**174,809**	**174,809**	**174,809**

Details of Project Cost Estimate

17-D-640-010: ECSE Access and Life Safety Infrastructure

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	2,852	5,600	0
Project Management	504	1,600	0
Contingency	0	1,200	0
Total, Design	**3,356**	**8,400**	**0**
Construction[a]			
Site Work	0	0	0
Equipment	0	0	0
Construction	31,606	29,240	0
Construction Management	5,368	1,500	0
Contingency	7,810	7,500	0
Total, Construction	**44,784**	**38,240**	**0**
Other TEC (if any)			
Cold Startup	0	0	0
Contingency	0	0	0
Total, Other TEC	**0**	**0**	**0**
Total Estimated Cost	**48,140**	**46,640**	0
Contingency, TEC	*7,810*	*7,500*	*0*
Other Project Cost (OPC)			
OPC except D&D			
R&D			
Conceptual Planning	200	200	0
Conceptual Design	281	281	0
Other OPC Costs	1,500	500	0
Contingency	0	0	0
Total, OPC	1,981	981	0
Contingency, OPC	*0*	*0*	*0*
Total Project Cost	**50,121**	**47,621**	**0**
Total Contingency (TEC+OPC)	**7,810**	**8,700**	**0**

17-D-640-020: ECSE Laboratory and Support Infrastructure

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	7,800	7,800	0
Project Management	1,900	1,900	0
Contingency	1,800	1,800	0
Total, Design	**11,500**	**11,500**	**0**
Construction			
Site Work	0	0	0
Equipment	0	0	0
Construction	74,460	69,560	0
Construction Management	9,600	4,500	0
Contingency	19,300	19,300	0
Total, Construction	**103,360**	**93,360**	**0**
Other TEC (if any)			
Cold Startup	0	0	0
Contingency	0	0	0
Total, Other TEC	**0**	**0**	**0**
Total Estimated Cost	**114,860**	**104,860**	0
Contingency, TEC	*21,100*	*21,100*	*0*
Other Project Cost (OPC)			
OPC except D&D			
R&D			
Conceptual Planning	300	300	0
Conceptual Design	728	728	0
Other OPC Costs	8,100	4,800	0
Contingency	700	300	0
Total, OPC	9,828	6,128	0
Contingency, OPC	*700*	*300*	*0*
Total Project Cost	**124,688**	**110,988**	**0**
Total Contingency (TEC+OPC)	**21,800**	**21,400**	**0**

17-D-640: Total Project

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	10,652	13,400	0
Project Management	2,404	3,500	0
Contingency	1,800	3,000	0
Total, Design	**14,856**	**19,900**	**0**

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Construction[a]			
Site Work	0	0	0
Equipment	0	0	0
Construction	106,066	98,800	0
Construction Management	14,968	6,000	0
Contingency	27,110	26,800	0
Total, Construction	**148,144**	**131,600**	**0**
Other TEC (if any)			
Cold Startup	0	0	0
Contingency	0	0	0
Total, Other TEC	**0**	**0**	**0**
Total Estimated Cost	**163,000**	**151,500**	0
Contingency, TEC	*28,910*	*29,800*	*0*
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	500	500	0
Conceptual Design	1,009	1,009	0
Other OPC Costs	9,600	5,300	0
Contingency	700	300	0
Total, OPC	11,809	7,109	0
Contingency, OPC	*700*	*300*	*0*
Total Project Cost	**174,809**	**158,609**	**0**
Total Contingency (TEC+OPC)	***29,610***	***30,100***	***0***

Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Outyears	Total
FY 2017	TEC	33,600	63,000	35,000	19,900	0	0	0	0	151,500
	OPC	6,309	800	0	0	0	0	0	0	7,109
	TPC	39,909	63,800	35,000	19,900	0	0	0	0	158,609
FY 2018	TEC	33,600	63,000	35,000	19,900	0	0	0	0	151,500
	OPC	6,309	800	0	0	0	0	0	0	7,109
	TPC	39,909	63,800	35,000	19,900	0	0	0	0	158,609
FY 2019	TEC	33,600	53,000	35,000	29,900	0	0	0	0	151,500
	OPC	6,309	800	0	0	0	0	0	0	7,109
	TPC	39,909	53,800	35,000	29,900	0	0	0	0	158,609
FY 2020	TEC	33,600	20,000	35,000	48,800	25,600	0	0	0	163,000
	OPC	6,309	0	0	0	1,000	0	4,500	0	11,809
	TPC	39,909	20,000	35,000	48,800	26,600	0	4,500	0	174,809

4. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	4Q FY2025
Expected Useful Life	30
Expected Future Start of D&D of this capital asset	4Q FY 2055

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	36	36	1,075	1,075

5. D&D Information

The new area being constructed in this project is not replacing existing facilities.

6. Acquisition Approach

The project is being managed by the NNSS Management and Operating (M&O) contractor because of operations within the U1a Complex, which is an underground facility with limited access. Design and construction of the underground modifications will be performed by the NNSS M&O contractor.

15-D-612, Emergency Operations Center
Lawrence Livermore National Laboratory (LLNL), California
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2020 Request for the 15-D-612, Emergency Operations Center project at LLNL is $5,000K. The current Total Project Cost (TPC) range is $24,600K to $52,800K. The project is not currently funded at the high-end range of the current estimate because the size of the facility has been reduced by approximately 50% from the conceptual design. Outyear funding amounts may be revised in future budget requests as NNSA baselines the project in accordance with the project management concepts within DOE Order 413.3B.

Significant Changes:
This project is a new start in FY 2020.

The most recent DOE Order 413.3B approved critical decision (CD) is CD-0, Approve Mission Need, approved on July 26, 2012, with a preliminary cost range of $45,000K to $75,000K for three Emergency Operations Centers (EOC) at Y-12, Lawrence Livermore National Laboratory, and Sandia National Laboratories and CD-4 date range of 2nd Quarter of Fiscal Year (FY) 2018 and 2nd Quarter FY 2020. Since the CD-0 decision, the projects have been separated into three distinct projects.

An Analysis of Alternatives was completed on August 30, 2016. The selected alternative had a cost range of $23,000K to $49,300K and an estimated CD-4 date of 1st Quarter FY 2023. The cost and schedule estimates have been updated to reflect the project starting in FY 2020.

The total estimated cost (TEC) for this project has increased due to significant construction cost escalation in the San Francisco Bay Area since 2012. The FY 2015 request for funding was not supported in the final appropriations bill. The project has been further deferred to prioritize other projects with higher risk-based mission impacts.

Critical Milestone History[a]

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	Final Design Complete	CD-2	CD-3	D&D Complete	CD-4
FY 2015	7/26/2012		4Q FY 2014	2Q FY 2017	1Q FY 2016	2Q FY 2017	N/A	4Q FY 2019
FY 2020	7/26/2012	3/23/2018	3Q FY 2019	3Q FY 2021	4Q FY 2020	4Q FY 2021	N/A	4Q FY 2023

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete(d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

[a] The schedules are only estimates and consistent with the high end of the schedule ranges.

Project Cost History[a]

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2015	4,000	16,000	20,000	2,500	N/A	2,500	22,500
FY 2020	5,000	27,000	32,000	3,200	N/A	3,200	35,200

2. Project Scope and Justification

Scope

The project would provide a new approximately 10,000 square foot facility to fulfill Emergency Operations Center and Emergency Program Office functions. The facility will include the following minimum capabilities, based on DOE Order 151.1: a) responding effectively and efficiently to operational emergencies and energy emergencies, providing emergency assistance so that appropriate response measures are taken to protect workers, the public, the environment, and national security; b) recognizing and categorizing emergencies, as necessary; classifying emergencies promptly; and monitoring parameters associated with the emergency to detect changed or degraded conditions; c) reporting and notifying emergencies; and d) accomplishing re-entry activities properly and safely and commencing recovery and post-emergency activities properly.

The new facility will be constructed to meet California Building Code 2013 Risk Category IV and Seismic Category D to meet natural phenomena, hazardous material release, and seismic requirements.
Considerations will be given for survivability and habitability (continued use of facility during emergencies), sustainability, and ease access to the site for responders and managers.

Justification

Problems with the existing facility include:

- Limited workspace for emergency personnel
- Low likelihood of survival during high-consequence natural phenomena events, such as earthquakes, tornadoes, or floods
- Location within the range of worst-case hazardous material releases analyzed in the Emergency Preparedness Hazard Assessment
- Does not provide a significant barrier to hazardous material releases and is not equipped with a positive pressure filtration system, i.e. HEPA filtration for habitability
- Inability to sustain operations for 72 hours as required by DOE Order 151.1
- Limited access and egress
- Noncompliance with Americans with Disabilities Act (ADA)
- Noncompliance with California Building Code 2013 Risk Category IV and Seismic Category D

The project is being conducted in accordance with the project management concepts within DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets.

Funds appropriated under this data sheet may be used for contracted support services to the Project Manager and to conduct reviews of design and construction.

Key Performance Parameters (KPPs)

The Threshold KPPs represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The Objective KPPs represent the desired project performance.

In accordance with the project management concepts within DOE Order 413.3B, KPPs will be finalized at approval of CD-2, *Approve Performance Baseline*.

[a] No construction will be performed until the project performance baseline has been validated and start of construction has been approved.

Performance Measure	Threshold	Objective
Functionality	Provide an Emergency Operations Center capable of self-sustained 24-hour operations during emergency conditions for a minimum of 72 hours without support from site infrastructure or services.	Provide space within the facility to accommodate site life safety/industrial alarms monitoring and site emergency communications (i.e. site fire department dispatching, building voice announcement system, etc.) functions.
Operational Capability	Maintain indoor air quality and radiation protection to maintain a habitable environment for a minimum of 72 hours after an on-site release of radiological or hazardous materials.	Provide space within the facility to accommodate site local emergency response functions.

3. Project Cost and Schedule

Financial Schedule[a]

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2020	5,000	5,000	3,500
FY 2021	0	0	1,500
Total Design	5,000	5,000	5,000
Construction			
FY 2021	27,000	27,000	8,000
FY 2022	0	0	16,000
FY 2023	0	0	3,000
Total Construction	27,000	27,000	27,000
Total Estimated Costs (TEC)			
FY 2020	5,000	5,000	3,500
FY 2021	27,000	27,000	9,500
FY 2022	0	0	16,000
FY 2023	0	0	3,000
Total TEC	32,000	32,000	32,000
Other Project Costs[b]			
FY 2013	237	237	237
FY 2014	155	155	155
FY 2015	108	108	108
FY 2016	500	500	213
FY 2017	600	600	329

[a] The project has not yet been approved for CD-2, and therefore has not been baselined. Outyear funding amounts may be revised in future budget requests as NNSA baselines the project in accordance with project management concepts within DOE Order 413.3B.

[b] The FY 2015 PDS reflected $200k costed in FY 2013. This number was incorrect and has been updated to reflect the correct amount costed in FY 2013.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2018	600	600	519
FY 2019	200	200	539
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
FY 2023	800	800	1,100
Total OPC, except D&D	**3,200**	**3,200**	**3,200**
Total Project Costs (TPC)			
FY 2013	237	237	237
FY 2014	155	155	155
FY 2015	108	108	108
FY 2016	500	500	213
FY 2017	600	600	329
FY 2018	600	600	519
FY 2019	200	200	539
FY 2020	5,000	5,000	3,500
FY 2021	27,000	27,000	9,500
FY 2022	0	0	16,000
FY 2023	800	800	4,100
Grand Total	35,200	35,200	35,200

Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	4,000	3,300	N/A
Contingency	1,000	700	N/A
Total, Design	5,000	4,000	N/A
Construction			
Site Work	500	500	N/A
Equipment	1,500	1,500	N/A
Construction	21,500	12,000	N/A
Federal Support	0	0	N/A
Contingency	3,500	2,000	N/A
Total, Construction	27,000	16,000	N/A
Tota TEC	**32,000**	**20,000**	**N/A**
Contingency, TEC	4,500	2,700	N/A
Other Project Cost (OPC)			

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
OPC except D&D			
Conceptual Planning	400	200	N/A
Conceptual Design	1,000	800	N/A
Start-up	800	500	N/A
Other OPCs	700	500	N/A
Contingency	300	500	N/A
Total, OPC except D&D	3,200	2,500	N/A
OPC D&D			
Demolition	N/A	N/A	N/A
Contingency	N/A	N/A	N/A
Total, OPC D&D	N/A	N/A	N/A
Total OPC	**3,200**	**2,500**	**N/A**
Contingency, OPC	*300*	*500*	*N/A*
Total Project Cost	**35,200**	**22,500**	**N/A**
Total Contingency (TEC+OPC)	**4,800**	**3,200**	**N/A**

Schedule of Appropriations Requests[a]

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Total
FY 2015	TEC	20,000	0	0	0	0	0	0	20,000
	OPC	2,300	200	0	0	0	0	0	2,500
	TPC	22,300	200	0	0	0	0	0	22,500
FY 2020	TEC	0	0	5,000	27,000	0	0	0	32,000
	OPC	2,200	200	0	0	0	800	0	3,200
	TPC	2,200	200	5,000	27,000	0	800	0	35,200

4. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	4QFY 2023
Expected Useful Life	30
Expected Future Start of D&D of this capital asset	4QFY 2053

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	N/A	0.26	N/A	6.72

[a] The project has not yet been approved for CD-2, and therefore has not been baselined. Outyear funding amounts may be revised in future budget requests as NNSA baselines the project in accordance with project management concepts within DOE Order 413.3B.

5. D&D Information

Area	Square Feet
Area of new construction	10,000
Area of existing facility(s) being replaced and D&D'ed by this project	NA
Area of other D&D outside the project	10,000
Area of additional D&D space to meet the "one-for-one" requirement from the banked area	NA

LLNL will D&D an offsetting amount of space in accordance with their current facility plan.

6. Acquisition Approach

Design and construction contracts will be acquired through open competition; selection will be based on best value to the government and awards will be on firm-fixed price delivery. The acquisition management approach will be finalized when the project is baselined.

15-D-611, Emergency Operations Center
Sandia National Laboratories (SNL), New Mexico
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2020 Request for the 15-D-611, Emergency Operations Center project at SNL is $4,000K. The current Total Project Cost (TPC) range based on the Conceptual Design is $29,750K to $63,750K. The project is not currently funded at the high-end of the current estimate because the size of the facility has been reduced. Outyear funding amounts may be revised in future budget requests as NNSA baselines the project in accordance with project management concepts within DOE Order 413.3B.

Significant Changes:
This project is a new start in FY 2020.

The most recent DOE Order 413.3B approved critical decision (CD) is CD-0, Approve Mission Need, approved on July 26, 2012, with a preliminary cost range of $45,000K to $75,000K for three Emergency Operations Centers (EOC) at Y-12, Lawrence Livermore National Laboratory, and Sandia National Laboratories and CD-4 date range of 2nd Quarter of Fiscal Year (FY) 2018 and 2nd Quarter FY 2020. The three EOCs are now being executed as three separate projects.

An Analysis of Alternatives was completed on December 18, 2017. The selected alternative had a cost range of $11,300K to $45,300K and an estimated CD-4 date of 4st Quarter FY 2021. The cost and schedule estimates have been updated to reflect the project starting in FY 2020.

The FY 2015 data sheet indicated three facilities were being replaced with this project, which is incorrect. This project is only replacing portions of one facility. The existing facility was constructed in 1949 and is located in the basement of Building 801 South in Technical Area I. Because Building 801 South is used for functions other than an Emergency Operations Center, demolition was removed from the scope of the project.

Although the total estimated cost (TEC) remains unchanged, the estimated size of the new facility was reduced from 47,000 square feet to 31,000 square feet and the design and construction proportions have been adjusted according to the estimate based upon the recently completed conceptual design. The FY 2015 request for funding was not supported in the final appropriations bill. The project has been further deferred to prioritize other projects with higher risk-based mission impacts.

Critical Milestone History[a]

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	Final Design Complete	CD-2	CD-3	D&D Complete	CD-4
FY 2015	7/26/2012		1Q FY 2015	4Q FY 2015	3Q FY 2015	3Q FY 2015	4Q FY 2019	4Q FY 2019
FY 2020	7/26/2012	8/30/2018	3Q FY 2019	4Q FY 2021	3Q FY 2020	1Q FY 2022	N/A	4Q FY 2023

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline

[a]The schedules are only estimates and consistent with the high end of the schedule ranges.

Final Design Complete – Estimated/Actual date the project design will be/was complete(d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

Project Cost History[a b]

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2015	2,000	38,000	40,000	1,500	1,200	2,700	42,700
FY 2020	4,000	36,000	40,000	2,500	0	2,500	42,500

2. Project Scope and Justification

Scope
The project would provide a facility with requisite parking for personnel, computing, communications, building systems, and fuel and water storage sufficient to meet the following requirements: a) responding effectively and efficiently to operational emergencies and energy emergencies, providing emergency assistance so that appropriate response measures are taken to protect workers, the public, the environment, and national security; b) recognizing and categorizing emergencies, as necessary; classifying emergencies promptly; and monitoring parameters associated with the emergency to detect changed or degraded conditions; c) reporting and notifying emergencies; and d) accomplishing re-entry activities properly and safely and commencing recovery and post-emergency activities properly. The proposed facility will be built to International Building Code 2015 Risk Category IV standards to meet DOE requirements for natural and hazardous material risks.

Justification
Emergency Response Operations at SNL are currently housed in the basement of a substandard facility built in 1949. The existing facility only marginally meets requirements for habitability and space for required personnel and equipment. Because the existing EOC does not meet habitability or seismic requirements, if a low probability/high impact event were to occur the EOC itself would have to be evacuatedAlthough SNL emergency response personnel have worked to address numerous shortfalls and gaps due to the quality of the current location, their efforts have potentially masked a situation that may compromise a response in the future.
Other problems with the existing facility include:

- Limited workspace for emergency personnel
- Low likelihood of survival during high-consequence natural phenomena events, such as earthquakes, tornadoes, or floods
- Location within the range of worst-case hazardous material releases analyzed in the hazards analysis
- Does not provide a significant barrier to hazardous material releases and is not equipped with a positive pressure filtration system, i.e. HEPA filtration for habitability
- Inability to sustain operations for 72 hours as required by DOE Order 151.1
- Limited access and egress
- Noncompliance with Americans with Disabilities Act (ADA)

An independent analysis of alternatives was conducted after CD-0 in accordance with the requirements of Office of Management and Budget (OMB) Circular A-11. The alternative which best met the mission need was construction of a new Emergency Operations Center at Sandia National Laboratories.
The project is being conducted in accordance with the project management concepts within DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets.

[a] No construction will be performed until the project performance baseline has been validated and CD-3 has been approved.
[b] The FY 2020 numbers are only estimates and consistent with the high end values of the cost ranges.

Funds appropriated under this data sheet may be used for contracted support services to the Project Manager and to conduct reviews of design and construction.

Key Performance Parameters (KPPs)
The Threshold KPPs represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The Objective KPPs represent the desired project performance.

In accordance with the project management concepts within DOE Order 413.3B, KPPs will be finalized at approval of CD-2, *Approve Performance Baseline*.

Performance Measure	Threshold	Objective
Functionality	Provide an Emergency Operations Center capable of self-sustained 24-hour operations during emergency conditions for a minimum of 72 hours without support from site infrastructure or services.	Provide space within the facility to accommodate site local emergency response functions.
Operational Capability	Maintain indoor air quality and radiation protection to maintain a habitable environment for a minimum of 72 hours after an on-site release of radiological or hazardous materials.	

3. Project Cost and Schedule

Financial Schedule[a]

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2020	4,000	4,000	2,000
FY 2021	0	0	2,000
Total Design	4,000	4,000	4,000
Construction			
FY 2022	36,000	36,000	16,000
FY 2023	0	0	20,000
Total Construction	36,000	36,000	36,000
Total Estimated Costs (TEC)			
FY 2020	4,000	4,000	2,000
FY 2021	0	0	2,000
FY 2022	36,000	36,000	16,000
FY 2023	0	0	20,000

[a] The project has not yet been approved for CD-2, and therefore has not been baselined. Outyear funding amounts may be revised in future budget requests as NNSA baselines the project in accordance with project management concepts within DOE Order 413.3B.

	Budget Authority (Appropriations)	Obligations	Costs
Total TEC	**40,000**	**40,000**	**40,000**
Other Project Costs			
FY 2014	400	400	400
FY 2015	200	200	200
FY 2016	0	0	0
FY 2017	200	200	152
FY 2018	355	355	403
FY 2019	345	345	345
FY 2020	200	200	200
FY 2021	0	0	0
FY 2022	0	0	0
FY 2023	800	800	800
Total OPC, except D&D	**2,500**	**2,500**	**2,500**
OPC D&D			
FY 2022	0	0	0
Total, OPC	**2,500**	**2,500**	**2,500**
Total Project Costs (TPC)			
FY 2014	400	400	400
FY 2015	200	200	200
FY 2016	0	0	0
FY 2017	200	200	152
FY 2018	355	355	403
FY 2019	345	345	345
FY 2020	4,200	4,200	2,200
FY 2021	0	0	2,000
FY 2022	36,000	36,000	16,000
FY 2023	800	800	20,800
Grand Total	**42,500**	**42,500**	**42,500**

Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	3,500	1,500	N/A
Contingency	500	500	N/A
Total, Design	4,000	2,000	N/A
Construction			

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Site Work	2,900	4,900	N/A
Equipment	4,400	4,500	N/A
Construction	24,900	24,800	N/A
Federal Support	0	0	N/A
Contingency	3,800	3,800	N/A
Total, Construction	36,000	38,000	N/A
Total, TEC	40,000	40,000	N/A
Contingency, TEC	4,300	4,300	N/A
Other Project Cost (OPC)			
OPC except D&D			
Conceptual Planning	200	0	N/A
Conceptual Design	695	400	N/A
Start-up	800	400	N/A
Other OPCs	805	400	N/A
Contingency	0	300	N/A
Total, OPC except D&D	2,500	1,500	N/A
Demolition	N/A	1,000	N/A
Contingency	N/A	200	N/A
Total, OPC D&D	N/A	1,200	N/A
Total OPC	2,500	2,700	N/A
Contingency, OPC	0	500	N/A
Total Project Cost	42,500	42,700	N/A
Total Contingency (TEC+OPC)	4,300	4,800	N/A

Schedule of Appropriations Requests[a]

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Total
FY 2015	TEC	40,000	0	0	0	0	0	0	40,000
	OPC	1,200	1,500	0	0	0	0	0	2,700
	TPC	41,200	1,500	0	0	0	0	0	42,700
FY 2020	TEC	0	0	4,000	0	36,000	0	0	40,000
	OPC	1,155	345	200	0	0	800	0	2,500
	TPC	1,155	345	4,200	0	36,000	800	0	42,500

[a] The project has not yet been approved for CD-2, and therefore has not been baselined. Outyear funding amounts may be revised in future budget requests as NNSA baselines the project in accordance with project management concepts within DOE Order 413.3B.

4. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	4QFY 2023
Expected Useful Life	40
Expected Future Start of D&D of this capital asset	4QFY 2063

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations	N/A	0.33	N/A	11.09
Utilities	N/A	0.01	N/A	0.37
Maintenance & Repair	N/A	0.20	N/A	6.51
Recapitalization	N/A	N/A	N/A	0.92
Total	N/A	0.54	N/A	18.89

5. D&D Information

Area	Square Feet
Area of new construction	31,000
Area of existing facility(s) being replaced and D&D'ed by this project	NA
Area of other D&D outside the project	NA
Area of additional D&D space to meet the "one-for-one" requirement from the banked area	31,000

SNL will offset the EOC square footage with disposed enterprise square footage.

6. Acquisition Approach

The acquisition strategy will be Design-Bid-Build. Design and construction contracts will be acquired through open competition; selection will be based on best value to the government and awards will be on firm-fixed price delivery. The acquisition management approach will be finalized when the project is baselined.

15-D-301 High Explosive Science and Engineering (HE S&E) Facility
Pantex Plant, Amarillo, Texas
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2020 Request for the High Explosive Science and Engineering (HE S&E) Facility is $123,000K. The most recent DOE O 413.3B approved Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, that was approved on January 9, 2015, with a preliminary cost range of $100,000K to $155,000K and CD-4 date of 4th Quarter FY 2023. The projected schedule that was established at CD-1 has been deferred by two years, deferring start of construction from early FY 2018 to FY 2020.

Significant Changes:
This Construction Project Data Sheet (CPDS) is an update of the Fiscal Year (FY) 2016 CPDS and does not include a new start for the budget year.

Preliminary and Final Design were completed in July 2018 before the project was placed on hold awaiting construction funding. Due to the length of time between design completion and receipt of construction funding, design revalidation efforts will need to be completed before construction can begin. The CD-2/3 approval support documents have been drafted, but will need to be completed. The Budget Request for construction funding was deferred by three years to accommodate higher priority projects. The top end of the Total Project Cost (TPC) range has increased from $154,479K to $195,497K due to this deferral, and the new top end of the range was used to develop this CPDS.

A Federal Project Director is not currently assigned to this project, but the organization responsible has reviewed and approved this CPDS. Construction will not be authorized until an FPD is assigned.

Critical Milestone History[a]

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2015	11/22/2011	N/A	4Q FY 2014	4Q FY 2015	3Q FY 2016	4Q FY 2016	3Q FY 2020	3Q FY 2020
FY 2016	11/22/2011	1/9/2015	1/09/2015	1Q FY 2018	4Q FY 2017	1Q FY 2018	3Q FY 2023	4Q FY 2023
FY 2020	11/22/2011	1/9/2015	1/09/2015	3Q FY 2020	2Q FY 2020[b]	3Q FY 2020	3Q FY 2025	4Q FY 2025

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete(d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

[a] The schedules are estimates and consistent with the high end of the schedule ranges.
[b] The final design was completed on 7/27/2018, but revalidation will be completed prior to CD-2/3 approval.

Project Cost History[a][b]

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2015	11,800	60,500	72,300	6,100	18,600	24,700	97,000
FY 2016	14,249	83,051	97,300	21,055	36,124	57,179	154,479
FY 2020	15,372	119,900	135,272	12,025	48,200	60,225	195,497

2. Project Scope and Justification

Scope

The project will build three structures totaling 67,711 square feet with associated weather-proofed ramps totaling 3,072 square feet. These structures will replace the aging facilities in Zone 11 with new facilities that meet current codes and standards and better support program requirements:

- HE Laboratory: Equipment and facility will be designed to sustain an HE loading of 12 lb (±15%) HE equivalent.
- HE Staging: Equipment and facility will be designed to sustain 50 lb (±15%) HE equivalent for temporary storage.
- Technology Development and Deployment Laboratory: Provide necessary laboratory space for a minimum of 73 personnel to support the weapons complex mission.

The project will also complete D&D of equivalent square footage and relocation of utilities out of the buildings and ramps planned for demolition, while continuing support for mission essential facilities.

Justification

Currently HE S&E personnel, as well as laboratory operations, are located in 15 separate facilities which are, on average, more than 60 years old. The existing facilities are not constructed for today's operations or HE limits, and their distribution across Zone 11 does not provide for efficient work processes. The distance between facilities increases travel time for personnel and materials back and forth, which adds additional cost to operations. In addition, safety, security, and environmental issues associated with these aging facilities are mounting, as are the costs of addressing them.

Current HE capacity limits that prohibit quantities greater than a small amount create inefficient operations in several of the laboratories. HE limits mandate additional moves of HE to various facilities as well as to maintain safe separation limits. The HE capacity limitations are primarily due to the original design and structure of the old facilities. The numerous HE handling activities required to load, unload and move the HE increase potential safety hazards.

This project provides the following additional benefits in support of HE Manufacturing:

- Computational and experimental capability
- Capability to develop diagnostic tools for the evaluation, manufacturing support, surveillance, and testing of materials
- Capability to conduct technology development in modern facilities (most existing facilities that provide these capabilities are over 60 years old)
- Separate classified and non-classified spaces, increasing efficiency and lowering Information Security risk

The project is being conducted in accordance with the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets. Funds appropriated under this data sheet may be used to provide independent assessments for planning and execution of this project, and contracted support services to the federal project team for oversight and support.

[a] No construction will be performed until the project performance baseline has been validated and CD-3 has been approved.

[b] The FY 2020 numbers are estimates and consistent with the high end values of the cost ranges.

Preliminary Key Performance Parameters (KPPs)
The Threshold KPPs, represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The Objective KPPs represent the desired project performance.

Performance Measure[a]	Threshold	Objective
HE Laboratory: Equipment and facility will be designed to sustain an HE loading of 12 lb (±15%) HE equivalent.	N/A	N/A
HE Staging: Equipment and facility will be designed to sustain 50 lb (±15%) HE equivalent for temporary storage.	N/A	N/A
Technology Development and Deployment Laboratory: Provide necessary laboratory space for a minimum of 73 personnel to support the weapons complex mission.	N/A	N/A

3. Project Cost and Schedule

Financial Schedule

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2015	11,800	11,760	61
FY 2016	0	-11	1,515
FY 2017	-28[b]	0	5,106
FY 2018	500[c]	519	4,041
FY 2019	0	4	839
FY 2020	3,100	3,100	2,900
FY 2021	0	0	910
Total, Design	**15,372**	**15,372**	**15,372**
Construction			
FY 2020	119,900	119,900	9,300
FY 2021	0	0	33,300
FY 2022	0	0	49,000
FY 2023	0	0	28,300
Total, Construction	**119,900**	**119,900**	**119,900**
Total Estimated Costs			
FY 2015	11,800	11,760	61

[a] Key Performance Parameters (KPPs) will be approved upon approval of the project baseline and the preliminary KPPs are subject to change post CD-2.
[b] Reflects recission of $28,013 in FY 2017.
[c] Reflects an internal reprogramming from 12-D-301, Transuranic Waste Facilities, LANL project to this project for continued design activities conducted by the U.S. Army Corps of Engineers.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2016	0	-11	1,515
FY 2017	-28	0	5,106
FY 2018	500	519	4,041
FY 2019	0	4	839
FY 2020	123,000	123,000	12,200
FY 2021	0	0	34,210
FY 2022	0	0	49,000
FY 2023	0	0	28,300
Total, TEC	**135,272**	**135,272**	**135,272**
Other Project Costs			
OPC, except D&D			
FY 2013[a]	1,790	1,790	200
FY 2014	750	750	50
FY 2015	100	100	134
FY 2016	100	100	0
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	130	130	1,300
FY 2021	3,750	3,750	3,500
FY 2022	3,750	3,750	3,150
FY 2023	1,655	1,655	3,000
FY 2024	0	0	691
Total OPC, except D&D	**12,025**	**12,025**	**12,025**
OPC D&D			
FY 2023	18,000	18,000	15,000
FY 2024	30,200	30,200	25,000
FY 2025	0	0	8,200
Total, OPC D&D	**48,200**	**48,200**	**48,200**
Total Other Project Costs			
FY 2013	1,790	1,790	200
FY 2014	750	750	50
FY 2015	100	100	134
FY 2016	100	100	0
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0

[a] The FY 2013 through FY 2015 costs were updated from the FY 2016 President's Budget Request to reflect actual costs.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2020	130	130	1,300
FY 2021	3,750	3,750	3,500
FY 2022	3,750	3,750	3,150
FY 2023	19,655	19,655	18,000
FY 2024	30,200	30,200	25,691
FY 2025	0	0	8,200
Total, OPC	**60,225**	**60,225**	**60,225**
Total Project Costs (TPC)			
FY 2013	1,790	1,790	200
FY 2014	750	750	50
FY 2015	11,900	11,860	195
FY 2016	100	89	1,515
FY 2017	-28	0	5,106
FY 2018	500	519	4,041
FY 2019	0	4	839
FY 2020	123,130	123,130	13,500
FY 2021	3,750	3,750	37,710
FY 2022	3,750	3,750	52,150
FY 2023	19,655	19,655	46,300
FY 2024	30,200	30,200	25,691
FY 2025	0	0	8,200
Grand Total	**195,497**	**195,497**	**195,497**

Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	13,572	12,444	N/A
Federal Design Review Support	1,300	500	N/A
Contingency	500	1,305	N/A
Total, Design	15,372	14,249	N/A
Construction			
Site Work	9,600	5,000	N/A
Equipment	5,000	5,000	N/A
Construction	86,000	51,300[a]	N/A

[a] Construction was incorrect in the FY 2016 President's Budget Request and should have been $50,573.

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Federal Support	2,600	2,000	N/A
Contingency	16,700	20,478	N/A
Total, Construction	119,900	83,051	N/A
Total, TEC	**135,272**	**97,300**	**N/A**
Contingency, TEC	*17,200*	*21,783*	*N/A*
Other Project Cost (OPC)			
OPC except D&D			
Analysis of Alternatives	200	390	N/A
Conceptual Design	1,600	1,800	N/A
Start-up	3,200	3,000	N/A
Equipment Move	4,800	9,473	N/A
Contingency	2,225	6,392	N/A
Total, OPC except D&D	12,025	21,055	N/A
OPC D&D			
Demolition	18,000	6,464	N/A
Utility Relocation	20,600	23,000	N/A
Contingency	9,600	6,660	N/A
Total, OPC D&D	48,200	36,124	N/A
Total, OPC	**60,225**	**57,179**	**N/A**
Contingency, OPC	*11,825*	*13,052*	*N/A*
Total Project Cost	**195,497**	**154,479**	**N/A**
Total Contingency (TEC+OPC)	***29,025***	***34,835***	***N/A***

Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Total
FY 2015	TEC	11,800	20,000	33,500	7,000	0	0	0	0	0	72,300
	OPC	2,740	100	6,000	13,654	2,206	0	0	0	0	24,700
	TPC	14,540	20,100	39,500	20,654	2,206	0	0	0	0	97,000
FY 2016	TEC	11,800	19,516	27,435	19,953	17,752	0	0	0	0	96,456
	OPC	2,740	100	6,000	13,654	14,451	0	0	0	20,234	57,179
	TPC	14,540	19,616	33,435	33,607	32,203	0	0	0	20,234	153,635
FY 2020	TEC	11,800	-28[a]	500[b]	0	123,000	0	0	0	0	135,272
	OPC	2,740	0	0	0	130	3,750	3,750	19,655	30,200	60,225
	TPC	14,540	-28	500	0	123,130	3,750	3,750	19,655	30,200	195,497

[a] Reflects recission of $28,013 in FY 2017

[b] Reflects an internal reprogramming from 12-D-301, Transuranic Waste Facilities, LANL project to this project for continued design activities conducted by the U.S. Army Corps of Engineers.

4. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy (fiscal quarter or date)	4QFY 2025
Expected Useful Life (number of years)	50
Expected Future Start of D&D of this capital asset (fiscal quarter)	4QFY 2075

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	15.14	15.14	757	757

5. D&D Information

	Square Feet
New area being constructed by this project at Pantex Plant	67,711
Area of D&D in this project at the Pantex Plant	93,806
Area at the Pantex Plant to be transferred, sold, and/or D&D outside the project including area previously “banked”	0
Area of D&D in this project at other sites	0
Area at other sites to be transferred, sold, and/or D&D outside the project including area previously “banked”	0
Total area eliminated	93,806

Pantex Plant Zone 11, Bldgs 11-2, 11-5, 11-14, 11-16, 11-17, 11-17A, 11-18, 11-19, 11-22, 11-27, 11-28, 11-29 (may be completed outside of project, prior to project baseline), 11-38, 11-45, 11-47, 11-054, 11-054A, 11-R-4, 11-R-7, 11-R-8, 11-R-10, 11-R-11, 11-R-13, 11-R-13A, 11-R-23. Substitute building(s) may be identified for demolition prior to performance baseline approval (CD-2).

6. Acquisition Approach

The design has been, and the construction will be, acquired through firm-fixed price contracts.

06-D-141, Uranium Processing Facility (UPF)
Y-12 National Security Complex, Oak Ridge, Tennessee
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2020 Request for the Uranium Processing Facility (UPF) project is $745,000K. The project's Total Project Cost (TPC) is $6,500 million. This FY 2020 Construction Project Data Sheet (CPDS) reflects the most recent Critical Decision (CD) approvals in February and March 2018.

The most recently approved DOE Order 413.3B CDs are the CD-2/3 approvals (*Performance Baseline and Start of Construction*) for the Main Process Building (MPB) Subproject and the Salvage and Accountability Building (SAB) Subproject approved on March 21, 2018, and the Process Support Facilities (PSF) Subproject approved on March 15, 2018. CD-4, *Project Completion*, for the Site Infrastructure and Services (SIS) Subproject was approved on February 28, 2018. The overall UPF CD-2 Total Project Cost is $6,500 million and CD-4 of December 31, 2025.

The UPF consists of processing capabilities for enriched uranium casting, oxide production, and salvage and accountability operations. The UPF project includes the MPB, the SAB, a Mechanical Electrical Building (MEB), and various support facilities. The UPF project will be considered complete upon successful authorization to startup of the described subset of Building 9212 capabilities in the new UPF buildings.

Significant Changes:
The Critical Decision (CD) 2/3 approvals for the MPB Subproject (-04), SAB Subproject (-09) and the PSF Subproject (-08) were obtained in March 2018. CD-4, Project Completion, for the SIS Subproject was approved on February 28, 2018. The established definitive scope, schedule, and cost baselines established by the MPB, SAB and PSF Subprojects CD-2/3 approvals as well as the final TPC for the SIS Subproject are presented in this CPDS.

Consistent with NNSA's increased emphasis on project management rigor and Departmental policy, subproject Total Project Costs (TPCs) and baseline schedules are based upon 90% design completion. The MPB, SAB, and PSF subprojects achieved 90% design in FY 2017. An independent cost estimate (ICE) and external independent review (EIR) were performed for the MPB, SAB and PSF Subprojects prior to CD-2/3 approval. Estimates for these Subprojects have been updated to reflect the approved Subproject TPCs at CD-2/3.

FY 2020 funds will be used for construction for the MPB, SAB, and PSF subprojects. Subproject descriptions are included in Section 2.

Site Readiness Subproject (06-D-141-01): The Site Readiness Subproject received CD-4 on February 27, 2015. The project was completed under budget and CD-4 was achieved on schedule.

Site Infrastructure and Services (SIS) Subproject (06-D-141-05): The SIS Subproject received CD-4 on February 28, 2018. The project was completed under budget and CD-4 was achieved on schedule.

Substation Subproject (06-D-141-07): The Substation Subproject CD-2/3 was approved on September 14, 2016, at a cost of $60 million with a CD-4 date of June 2020.

Mechanical Electrical Building (MEB) Subproject (06-D-141-06): The MEB Subproject CD-2/3 was approved on December 13, 2016 at a cost of $284 million with a CD-4 date of January 2022.

Process Support Facilities Subproject (PSF) (06-D-141-08): The PSF Subproject CD-2/3 was approved on March 15, 2018 at a cost of $140 million with a CD-4 date of December 2025.

Salvage and Accountability Building Subproject (SAB) (06-D-141-09): The SAB Subproject CD-2/3 was approved on March 21, 2018 at a cost of $1,180 million with a CD-4 date of December 2025. The long lead equipment authorized as part of CD-3B for the SAB is included in the SAB TPC.

Main Process Building Subproject (MPB) (06-D-141-04): The MPB subproject CD-2/3 was approved on March 21, 2018 at a cost of $4,732 million with a CD-4 date of December 2025. The MPB subproject includes UPF design, site preparation, and long lead procurements as well as construction of the MPB nuclear facility. The CD-3A for Long Lead Procurement and Site Preparation was approved on March 30, 2016. The long lead equipment authorized as part of CD-3B for the MPB is included in the MPB TPC.

A Level 4 PMCDP qualified Federal Project Director has been assigned to this project and has approved this CPDS. A Federal Project Director at the appropriate level has been assigned to each subproject. Project funds may be used by the Federal Project Director for contracted support services for the federal project team.

As represented since the FY 2012 request, design, construction and Other Project Costs (OPC) will continue to be executed through the line item funding. After October 1, 2011, OPC work has been and will only be performed using funding specifically appropriated by Congress for the project.

Critical Milestone History
Overall Project (06-D-141)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2011	12/17/2004		7/25/2007	TBD	2QFY2014	TBD	TBD	TBD
FY 2012	12/17/2004		7/25/2007	4QFY2013	2QFY2014	4QFY2013	TBD	TBD
FY 2013	12/17/2004		7/25/2007	4QFY2013	2QFY2014	4QFY2013	N/A	
FY 2104	12/17/2004		6/8/2012	3QFY2014	4QFY2015	3QFY2015	N/A	TBD
FY 2015	12/17/2004		6/8/2012	TBD	TBD	TBD	N/A	TBD
FY 2016	12/17/2004	2/9/2006	6/8/2012	TBD	TBD	TBD	N/A	TBD
FY 2017	12/17/2004	6/24/2015	6/8/2012	4QFY2017	4QFY2017	4QFY2017	N/A	4QFY2025
FY 2018	12/17/2004	6/24/2015	6/8/2012	2QFY2018	4QFY2017	2QFY2018	N/A	4QFY2025
FY 2019	12/17/2004	6/24/2015	6/8/2012	2QFY2018	8/25/2017	2QFY2018	N/A	4QFY2025
FY 2020 PB	12/17/2004	6/24/2015	6/8/2012	3/21/2018	8/25/2017	3/21/2018	N/A	12/31/2025

Site Readiness Subproject (06-D-141-01)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2014 PB	12/17/2004		6/8/2012	1/29/2013	1/29/2013	1/29/2013	N/A	2QFY2015
FY 2015	12/17/2004		6/8/2012	1/29/2013	1/29/2013	1/29/2013	N/A	2QFY2015
FY 2016	12/17/2004	2/9/2006	6/8/2012	1/29/2013	1/29/2013	1/29/2013	N/A	2QFY2015
FY 2017	12/17/2004	2/9/2006	6/8/2012	1/29/2013	1/29/2013	1/29/2013	N/A	2/27/2015
FY 2018	12/17/2004	2/9/2006	6/8/2012	1/29/2013	1/29/2013	1/29/2013	N/A	2/27/2015
FY 2019	12/17/2004	2/9/2006	6/8/2012	1/29/2013	1/29/2013	1/29/2013	N/A	2/27/2015
FY 2020	12/17/2004	2/9/2006	6/8/2012	1/29/2013	1/29/2013	1/29/2013	N/A	2/27/2015

Site Infrastructure and Services Subproject (06-D-141-05)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2015	12/17/2004		7/25/2007	4QFY2014	4QFY2013	4QFY2014	N/A	4QFY2016
FY 2016	12/17/2004	2/9/2006	6/8/2012	2QFY2015	3QFY2015	2QFY2015	N/A	4QFY2016
FY 2017 PB	12/17/2004	2/9/2006	6/8/2012	3/12/2015	3/12/2015	3/12/2015	N/A	4/28/2018
FY 2018	12/17/2004	2/9/2006	6/8/2012	3/12/2015	3/12/2015	3/12/2015	N/A	4/28/2018
FY 2019	12/17/2004	2/9/2006	6/8/2012	3/12/2015	3/12/2015	3/12/2015	N/A	4/28/2018
FY 2020	12/17/2004	2/9/2006	6/8/2012	3/12/2015	3/12/2015	3/12/2015	N/A	2/28/2018

Substation Subproject (06-D-141-07)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2017	12/17/2004	6/24/2015	6/8/2012	4QFY2016	4QFY2016	4QFY2016	N/A	1QFY2019
FY 2018 PB	12/17/2004	6/24/2015	6/8/2012	9/14/2016	9/30/2017	9/14/2016	N/A	6/30/2020
FY 2019	12/17/2004	6/24/2015	6/8/2012	9/14/2016	12/22/2017	9/14/2016	N/A	6/30/2020
FY 2020	12/17/2004	6/24/2015	6/8/2012	9/14/2016	12/22/2017	9/14/2016	N/A	6/30/2020

Mechanical Electrical Building (MEB) Subproject (06-D-141-06)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2017	12/17/2004	6/24/2015	6/8/2012	2QFY2017	4QFY2017	2QFY2017	N/A	4QFY2021
FY 2018 PB	12/17/2004	6/24/2015	6/8/2012	12/13/2016	4QFY2017	12/13/2016	N/A	1/31/2022
FY 2019	12/17/2004	6/24/2015	6/8/2012	12/13/2016	9/30/2017	12/13/2016	N/A	1/30/2022
FY 2020	12/17/2004	6/24/2015	6/8/2012	12/13/2016	9/30/2017	12/13/2016	N/A	1/30/2022

Process Support Facilities Subproject (06-D-141-08)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2017	12/17/2004	6/24/2015	6/8/2012	3QFY2017	3QFY2017	3QFY2017	N/A	4QFY2021
FY 2018	12/17/2004	6/24/2015	6/8/2012	2QFY2018	4QFY2017	2QFY2018	N/A	4QFY2025
FY 2019	12/17/2004	6/24/2015	6/8/2012	2QFY2018	9/30/2017	2QFY2018	N/A	4QFY2025
FY 2020 PB	12/17/2004	6/24/2015	6/8/2012	3/15/2018	9/30/2017	3/15/2018	N/A	12/31/2025

Salvage and Accountability Building Subproject (06-D-141-09)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2017	12/17/2004	6/24/2015	6/8/2012	4QFY2017	4QFY2017	4QFY2017	N/A	4QFY2025
FY 2018	12/17/2004	6/24/2015	6/8/2012	2QFY2018	4QFY2017	2QFY2018	N/A	4QFY2025
FY 2019	12/17/2004	6/24/2015	6/8/2012	2QFY2018	8/25/2017	2QFY2018	N/A	4QFY2025
FY 2020 PB	12/17/2004	6/24/2015	6/8/2012	3/21/2018	8/25/2017	3/21/2018	N/A	12/31/2025

Main Process Building Subproject (06-D-141-04)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2104	12/17/2004		6/8/2012	3QFY2014	4QFY2015	3QFY2015	N/A	TBD
FY 2015	12/17/2004		6/8/2012	TBD	TBD	TBD	N/A	TBD
FY 2016	12/17/2004	2/9/2006	6/8/2012	TBD	TBD	TBD	N/A	TBD
FY 2017	12/17/2004	6/24/2015	6/8/2012	4QFY2017	4QFY2017	4QFY2017	N/A	4QFY2025
FY 2018	12/17/2004	6/24/2015	6/8/2012	2QFY2018	4QFY2017	2QFY2018	N/A	4QFY2025
FY 2019	12/17/2004	6/24/2015	6/8/2012	2QFY2018	8/25/2017	2QFY2018	N/A	4QFY2025
FY 2020 PB	12/17/2004	6/24/2015	6/8/2012	3/21/2018	8/25/2017	3/21/2018	N/A	12/31/2025

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete (d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

Fiscal Quarter or Date

Fiscal Year	MPB CD-3A	MPB CD-3B	MPB CD-3C	Substation CD-3A
FY 2017	2Q FY 2016	1Q FY 2017	1Q FY 2017	3Q FY 2016
FY 2018	3/30/2016	1/13/2017	N/A	N/A
FY 2019	3/30/2016	1/13/2017	N/A	N/A
FY 2020	3/30/2016	1/13/2017	N/A	N/A

MPB CD-3A – Long Lead Procurement for site preparation and long lead procurements
MPB CD-3B – Long Lead Procurements
MPB CD-3C – Cancelled as reflected in the FY 2018 CPDS
Substation CD-3A – Cancelled as reflected in the FY 2018 CPDS

Project Cost History

Overall Project (06-D-141-01 through 06-D-141-09)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2011	351,149	935,000-1,604,000	1,124,000-1,928,000	276,000-472,000	TBD	TBD	1,400,000-3,500,000
FY 2012	528,690	3,174,779-5,320,310	3,703,000-5,849,000	497,000-651,000	N/A	497,000-651,000	4,200,000-6,500,000
FY 2013	566,192	3,136,808-5,150,808	3,703,000-5,717,000	497,000-783,000	N/A	497,000-783,000	4,200,000-6,500,000
FY 2014	1,164,000	TBD	TBD	TBD	N/A	TBD	TBD
FY 2015	TBD	TBD	TBD	TBD	N/A	TBD	TBD
FY 2016	TBD	TBD	TBD	TBD	N/A	TBD	TBD
FY 2017	1,880,000	4,103,000	5,983,000	517,000	0	517,000	6,500,000
FY 2018	1,926,000	4,148,500	6,074,500	425,500	0	425,500	6,500,000
FY 2019	1,855,809	4,463,724	6,319,533	180,467	0	180,467	6,500,000
FY 2020	1,838,000	4,283,337	6,121,337	378,663	0	378,663	6,500,000

Site Readiness Subproject (06-D-141-01)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2015	N/A	64,000	64,000	1,000	N/A	1,000	65,000
FY 2016		64,000	64,000	1,000	N/A	1,000	65,000
FY 2017	0	43,277	43,277	0	0	0	43,277
FY 2018	0	43,277	43,277	0	0	0	43,277
FY 2019	0	43,714	43,714	0	0	0	43,714
FY 2020	0	43,714	43,714	0	0	0	43,714

Site Infrastructure and Services Subproject (06-D-141-05)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2015	N/A	58,000	58,000	1,500	N/A	1,500	59,500
FY 2016	N/A	84,500	84,500	500	N/A	500	85,000
FY 2017	0	78,000	78,000	500	0	500	78,500
FY 2018	0	78,000	78,000	500	0	500	78,500
FY 2019	0	78,000	78,000	500	0	500	78,500
FY 2020	0	60,500	60,500	0	0	0	60,500

Substation Subproject (06-D-141-07)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2017	0	48,000	48,000	2,000	0	2,000	50,000
FY 2018	0	60,000	60,000	0	0	0	60,000
FY 2019	0	60,000	60,000	0	0	0	60,000
FY 2020	0	60,000	60,000	0	0	0	60,000

Mechanical Electrical Building (MEB) Subproject (06-D-141-06)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2017	0	540,000	540,000	60,000	0	60,000	600,000
FY 2018	0	284,000	284,000	0	0	0	284,000
FY 2019	0	283,917	283,917	83	0	83	284,000
FY 2020	0	282,980	282,980	1,020	0	1,020	284,000

Process Support Facilities Subproject (06-D-141-08)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2017	0	55,000	55,000	5,000	0	5,000	60,000
FY 2018	0	111,000	111,000	10,000	0	10,000	121,000
FY 2019	0	116,702	116,702	4,298	0	4,298	121,000
FY 2020	0	118,000	118,000	22,000	0	22,000	140,000

Salvage and Accountability Building Subproject (06-D-141-09)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2017	0	1,200,000	1,200,000	130,000	0	130,000	1,330,000
FY 2018	0	1,060,250	1,060,250	25,000	0	25,000	1,085,250
FY 2019	0	1,013,761	1,013,761	16,239	0	16,239	1,030,000
FY 2020	0	1,105,000	1,105,000	75,000	0	75,000	1,180,000

Main Process Building Subproject (06-D-141-04)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2015	TBD	TBD	TBD	TBD	N/A	TBD	TBD
FY 2016	TBD	TBD	TBD	TBD	N/A	TBD	TBD
FY 2017	1,880,000	2,138,723	4,018,723	319,500	0	319,500	4,338,223
FY 2018	1,926,000	2,511,973	4,437,973	390,000	0	390,000	4,827,973
FY 2019	1,855,809	2,867,630	4,723,439	159,347	0	159,347	4,882,786
FY 2020	1,838,000	2,613,143	4,451,143	280,643	0	280,643	4,731,786

2. Project Scope and Justification

Scope

The UPF Project, which consists of a series of industrial and nuclear buildings and supporting infrastructure, is a major system acquisition that was selected in the Record of Decision for the Complex Transformation Supplemental Programmatic Environmental Impact Statement to ensure the long-term viability, safety, and security of the EU capability at the Y-12 National Security Complex. Within budget constraints, the UPF project focuses on modernizing uranium processing capabilities at Y-12 to reduce program and safety risk. The UPF project provides new buildings to replace the Building 9212 capabilities for Highly Enriched Uranium (HEU) casting, oxide production, recovery, decontamination and assay. Coordination between Headquarters Acquisition and Project Management, the Uranium Program Manager, the NNSA Production Office and the UPF Project Office is essential as the uranium mission strategy and associated implementation plans define how the uranium capabilities are transitioned, relocated, sustained and/or replaced.

The goals and objectives of the UPF Project are to support the following modernization strategy:

- Ensure the long-term capability and improve the reliability of EU operations;
- Replace deteriorating, end-of-life buildings with modern manufacturing buildings;
- Significantly improve the health and safety posture for workers and the public by replacing administrative controls with engineered controls to manage the risks related to worker safety, criticality safety, fire protection, and environmental compliance.

The UPF project consists of the following subprojects:

Site Readiness Subproject (06-D-141-01): The Site Readiness Subproject scope included Bear Creek Road relocation, including a bridge overpass of the haul road; installation of potable water lines paralleling the new road; electrical line demolition to make way for the road and clear the construction site; electrical line and communication cable installation; preparation of the West Borrow area to receive excess-soil and preparation and maintenance of a spoil area for wet soil; extension of an existing haul road for access to the construction site; and jack-and-bore installation of casings for future utilities.

Site Infrastructure and Services Subproject (06-D-141-05): The SIS Subproject scope included demolition of Building 9107 and its hillside, installation of haul road security features, completion of a sedimentation basin, a concrete batch plant and completion of the Construction Support Building.

Substation Subproject (06-D-141-07): The Substation Subproject provides for the installation of the 161kV Main Electrical Substation for the Uranium Processing Facility Project and capacity for most of the rest of the Y-12 plant. The Substation will provide electrical power from the Tennessee Valley Authority (TVA) 161kV transmission system. The Substation Subproject includes all equipment, facilities or structures needed for a fully operational substation including the high voltage superstructure, control house buildings, site work, equipment foundations, oil containment system, fencing, outdoor lighting, grounding system and all underground raceways, conduits and cable trenches, transmission lines, access road and fire protection for the substation. The CD-3A for long lead equipment was cancelled in 2016.

Mechanical Electrical Building (MEB) Subproject (06-D-141-06): The MEB Subproject will construct a facility and install the utility equipment and support systems required by both the MPB and the SAB. The MEB will be a stand-alone building housing mechanical, electrical, heating, ventilation, and air conditioning, utility equipment and support systems. The MEB will be constructed to nonnuclear commercial industrial standards. This subproject includes support buildings including leased temporary and permanent construction support facilities.

Process Support Facilities Subproject (06-D-141-08): The Process Support Facilities Subproject provides facilities for the chilled water, instrument air, demineralized water, waste management, and chemical and gas storage needed to support the MPB and SAB.

Salvage and Accountability Building Subproject (06-D-141-09): The SAB will contain the following processes: waste preparation, decontamination, nondestructive analysis, the clean and contaminated shops, chemical recovery, calcination and leaching, electronics and calibration maintenance, filter room, and personnel-related rooms. The SAB will be constructed to standards commensurate with the radioactive hazard and security requirements for the materials and processes contained within. This subproject includes support buildings including a fire tank pump building as well as the Personnel Support Building which provides personnel access and monitoring station, truck bay, loading dock and material access. Long lead equipment purchases associated with the SAB Subproject will be allocated to the SAB TPC.

> **Long Lead Procurements, CD-3B:** Includes long lead gloveboxes, skids, and select long lead procurements for structural steel, rebar, embeds and specialty items associated with SAB.

Main Process Building Subproject (06-D-141-04): The MPB will house the casting and oxide production capabilities. It also contains nondestructive analysis and waste preparations, furnaces and repacking, and spaces needed for process support such as the shift manager's office, restrooms, and other personnel-related rooms. The MPB will be constructed to nuclear standards commensurate with high-hazard materials and security for the processes to be carried out within. The MPB Subproject will include the construction of the HEUMF connector, and the new Perimeter Intrusion Detection and Assessment System surrounding the UPF campus and support buildings. Design costs for the UPF project are included in the MPB Subproject baseline, as design costs are not tracked for each individual UPF subproject.

Site Preparation and Long Lead Procurements, CD-3A: Includes excavation and fill for the MPB, SAB and the MEB; installation of temporary facilities, power, storm water and sanitary sewers; and long lead procurements of tower cranes and rebar for the MEB slab.

Long Lead Procurements, CD-3B: Includes long lead gloveboxes, skids and select long lead procurements for structural steel, rebar, embeds and specialty items associated with MPB.

Justification

The UPF Project is needed to ensure the long-term viability, safety, and security of the Enriched Uranium (EU) capability in the United States. The UPF Project will support the Nation's nuclear weapons stockpile, down blending of EU in support of nonproliferation, and provide uranium as feedstock for fuel for naval reactors. Currently, these capabilities reside in aged and "genuinely decrepit" facilities as noted by the 2009 Strategic Posture Commission. There is substantial risk that the existing facilities will continue to deteriorate to the point of significant impact to Defense Programs, Defense Nuclear Nonproliferation, and Naval Reactors programs. The impacts could result in loss of the U.S. capability to maintain the nuclear weapons stockpile through life extension programs, shutdown of the U.S. Navy nuclear powered fleet due to lack of EU fuel feedstock materials, and impact to the Defense Nuclear Nonproliferation program's ability to reduce the enrichment level of foreign research reactors through supply of lower enrichment fuels manufactured at Y-12. The risk of inadvertent or accidental shutdown of the existing facilities is high and may occur prior to completion and startup of the UPF Project.

The project is being conducted in accordance with the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets. Consistent with DOE O 413.3B, Earned Value information for all subprojects and the UPF design effort will be reported in the Project Assessment and Reporting System (PARS). Funds appropriated under this data sheet may be used for the incremental funding and execution of the project on an annual basis. Funds appropriated under this data sheet may be used for contracted support services to the Federal Project Director and to conduct reviews of design and construction.

Key Performance Parameters (KPPs)

The Threshold KPPs represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The Objective KPPs represent the desired project performance.

Performance Measure	Threshold	Objective
UPF supports phasing out mission dependency on 9212 by the end of 2025	Threshold Performance Parameters are identified in the Classified Project Requirements Document	Objective Performance Parameters are identified in the Classified Project Requirements Document

3. Project Cost and Schedule

Financial Schedule

UPF funding is appropriated at the Overall Project level (06-D-141) and is allocated to the subprojects in the tables below.

Site Readiness Subproject (06-D-141-01)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2016	N/A	0	0
FY 2017	N/A	0	0
Total Design	N/A	0	0
Construction			
FY 2013	43,714	43,714	5,242
FY 2014	0	0	25,928
FY 2015	0	0	12,107
FY 2016	0	0	437
FY 2017	0	0	0
Total Construction	43,714	43,714	43,714
Total Estimated Costs (TEC)			
FY 2013	43,714	43,714	5,242
FY 2014	0	0	25,928
FY 2015	0	0	12,107
FY 2016	0	0	437
FY 2017	0	0	0
Total TEC	**43,714**	**43,714**	**43,714**
Other Project Costs (OPC)			
FY 2016	0	0	0
FY 2017	0	0	0
Total OPC	0	0	0
Total Project Costs (TPC)			
FY 2013	43,714	43,714	5,242
FY 2014	0	0	25,928
FY 2015	0	0	12,107
FY 2016	0	0	437
FY 2017	0	0	0
Grand Total	**43,714**	**43,714**	**43,714**

Site Infrastructure and Services Subproject (06-D-141-05)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2016	N/A	0	0
FY 2017	N/A	0	0
Total Design	N/A	0	0
Construction			
FY 2015	60,500[a]	60,500	8,746
FY 2016	0	0	26,875
FY 2017	0	0	23,166
FY 2018	0	0	1,713
FY 2019	0	0	0
Total Construction	60,500	60,500	60,500
Total Estimated Costs (TEC)			
FY 2015	60,500	60,500	8,746
FY 2016	0	0	26,875
FY 2017	0	0	23,166
FY 2018	0	0	1,713
FY 2019	0	0	0
Total TEC	**60,500**	**60,500**	**60,500**
Other Project Costs (OPC)			
FY 2017	0	0	0[b]
FY 2018	0	0	0[c]
Total OPC	0	0	0
Total Project Costs (TPC)			
FY 2015	60,500	60,500	8,746
FY 2016	0	0	26,875
FY 2017	0	0	23,166
FY 2018	0	0	1,713
FY 2019	0	0	0
Grand Total	**60,500**	**60,500**	**60,500**

[a] Subproject received CD-4 approval in FY 2018 and completed under budget; baseline was $78M, actual cost was $60.5M.

[b] The FY 2017 amount included in the FY 2019 data sheet was an error and should have been $0.

[c] The amount included in the FY 2019 data sheet was an estimate and has been revised to reflect actual cost in FY 2018.

Substation Subproject (06-D-141-07)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2016	N/A	0	0
FY 2017	N/A	0	0
Total Design	N/A	0	0
Construction			
FY 2016	60,000	60,000	0
FY 2017	0	0	11,064
FY 2018	0	0	26,101
FY 2019	0	0	10,559
FY 2020	0	0	12,276
Total Construction	60,000	60,000	60,000
Total Estimated Costs (TEC)			
FY 2016	60,000	60,000	0
FY 2017	0	0	11,064
FY 2018	0	0	26,101
FY 2019	0	0	10,559
FY 2020	0	0	12,276
Total TEC	**60,000**	**60,000**	**60,000**
Other Project Costs (OPC)			
FY 2016	0	0	0
FY 2017	0	0	0
Total OPC	0	0	0
Total Project Costs (TPC)			
FY 2016	60,000	60,000	0
FY 2017	0	0	11,064
FY 2018	0	0	26,101
FY 2019	0	0	10,559
FY 2020	0	0	12,276
Grand Total	**60,000**	**60,000**	**60,000**

Mechanical Electrical Building (MEB) Subproject (06-D-141-06)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2016	N/A	0	0
FY 2017	N/A	0	0
Total Design	N/A	0	0
Construction			
FY 2017	55,000	55,000	1,425[a]
FY 2018	160,000	160,000	35,061
FY 2019	67,980	67,980	215,000
FY 2020	0	0	23,000
FY 2021	0	0	8,494
FY 2022	0	0	0
Total Construction	282,980	282,980	282,980
Total Estimated Costs (TEC)			
FY 2017	55,000	55,000	1,425
FY 2018	160,000	160,000	35,061
FY 2019	67,980	67,980	215,000
FY 2020	0	0	23,000
FY 2021	0	0	8,494
FY 2022	0	0	0
Total TEC	**282,980**	**282,980**	**282,980**
Other Project Costs (OPC)			
FY 2019	1,020	1,020	0
FY 2020	0	0	0
FY 2021	0	0	1,000
FY 2022	0	0	20
Total OPC	1,020	1,020	1,020
Total Project Costs (TPC)			
FY 2017	55,000	55,000	1,425
FY 2018	160,000	160,000	35,061
FY 2019	69,000	69,000	215,000
FY 2020	0	0	23,000
FY 2021	0	0	9,494
FY 2022	0	0	20
Grand Total	**284,000**	**284,000**	**284,000**

[a] The amount included in the FY 2019 data sheet was an estimate and has been revised to reflect actual cost in FY 2017.

Process Support Facilities Subproject (06-D-141-08)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2016	N/A	0	0
FY 2017	N/A	0	0
Total Design	N/A	0	0
Construction			
FY 2018	15,000	15,000	2,139
FY 2019	30,000	30,000	32,000
FY 2020	54,000	54,000	64,000
FY 2021	19,000	19,000	13,000
FY 2022	0	0	6,861
FY 2023	0	0	0
FY 2024	0	0	0
FY 2025	0	0	0
Total Construction	118,000	118,000	118,000
Total Estimated Costs (TEC)			
FY 2018	15,000	15,000	2,139
FY 2019	30,000	30,000	32,000
FY 2020	54,000	54,000	64,000
FY 2021	19,000	19,000	13,000
FY 2022	0	0	6,861
FY 2023	0	0	0
FY 2024	0	0	0
FY 2025	0	0	0
Total TEC	**118,000**	**118,000**	**118,000**
Other Project Costs (OPC)			
FY 2020	1,000	1,000	1,000
FY 2021	21,000	21,000	2,000
FY 2022	0	0	14,000
FY 2023	0	0	4,000
FY 2024	0	0	750
FY 2025	0	0	250
Total OPC	22,000	22,000	22,000
Total Project Costs (TPC)			
FY 2018	15,000	15,000	2,139
FY 2019	30,000	30,000	32,000
FY 2020	55,000	55,000	65,000
FY 2021	40,000	40,000	15,000

	Budget Authority (Appropriations)	Obligations	Costs
FY 2022	0	0	20,861
FY 2023	0	0	4,000
FY 2024	0	0	750
FY 2025	0	0	250
Grand Total	**140,000**	**140,000**	**140,000**

Salvage and Accountability Building Subproject (06-D-141-09)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2016	N/A	0	0
FY 2017	N/A	0	0
Total Design	N/A	0	0
Construction			
FY 2018	195,000	195,000	56,194
FY 2019	253,000	253,000	280,000
FY 2020	250,000	250,000	280,000
FY 2021	197,000	197,000	200,000
FY 2022	178,000	178,000	100,000
FY 2023	32,000	32,000	90,000
FY 2024	0	0	98,806
FY 2025	0	0	0
Total Construction	1,105,000	1,105,000	1,105,000
Total Estimated Costs (TEC)			
FY 2018	195,000	195,000	56,194
FY 2019	253,000	253,000	280,000
FY 2020	250,000	250,000	280,000
FY 2021	197,000	197,000	200,000
FY 2022	178,000	178,000	100,000
FY 2023	32,000	32,000	90,000
FY 2024	0	0	98,806
FY 2025	0	0	0
Total TEC	**1,105,000**	**1,105,000**	**1,105,000**
Other Project Costs (OPC)			
FY 2020	2,000	2,000	2,000
FY 2021	5,000	5,000	5,000
FY 2022	22,000	22,000	22,000

	Budget Authority (Appropriations)	Obligations	Costs
FY 2023	38,000	38,000	31,000
FY 2024	8,000	8,000	8,000
FY 2025	0	0	7,000
Total OPC	75,000	75,000	75,000
Total Project Costs (TPC)			
FY 2018	195,000	195,000	56,194
FY 2019	253,000	253,000	280,000
FY 2020	252,000	252,000	282,000
FY 2021	202,000	202,000	205,000
FY 2022	200,000	200,000	122,000
FY 2023	70,000	70,000	121,000
FY 2024	8,000	8,000	106,806
FY 2025	0	0	7,000
Grand Total	**1,180,000**	**1,180,000**	**1,180,000**

Main Process Building Subproject (06-D-141-04)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2005	0	0	0
FY 2006	5,000	5,000	0
FY 2007	5,000	5,000	677
FY 2008	38,583	38,583	33,950
FY 2009	90,622	90,622	79,184
FY 2010	94,000	94,000	80,959
FY 2011	115,271	115,271[a]	109,855
FY 2012	160,194	160,109	170,700
FY 2013	269,069	269,026	192,389
FY 2014	301,886[b]	301,886	198,448
FY 2015	270,929[c]	269,823	220,761
FY 2016	298,000	297,978	309,154

[a] Corrects an error in TEC and OPC obligations that were misrepresented in the contractor's work breakdown structure.
[b] In FY 2014, $5,000,000 in prior year funding was reprogrammed from 06-D-141, Uranium Processing Facility to Maintenance and Repair of Facilities at Y-12. Change from FY 2018 CPDS also reflects a rescission of $2,114,341.
[c] In FY 2016, $2,885,659 in prior year funding was reprogrammed from 06-D-141, Uranium Processing Facility to Uranium Sustainment: Storage under the Directed Stockpile Work program. Change from FY 2018 CPDS also reflects a rescission of $685,002.08. Corrects an error in TEC and OPC obligations that were misrepresented in the contractor's work breakdown structure.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2017	179,884[a][d]	179,748	326,205
FY 2018	9,562	10,954	115,718
Total Design	1,838,000	1,838,000	1,838,000[e]
Construction			
FY 2016	72,000	72,000	4,958
FY 2017	340,116	340,116	54,263
FY 2018	283,438	283,438	177,259
FY 2019	351,000	351,000	509,175
FY 2020	436,000	436,000	536,267
FY 2021	502,500	502,500	545,109
FY 2022	388,500	388,500	521,098
FY 2023	171,000	171,000	146,045
FY 2024	68,589	68,589	118,826
FY 2025	0	0	143
FY 2026	0	0	0
Total Construction	2,613,143	2,613,143	2,613,143
Total Estimated Costs (TEC)			
FY 2005	0	0	0
FY 2006	5,000	5,000	0
FY 2007	5,000	5,000	677
FY 2008	38,583	38,583	33,950
FY 2009	90,622	90,622	79,184
FY 2010	94,000	94,000	80,959
FY 2011	115,271	115,271	109,855
FY 2012	160,194	160,109	170,700
FY 2013	269,069	269,026	192,389
FY 2014	301,886	301,886	198,448
FY 2015	270,929	269,823	220,761
FY 2016	370,000	369,978	314,112
FY 2017	520,000	519,864	380,468
FY 2018	293,000	294,392	292,977
FY 2019	351,000	351,000	509,175
FY 2020	436,000	436,000	536,267
FY 2021	502,500	502,500	545,109
FY 2022	388,500	388,500	521,098

[d] The amount included in the FY 2019 data sheet was an estimate and has been revised to reflect actual budget authority and obligations in FY 2017.

[e] Allocations to Design will be updated in future data sheets as final design costs and fee payment requests are reviewed and adjudicated.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2023	171,000	171,000	146,045
FY 2024	68,589	68,589	118,826
FY 2025	0	0	143
FY 2026	0	0	0
Total TEC	**4,451,143**	**4,451,143**	**4,451,143**
Other Project Costs (OPC)			
FY 2005	12,113	12,113	12,113
FY 2006	7,809	7,809	7,809
FY 2007	10,082	10,082	10,082
FY 2008	11,730	11,730	11,730
FY 2009	14,000	14,000	14,000
FY 2010	20,500	20,500	20,500
FY 2011	18,409[f]	18,409	18,409[g]
FY 2012	0	0	0
FY 2013	0	0	0
FY 2014	0	0	0
FY 2015	0	0	0
FY 2016	0	0	0
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	2,000	2,000	2,000
FY 2021	5,500	5,500	5,500
FY 2022	31,500	31,500	31,500
FY 2023	59,000	59,000	59,000
FY 2024	88,000	88,000	82,500
FY 2025	0	0	5,500
FY 2026	0	0	0
Total OPC	280,643	280,643	280,643
Total Project Costs (TPC)			
FY 2005	12,113	12,113	12,113
FY 2006	12,809	12,809	7,809
FY 2007	15,082	15,082	10,759
FY 2008	50,313	50,313	45,680
FY 2009	104,622	104,622	93,184

[f] Updated to correctly represent the OPC funding allocated to the MPB subproject. This was an error in the prior year's PDS, and budget authority should have been aligned to the actual costs (see footnote g).

[g] Updated to reflect actual costs following DCAA audit.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2010	114,500	114,500	101,459
FY 2011	133,680	133,680	128,264
FY 2012	160,194	160,109	170,700
FY 2013	269,069	269,026	192,389
FY 2014	301,886	301,886	198,448
FY 2015	270,929	269,823	220,761
FY 2016	370,000	369,978	314,112
FY 2017	520,000	519,864	380,468
FY 2018	293,000	294,392	292,977
FY 2019	351,000	351,000	509,175
FY 2020	438,000	438,000	538,267
FY 2021	508,000	508,000	550,609
FY 2022	420,000	420,000	552,598
FY 2023	230,000	230,000	205,045
FY 2024	156,589	156,589	201,326
FY 2025	0	0	5,643
FY 2026	0	0	0
Grand Total	**4,731,786**	**4,731,786**	**4,731,786**

Overall Project (06-D-141)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2005	0	0	0
FY 2006	5,000	5,000	0
FY 2007	5,000	5,000	677
FY 2008	38,583	38,583	33,950
FY 2009	90,622	90,622	79,184
FY 2010	94,000	94,000	80,959
FY 2011	115,271	115,271	109,855
FY 2012	160,194	160,109	170,700
FY 2013	269,069	269,026	192,389
FY 2014	301,886	301,886	198,448
FY 2015	270,929	269,823	220,761
FY 2016	298,000	297,978	309,154
FY 2017	179,884	179,748	326,205
FY 2018	9,562	10,954	115,718

	Budget Authority (Appropriations)	Obligations	Costs
Total Design	1,838,000	1,838,000	1,838,000[a]
Construction			
FY 2012	0	0	0
FY 2013	43,714	43,714	5,242
FY 2014	0	0	25,928
FY 2015	60,500	60,500	20,853
FY 2016	132,000	132,000	32,270
FY 2017	395,116	395,116	89,918
FY 2018	653,438	653,438	298,467
FY 2019	701,980	701,980	1,046,734
FY 2020	740,000	740,000	915,543
FY 2021	718,500	718,500	766,603
FY 2022	566,500	566,500	627,959
FY 2023	203,000	203,000	236,045
FY 2024	68,589	68,589	217,632
FY 2025	0	0	143
FY 2026	0	0	0
Total Construction	4,283,337	4,283,337	4,283,337
Total Estimated Costs (TEC)			
FY 2005	0	0	0
FY 2006	5,000	5,000	0
FY 2007	5,000	5,000	677
FY 2008	38,583	38,583	33,950
FY 2009	90,622	90,622	79,184
FY 2010	94,000	94,000	80,959
FY 2011	115,271	115,271	109,855
FY 2012	160,194	160,109	170,700
FY 2013	312,783	312,740	197,631
FY 2014	301,886	301,886	224,376
FY 2015	331,429	330,323	241,614
FY 2016	430,000	429,978	341,424
FY 2017	575,000	574,864	416,123
FY 2018	663,000	664,392	414,185
FY 2019	701,980	701,980	1,046,734
FY 2020	740,000	740,000	915,543
FY 2021	718,500	718,500	766,603

[a] Allocations to Design will be updated in future data sheets as final design costs and fee payment requests are reviewed and adjudicated.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2022	566,500	566,500	627,959
FY 2023	203,000	203,000	236,045
FY 2024	68,589	68,589	217,632
FY 2025	0	0	143
FY 2026	0	0	0
Total TEC	**6,121,337**	**6,121,337**	**6,121,337**
Other Project Costs (OPC)			
FY 2005	12,113	12,113	12,113
FY 2006	7,809	7,809	7,809
FY 2007	10,082	10,082	10,082
FY 2008	11,730	11,730	11,730
FY 2009	14,000	14,000	14,000
FY 2010	20,500	20,500	20,500
FY 2011	18,409	18,409[b]	18,409
FY 2012	0	0	0
FY 2013	0	0	0
FY 2014	0	0	0
FY 2015	0	0	0
FY 2016	0	0	0
FY 2017	0	0	0[c]
FY 2018	0	0	0
FY 2019	1,020	1,020	0
FY 2020	5,000	5,000	5,000
FY 2021	31,500	31,500	13,500
FY 2022	53,500	53,500	67,520
FY 2023	97,000	97,000	94,000
FY 2024	96,000	96,000	91,250
FY 2025	0	0	12,750
FY 2026	0	0	0
Total OPC	**378,663**	**378,663**	**378,663**
Total Project Costs (TPC)			
FY 2005	12,113	12,113	12,113
FY 2006	12,809	12,809	7,809
FY 2007	15,082	15,082	10,759
FY 2008	50,313	50,313	45,680
FY 2009	104,622	104,622	93,184

[b] Updated to correctly represent the OPC funding allocated to the MPB subproject. This was an error in the prior year's PDS and budget authority should have been aligned to the actual costs based on DCAA audit.

[c] The amount included in the FY 2019 data sheet was an estimate and has been revised to reflect actual cost in FY 2017.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2010	114,500	114,500	101,459
FY 2011	133,680	133,680	128,264
FY 2012	160,194	160,109	170,700
FY 2013	312,783	312,740	197,631
FY 2014	301,886[d]	301,886	224,376
FY 2015	331,429[e]	330,323	241,614
FY 2016	430,000	429,978	341,424
FY 2017	575,000	574,864	416,123
FY 2018	663,000	664,392	414,185
FY 2019	703,000	703,000	1,046,734
FY 2020	745,000	745,000	920,543
FY 2021	750,000	750,000	780,103
FY 2022	620,000	620,000	695,479
FY 2023	300,000	300,000	330,045
FY 2024	164,589	164,589	308,882
FY 2025	0	0	12,893
FY 2026	0	0	0
Grand Total	**6,500,000**	**6,500,000**	**6,500,000**

[d] In FY 2014, $5,000,000 in prior year funding was reprogrammed from 06-D-141, Uranium Processing Facility to Maintenance and Repair of Facilities at Y-12. Change from FY 2018 CPDS also reflects a rescission of $2,114,341.
[e] In FY 2016, $2,885,659 in prior year funding was reprogrammed from 06-D-141, Uranium Processing Facility to Uranium Sustainment: Storage under the Directed Stockpile Work program. Change from FY 2018 CPDS also reflects a rescission of $685,002.08.

Details of Project Cost Estimate

Site Readiness Subproject (06-D-141-01)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	0	0	N/A
Contingency	0	0	N/A
Total Design	0	0	N/A
Construction			
Site Preparation	43,714	43,714	50,200
Equipment	0	0	0
Construction	0	0	0
Other, as needed	0	0	0
Contingency	0	0	13,800
Total Construction	43,714	43,714	64,000
Other TEC (if any)			
Cold Startup	0	0	0
Contingency	0	0	0
Total, Other TEC	0	0	0
Total Estimated Cost	43,714	43,714	64,000
Contingency, TEC	0	0	13,800
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	0	0	0
Conceptual Design	0	0	0
Start-up	0	0	1,000
Contingency	0	0	0
Total, OPC	0	0	1,000
Contingency, OPC	0	0	0
Total Project Cost	**43,714**	**43,714**	**65,000**
Total Contingency (TEC+OPC)	**0**	**0**	**13,800**

Site Infrastructure and Services Subproject (06-D-141-05)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	0	0	0
Contingency	0	0	0
Total Design	0	0	0
Construction			
Site Preparation	0	0	26,000
Equipment	0	0	0
Construction	60,500	60,000	30,000
Other, as needed	0	0	0
Contingency	0	18,000	22,500
Total Construction	60,500	78,000	78,500
Other TEC (if any)			
Cold Startup	0	0	0
Contingency	0	0	0
Total, Other TEC	0	0	0
Total Estimated Cost	60,500	78,000	78,500
Contingency, TEC	0	18,000	22,500
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	0	0	0
Conceptual Design	0	0	0
Start-up	0	460	0
Contingency	0	40	0
Total, OPC	0	500	0
Contingency, OPC	0	40	0
Total Project Cost	**60,500**	**78,500**	**78,500**
Total Contingency (TEC+OPC)	**0**	**18,040**	**22,500**

Substation Subproject (06-D-141-07)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	0	0	0
Contingency	0	0	0
Total Design	0	0	0
Construction			
Site Preparation	0	0	3,000
Equipment	0	0	47,000
Construction	48,000	46,277	0
Other, as needed	0	0	0
Contingency	12,000	13,723	10,000
Total Construction	60,000	60,000	60,000
Other TEC (if any)			
Cold Startup	0	0	0
Contingency	0	0	0
Total, Other TEC	0	0	0
Total Estimated Cost	60,000	60,000	60,000
Contingency, TEC	12,000	13,723	10,000
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	0	0	0
Conceptual Design	0	0	0
Start-up	0	0	0
Contingency	0	0	0
Total, OPC	0	0	0
Contingency, OPC	0	0	0
Total Project Cost	**60,000**	**60,000**	**60,000**
Total Contingency (TEC+OPC)	**12,000**	**13,723**	**10,000**

Mechanical Electrical Building (MEB) Subproject (06-D-141-06)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	0	0	0
Contingency	0	0	0
Total Design	0	0	0
Construction			
Site Preparation	0	0	0
Equipment	18,000	18,213	20,000
Construction	201,780	186,740	184,000
Other, as needed	0	0	0
Contingency	63,200	78,964	80,000
Total Construction	282,980	283,917	284,000
Other TEC (if any)			
Cold Startup	0	0	0
Contingency	0	0	0
Total, Other TEC	0	0	0
Total Estimated Cost	282,980	283,917	284,000
Contingency, TEC	63,200	78,964	80,000
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	0	0	0
Conceptual Design	0	0	0
Start-up	1,000	76	0
Contingency	20	7	0
Total, OPC	1,020	83	0
Contingency, OPC	20	7	0
Total Project Cost	**284,000**	**284,000**	**284,000**
Total Contingency (TEC+OPC)	**63,220**	**78,971**	**80,000**

Process Support Facilities Subproject (06-D-141-08)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline[a]
Total Estimated Cost (TEC)			
Design			
Design	0	0	0
Contingency	0	0	0
Total Design	0	0	0
Construction			
Site Preparation	0	0	0
Equipment	10,000	10,305	10,000
Construction	85,500	89,834	85,500
Other, as needed	0	0	0
Contingency	22,500	16,563	22,500
Total Construction	118,000	116,702	118,000
Other TEC (if any)			
Cold Startup	0	0	0
Contingency	0	0	0
Total, Other TEC	0	0	0
Total Estimated Cost	118,000	116,702	118,000
Contingency, TEC	22,500	16,563	22,500
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	0	0	0
Conceptual Design	0	0	0
Start-up	18,000	3,954	18,000
Contingency	4,000	344	4,000
Total, OPC	22,000	4,298	22,000
Contingency, OPC	4,000	344	4,000
Total Project Cost	**140,000**	**121,000**	**140,000**
Total Contingency (TEC+OPC)	**26,500**	**16,907**	**26,500**

[a] This reflects the original validated baseline based on CD-2/3 approved in 2018.

Salvage and Accountability Building Subproject (06-D-141-09)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline[a]
Total Estimated Cost (TEC)			
Design			
Design	0	0	0
Contingency	0	0	0
Total Design	0	0	0
Construction			
Site Preparation	0	0	0
Equipment	378,000	176,019	378,000
Construction	503,500	732,268	503,500
Other, as needed	0	0	0
Contingency	223,500	105,474	223,500
Total Construction	1,105,000	1,013,761	1,105,000
Other TEC (if any)			
Cold Startup	0	0	0
Contingency	0	0	0
Total, Other TEC	0	0	0
Total Estimated Cost	1,105,000	1,013,761	1,105,000
Contingency, TEC	223,500	105,474	223,500
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	0	0	0
Conceptual Design	0	0	0
Start-up	60,000	14,940	60,000
Contingency	15,000	1,299	15,000
Total, OPC	75,000	16,239	75,000
Contingency, OPC	15,000	1,299	15,000
Total Project Cost	**1,180,000**	**1,030,000**	**1,180,000**
Total Contingency (TEC+OPC)	**238,500**	**106,773**	**238,500**

[a] This reflects the original validated baseline based on CD-2/3 approved in 2018.

Main Process Building Subproject (06-D-141-04)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline[a]
Total Estimated Cost (TEC)			
Design			
Design	1,838,000	1,835,809	1,838,000
Contingency	0	20,000	0
Total Design	1,838,000	1,855,809	1,838,000
Construction			
Site Preparation	112,500	83,818	112,500
Equipment	919,300	373,353	919,300
Construction	1,139,343	2,004,918	1,139,343
Other, as needed	0	0	0
Contingency	442,000	405,541	442,000
Total Construction	2,613,143	2,867,630	2,613,143
Other TEC (if any)			
Cold Startup	0	0	0
Contingency	0	0	0
Total, Other TEC	0	0	0
Total Estimated Cost	4,451,143	4,723,439	4,451,143
Contingency, TEC	442,000	425,541	442,000
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	30,000	30,000	30,000
Conceptual Design	64,643	64,643	64,643
Start-up	146,000	59,528	146,000
Contingency	40,000	5,176	40,000
Total, OPC	280,643	159,347	280,643
Contingency, OPC	40,000	5,176	40,000
Total Project Cost	**4,731,786**	**4,882,786**	**4,731,786**
Total Contingency (TEC+OPC)	**482,000**	**430,717**	**482,000**

[a] This reflects the original validated baseline based on CD-2/3 approved in 2018.

Overall Project (06-D-141)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline[a]
Total Estimated Cost (TEC)			
Design			
Design	1,838,000	1,835,809	1,838,000
Contingency	0	20,000	0
Total Design	1,838,000	1,855,809	1,838,000
Construction			
Site Preparation	156,214	127,532	156,214
Equipment	1,325,300	577,890	1,325,300
Construction	2,038,623	3,120,037	2,038,623
Other, as needed	0	0	0
Contingency	763,200	638,265	763,200
Total Construction	4,283,337	4,463,724	4,283,337
Other TEC (if any)			
Cold Startup	0	0	0
Contingency	0	0	0
Total, Other TEC	0	0	0
Total Estimated Cost	6,121,337	6,319,533	6,121,337
Contingency, TEC	763,200	658,265	763,200
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	30,000	30,000	30,000
Conceptual Design	64,643	64,643	64,643
Start-up	225,000	78,958	225,000
Contingency	59,020	6,866	59,020
Total, OPC	378,663	180,467	378,663
Contingency, OPC	59,020	6,866	59,020
Total Project Cost	**6,500,000**	**6,500,000**	**6,500,000**
Total Contingency (TEC+OPC)	**822,220**	**665,131**	**822,220**

[a] This reflects the original validated baseline based on CD-2/3 approved in 2018.

Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	Total
FY 2011	TEC	1,233,620	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	OPC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TPC	1,499,649	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
FY 2012	TEC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	OPC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TPC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
FY 2013	TEC	2,254,185	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	OPC	129,128	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TPC	2,383,313	TBD	TBD	TBD	TBD	TBD	TBD	TBD	6,500,000
FY 2014	TEC	3,436,047	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	OPC	174,313	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TPC	3,610,360	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
FY 2015	TEC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	OPC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TPC	3,005,096	520,000	TBD	TBD	TBD	TBD	TBD	TBD	TBD
FY 2016	TEC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	OPC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TPC	3,005,096	520,000	525,000	TBD	TBD	TBD	TBD	TBD	TBD
FY 2017	TEC	TBD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	TBD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	3,180,096	620,000	620,000	635,000	645,000	500,000	250,000	49,904	6,500,000
FY 2018	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	3,223,096	722,000	735,000	740,000	630,000	385,000	64,904	0	6,500,000
FY 2019	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	3,223,096	703,000	745,000	750,000	620,000	300,000	159,000	5,589	6,500,000
FY 2020	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	3,217,411	703,000	745,000	750,000	620,000	300,000	164,589	0	6,500,000

4. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	2025
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset (fiscal quarter)	N/A

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	466	466	32,915	32,915

5. D&D Information

The new area being constructed in this project is replacing existing facilities; however, the costs of D&D of the facilities that are being replaced are not included in the costs of this construction project. Following risk reduction and stabilization activities by NNSA, final D&D of existing facilities will be the responsibility of the DOE Office of Environmental Management.

The construction of the UPF Project will add approximately 230,000 base-level square[a] feet of new buildings to the Y-12 footprint and will allow eventual replacement of functions in Building 9212 including EU casting and EU chemical processing operations. The final D&D and demolition of these areas are not considered part of the UPF project. Building 9107 (11,000 square feet) was demolished as part of the SIS Subproject to facilitate clearing the UPF construction site.

6. Acquisition Approach

The NNSA Federal Project Director and the Integrated Project Team is responsible for the execution of the project. The Management and Operating (M&O) partners for Y-12 are the designated design authority. The Office of Defense Programs (NA-10) and the Uranium Program Manager are responsible for defining program requirements, selecting the preferred alternatives, and for any project scope changes. The Office of Acquisition and Project Management (NA-APM) is responsible for providing support for alternative studies, and serves as the lead NNSA office during design and construction of the project. The UPF Project is being executed through several acquisition strategies, to include firm-fixed-price design-bid-build and design-build contracts, and cost-plus design-build contracts.

The Department is administering Architect-Engineer and Construction Contracts utilizing the M&O and stand-alone contract vehicles. Additionally, the United States Army Corps of Engineers (USACE) and Tennessee Valley Authority have acquisition and project management responsibility for appropriate scopes of work as determined by the Department.
Construction scope is being performed under firm fixed price construction contracts or subcontracts along with cost-plus contracts as determined to be the best value for the government.

[a] Square footage figures rounded to the next highest 1,000 square feet.

04-D-125, Chemistry and Metallurgy Research Replacement (CMRR) Project
Los Alamos National Laboratory (LANL), Los Alamos, New Mexico
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2020 Request for the Chemistry and Metallurgy Research Replacement (CMRR) Project is $168,444K. Critical Decision (CD)-2/3 for the subprojects, RLUOB Equipment Installation Phase 2 (REI2) and PF-4 Equipment Installation Subproject, Phase 1 (PEI1) was approved on October 31, 2016 with a total project cost (TPC) for both subprojects of $1,027,250K. CD-1, Approve Alternative Selection and Cost Range, for the CMRR project was approved on August 21, 2014 with a cost range of $2,400,000K - $2,900,000K and CD-4 in FY 2024.

The CMRR Project provides continuity in analytical chemistry (AC) and materials characterization (MC) capabilities, and supports the cessation of programmatic operations in the existing CMR facility. Execution of the CMRR Project is under the scope parameters established at CD-1 (2014), and as stated in the Program Requirements Document, to include necessary infrastructure (office facilities, physical security, warehouse, material staging and laydown area, access control and change rooms, etc.) and equipment needed to support missions assigned to LANL with nuclear AC/MC operations and supporting capabilities. Although guidance contained in the Conference Report accompanying the Energy and Water Development and Related Agencies Appropriations Act, 2019 directs transitioning this scope to a new line item, some of this scope was authorized as part of CD-3A/B scope for REI2 and PEI1 and continues to be executed under the CMRR project.

This project was initiated in FY 2004.

Significant Changes:
The FY 2020 Construction Project Data Sheet (CPDS) is an update from FY 2019, and does not include a new start for the budget year. As directed in the Conference Report accompanying the Energy and Water Development and Related Agencies Appropriations Act, 2019 this data sheet redefines the project to include, 1) previously completed subprojects, 2) the two active baselined subprojects, REI Phase 2 (REI2) and PF-4 Equipment Installation Phase 1 (PEI 1), and 3) the removal of the PF-4 Equipment Installation Phase 2 (PEI2) and Re-categorizing RLUOB to Hazard Category 3 (RC3) subprojects. Per the Conference Report, the NNSA is "to budget for capital improvements and equipment installations to meet plutonium pit production targets, including the RLUOB re-categorization and the PF-4 phase 2 subprojects, as subprojects within the (new) Plutonium Pit Production Project…", thus removing these subprojects' scope from the CMRR project.

Movement of PEI2 and RC3 out of the CMRR Project will reduce the CMRR Project cost to $1,891,753K. As directed, these projects will be included in the Plutonium Pit Production Project subprogram within Directed Stockpile Work. This data sheet reflects the impact of this direction to the CMRR project's overall milestones and total project costs. Based on the above noted changes, PEI2 and RC3 are reflected within this CPDS through FY 2016 only. The FY 2020 Request supports the project baselines established for the REI2 and PEI1 subprojects.

The CMRR subprojects are described below:

RLUOB Subproject (04-D-125-01): CD-4 approved on June 24, 2010.

RLUOB Equipment Installation (REI1) Subproject (04-D-125-02): CD-4 approved on June 20, 2013.
Nuclear Facility (NF) Subproject (04-D-125-03): This subproject is cancelled.

REI Phase 2 (REI2) Subproject (04-D-125-04): Transfers part of AC and MC capabilities from CMR to RLUOB by designing, purchasing, and installing additional equipment in RLUOB. A CD-3A request for procurement of long lead equipment and site preparations, following a reconciled Independent Cost Estimate (ICE) conducted by DOE-PM, was approved for REI2 on December 18, 2014. CD-3B for additional long lead procurements for REI2 was approved on December 22, 2015. REI2 CD-2/3 approval was received on October 31, 2016 with the Performance baseline established at $633,250K. CD-4 completion is scheduled for 2Q FY2022.

PF-4 Equipment Installation Phase 1 (PEI1) Subproject (04-D-125-05): Maximizes use of PF-4 by decommissioning and decontaminating (D&D) old gloveboxes and equipment, reconfiguring and reusing existing gloveboxes, consolidating and relocating existing capabilities, and installing new gloveboxes and equipment for AC/MC capabilities. PEI1 will establish AC and MC capabilities that utilize larger amounts of nuclear materials and therefore are required to be in PF-4 operational space. CD-3A for long lead procurements for PEI1 was approved on March 18, 2015. CD-3B for additional long lead procurements was approved on December 22, 2015. PEI1 CD-2/3 approval was received on October 31, 2016 with the Performance Baseline established at $394,000K. CD-4 completion is scheduled for 3Q FY2022.

A Federal Project Director (FPD) is assigned to each sub-project.

Critical Milestone History

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2004	07/16/2002	N/A	1QFY2004		N/A	2QFY2004	N/A	1QFY2011
FY 2005	07/16/2002	N/A	3QFY2004		N/A	3QFY2005	N/A	3QFY2012
FY 2006	07/16/2002	N/A	2QFY2005	4QFY2005	N/A	1QFY2006	N/A	4QFY2010
FY 2007	07/16/2002	N/A	09/30/2005	1QFY2006	N/A	1QFY2006	N/A	1QFY2013
FY 2008	07/16/2002	N/A	09/30/2005	10/21/2005	N/A	1QFY2006	N/A	1QFY2013
FY 2009	07/16/2002	N/A	09/30/2005	TBD	N/A	TBD	N/A	TBD
FY 2010	07/16/2002	N/A	09/30/2005	TBD	N/A	TBD	N/A	TBD
FY 2011	07/16/2002	N/A	05/18/2005	TBD	N/A	TBD	N/A	TBD
FY 2012	07/16/2002	N/A	05/18/2005	4QFY2012	N/A	4QFY2012	N/A	TBD
FY 2012 Rep	07/16/2002	N/A	05/18/2005	TBD	TBD	TBD	N/A	TBD
FY 2016	07/16/2002	N/A	4QFY2014	3QFY2016	2QFY2016	3QFY2016	4QFY2019	4QFY2024
FY 2017	07/16/2002	N/A	08/21/2014	3QFY2016	2QFY2016	3QFY2016	4QFY2019	4QFY2024
FY 2018	07/16/2002	N/A	08/21/2014	2QFY2022	3QFY2021	2QFY2022	4QFY2026	4QFY2026
FY 2019	07/16/2002	N/A	08/21/2014	4QFY2022	4QFY2022	4QFY2022	4QFY2026	4QFY2026
FY 2020	07/16/2002	N/A	08/21/2014	10/31/2016	12/1/2016	10/31/2016	N/A	3QFY2022[a]

RLUOB Subproject (04-D-125-01)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2011	07/16/2002	N/A	05/18/2005	10/21/2005	N/A	10/21/2005	N/A	02/28/2010
FY 2012	07/16/2002	N/A	05/18/2005	10/21/2005	N/A	10/21/2005	N/A	06/24/2010
FY 2012 Rep	07/16/2002	N/A	05/18/2005	10/21/2005	N/A	10/21/2005	N/A	06/24/2010
FY 2016	07/16/2002	N/A	05/18/2005	10/21/2005	N/A	10/21/2005	N/A	06/24/2010
FY 2017	07/16/2002	N/A	05/18/2005	10/21/2005	N/A	10/21/2005	N/A	06/24/2010
FY 2018	07/16/2002	N/A	05/18/2005	10/21/2005	N/A	10/21/2005	N/A	06/24/2010
FY 2019	07/16/2002	N/A	05/18/2005	10/21/2005	N/A	10/21/2005	N/A	06/24/2010
FY 2020	07/16/2002	N/A	05/18/2005	10/21/2005	N/A	10/21/2005	N/A	06/24/2010

RLUOB Equipment Installation (REI1) Subproject (04-D-125-02)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2011	07/16/2002	N/A	05/18/2005	07/17/2009	N/A	07/17/2009	N/A	04/30/2013
FY 2012	07/16/2002	N/A	05/18/2005	07/17/2009	N/A	07/17/2009	N/A	04/30/2013
FY 2012 Rep	07/16/2002	N/A	05/18/2005	07/17/2009	N/A	07/17/2009	N/A	3QFY2013
FY 2016	07/16/2002	N/A	05/18/2005	07/17/2009	N/A	07/17/2009	N/A	06/20/2013
FY 2017	07/16/2002	N/A	05/18/2005	07/17/2009	N/A	07/17/2009	N/A	06/20/2013
FY 2018	07/16/2002	N/A	05/18/2005	07/17/2009	N/A	07/17/2009	N/A	06/20/2013
FY 2019	07/16/2002	N/A	05/18/2005	07/17/2009	N/A	07/17/2009	N/A	06/20/2013
FY 2020	07/16/2002	N/A	05/18/2005	07/17/2009	N/A	07/17/2009	N/A	06/20/2013

Nuclear Facility (NF) Subproject (04-D-125-03)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2011	07/16/2002	N/A	05/18/2005	TBD	N/A	TBD	N/A	TBD
FY 2012	07/16/2002	N/A	05/18/2005	4QFY2012	N/A	4QFY2012	N/A	TBD
FY 2012 Rep	07/16/2002	N/A	05/18/2005	TBD	TBD	TBD	N/A	TBD
FY 2016	07/16/2002	N/A	05/18/2005	Cancelled	Cancelled	Cancelled	N/A	Cancelled
FY 2017	07/16/2002	N/A	05/18/2005	Cancelled	Cancelled	Cancelled	N/A	Cancelled
FY 2018	07/16/2002	N/A	05/18/2005	Cancelled	Cancelled	Cancelled	N/A	Cancelled
FY 2019	07/16/2002	N/A	05/18/2005	Cancelled	Cancelled	Cancelled	N/A	Cancelled
FY 2020	07/16/2002	N/A	05/18/2005	Cancelled	Cancelled	Cancelled	N/A	Cancelled

REI Phase 2 (REI2) Subproject (04-D-125-04)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2016	07/16/2002	8/21/2014	8/21/2014	3QFY2016	2QFY2016	3QFY2016	N/A	1QFY2020
FY 2017	07/16/2002	8/21/2014	8/21/2014	3QFY2016	2QFY2016	3QFY2016	N/A	1QFY2020
FY 2018 PB	07/16/2002	8/21/2014	8/21/2014	10/31/2016	4/6/2016	10/31/2016	N/A	2QFY2022
FY 2019	07/16/2002	8/21/2014	8/21/2014	10/31/2016	4/6/2016	10/31/2016	N/A	2QFY2022
FY 2020	07/16/2002	8/21/2014	8/21/2014	10/31/2016	4/6/2016	10/31/2016	N/A	2QFY2022

Fiscal Quarter or Date

Fiscal Year	Performance Baseline Validation	CD-3A	CD-3B
FY 2016		12/18/2014	2QFY2015
FY 2017		12/18/2014	12/22/2015
FY 2018		12/18/2014	12/22/2015
FY 2019		12/18/2014	12/22/2015
FY 2020		12/18/2014	12/22/2015

CD-3A – Approve Long-Lead Procurements

CD-3B – Approve Long-Lead Procurements

PF-4 Equipment Installation Phase 1 (PEI1) Subproject (04-D-125-05)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2016	07/16/2002	4QFY2015	4QFY2014	3QFY2016	2QFY2016	3QFY2016	4QFY2019	1QFY2024
FY 2017	07/16/2002	8/21/2014	08/21/2014	3QFY2016	2QFY2016	3QFY2016	4QFY2019	1QFY2020
FY 2018 PB	07/16/2002	8/21/2014	08/21/2014	10/31/2016	12/1/2016	10/31/2016	4QFY2019	3QFY2022
FY 2019	07/16/2002	8/21/2014	08/21/2014	10/31/2016	12/1/2016	10/31/2016	4QFY2019	3QFY2022
FY 2020	07/16/2002	8/21/2014	08/21/2014	10/31/2016	12/1/2016	10/31/2016	4QFY2019	3QFY2022

Fiscal Quarter or Date

Fiscal Year	Performance Baseline Validation	CD-3A	CD-3B
FY 2016		03/18/2015	12/22/2015
FY 2017		03/18/2015	12/22/2015
FY 2018		03/18/2015	12/22/2015
FY 2019		03/18/2015	12/22/2015
FY 2020		03/18/2015	12/22/2015

CD-3A – Approve Long-Lead Procurements
CD-3B – Approve Long-Lead Procurements

PF-4 Equipment Installation Phase 2 (PEI2) Subproject (04-D-125-06)[b]

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2016	07/16/2002	8/21/14	4QFY2014	3QFY2016	2QFY2016	3QFY2016	4QFY2019	1QFY2024

Fiscal Quarter or Date

Fiscal Year	Performance Baseline Validation	CD-3A
FY 2016		03/18/2015

CD-3A – D&D of Room 209

Re-categorizing RLUOB to Hazard Category 3 (RC3) Subproject (04-D-125-07)[b]

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2016	07/16/2002	08/21/2014	4QFY2014	3QFY2018	2QFY2017	4QFY2017	N/A	1QFY2024

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete(d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

Project Cost History

(Dollars in Thousands)

Fiscal Year	TEC, Design 03-D-103	TEC, Design/Construction 04-D-125	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2004	N/A	N/A	500,000	100,000	N/A	N/A	600,000
FY 2005	N/A	N/A	500,000	100,000	N/A	N/A	600,000
FY 2006	N/A	N/A	750,000	100,000	N/A	N/A	850,000
FY 2007	N/A	N/A	738,097	100,000	N/A	N/A	838,097
FY 2008	65,939	672,158	738,097	100,000	N/A	N/A	838,098
FY 2009	TBD	TBD	TBD	TBD	N/A	TBD	TBD
FY 2010	65,138	TBD	TBD	TBD	N/A	TBD	TBD
FY 2016	63,646	2,295,936	2,359,582	463,721	54,000	517,721	2,877,303
FY 2017	63,646	2,243,436	2,307,082	516,221	54,000	570,221	2,877,303
FY 2018	63,573	2,209,842	2,273,415	549,815	54,000	603,815	2,877,230
FY 2019	63,573	2,209,069	2,272,642	550,588	54,000	604,588	2,877,230
FY 2020	63,573	1,492,091	1,555,664	336,089	N/A	336,089	1,891,753[c]

RLUOB Subproject (04-D-125-01)[d]

(Dollars in Thousands)

Fiscal Year	TEC, Design 03-D-103	TEC, Design/Construction 04-D-125	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2011	N/A	159,130	159,130	4,870	N/A	4,870	164,000
FY 2012	N/A	159,130	159,130	4,870	N/A	4,870	164,000
FY 2012 Rep	N/A	159,130	159,130	4,870	N/A	4,870	164,000
FY 2016	N/A	194,130	194,130	4,870	N/A	4,870	199,000
FY 2017	N/A	194,130	194,130	4,870	N/A	4,870	199,000
FY 2018	N/A	194,130	194,130	4,870	N/A	4,870	199,000
FY 2019	N/A	194,130	194,130	4,870	N/A	4,870	199,000
FY 2020	N/A	194,130	194,130	4,870	N/A	4,870	199,000

RLUOB Equipment Installation (REI1) Subproject (04-D-125-02)[d]

(Dollars in Thousands)

Fiscal Year	TEC, Design 03-D-103	TEC, Design/Construction 04-D-125	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2011	N/A	152,900	152,900	46,500	N/A	46,500	199,400
FY 2012	N/A	152,900	152,900	46,500	N/A	46,500	199,400
FY 2012 Rep	N/A	152,900	152,900	46,500	N/A	46,500	199,400
FY 2016	N/A	151,963	151,963	44,797	N/A	44,797	196,760
FY 2017	N/A	151,963	151,963	44,797	N/A	44,797	196,760
FY 2018	N/A	151,963	151,963	44,797	N/A	44,797	196,760
FY 2019	N/A	151,963	151,963	44,797	N/A	44,797	196,760
FY 2020	N/A	151,963	151,963	44,797	N/A	44,797	196,760

Nuclear Facility (NF) Subproject (03-D-103 and 04-D-125-03)[d]

(Dollars in Thousands)

Fiscal Year	TEC, Design 03-D-103	TEC, Design/Construction 04-D-125	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2011	65,138	TBD	TBD	TBD	N/A	TBD	TBD
FY 2012	65,138	3,239,862 – 5,169,862	3,305,000 – 5,235,000	405,000 - 625,000	N/A	405,000- 625,000	3,710,000 - 5,860,000
FY 2012 Rep	65,138	TBD	TBD	4,870	N/A	TBD	TBD
FY 2016	63,646	391,324	454,970	40,274	N/A	40,274	495,244
FY 2017	63,646	391,324	454,970	40,274	N/A	40,274	495,244
FY 2018	63,573	336,919	400,492	39,054	N/A	39,054	439,546
FY 2019	63,573	336,919	400,492	39,054	N/A	39,054	439,546
FY 2020	63,573	336,919	400,492	39,054	N/A	39,054	439,546

REI Phase 2 (REI2) Subproject (04-D-125-04)

(Dollars in Thousands)

Fiscal Year	TEC, Design 03-D-103	TEC, Design/Construction 04-D-125	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2016	0	540,000	540,000	135,000	N/A	135,000	675,000
FY 2017	0	540,000	540,000	135,000	N/A	135,000	675,000
FY 2018 PB	0	488,040	488,040	145,210	N/A	145,210	633,250
FY 2019	0	488,040	488,040	145,210	N/A	145,210	633,250
FY 2020	0	488,040	488,040	145,210	N/A	145,210	633,250

PF-4 Equipment Installation Phase 1 (PEI1) Subproject (04-D-125-05)

(Dollars in Thousands)

Fiscal Year	TEC, Design 03-D-103	TEC, Design/Construction 04-D-125	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2016	0	1,071,000	1,071,000	240,000	54,000	294,000	1,365,000
FY 2017	0	257,595	257,595	57,405	N/A	57,405	315,000
FY 2018 PB	0	292,300	292,300	101,700	N/A	101,700	394,000
FY 2019	0	292,300	292,300	101,700	N/A	101,700	394,000
FY 2020	0	292,300	292,300	101,700	N/A	101,700	394,000

PF-4 Equipment Installation Phase 2 (PEI2) Subproject (04-D-125-06)[b]

(Dollars in Thousands)

Fiscal Year	TEC, Design 03-D-103	TEC, Design/Construction 04-D-125	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2016	0	471,500	471,500	159,500	54,000	213,500	685,000
FY 2020	0	28,739	28,739	296	N/A	296	29,035

Re-categorizing RLUOB to Hazard Category 3 (RC3) Subproject (04-D-125-07)[b]

(Dollars in Thousands)

Fiscal Year	TEC, Design 03-D-103	TEC, Design/Construction 04-D-125	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2016	0	289,405	289,405	75,595	N/A	75,595	365,000
FY 2020	0	0	0	162	N/A	162	162

2. Project Scope and Justification

Scope

The CMRR Project as originally proposed relocated and consolidated mission critical analytical chemistry (AC), material characterization (MC), and actinide research and development (R&D) capabilities, and provided special nuclear material (SNM) storage and large vessel handling capabilities. The SNM storage and large vessel handling capabilities originally planned for CMRR-NF are not included in the current set of CMRR subprojects. This data sheet provides information related to four subprojects to transition AC and MC capabilities into RLUOB and PF-4 to ensure continuity in plutonium support capabilities and enable the cessation of program operations in CMR.

The complete list of CMRR line item subprojects since inception are:

- **RLUOB Subproject (04-D-125-01):** Construction of a 203,686 gross square foot (gsf) facility to house laboratory space capable of handling radiological quantities of SNM; a 22,071 gsf utility building sized to provide utility services (including chilled and hot water, potable hot/cold water, compressed air, and process gases) for all CMRR facility elements; office space for CMRR workers located outside of perimeter security protection systems; and space for centralized TA-55 training activities. The RLUOB became fully functional and operational after the completion of the equipment installation effort for this facility in the REI phase.

- **RLUOB Equipment Installation (REI) Subproject (04-D-125-02):** Equipment installation included gloveboxes, hoods, AC/MC instrumentation, security and communication hardware, and final facility tie-ins and operational readiness/turnover activities. RLUOB equipment fabrication, installation, testing, and acceptance physically completed in FY 2012. Staff occupation of the office spaces has occurred and CD-4 has been approved. The facility exceeded its sustainability goal of LEED Silver by achieving LEED Gold in June 2012.

- **Nuclear Facility (NF) Subproject (04-D-125-03):** This subproject is cancelled with the remaining mission need (excluding SNM storage and large vessel handling) for CMRR to be met by REI2, PEI1, and the PEI2 and RC3 scope moved to the Plutonium Pit Production Project subprogram within Directed Stockpile Work.

- **REI Phase 2 (REI2) Subproject (04-D-125-04):** Maximizes the use of RLUOB laboratories by both reconfiguring some existing laboratory space and equipping empty laboratories with AC and MC capabilities. The RLUOB will operate at the increased radiological limit, 38.6 g of Pu-239 equivalent, consistent with the new limit established by NNSA Supplemental Guidance NA-1 SD G 1027, which enables additional AC and MC operations to move in. New gloveboxes/hoods and equipment will be installed in RLUOB through this subproject. This project makes progress toward ceasing program operations in CMR. Specific capabilities in REI2 scope include, but are not limited to the following:
  - Trace Elements Sample Preparation
  - Mass Spectrometry Sample Preparation
  - X-Ray Fluorescence Sample Preparation and Instruments
  - Radiochemistry Counting Laboratory and Sample Preparation
  - Oxide and Metal Sample Distribution
  - Coulometry
  - AC and MC Capabilities for R&D and Troubleshooting

- **PF-4 Equipment Installation Phase 1 (PEI1) Subproject (04-D-125-05):** The PEI1 subproject involves the following: relocation of existing PF-4 processes to create open consolidated space, reusing existing gloveboxes for new processes, decontamination and decommissioning (D&D) of old gloveboxes/equipment in PF-4 to create open laboratory space; and, installation of new gloveboxes/equipment in the created open space. PEI1 will support the AC and MC capabilities that require the processing of larger amounts of nuclear material. This project makes progress toward ceasing program operations in CMR. These capabilities support pit production, pit surveillance, plutonium science and other national security programs. The removal work will be executed as site-prep work within this subproject. Specific capabilities in PEI1 scope include, but are not limited to the following:

- Sample Preparation Surface Science
- Mechanical Testing
- Physical Properties
- Small Sample Fabrication and Preparation

PF-4 Equipment Installation Phase 2 (PEI2) Subproject (04-D-125-06)/PF-4 Reconfiguration Project (PRP) – 17-D-126: Moved to the Plutonium Pit Production Project subprogram within Directed Stockpile Work. This scope will maximize use of PF-4 by consolidating and relocating existing capabilities, replacing existing equipment, installing gloveboxes and equipment and D&D of existing laboratory space for AC/MC capabilities. PEI2 will establish enduring AC and MC capabilities for supporting NNSA actinide-based missions. The preliminary cost range for the work in this subproject is $523,000K - $675,340K and schedule range 2024 to 2026; the cost estimate will be updated prior to CD-2/3 approval for this subproject. An integrated master schedule will be developed at CD-2/3.
Re-categorizing RLUOB to Hazard Category 3 (RC3) Subproject (04-D-125-07)/RLUOB Reconfiguration Project (RRP) – 17-D-125: Moved to the Plutonium Pit Production Project subprogram within Directed Stockpile Work. This scope will maximizes use of RLUOB by reconfiguring existing laboratory space and equipping the remaining empty laboratories with AC and MC capabilities, and enables the RLUOB to be re-categorized facility to a limited hazard category-3 nuclear facility. RC3 will establish enduring AC and MC capabilities for supporting NNSA actinide-based missions. The preliminary cost range for the work in this subproject is $208,000K - $339,335K and schedule range of 2024 to 2026; the cost estimate will be updated prior to CD-2/3 approval for this subproject. An integrated master schedule will be developed at CD-2/3.

Justification

As defined in the most recent revision of the Mission Need Statement (MNS), the mission of the Chemistry and Metallurgy Research Replacement Project is to ensure continuity in enduring analytical chemistry and materials characterization capabilities for NNSA actinide-based missions in support of stockpile stewardship. The AC and MC capabilities provided by this project support pit production, pit surveillance, plutonium science and other national security programs. During development of the plutonium strategy, the joint DOD-CAPE business case analysis (BCA) indicated that optimizing RLUOB and repurposing space in PF-4 should be started as soon as possible to maintain continuity in AC and MC capabilities.

The project is being conducted in accordance with the project management requirements in DOE Order 413.3B, Program and Project Management for the Acquisition of Capital Assets.

Funds appropriated for this project may be used to provide independent assessments and other direct contractual support determined necessary by the FPD for the planning and execution of this project.

Key Performance Parameters (KPPs)

REI Phase 2 (REI2) Subproject (04-D-125-04): Transfer AC/MC capabilities from CMR to the RLUOB and complete transition to operations (i.e., preparation of operational startup, management self-assessments and hot testing) of AC/MC capabilities in eight RLUOB laboratory rooms as referenced in the CMRR REI2 and PEI1 Transition to Operations (TTO) Plan (CMRR-PLAN-00004) and PEP section 5.19 Transition to Operations.

PF-4 Equipment Installation Phase 1 (PEI1) Subproject (04-D-125-05): Transfer AC/MC capabilities from CMR to PF-4 and complete transition to operations (i.e., preparation of operational startup, management self-assessments and hot testing) of AC/MC capabilities in PF-4 Rooms 115/124 and nondestructive analysis (NDA) capability as referenced in the CMRR REI2 and PEI1 TTO Plan (CMRR-PLAN-00004) and PEP Section 5.20 Transition to Operations.

Financial Schedule

Prior Subprojects (RLUOB/REI/Nuclear Facility)

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Cost
Total Estimated Costs (TEC)			
Design (03-D-103-010)			
FY 2004	9,500	0	0
FY 2005	13,567	23,067	1,848
FY 2006	27,910	27,910	19,147
FY 2007	14,161	14,161	27,213
FY 2008	0	0	15,079
FY 2009	0	0	-329
FY 2010	0	0	44
FY 2011	0	0	0
FY 2012	-1,565	-1,565	339
FY 2013	0	0	188
FY 2014	0	0	44
FY 2015	73	73	0
FY 2016	-73	-73	0
Total Design (03-D-103-010)	**63,573**	**63,573**	**63,573**
Design (04-D-125)			
FY 2007	11,489	11,489	3,109
FY 2008	41,581	41,581	24,713
FY 2009	92,196	92,196	47,102
FY 2010	57,000	57,000	62,252
FY 2011	146,699	146,699	101,924
FY 2012	37,964[e]	37,964[e]	132,593
FY 2013	0	0	15,158
FY 2014	0	0	724
FY 2015	0	0	-646
FY 2016	0	0	0
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
Total Design (04-D-125)	**386,929**	**386,929**	**386,929**
Total Design			
FY 2004	9,500	0	0
FY 2005	13,567	23,067	1,848
FY 2006	27,910	27,910	19,147
FY 2007	25,650	25,650	30,322

	Budget Authority (Appropriations)	Obligations	Cost
FY 2008	41,581	41,581	39,792
FY 2009	92,196	92,196	46,773
FY 2010	57,000	57,000	62,296
FY 2011	146,699	146,699	101,924
FY 2012	36,399[e]	36,399[e]	132,932
FY 2013	0	0	15,346
FY 2014	0	0	768
FY 2015	73	73	-646
FY 2016	-73	-73	0
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
Total Design (04-D-125)	**450,502**	**450,502**	**450,502**
Construction (04-D-125)			
FY 2004	9,941	0	0
FY 2005	39,684	49,625	0
FY 2006	54,450	54,450	15,933
FY 2007	41,933	41,933	29,214
FY 2008	32,560	32,560	50,236
FY 2009	4,998	4,998	62,288
FY 2010	40,000	40,000	40,515
FY 2011	59,000	59,000	82,942
FY 2012	13,590[e]	13,590[e]	16,306
FY 2013	0	0	-5
FY 2014	0	0	-68
FY 2015	-73	-73	-1,264
FY 2016	0	0	-14
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
Total Construction (04-D-125)	**296,083**	**296,083**	**296,083**
TEC			
FY 2004	19,441	0	0
FY 2005	53,251	72,692	1,848
FY 2006	82,360	82,360	35,080
FY 2007	67,583	67,583	59,536
FY 2008	74,141	74,141	90,028

	Budget Authority (Appropriations)	Obligations	Cost
FY 2009	97,194	97,194	109,061
FY 2010	97,000	97,000	102,811
FY 2011	205,699	205,699	184,866
FY 2012	49,989[e]	49,989[e]	149,238
FY 2013	0	0	15,341
FY 2014	0	0	700
FY 2015	0	0	-1,910
FY 2016	-73	-73	-14
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
Total TEC	**746,585**	**746,585**	**746,585**
Other Project Cost (OPC)			
(OPC except D&D)			
FY 2002	1,665	1,665	1,665
FY 2003	12,177	12,177	10,853
FY 2004	7,214	7,214	7,702
FY 2005	7,164	7,164	4,934
FY 2006	1,209	1,209	4,265
FY 2007	4,187	4,187	1,196
FY 2008	0	0	2,335
FY 2009	9,000	9,000	9,075
FY 2010	14,403	14,403	14,666
FY 2011	30,668	30,668	19,240
FY 2012	1,051	0	9,142
FY 2013	0	1,051	3,665
FY 2014	0	0	-17
FY 2015	0	0	0
FY 2016	-17	-17	0
FY 2017	0	0	0
FY 2018	0	0	0
Total Project Cost (TPC)			
FY 2002	1,665	1,665	1,665
FY 2003	12,177	12,177	10,853
FY 2004	26,655	7,214	7,702
FY 2005	60,415	79,856	6,782
FY 2006	83,569	83,569	39,345
FY 2007	71,770	71,770	60,732
FY 2008	74,141	74,141	92,363

	Budget Authority (Appropriations)	Obligations	Cost
FY 2009	106,194	106,194	118,136
FY 2010	111,403	111,403	117,477
FY 2011	236,367	236,367	204,106
FY 2012	51,040[e]	49,989[e]	158,380
FY 2013	0	1,051	19,006
FY 2014	0	0	683
FY 2015	0	0	-1,910
FY 2016	-90	-90	-14
FY 2017	0	0	0
FY 2018	0	0	0
FY 2019	0[e]	0	0
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
Total TPC (04-D-125)	**835,306**	**835,306**	**835,306**

REI Phase 2 (REI2) Subproject (04-D-125-04)

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Cost
Design (04-D-125-04)			
FY 2012	32,646[e]	0	0
FY 2013	0	0	0
FY 2014	0	32,000	841
FY 2015	9,359	9,359	19,452
FY 2016	174[g]	820	19,615[f]
FY 2017	0	0	2,271
FY 2018	0	0	0
Total Design (04-D-125-04)	**42,179**	**42,179**	**42,179**
Construction (04-D-125-04)			
FY 2012	5,418[e]	0	0
FY 2013	0	0	0
FY 2014	0	0	0
FY 2015	0	3,299	3,299
FY 2016	107,180[g]	87,177	33,830[f]
FY 2017	58,000	53,665	91,100
FY 2018	111,691	97,541	100,708
FY 2019	99,262	78,912	84,730
FY 2020	60,270	84,688	86,523
FY 2021	4,040	40,579	34,919
FY 2022	0	0	10,752
Total Construction (04-D-125-04)	**445,861**	**445,861**	**445,861**

	Budget Authority (Appropriations)	Obligations	Cost
TEC (04-D-125-04)			
FY 2012	38,064[e]	0	0
FY 2013	0	0	0
FY 2014	0	32,000	841
FY 2015	9,359	12,658	22,751
FY 2016	107,354[g]	87,997	53,445[f]
FY 2017	58,000[f]	53,665	93,371
FY 2018	111,691	97,541	100,708
FY 2019	99,262	78,912	84,730
FY 2020	60,270	84,688	86,523
FY 2021	4,040	40,579	34,919
FY 2022	0	0	10,752
Total TEC (04-D-125-04)	**488,040**	**488,040**	**488,040**
Other Project Cost (OPC) (OPC except D&D)			
FY 2012	8,049	0	0
FY 2013	0	0	0
FY 2014	0	8,049	4,371
FY 2015	79	79	363
FY 2016	9,000	3,138[f]	1,216[f]
FY 2017	17,000	18,500[f]	8,835
FY 2018	15,334	15,897	8,632
FY 2019	50,000	40,000	37,375
FY 2020	30,000	40,000	40,290
FY 2021	15,748	19,547	44,128
Total OPC except D&D (04-D-125-04)	**145,210**	**145,210**	**145,210**
Total Project Cost (TPC)			
FY 2012	46,113[f]	0	0
FY 2013	0	0	0
FY 2014	0	40,049	5,212
FY 2015	9,438	12,737	23,114
FY 2016	116,354[g]	91,135[f]	54,661[f]
FY 2017	75,000[f]	72,165[f]	102,206
FY 2018	127,025	113,438	109,340
FY 2019	149,262	118,912	122,105
FY 2020	90,270	124,688	126,813
FY 2021	19,788	60,126	79,047
FY 2022	0	0	10,752
Total TPC (04-D-125-04)	**633,250**	**633,250**	**633,250**

PF-4 Equipment Installation Phase 1 (PEI1) Subproject (04-D-125-05)

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Cost
Design (04-D-125-05)			
FY 2012	8,300	0	0
FY 2013	0	0	0
FY 2014	0	8,300	0
FY 2015	17,262	10,700	18,942
FY 2016	6,049[g]	11,035[f]	11,042[f]
FY 2017	0	1,576	1,575
FY 2018	0	0	52
FY 2019	0	0	0
Total Design (04-D-125-05)	**31,611**	**31,611**	**31,611**
Construction (04-D-125-05)			
FY 2012	48,974	0	0
FY 2013	0	0	0
FY 2014	0	13,390	0
FY 2015	0	0	7,891
FY 2016	11,634[g]	24,754[f]	13,407[f]
FY 2017	68,597[f]	70,874[f]	42,112
FY 2018	28,499	47,417	46,835
FY 2019	45,580	31,793	44,415
FY 2020	54,574	17,316	44,168
FY 2021	2,831	55,145	46,311
FY 2022	0	0	15,550
Total Construction (04-D-125-05)	**260,689**	**260,689**	**260,689**
TEC (04-D-125-05)			
FY 2012	57,274	0	0
FY 2013	0	0	0
FY 2014	0	21,690	0
FY 2015	17,262	10,700	26,833
FY 2016	17,683[g]	35,789[f]	24,449[f]
FY 2017	68,597[f]	72,450[f]	43,687
FY 2018	28,499	47,417	46,887
FY 2019	45,580	31,793	44,415
FY 2020	54,574	17,316	44,168
FY 2021	2,831	55,145	46,311
FY 2022	0	0	15,550
Total TEC (04-D-125-05)	**292,300**	**292,300**	**292,300**
Other Project Cost (OPC)			
(OPC except D&D)			
FY 2012	8,559	0	0
FY 2013	0	0	0
FY 2014	0	7,302	4,089

	Budget Authority (Appropriations)	Obligations	Cost
FY 2015	0	488	413
FY 2016	0	0	1,415[f]
FY 2017	7,018	6,000[f]	7,749
FY 2018	21,715	21,715	11,012
FY 2019	25,000	25,046	24,221
FY 2020	23,600	25,341	24,365
FY 2021	15,808	15,808	28,436
Total OPC except D&D (04-D-125-05)	**101,700**	**101,700**	**101,700**

	Budget Authority (Appropriations)	Obligations	Cost
Total Other Project Cost (OPC)			
FY 2012	8,559	0	0
FY 2013	0	0	0
FY 2014	0	7,302	4,089
FY 2015	0	488	413
FY 2016	0	0	1,415[f]
FY 2017	7,018	6,000[f]	7,749
FY 2018	21,715	21,715	11,012
FY 2019	25,000	25,046	24,221
FY 2020	23,600	25,341	24,365
FY 2021	15,808	15,808	28,436
FY 2022	0	0	0
Total OPC (04-D-125-05)	**101,700**	**101,700**	**101,700**
Total Project Cost (TPC)			
FY 2012	65,833	0	0
FY 2013	0	0	0
FY 2014	0	28,992	4,089
FY 2015	17,262	11,188	27,246
FY 2016	17,683[g]	35,789[f]	25,864[f]
FY 2017	75,615[f]	78,450[f]	51,436
FY 2018	50,214	69,132	57,899
FY 2019	70,580	56,839	68,636
FY 2020	78,174	42,657	68,533
FY 2021	18,639	70,953	74,747
FY 2022	0	0	15,550
Total TPC (04-D-125-05)	**394,000**	**394,000**	**394,000**

PF-4 Equipment Installation Phase 2 (PEI2) Subproject (04-D-125-06)[b]

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Cost
Design (04-D-125-06)			
FY 2012	0	0	0
FY 2013	0	0	0
FY 2014	0	0	0
FY 2015	9,000	0	0
FY 2016	5,991[b]	14,991	14,991[b]
Total Design (04-D-125-06)	**14,991**	**14,991**	**14,991**
Construction (04-D-125-06)			
FY 2012	0	0	0
FY 2013	0	0	0
FY 2014	0	0	0
FY 2015	0	0	0
FY 2016	13,748[b]	13,748	13,748[b]
FY 2017	0	0	0
Total Construction (04-D-125-06)	**13,748**	**13,748**	**13,748**
TEC (04-D-125-06)			
FY 2012	0	0	0
FY 2013	0	0	0
FY 2014	0	0	0
FY 2015	9,000	0	0
FY 2016	19,739	28,739	28,739
FY 2017	0	0	0
Total TEC (04-D-125-06)	**28,739**	**28,739**	**28,739**
Other Project Cost (OPC)			
(OPC except D&D)			
FY 2012	296	0	0
FY 2013	0	0	0
FY 2014	0	0	0
FY 2015	0	0	0
FY 2016	0	296	296
Total OPC except D&D (04-D-125-06)	**296**	**296**	**296**
Other Project Cost (OPC) D&D			
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
FY 2023	0	0	0
FY 2024	0	0	0
FY 2025	0	0	0
Total OPC D&D (04-D-125-06)	**0**	**0**	**0**

	Budget Authority (Appropriations)	Obligations	Cost
Total Other Project Cost (OPC)			
FY 2012	296	0	0
FY 2013	0	0	0
FY 2014	0	0	0
FY 2015	0	0	0
FY 2016	0	296	296
Total OPC (04-D-125-06)	**296**	**296**	**296**
Total Project Cost (TPC)			
FY 2012	296	0	0
FY 2013	0	0	0
FY 2014	0	0	0
FY 2015	9,000	0	0
FY 2016	19,739[b]	29,035	29,035[b]
FY 2017	0	0	0
Total TPC (04-D-125-06)	**29,035[b]**	**29,035**	**29,035**

Re-categorizing RLUOB to Hazard Category 3 (RC3) Subproject (04-D-125-07)[b]

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Cost
Design (17-D-125-07)			
FY 2012	0	0	0
FY 2013	0	0	0
FY 2014	0	0	0
FY 2015	0	0	0
FY 2016	0	0	0
Total Design (04-D-125-07)	**0**	**0**	**0**
Construction (04-D-125-07)			
FY 2012	0	0	0
FY 2013	0	0	0
FY 2014	0	0	0
FY 2015	0	0	0
FY 2016	0	0	0
Total Construction (04-D-125-07)	**0**	**0**	**0**
TEC (04-D-125-07)			
FY 2012	0	0	0
FY 2013	0	0	0
FY 2014	0	0	0
FY 2015	0	0	0
FY 2016	0	0	0
Total TEC (04-D-125-07)	**0**	**0**	**0**

	Budget Authority (Appropriations)	Obligations	Cost
Other Project Cost (OPC)			
(OPC except D&D)			
FY 2012	162	0	0
FY 2013	0	0	0
FY 2014	0	0	0
FY 2015	0	0	0
FY 2016	0	162	162
Total OPC except D&D (04-D-125-07)	**162**	**162**	**162**
Total Other Project Cost (OPC)			
FY 2012	162[b]	0	0
FY 2013	0	0	0
FY 2014	0	0	0
FY 2015	0	0	0
FY 2016	0	162	162
Total OPC (04-D-125-07)	**162**	**162**	**162**
Total Project Cost (TPC)			
FY 2012	162[b]	0	0
FY 2013	0	0	0
FY 2014	0	0	0
FY 2015	0	0	0
FY 2016	0	162	162
Total TPC (04-D-125-07)	**162**	**162**	**162**

Total Project

(dollars in thousands)

	Budget Authority (Appropriations)	Obligations	Cost
Design (03-D-103-010)			
FY 2004	9,500	0	0
FY 2005	13,567	23,067	1,848
FY 2006	27,910	27,910	19,147
FY 2007	14,161	14,161	27,213
FY 2008	0	0	15,079
FY 2009	0	0	-329
FY 2010	0	0	44
FY 2011	0	0	0
FY 2012	-1,565	-1,565	339
FY 2013	0	0	188
FY 2014	0	0	44
FY 2015	73	73	0
FY 2016	-73	-73	0
Total Design (30-D-103-010)	**63,573**	**63,573**	**63,573**

	Budget Authority (Appropriations)	Obligations	Cost
Design (04-D-125)			
FY 2007	11,489	11,489	3,109
FY 2008	41,581	41,581	24,713
FY 2009	92,196	92,196	47,102
FY 2010	57,000	57,000	62,252
FY 2011	146,699	146,699	101,924
FY 2012	78,910	37,964	132,593
FY 2013	0	0	15,158
FY 2014	0	40,300	1,565
FY 2015	35,621	20,059	37,748
FY 2016	12,214[f]	26,846[f]	45,648[f]
FY 2017	0[f]	1,576[f]	3,846[f]
FY 2018	0[f]	0[f]	52
FY 2019	0	0	0
FY 2020	0	0	0
FY 2021	0	0	0
FY 2022	0	0	0
Total Design (04-D-125)	**475,710**	**475,710**	**475,710**
Construction (04-D-125)			
FY 2004	9,941	0	0
FY 2005	39,684	49,625	0
FY 2006	54,450	54,450	15,933
FY 2007	41,933	41,933	29,214
FY 2008	32,560	32,560	50,236
FY 2009	4,998	4,998	62,288
FY 2010	40,000	40,000	40,515
FY 2011	59,000	59,000	82,942
FY 2012	67,982	13,590	16,306
FY 2013	0	0	-5
FY 2014	0	13,390	-68
FY 2015	-73	3,226	9,926
FY 2016	132,562[g]	125,679[f]	60,971[f]
FY 2017	126,597[f]	124,539[f]	133,212[f]
FY 2018	140,190	144,958	147,543
FY 2019	144,842	110,705	129,145
FY 2020	114,844	102,004	130,691
FY 2021	6,871	95,724	81,230
FY 2022	0	0	26,302
Total Construction (04-D-125)	**1,016,381**	**1,016,381**	**1,016,381**
TEC (04-D-125)			
FY 2004	19,441	0	0
FY 2005	53,251	72,692	1,848
FY 2006	82,360	82,360	35,080

	Budget Authority (Appropriations)	Obligations	Cost
FY 2007	67,583	67,583	59,536
FY 2008	74,141	74,141	90,028
FY 2009	97,194	97,194	109,061
FY 2010	97,000	97,000	102,811
FY 2011	205,699	205,699	184,866
FY 2012	145,327[e]	49,989[e]	149,238
FY 2013	0	0	15,341
FY 2014	0	53,690	1,541
FY 2015	35,621	23,358	47,674
FY 2016	144,703[g]	152,452[f]	106,619[f]
FY 2017	126,597[f]	126,115[f]	137,058[f]
FY 2018	140,190	144,958	147,595
FY 2019	144,842	110,705	129,145
FY 2020	114,844	102,004	130,691
FY 2021	6,871	95,724	81,230
FY 2022	0	0	26,302
Total TEC (04-D-125)	**1,555,664**	**1,555,664**	**1,555,664**
Other Project Cost (OPC)			
(OPC except D&D)			
FY 2002	1,665	1,665	1,665
FY 2003	12,177	12,177	10,853
FY 2004	7,214	7,214	7,702
FY 2005	7,164	7,164	4,934
FY 2006	1,209	1,209	4,265
FY 2007	4,187	4,187	1,196
FY 2008	0	0	2,335
FY 2009	9,000	9,000	9,075
FY 2010	14,403	14,403	14,666
FY 2011	30,668	30,668	19,240
FY 2012	18,117	0	9,142
FY 2013	0	1,051	3,665
FY 2014	0	15,351	8,443
FY 2015	79	567	776
FY 2016	8,983	3,579[f]	3,089[f]
FY 2017	24,018[f]	24,500[f]	16,584[f]
FY 2018	37,049	37,612	19,644
FY 2019	75,000	65,046	61,596
FY 2020	53,600	65,341	64,655
FY 2021	31,556	35,355	72,564
FY 2022	0	0	0
Total OPC except D&D	**336,089**	**336,089**	**336,089**

	Budget Authority (Appropriations)	Obligations	Cost
OPC Total			
OPC Total			
FY 2002	1,665	1,665	1,665
FY 2003	12,177	12,177	10,853
FY 2004	7,214	7,214	7,702
FY 2005	7,164	7,164	4,934
FY 2006	1,209	1,209	4,265
FY 2007	4,187	4,187	1,196
FY 2008	0	0	2,335
FY 2009	9,000	9,000	9,075
FY 2010	14,403	14,403	14,666
FY 2011	30,668	30,668	19,240
FY 2012	18,117	0	9,142
FY 2013	0	1,051	3,665
FY 2014	0	15,351	8,443
FY 2015	79	567	776
FY 2016	8,983	3,579[f]	3,089[f]
FY 2017	24,018[f]	24,500[f]	16,584[f]
FY 2018	37,049	37,612	19,644
FY 2019	75,000	65,046	61,596
FY 2020	53,600	65,341	64,655
FY 2021	31,556	35,355	72,564
FY 2022	0	0	0
Total OPC	**336,089**	**336,089**	**336,089**
Total Project Costs (TPC)			
FY 2002	1,665	1,665	1,665
FY 2003	12,177	12,177	10,853
FY 2004	26,655	7,214	7,702
FY 2005	60,415	79,856	6,782
FY 2006	83,569	83,569	39,345
FY 2007	71,770	71,770	60,732
FY 2008	74,141	74,141	92,363
FY 2009	106,194	106,194	118,136
FY 2010	111,403	111,403	117,477
FY 2011	236,367	236,367	204,106
FY 2012	163,444[e]	49,989[e]	158,380
FY 2013	0	1,051	19,006[h]
FY 2014	0	69,041	9,984
FY 2015	35,700	23,925	48,450
FY 2016	153,686[g]	156,031[f]	109,708[f]
FY 2017	150,615[f]	150,615[f]	153,642[f]
FY 2018	177,239	182,570	167,239
FY 2019	219,842	175,751	190,741

FY 2020	168,444	167,345	195,346
FY 2021	38,427	131,079	153,794
FY 2022	0	0	26,302
Total TPC	**1,891,753**	**1,891,753**	**1,891,753**

<u>Details of Project Cost Estimate</u>

Prior Subprojects (RLUOB/REI/Nuclear Facility)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			N/A
Design			N/A
Contingency			N/A
Total, Design	450,502	450,502	N/A
Construction			N/A
Site Work			N/A
Equipment			N/A
Construction			N/A
Other, as needed			N/A
Contingency			N/A
Total, Construction	296,083	296,083	N/A
Other TEC (if any)			N/A
Cold Startup			N/A
Contingency			N/A
Total, Other TEC			N/A
Total Estimated Cost	746,585	746,585	N/A
Contingency, TEC			
Other Project Cost (OPC)			
OPC except D&D			
R&D			N/A
Conceptual Planning			N/A
Conceptual Design			N/A
Other OPC Costs			N/A
Contingency			N/A
Total, OPC	88,721	88,721	N/A
Contingency, OPC			
Total Project Cost	835,306	835,306	N/A
Total Contingency (TEC+OPC)			N/A

REI Phase 2 (REI2) Subproject (04-D-125-04)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design			N/A
Contingency			N/A
Total, Design	42,179[f]	44,816	44,816
Construction			
Site Work	5,461	5,461	5,461
Equipment	52,089	52,089	52,089
Construction	307,660	305,023	305,023
Other, as needed	0	0	0
Contingency	80,651	80,651	80,651
Total, Construction	445,861	443,224	443,224
Other TEC (if any)			
Cold Startup			
Contingency			
Total, Other TEC			
Total Estimated Cost	488,040	488,040	488,040
Contingency, TEC	80,651	80,651	80,651
Other Project Cost (OPC)			
OPC except D&D			
R&D			
Conceptual Planning	1,883	1,883	1,883
Conceptual Design	2,663	2,663	2,663
Other OPC Costs	81,070	81,070	81,070
Contingency	59,594	59,594	59,594
Total, OPC	145,210	145,210	145,210
Contingency, OPC	59,594	59,594	59,594
Total Project Cost	**633,250**	**633,250**	**633,250**
Total Contingency (TEC+OPC)	***140,245***	***140,245***	***140,245***

PF-4 Equipment Installation Phase 1 (PEI1) Subproject (04-D-125-05)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design			N/A
Contingency			N/A
Total, Design	31,611[f]	34,308	34,308
Construction			
Site Work	43,054	43,054	45,054
Equipment	11,842	11,842	11,842
Construction	140,589	137,892	137,892
Other, as needed			
Contingency	65,204	65,204	65,204
Total, Construction	260,689	257,992	257,992
Other TEC (if any)			
Cold Startup			N/A
Contingency			N/A
Total, Other TEC			N/A
Total Estimated Cost	**292,300**	**292,300**	**292,300**
Contingency, TEC	*65,204*	*65,204*	*65,204*
Other Project Cost (OPC)			
OPC except D&D			
R&D			
Conceptual Planning	2,189	2,189	2,189
Conceptual Design			N/A
Other OPC Costs	63,686	63,686	86,686
Contingency	35,825	35,825	35,825
Total, OPC	**101,700**	**101,700**	**101,700**
Contingency, OPC	*35,825*	*35,825*	*35,825*
Total Project Cost	**394,000**	**394,000**	**394,000**
Total Contingency (TEC+OPC)	***101,029***	***101,029***	***101,029***

PF-4 Equipment Installation Phase 2 (PEI2) Subproject (04-D-125-06)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design			N/A
Contingency			N/A
Total, Design	14,991	46,657	N/A
Construction			
Site Work			N/A
Equipment			N/A
Construction			N/A
Other, as needed			N/A
Contingency			N/A
Total, Construction	13,748	428,585	N/A
Other TEC (if any)			
Cold Startup			N/A
Contingency			N/A
Total, Other TEC			N/A
Total Estimated Cost	28,739	475,538	N/A
Contingency, TEC			
Other Project Cost (OPC)			
OPC D&D			
OPC D&D	0	54,000	N/A
OPC except D&D			
R&D			
Conceptual Planning			
Conceptual Design			
Other OPC Costs	296	146,098	N/A
Contingency			
Total, OPC	**296**	**200,098**	N/A
Contingency, OPC			N/A
Total Project Cost	**29,035**	**675,340**	N/A
Total Contingency (TEC+OPC)			N/A

Re-categorizing RLUOB to Hazard Category 3 (RC3) Subproject (04-D-125-07)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design			N/A
Contingency			N/A
Total, Design	0	44,000	N/A
Construction			
Site Work			N/A
Equipment			N/A
Construction			N/A
Other, as needed			N/A
Contingency			N/A
Total, Construction	0	226,475	N/A
Other TEC (if any)			N/A
Cold Startup			N/A
Contingency			N/A
Total, Other TEC			N/A
Total Estimated Cost	**0**	**270,952**	N/A
Contingency, TEC			
Other Project Cost (OPC)			
OPC except D&D			
R&D			N/A
Conceptual Planning			N/A
Conceptual Design			N/A
Other OPC Costs	162	68,859	N/A
Contingency			N/A
Total, OPC	162	68,859	N/A
Contingency, OPC			N/A
Total Project Cost	**162**	**339,334**	N/A
Total Contingency (TEC+OPC)			N/A

Total Project

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design			N/A
Contingency			N/A
Total, Design	539,283	620,283	N/A
Construction			N/A
Site Work			N/A
Equipment			N/A
Construction			N/A
Other, as needed			N/A
Contingency			N/A
Total, Construction	1,016,381	1,652,359	N/A
Other TEC (if any)			N/A
Cold Startup			N/A
Contingency			N/A
Total, Other TEC			N/A
Total Estimated Cost	1,555,664	2,272,642	N/A
Contingency, TEC	*145,855*		N/A
Other Project Cost (OPC)			N/A
OPC D&D			N/A
OPC D&D	0		N/A
OPC except D&D			N/A
R&D			
Conceptual Planning			
Conceptual Design			N/A
Other OPC Costs			N/A
Contingency			N/A
Total, OPC	**336,089**	**604,588**	N/A
Contingency, OPC	*95,419*		N/A
Total Project Cost	**1,891,753**	**2,877,230**	N/A
Total Contingency (TEC+OPC)	***241,274***		N/A

Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY2019	FY2020	FY2021	FY2022	FY 2023	FY 2024	Outyears	Total
FY 2009	TEC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	OPC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TPC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
FY 2010	TEC	670,331	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	OPC	86,814	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TPC	757,145	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
FY 2011	TEC	1,856,330	0	0	0	0	0	0	1,532,769	3,389,099
	OPC	105,401	0	0	0	0	0	0	300,500	405,901
	TPC	1,961,731	0	0	0	0	0	0	1,833,269	3,795,000
FY 2012	TEC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	OPC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TPC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
FY 2016	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	1,139,093	216,095	239,600	289,000	294,000	0	0	359,000	2,877,303
FY 2017	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	1,139,093	216,095	239,600	289,000	294,000	0	0	359,000	2,877,303
FY 2018	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	1,139,020	236,095	239,600	274,000	289,000	0	0	359,000	2,877,230
FY 2019	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	1,139,020	236,095	239,600	274,000	285,000	0	0	363,994	2,877,230
FY 2020	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	1,463,650	219,842	168,444	39,817	0	0	0	0	1,891,753

Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	3Q FY 2022
Expected Useful Life	50 years
Expected Future Start of D&D of this capital asset	1Q FY 2072

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	25	25	1,250	1,250

D&D Information

The scope parameters established at CD-1, provided necessary Site Infrastructure Improvements (office facilities, physical security, warehouse, material staging and laydown area, access control and change rooms, etc) to enable increased construction capacity, risk mitigation, or project efficiency. These activities will include an increase in site square footage and the D&D of existing facilities. The D&D of existing facilities is not funded on this project.

Current Future Years Nuclear Security Program (FYNSP) funding profiles do not include the funding for the D&D of the CMR. CMR D&D is not part of the CMRR project scope. Some removal of contaminated equipment in PF-4 for space reuse will occur using project funds.

Square footage associated with construction of the RLUOB will be offset by LANL "banked excess" D&D space. Given planned new construction (including RLUOB) at LANL and planned excess facility reductions, LANL is projecting it will have banked adequate square footage before CMR is demolished.

	REI1 Square Feet	REI2/PEI1 Square Feet
New area constructed previously by this project at Los Alamos National Laboratory……………………………………………………………………	225,757	50,000
Area of D&D in this project at Los Alamos National Laboratory ………..	0	0
Area at Los Alamos National Laboratory to be transferred, sold, and/or D&D outside the project including area previously "banked"…………………………………………………………………………………………	225,757	50,000
Area of D&D in this project at other sites …………..……………………..…………	0	0
Area at other sites to be transferred, sold, and/or D&D outside the project including area previously "banked"…………….………………………..……	0	0
Total area eliminated …………………….…………………………………………..…....	0	0

Acquisition Approach

The CMRR Acquisition Strategy is based on procurement strategies specific for each subproject of the CMRR project in order to mitigate overall technical and schedule risk. The RLUOB subproject was executed via LANL-issued design-build subcontract based on performance specifications developed during CMRR Conceptual Design. The REI subproject was executed via LANL-issued final design-bid build construction contracts. The REI2 subproject is being executed via LANL-issued final design-bid-build construction contracts. The PEI1 subproject is being executed, via LANL-issued final design, and the construction will be self-performed in the PF-4. Selected non-nuclear design and construction will be executed via the US Army Corps of Engineers. The performance baselines for each subproject have been established upon completion of 90% design maturity to allow development of credible cost estimates in accordance with DOE Order 413.3B and NNSA policy.

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[a] As directed in the Energy and Water Development and Related Agencies Appropriations Act, 2019, this data sheet reflects the removal of PF-4 Equipment Installation Phase 2 (PEI2) and Re-categorizing RLUOB to Hazard Category 3 (RC3).

[b] As directed in the Energy and Water Development and Related Agencies Appropriations Act, 2019, this data sheet reflects the removal of PF-4 Equipment Installation Phase 2 (PEI2) and Re-categorizing RLUOB to Hazard Category 3 (RC3). Based on the noted changes, PEI2 and RC3 are reflected within this CPDS through FY 2016 only.

[c] As directed in the Energy and Water Development and Related Agencies Appropriations Act, 2019, this data sheet incorporates the (2) two active baselined subprojects and the removal of PEI2 and RC3. These projects will be included in the Plutonium Pit Production Project within Directed Stockpile Work. This data sheet has been updated consistent with this direction and reflects the impact to total project costs.

[d] Beginning in the FY 2016 CPDS, the completed subproject (RLUOB) and cancelled subproject (NF) total costs have been adjusted to match final expenditures. Final costs adjusted to account for official contract closeout of all past CMRR design and construction contracts.
[e] A full reconciliation was completed to ensure appropriations, obligations and costs were aligned appropriately, as these subprojects have been completed or canceled. Adjustments for prior project rebates were made.
[f] A full reconciliation is ongoing in to ensure appropriations, obligations and costs are aligned appropriately.
[g] FY 2016 Budget Authority is in the process of being reconciled and does not match the appropriation.
[h] FY 2013 obligations are in the process of being reconciled.

Secure Transportation Asset

Overview

The Secure Transportation Asset (STA) program safely and securely transports nuclear weapons, weapons components, and special nuclear materials to meet mission requirements.

The STA program includes the Operations and Equipment (O&E) and Program Direction subprograms. The O&E subprogram provides the STA's transportation service infrastructure required to meet NNSA's nuclear security activities as outlined in the FY 2019 Stockpile Stewardship and Management Plan. The Program Direction subprogram provides salaries, travel, and other related expenses for Federal Agents and the secure transportation workforce.

STA currently has the mission capacity to meet NNSA stockpile sustainment priorities, strategic material and component transfers, and other DOE workload. The Secure Transportation Steering Committee will continue to balance and prioritize customer requests against STA capacity. Since its establishment in 1974, STA has maintained its legacy of safety and security to include no loss of cargo and no radiological release on any shipment. However, aging transportation assets must be replaced to meet and maintain convoy safety and security requirements. The mobile guardian transporter (MGT) program and the planned replacement of the DC-9 aircraft in FY 2021 are key aspects of modernizing STA's aging transportation assets.

Secure Transportation Asset
Funding

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
	(Dollars in Thousands)			
Secure Transportation Asset				
Operations and Equipment	185,568	176,617	209,502	+32,885
Program Direction	105,600	102,022	107,660	+5,638
Total, Secure Transportation Asset	**291,168**	**278,639**	**317,162**	**+38,523**
Federal FTEs	**509**	**564**	**590**	**+26**

Outyears for Secure Transportation Asset
Funding

	FY 2021 Request[1]	FY 2022 Request	FY 2023 Request	FY 2024 Request
	(Dollars in Thousands)			
Secure Transportation Asset (STA)				
Operations and Equipment	246,867	180,577	170,790	193,209
Program Direction	109,959	112,143	114,663	116,863
Total, Secure Transportation Asset	**356,826**	**292,720**	**285,453**	**310,072**
Federal FTEs	**590**	**590**	**590**	**590**

[1] Aircraft included at $38,000

Secure Transportation Asset
Funding

(Dollars in Thousands)

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Secure Transportation Asset (STA)				
Operations and Equipment				
Mission Capacity	55,466	59,892	61,599	+1,707
Security/Safety Capability	26,515	22,218	22,021	-197
Infrastructure and C5 Systems	34,919	31,858	36,443	+4,585
Program Management	10,836	10,817	9,704	-1,113
Mobile Guardian Transporter	57,832	51,832	79,735	+27,903
Total, Operations and Equipment	**185,568**	**176,617**	**209,502**	**+32,885**
Program Direction				
Salaries and Benefits	84,595	80,714	86,741	+6,027
Travel	5,554	5,935	6,121	+186
Other Related Expenses	15,451	15,373	14,798	-575
Total, Program Direction	**105,600**	**102,022**	**107,660**	**+5,638**
Total, Secure Transportation Asset	**291,168**	**278,639**	**317,162**	**38,523**
Federal FTEs - Program Direction Funded	509	564	590	+26
Federal FTEs - WCF Funded	0	0	0	+0
Total FTEs	**509**	**564**	**590**	**+26**

Secure Transportation Asset
Explanation of Major Changes
(Dollars in Thousands)

	FY 2020 Request vs FY 2019 Enacted
Secure Transportation Asset	
Operations and Equipment: Funding increase supports development of the MGT Test Article 1 (P-1) side impact crash test, Test Article 2 (P-2) assembly (for head-on impact crash test), and the Pre-Production Unit (PPU) Rolling Chassis Manufacturing Readiness Review. In addition, the FY 2020 funding supports efforts to restore Federal Agent strength levels required to meet the STA mission capacity and deferred maintenance and minor construction projects of existing facilities at multiple STA facilities Examples of planned projects include an exercise field/track at multiple commands, replacement of a temporary shipping/receiving building with permanent structure, modification/expansion of range, and construction of a range consolidation storage facility.	**+32,885**
Program Direction: The funding supports efforts to increase the number of Federal Agents, including inflation and DOE Common Operating Environment (DOECOE) Information Technology Fees associated with full cost recovery efforts.	**+5,638**
Total, Secure Transportation Asset	**+38,523**

Secure Transportation Asset
Operations and Equipment

Description

The Operations and Equipment (O&E) subprogram includes providing trained Federal Agents, specialized vehicles such as highly secure trailers, and robust communications systems. Within the STA O&E subprogram, five activities make unique contributions to the safety and security of the nuclear stockpile. These activities accomplish the following:

(1) Mission Capacity – provides mission-essential agent equipment, maintenance, modification, and replacement of the transportation fleet, and aviation services
(2) Security/Safety Capability - provides Agent Candidate Training (ACT) to increase the Federal Agent workforce, develop and implement new fleet technologies, execute agent sustainment training, and implement Security, Safety, and Emergency Response programs, uniforms, or allowances for a uniform as authorized by 5 U.S.C. 5901-5902
(3) Infrastructure and Command and Control, Communication, Computer and Cyber (C5) Systems - provides support for maintenance and minor construction projects and C5 systems
(4) Program Management - provides corporate functions and business operations that control, assist, and direct secure transport operations
(5) Mobile Guardian Transporter (MGT) – the design, development, test, and fabrication of the MGT

The Mission Capacity activity sustains STA systems capacity through equipment purchases to fulfill the present transportation requirements. STA must maintain assets to support current and future missions based on changing customer needs and potential threats. These assets include agent equipment, vehicles (tractors, trailers, and escort vehicles), and aircraft. Modernizing and sustaining these assets requires an integrated, long-term strategy and a substantial investment. The STA strategy includes eliminating outdated assets, refurbishing existing assets to extend their useful life, and procuring new assets. This includes the following activities:

- Replace the vehicle fleet with new-vehicles including the design, engineering, testing, and fielding of specialized vehicles, tractors, and trailers necessary for successful convoy operations
- Maintain the aviation program, to include the maintenance and sustainment of STA's aircraft fleet
- Maintain the readiness posture of the STA fleet

The Security/Safety Capability activity sustains STA systems capacity through safety and security upgrades. This includes the following activities:

- Identify, design, and test new fleet and mission technologies. Deliverables include safety and security upgrades as well as enhancements to the secure trailers, analysis of intelligence data, dissemination of information, and the application of emerging physical security technology
- Conduct ACT classes to increase the agent end-strength, including the equipping and training of Federal Agent candidates
- Maintain specialized Federal Agent skills and qualifications, sustain and support training to include technical equipment, logistics, curriculum development, and staffing necessary to conduct Special Response Force (SRF) training, Operational Readiness Training (ORT), Validation Force-on-Force (VFOF) exercises, and agent sustainment training. Sustainment training includes surveillance detection, tactics, advanced driving, and firearms. Contracts for mission operation support and off-site training venues capable of supporting unit or command training
- Maintain security and safety programs. Includes liaison activities with state and local law enforcement organizations, analysis of security methods and equipment, vulnerability assessments, development of the Safeguards and Security Plan and combat simulation computer modeling, validation of safety and security, and execution of safety studies and safety engineering for the Safety Basis, Nuclear Explosive Safety, and over-the-road safety issues
- Maintain the NNSA Emergency Operations Center (EOC) in Albuquerque, New Mexico and train and exercise the STA response capability. Includes the Emergency Management Program, Federal Agent Incident Command System refresher, and sustainment training
- Research unmanned systems to determine viability for use in the STA mission to conduct safe and secure operations

The Infrastructure and Command, and Control, Communication, Computer, and Cyber (C5) Systems activity sustains the infrastructure and command and control system platforms operated by STA. Mission support systems provide the critical information necessary to ensure mission success. This includes information that is obtained, analyzed, and disseminated prior to the mission, the continuous monitoring of that information to ensure it is accurate and valid, and constant communication within the convoys and between the convoy and headquarters. This must be accomplished seamlessly in real-time while balancing the evolving requirements of cyber security to ensure system reliability and integrity. Additionally, STA leverages other information technology systems supporting business processes and operations to improve the efficiency and effectiveness of the STA mission. This funding supports the following sub-elements:

- Modernize and maintain C5 systems activities to maintain vigilant oversight of nuclear convoys. Operate the Transportation Emergency Control Centers (TECC) and maintain the New Mexico Relay Station, as well as maintain communications systems across the STA
- Maintain and expand a secure unclassified to classified controlled interface, Mission Management System. This allows communications from unclassified to classified systems, and maintenance and enhancement of a common operating picture for the TECC as well as convoys
- Expand, upgrade, and maintain the STA facilities and equipment in support of mission requirements. STA has approximately 62 facilities, many of which are in inadequate condition as a result of deferred maintenance. Facilities include Federal Agent commands, vehicle mechanical and electronic maintenance facilities, training facilities, and facilities operated to house support staff. Activities to sustain these facilities include maintenance and minor construction projects.

The Program Management activity creates a well-managed, responsive, and accountable organization by employing effective business practices for the STA program. This goal includes:

- Corporate functions such as technical document support and business operations that control, assist, and direct secure transport operations including supplies, equipment, and regulation control processes
- Assess, evaluate, and improve work functions and processes including self-assessments, routine STA intranet support, configuration management, implementation of the Quality Assurance program, and business integration activities

The Mobile Guardian Transporter (MGT) activity provides for the design, development, and testing of the MGT, the replacement for the existing Safeguard Transporter (SGT). The MGT will assure the safety and security cargo and containers, protect the public, meet nuclear explosive safety requirements associated with accident scenarios, reduce the risk to new security threats, and provide the means for enhanced communications. This includes the following activities:

- Test Article(s) Assembly and Testing
- Mechanical Systems Development
- Electronics and Auxiliary Systems Development
- Active Delay System (ADS) Development
- Assembly Integration and Test
- Enhanced Cargo Restraint Development

Highlights of the FY 2020 Budget Request

The FY 2020 O&E Budget Request reflects an increase above the FY 2019 enacted amount to support STA mission priorities. These include providing specialized vehicles such as highly secure trailers, trained Federal Agents, and robust communications systems. FY 2020 funding specifically supports:

- MGT development activities including a side impact crash test (Test Article 1, P-1), assembly for a head-on impact crash test (Test Article 2, P-2), and the Pre-Production Unit (PPU) Rolling Chassis Manufacturing Readiness Review. The current MGT funding profile supports the First Production Unit (FPU) in FY 2025. The completion of the PPU assembly is scheduled for FY 2022 with the completion of the PPU testing in FY 2023.
- SGT life extension and risk reduction efforts to include addressing rust and kingpin issues identified in 2018. SGTs were designed to meet safety standards through FY 2018 and are currently operating beyond their 20-year service life. These activities will ensure the SGT fleet continues to meet the Nuclear Explosive Safety Study (NESS) requirements associated with transporting nuclear weapons and components.
- FPU of the next-generation armored tractor (T4) and Escort Vehicle 4 (EV4).

- Deferred maintenance and minor construction projects of existing facilities, steady state replacement of vehicles and tractors, DOE Common Operating Environment (DOECOE) Information Technology Fees, support service contracts, and rising costs due to inflation.

FY 2021 - FY 2024 Key Milestones
- Maintain risk reduction efforts to keep a portion of the SGT fleet in operation far beyond the 20-year service life.
- Develop MGT with FPU delivery in FY 2025.
- Replace aging DC-9 aircraft.
- Refurbish and replace Federal Agent equipment and vehicles.

FY 2018 Accomplishments
- Completed more than 140 over-the-road shipments and made 40 limited-life component deliveries without incident
- Enhanced reliability and availability of mission support communications.
- Executed vehicle sustainment efforts to remove mission vehicles that reach the end-of-service life.
- Awarded the MGT Test Article 1 (P1) Rolling Chassis Contract and completed the Manufacturing Readiness Review for Test Article 2 (P2).

Operations and Equipment

Activities and Explanation of Changes

<table>
<tr><th>FY 2019 Enacted</th><th>FY 2020 Request</th><th>Explanation of Changes
FY 2020 Request vs FY 2019 Enacted</th></tr>
<tr><td>Operations and Equipment $176,617,000</td><td>Operations and Equipment $209,502,000</td><td>Operations and Equipment +$32,885,000</td></tr>
<tr><td>Mission Capacity $59,892,000</td><td>Mission Capacity $61,599,000</td><td>Mission Capacity +$1,707,000</td></tr>
<tr><td>• Design and build the Next Generation Armored Tractor to obtain steady state production; include delivery of the First Production Unit and three (3) additional tractors.
• Build 12 Support Vehicles (SV2), refurbish 6 Escort Vehicle Light Chassis (EVLCs).</td><td>• Contract delays in FY 2018 caused a slip in design and production of new generation Armored Tractor (T4). Design, build and production expected in FY 2020.
• Design and build the new Escort Vehicle (EV4) to obtain steady state production and testing of the FPU and the production of an additional 2 vehicles.
• Produce 10 SV2 vehicles, refurbish 6 EVLCs.</td><td>• The increase supports design, build and production of EV4.</td></tr>
<tr><td>Security/Safety Capability $22,218,000</td><td>Security/Safety Capability $22,021,000</td><td>Security/Safety Capability -$197,000</td></tr>
<tr><td>• Conduct three ACT classes.
• Conduct an operational emergency response exercise.
• Continue research and testing of unmanned systems to determine viability for use in the STA mission.
• Conduct Security Site Survey and Staff Assistance Visits.
• Continue National Incident Management System/Incident Command System (NIMS/ICS) training program for agents and staff.</td><td>• Conduct three ACT classes.
• Conduct an operational emergency response exercise.
• Continued research and testing of unmanned systems to determine viability for use in the STA mission.
• Conduct Security Site Survey and Staff Assistance Visits.
• Continue NIMS/ICS training program for agents and staff.</td><td>• The decrease reflects a safety equipment procurement for FY 2019 only.</td></tr>
<tr><td>Infrastructure and C5 Systems $31,858,000</td><td>Infrastructure and C5 Systems $36,443,000</td><td>Infrastructure and C5 Systems +$4,585,000</td></tr>
<tr><td>• Integrate High-Frequency Communications systems into the vehicle fleet as a backup system to reach the Transportation Emergency Control Center (TECC) in the event of Internet collapse.
• Implement STA Active Security Doctrine in cyber security operations.
• Apply additional data to the Mission Management System (MMS) (Phase IV) to</td><td>• Conduct maintenance and deferred minor construction projects at the Federal Agent commands and STA HQs.
• Continue to apply additional data to MMS (Phase IV) to include personnel schedules, qualifications, and maintenance information to enhance STA's Common Operating Picture.
• Continue to implement applications/systems that interconnect MGT with the TECC and OST vehicles.</td><td>• The increase supports projects planned at the STA training facility:
○ Exercise field/track at multiple commands
○ Replacement of a temporary shipping/ receiving building with permanent structure
○ Modification/expansion of range, and construction of a range consolidation storage facility</td></tr>
</table>

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
include personnel schedules, qualifications, and maintenance information to enhance STA's Common Operating Picture. • Procure upgraded long-lead communications equipment for the TECC/Emergency Operations Center to support the transition to the new NNSA Complex in FY 2020. • Implement the Vehicle and Property Management System. • Conduct maintenance and minor construction projects at the Federal Agent commands and STA HQs.	• Continue to support advanced cyber threat intelligence capabilities and integrate awareness into mission operations.	
Program Management $10,817,000	**Program Management $9,704,000**	**Program Management -$1,113,000**
• Execute program with efficient support service contracts for acquisitions and personnel service support. • Conduct Quality Assurance assessments. • Continue corporate business services and integration activities.	• Execute program with efficient support service contracts for acquisitions and personnel service support. • Conduct Quality Assurance assessments. • Continued corporate business services and integration activities.	• The reduction reflects the decision to use on-board Federal workforce vice support services.
Mobile Guardian Transporter $51,832,000	**Mobile Guardian Transporter $79,735,000**	**Mobile Guardian Transporter +$27,903,000**
• Assemble and integrated Test Article 1 (P-1). • Complete the Rolling Chassis. Manufacturing Readiness Review for Test Article 2 (P-2). • Complete the Cargo Manufacturing Readiness Review.	• Conduct side impact crash test for Test Article 1 (P-1). • Assemble Test Article 2 (P-2) for head-on impact crash test. • Complete the Pre-Production Unit Rolling Chassis Manufacturing Readiness Review.	• The increase supports critical requirements of the MGT production schedule including: o Conduct side impact crash test for Test Article 1 (P-1) o Assembly of Test Article 2 (P-2) for head-on impact crash test o Completion of the Pre-Production Unit Rolling Chassis Manufacturing Readiness Review

Secure Transportation Asset
Program Direction

Description

The STA Program Direction subprogram provides personnel to support the security and safety of the nuclear stockpile. The total planned Full Time Equivalents (FTEs) support the Federal Agent force, federal pilots, emergency management, security and safety programs and other key elements of the STA mission. STA has committed to a stable human resources strategy to achieve an optimal agent force and meet the NNSA's nuclear security enterprise priorities and mission requirements. The optimal agent force is validated by customer workload projections. STA has increased Federal Agent staffing numbers by optimizing position qualifications, managing risk associated with the Human Reliability Program (HRP) allowing Federal Agent candidate participation in the Nuclear Material Courier Basic training before their security clearance is granted since it is not required for this portion of their training. New recruits are brought on board and placed into training once the psychological and medical screening are successfully completed. STA is ramping up to 370 Federal Agents and anticipates hiring 60 agents in FY 2019 and 57 in FY 2020.

Salaries and benefits are provided for the program staff located at Albuquerque, New Mexico; Fort Chaffee, Arkansas; and, Washington, District of Columbia; and for Federal Agents and support staff at the three Federal Agent force locations in Albuquerque, New Mexico, Oak Ridge, Tennessee, and Amarillo, Texas. It also includes salaries, overtime, worker's compensation, and health/retirement benefits associated with Federal Agents, secondary positions, and support staff. The total onboard count may not match the planned FTEs. Funding allocations account for projected average vacancy rates over the entire year and may not match actual onboard FTEs at any given time.

Travel is associated with secure convoys, training at other federal facilities and military installations, and program oversight.

Other Related Expenses provides required certification training for the handling of nuclear materials by Federal Agents as well as staff professional development. Maintains the HRP for Federal Agents and designated staff. Provides for Permanent Change of Station moves and other contractual service requirements to include facility maintenance, and the request includes the functional transfer of activities from Secure Transportation Asset (STA) Program Direction. With the planned completion of the Albuquerque facility in FY 2020, operational funding is consolidated in FSE and IM to provide efficiencies in operations. The funding transfer is equivalent to current STA operational cost for the Albuquerque complex.

Highlights of the FY 2020 Budget Request

The FY 2020 Program Direction Budget Request reflects an increase above the FY 2019 enacted amount to support Federal and Federal Agent staffing needs for STA mission priorities. These include:

- The anticipated increase in Federal Agents
- DOE Common Operating Environment (DOECOE) Information Technology Fees
- Funding for support service contracts

FY 2021 - FY 2024 Key Milestones

- Provide for salaries, travel, and other related expenses for the Federal Agents and the secure transportation federal and non-federal workforce
- On-board Federal Agents to reach goal of 370

FY 2018 Accomplishments

- On-boarded 45 Federal Agents

Program Direction

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Program Direction $102,022,000	**Program Direction $107,660,000**	**Program Direction +$5,638,000**
Salaries and Benefits $80,714,000	**Salaries and Benefits $86,741,000**	**Salaries and Benefits +$6,027,000**
• Recruit, hire, and retain quality personnel based on current and future mission needs. • Fill agent vacancies to support workload requirements. • Conduct Agent Candidate Training (ACT) classes.	• Recruit, hire, and retain quality personnel based on current and future mission needs. • Continue to fill agent vacancies to support workload requirements. • Conduct ACT classes.	• The increase represents inflation and supports the continued efforts to increase the number of Federal Agents.
Travel $5,935,000	**Travel $6,121,000**	**Travel +$186,000**
• Support travel required to transport nuclear weapons, components, and special nuclear material. • Support federal facilities that provided unique training to maintain agent skill sets.	• Continue to support travel required to transport nuclear weapons, components, and special nuclear material. • Continue to support federal facilities that provided unique training to maintain agent skill sets.	• The decrease reflects adjustments necessary to meet Program Direction requirements.
Other Related Expenses $15,373,000	**Other Related Expenses $14,798,000**	**Other Related Expenses -$575,000**
• Perform HRP reviews to ACT candidates. • Conduct Federal Agent candidate training at Federal Law Enforcement Training Center (FLETC). • Provide for processing of security clearances. • Support Department of Energy Common Operating Environment (DOECOE) and tenant fees.	• Perform HRP reviews to ACT candidates. • Conducted Federal Agent candidate training at FLETC. • Support processing of security clearances. • Support DOECOE.	• The decrease reflects a transfer to FSE and IM for operations and maintenance costs for the Albuquerque facility ($1,600,000).

Secure Transportation Asset
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	1,083	1,083	1,107	1,131	+24
Minor Construction	N/A	N/A	7,500	10,600	8,600	15,000	+6,400
Total, Capital Operating Expenses	N/A	N/A	**8,583**	**11,683**	**9,707**	**16,131**	**+6,424**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	1,083	1,083	1,107	1,131	+24
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**1,083**	**1,083**	**1,107**	**1,131**	**+24**

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A	7,500	10,600	8,600	15,000	+6,400
Total, Minor Construction Projects	**N/A**	**N/A**	**7,500**	**10,600**	**8,600**	**15,000**	**+6,400**
Total, Capital Summary	**N/A**	**N/A**	**8,583**	**11,683**	**9,707**	**16,131**	**+6,424**

Outyears for Secure Transportation Asset
Capital Summary

(Dollars in Thousands)

	FY 2021 Estimate	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	1,156	1,181	1,207	1,234	0
Minor Construction	7,500	7,500	7,500	7,500	0
Total, Capital Operating Expenses	**8,656**	**8,681**	**8,707**	**8,734**	**0**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	1,156	1,181	1,207	1,234	0
Total, Capital Equipment (including MIE)	**1,156**	**1,181**	**1,207**	**1,234**	**0**
Minor Construction Projects (Total Estimated Cost (TEC)					
Total Minor Construction Projects (TEC <$5M)	7,500	7,500	7,500	7,500	0
Total, Minor Construction Projects	**7,500**	**7,500**	**7,500**	**7,500**	**0**
Total, Capital Summary	**8,656**	**8,681**	**8,707**	**8,734**	**0**

Defense Nuclear Security

Overview

The Defense Nuclear Security (DNS) program is an essential component of the National Nuclear Security Administration (NNSA) nuclear security enterprise. DNS provides protection for NNSA personnel, facilities, nuclear weapons, and materials from a full spectrum of threats, ranging from minor security incidents to acts of terrorism at its national laboratories, production plants, processing facilities, and the Nevada National Security Site (NNSS). In addition, DNS provides nuclear security expertise for a broad set of 21st century national security needs, in line with its core mission, such as those in defense nuclear nonproliferation, homeland security, and intelligence. Employing more than 1,500 protective force officers, DNS secures more than 4,400 buildings, and protects more than 57,000 personnel.

Defense Nuclear Security
Funding

(Dollars in Thousands)

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Defense Nuclear Security				
Operations and Maintenance				
Protective Forces	407,042	376,279	383,187	+6,908
Physical Security Systems	99,032	105,193	179,611	+74,418
Information Security	32,929	43,011	44,004	+993
Personnel Security	34,219	40,376	40,959	+583
Material Control and Accountability	27,532	31,125	32,506	+1,381
Security Program Operations and Planning	86,223	94,654	97,946	+3,292
Total, Operations and Maintenance	**686,977**	**690,638**	**778,213**	**+87,575**
Security Improvements Program (SIP)	30,000	0	0	0
Construction	53,600	0	0	0
Total, Defense Nuclear Security	**770,577**	**690,638**	**778,213**	**+87,575**

Outyears for Defense Nuclear Security
Funding

(Dollars in Thousands)

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Defense Nuclear Security				
Operations and Maintenance				
Protective Forces	390,850	398,668	406,641	414,774
Physical Security Systems	126,513	109,237	141,018	152,825
Information Security	44,884	45,782	46,698	47,632
Personnel Security	41,779	42,614	43,466	44,336
Material Control and Accountability	33,156	33,819	34,495	35,185
Security Program Operations and Planning	99,905	101,902	103,941	106,018
Total, Operations and Maintenance	**737,087**	**732,022**	**776,259**	**800,770**
Construction	36,000	41,900	8,810	0
Total, Defense Nuclear Security	**773,087**	**773,922**	**785,069**	**800,770**

Defense Nuclear Security
Explanation of Major Changes
(Dollars in Thousands)

	FY 2020 Request vs FY 2019 Enacted
Defense Nuclear Security	
Operations and Maintenance: The increases reflects costs associated with critical Security Infrastructure Revitalization Program projects to implement the 10-Year Refresh Plan at all NNSA sites; Argus modernization; sustaining implementation of a Technical Security Program across the enterprise that provides technical investigative services of NNSA facilities, systems, and activities that detect and neutralize the presence of and determine the vulnerability to technical exploitation; sustaining implementation and operation of Counter Unmanned Aircraft Systems at sites possessing Category 0/I Special Nuclear Material; efforts to begin implementation of the Design Basis Threat policy; and planned equipment lifecycle replacements across all security program areas at the sites.	**+87,575**
Construction: No line item funding is requested in FY 2020. No line item funding was requested in FY 2019, reflecting a $0 change.	**+0**
Total, Defense Nuclear Security	**+87,575**

Defense Nuclear Security
Operations and Maintenance

Description

Defense Nuclear Security Operations and Maintenance integrates personnel, equipment, and procedures to protect physical assets and resources against theft, sabotage, diversion, or other criminal acts. Each NNSA site or facility has an approved Site Security Plan detailing protection measures and resources needed to protect site security interests.

Protective Forces include duties, specialized training, performance testing, facilities, equipment, weapons/firearms, ammunition, vehicles, and other expenses. These forces are each site's primary front-line protection, consisting of armed, uniformed officers. Protective Forces are an integral part of a site's security posture and are trained in tactics and procedures necessary to protect site interests.

Physical Security Systems includes critical Security Infrastructure Revitalization Program (SIRP) projects, Counter Unmanned Aircraft Systems (CUAS), intrusion detection and assessment systems (IDAS), performance testing and certification/recertification, access control systems, barrier and delay mechanisms, canine explosive detection programs, and tactical systems. Many of the systems are in use well beyond their designed lifecycles and require increased maintenance and testing. Additional investment in critical security systems and infrastructure upgrade projects are necessary to sustain these systems. This includes the centrally-managed Argus program for sites possessing Category I quantities of Special Nuclear Material (SNM) and the Physical Security Center of Excellence at Sandia, New Mexico.

Table 1 shows the plans for critical SIRP projects to be executed in FYs 2020-2024. Other than PIDAS vehicle barrier upgrades, SIRP projects do not qualify as minor construction. Rather, SIRP projects include sensor, camera, lighting and communication refreshes and smaller capital equipment projects. These projects were derived from data obtained during development of the 10-year Refresh Plan. The need for a SIRP is driven by the urgent necessity to repair the identified systems with the highest risk for failure in support of the NNSA mission.

Table 1

Planned FY 2020-2024 SIRP Project Allocations by Site (Dollars in Thousands)		
Site	**Project Name**	**FY 2020 Allocation ($K)**
PX	Pantex Zone 12 PIDAS/North	21,000
PX	Pantex Zone 12 PIDAS Vehicle Barriers	5,500
Subtotal, Pantex Plant		**26,500**
Y12	Y-12 Q1 PIDAS	36,000
	Y-12 Q2 PIDAS	25,000
	Y-12 PIDAS Vehicle Barriers	10,900
Subtotal, Y-12 National Security Complex		**71,900**
Total, FY 2020		**98,400**
Site	**Project Name**	**FY 2021 Allocation ($K)**
PX	Pantex Zone 12 PIDAS/East	21,000
	Pantex Zone 4 PIDAS/West	16,000
	Pantex Zone 12 PIDAS Vehicle Barriers	5,500
Subtotal, Pantex Plant		**42,500**
Total, FY 2021		**42,500**
Site	**Project Name**	**FY 2022 Allocation ($K)**
PX	Pantex Zone 12 PIDAS/South	20,000
	Pantex Zone 4 PIDAS/North	17,000
	Pantex Zone 4 PIDAS Vehicle Barriers	5,500
Subtotal, Pantex Plant		**42,500**
Total, FY 2022		**42,500**
Site	**Project Name**	**FY 2023 Allocation ($K)**
PX	Pantex Zone 12 PIDAS/West	19,000
	Pantex Zone 4 PIDAS/East	16,000
	Pantex Zone 4 PIDAS Vehicle Barriers	5,500
Subtotal, Pantex Plant		**40,500**
Y-12	Y12 MAA Personnel Portals	7,900
Subtotal, Y-12 National Security Complex		**7,900**
Total, FY 2023		**48,400**
Site	**Project Name**	**FY 2024 Allocation ($K)**
Y12	MAA Revitalization Building 9204-2E	9,000
	MAA Revitalization 9215	8,900
Subtotal, Y-12 National Security Complex		**17,900**
PX	Pantex Zone 4 PIDAS/South	18,000
	Pantex Z12 MAA Phase 1,2	4,200
Subtotal, Pantex Plant		**22,200**
Total, FY 2024		**40,100**

Information Security provides classification guidance, technical surveillance countermeasures, operations security, and classified matter protection and control, which comprises administrative requirements for maintaining security containers and combinations, marking, and control systems.

Personnel Security includes access authorizations, badging programs, the Human Reliability Programs, control of classified and unclassified visits, and assignments by foreign nationals. It encompasses the administrative support to the site clearance process, including processes for security clearance determinations at each site to ensure that individuals are eligible for access to classified information or matter, and/or access to or control over SNM or nuclear weapons.

Material Control and Accountability (MC&A) controls and accounts for special and alternate nuclear materials through measurements, quality assurance, accounting, containment, surveillance, and physical inventory. This activity also includes the Local Area Nuclear Material Accountability System (LANMAS) software application, as well as training and operational support provided to Department of Energy (DOE) and NNSA sites and facilities to use as the core of their nuclear accountability systems. The LANMAS software is used by 18 DOE sites, 5 of which are NNSA sites.

Security Program Operations and Planning includes: development of budgets; responses to audits and information requests, Site Security Plans, vulnerability/risk assessments, and performance testing and assurance activities; security incident and reporting management; security surveys and self-assessments; activities related to deviation requests; and control of security technology transfer activities, processing facility clearances, and Foreign Ownership, Control, or Influence determinations for security contracts.

Highlights of the FY 2020 Budget Request

The FY 2020 Budget Request of $778,213,000 reflects an increase of $87,575,000 or 12.7% above the FY 2019 enacted amount. The Budget Request for FY 2020 includes funding to fill positions in key security program areas at the sites, including protective forces, physical security systems, information security, technical security, personnel security, nuclear MC&A, and security program operations and planning; supports sustaining implementation and operation of counter unmanned aircraft systems at sites possessing Category 0/I special nuclear material; and supports efforts to begin implementation of the Design Basis Threat policy. It also includes funding to accelerate critical SIRP projects, which address high-priority security systems and related security infrastructure and equipment refresh needs. .

In FY 2021, the Device Assembly Facility (DAF) Argus Line Item Project at the Nevada National Security Site (NNSS) is scheduled for completion. Remaining Other Project Costs (OPC) funds will be used for project certification and turnover to operations. Argus is the NNSA standard security system to integrate access control, intrusion detection, and video assessment of alarms for protection of high consequence assets.

FY 2021 - FY 2024 Key Milestones

Physical Security Systems

- Sustain CUAS implementation and operation at sites possessing Category 0/I quantities of SNM
- Complete critical SIRP projects needed to implement the 10-Year Refresh Plan at all NNSA sites

Security Program Operations and Planning

- Complete all vulnerability analysis and risk assessments in support of Design Basis Threat implementation

Construction

- Complete West End Protected Area Reduction project at Y-12 National Security Complex (Y-12)

FY 2018 Accomplishments

- Completed the deployment and operational testing of the first CUAS system within the DOE
- Completed Phase I of Security Management Improvement Program, which provided program leadership a concise baseline of security management practices being used across NNSA
- Implemented the NNSA Security Culture Campaign to reinforce the growing importance of a positive security culture and provide leadership with viable recommendations on improving the security culture
- Began execution of critical SIRP projects needed to refresh NNSA's aging security infrastructure

Operations and Maintenance

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Operations and Maintenance $690,638,000	**Operations and Maintenance $778,213,000**	**Operations and Maintenance +$87,575,000**
Protective Forces $376,279,000	**Protective Forces $383,187,000**	**Protective Forces +$6,908,000**
• Maintains sufficient protective forces to meet protection requirements based on approved vulnerability and risk assessments. • Addresses non-nuclear security protection requirements and "lower level threat" scenarios, in a graded, prioritized manner.	• Maintains sufficient protective forces to meet protection requirements based on approved vulnerability and risk assessments. • Addresses non-nuclear security protection requirements and "lower level threat" scenarios, in a graded, prioritized manner.	• Reflects regular escalation and small increases to address planned equipment lifecycle replacements and replenishment of ammunition inventories.
Physical Security Systems $105,193,000	**Physical Security Systems $179,611,000**	**Physical Security Systems +$74,418,000**
• Funds preventive and corrective maintenance for physical security systems and infrastructure at NNSA sites, and provides protection against the threat as documented in the 2008 Graded Security Protection policy. • Includes OPC for preliminary planning and design for future Perimeter Intrusion Detection and Assessment System (PIDAS) replacements at the Pantex Plant and Y-12.	• Funds preventive and corrective maintenance for physical security systems and infrastructure at NNSA sites, and provides protection against the threat as documented in the 2008 Graded Security Protection policy. • Includes funding for Physical Security Center of Excellence activities at Sandia. • Sustains CUAS implementation and operation at sites possessing Category 0/I quantities of SNM. • Supports critical SIRP projects needed to implement the 10-Year Refresh Plan at all NNSA sites.	• Reflects regular escalation and funds sustainment of CUAS implementation and operation. • Funds increasing preventive and corrective maintenance for aging systems and infrastructure at NNSA sites, pending completion of upgrades/replacement. • Includes funding to address SIRP related minor construction projects.
Information Security $43,011,000	**Information Security $44,004,000**	**Information Security +$993,000**
• Maintains an information protection program and permits staff increases to implement new DOE Order 470.6, *Technical Security Program*.	• Maintains an information protection program and sustains implementation of DOE Order 470.6, *Technical Security Program*.	• Reflects regular escalation and minimal scope adjustments.
Personnel Security $40,376,000	**Personnel Security $40,959,000**	**Personnel Security +$583,000**
• Maintains a personnel security program while implementing efficiencies in a risk-based manner.	• Maintains a personnel security program while implementing efficiencies in a risk-based manner.	• Reflects regular escalation and minimal scope adjustments.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Material Control and Accountability $31,125,000	**Material Control and Accountability $32,506,000**	**Material Control and Accountability +$1,381,000**
• Provides for control and accountability of special and alternative nuclear materials and maintains a level of effort that is a critical part of NNSA's layered protection program. • Continues implementation of the LANMAS software upgrade. • Fills key positions at several sites.	• Provides for control and accountability of special and alternative nuclear materials and maintains a level of effort that is a critical part of NNSA's layered protection program. • Continues implementation of the LANMAS software upgrade.	• Reflects regular escalation and funds ongoing implementation of the LANMAS software upgrade.
Security Program Operations and Planning $94,654,000	**Security Program Operations and Planning $97,946,000**	**Security Program Operations and Planning +$3,292,000**
• Maintains site security plans, risk/vulnerability assessment capabilities, budget development, management of site programs for incidents of security concern, and security awareness programs.	• Maintains site security plans, risk/vulnerability assessment capabilities, budget development, management of site programs for incidents of security concern, and security awareness programs.	• Reflects regular escalation and minimal scope adjustments.

Defense Nuclear Security
Construction

Description

The DNS Construction supports critical physical security infrastructure within the NNSA nuclear security enterprise. Project 14-D-710, Device Assembly Facility (DAF) Argus Installation Project at the NNSS, works in conjunction with the Entry Guard Station Expansion and legacy completed projects. Argus is necessary to support the DAF complex, which is a critical facility within the NNSA nuclear security enterprise designed for the staging of SNM.

The Argus project originated as a minor construction project in late FY 2010, with planning commencing in FY 2011. In FY 2012, it was determined that the project would exceed the minor construction threshold, and a decision was made to convert it into a line item construction project. Within the period in which it was executed as a minor construction project, NNSA completed much of the Argus system design; a significant level of conceptual planning, followed by preliminary planning for startup testing, acceptance, cyber security, and system cut-over; and a commensurate amount of project management. In FY 2016, a decision was made to break the project into two subprojects in order to address higher security risks in a timely manner:

Perimeter Protection (PP) subproject (14-D-710-01): The PP subproject Critical Decision (CD)-2/3 was approved in December 2016, at a cost of $19,200,000 with a CD-4 date of December 2018. The PP subproject CD-4 was approved in August 2018, at a cost of $13,446,000.

Interior Protection (IP) subproject (14-D-710-02): The IP subproject CD-2/3 was approved in December 2018, at a cost of $24,421,000. The projected CD-4 date is January, 2021.

The Argus security system, once complete, will replace the aging Process Equipment Control Operating System (PECOS) in the DAF at the NNSS. Argus is the designated NNSA enterprise security system, integrating access control, intrusion detection, and video assessment of alarms to protect and control high-consequence assets. Completion of this project provides the security required to protect SNM.

Funding for 17-D-710, the West End Protected Area Reduction (WEPAR), or Protected Area Reduction Project at Y-12 was provided in FY 2017 ($2,500,000) and 2018 ($53,600,000). This project will install a new PIDAS section to reduce the Y-12 Protected Area by approximately 50%. CD-1 was approved in December 2018. Funding provided for WEPAR will be used in FY 2019 and FY 2020 to complete design work and prepare for CD-2/3. Contract acquisition will start in FY 2020 and prepare the project for funding in FY 2021. The change from the FY 2019 Future Years' Nuclear Security Program (FYNSP) is credited to the project completing CD-1 and better defining scope, schedule and cost for the project.

Planning and conceptual design is underway for a series of future projects to sustain and recapitalize the PIDAS at Pantex and Y-12. Outyear funding originally included in the FY 2019 FYNSP for these projects was removed from the FY 2020 FYNSP. Funding needs associated with these projects will be listed as line item construction or minor construction projects in a future request once funding profiles have been developed.

Construction

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Construction $0	**Construction $0**	**Construction $+0**
• DAF Argus construction underway.	• DAF Argus construction underway.	• No new line item funding requested in FY 2020.

Defense Nuclear Security
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	2,093	2,093	2,139	2,186	+47
Minor Construction	N/A	N/A	1,500	1,500	17,150	23,900	+6,750
Total, Capital Operating Expenses	N/A	N/A	**3,593**	**3,593**	**19,289**	**26,086**	**+6,797**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	2,093	2,093	2,139	2,186	+47
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**2,093**	**2,093**	**2,139**	**2,186**	**+47**

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A	0	0	0	0	+0
TA-72 Outdoor Range Upgrades Project, LANL	7,000	0	1,500	1,500	5,500	0	-5,500
Range Facility Replacement, LLNL	9,800	0	0	0	9,800	0	-9,800
Y12 CAS/SAS Refurbishment	8,500	0	0	0	1,000	7,500	+6,500
Y12 PIDAS Vehicle Barriers	11,250	0	0	0	350	10,900	+10,550
Zone 12 PIDAS Vehicle Barriers, PX	11,250	0	0	0	250	5,500	+5,250
Pantex Zone 4 PIDAS Vehicle Barriers	11,250	0	0	0	250	0	-250
Total, Minor Construction Projects	**N/A**	**N/A**	**1,500**	**1,500**	**17,150**	**23,900**	**6,750**
Total, Capital Summary	**N/A**	**N/A**	**3,593**	**3,593**	**19,289**	**26,086**	**+6,797**

Outyears for Defense Nuclear Security

(Dollars in Thousands)

	FY 2021 Estimate	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	2,234	2,283	2,333	2,384	0
Minor Construction	5,500	5,500	5,500	0	0
Total, Capital Operating Expenses	**7,734**	**7,783**	**7,833**	**2,384**	**0**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	2,234	2,283	2,333	2,384	0
Total, Capital Equipment (including MIE)	**2,234**	**2,283**	**2,333**	**2,384**	**0**
Minor Construction Projects (Total Estimated Cost (TEC)					
Total Minor Construction Projects (TEC <$5M)	0	0	0	0	0
TA-72 Outdoor Range Upgrades Project, LANL	0	0	0	0	0
Range Facility Replacement, LLNL	0	0	0	0	0
Y12 CAS/SAS Refurbishment	0	0	0	0	0
Y12 PIDAS Vehicle Barriers	0	0	0	0	0
Zone 12 PIDAS Vehicle Barriers, PX	5,500	0	0	0	0
Pantex Zone 4 PIDAS Vehicle Barriers	0	5,500	5,500	0	0
Total, Minor Construction Projects	**5,500**	**5,500**	**5,500**	**0**	**0**
Total, Capital Summary	**7,734**	**7,783**	**7,833**	**2,384**	**0**

Minor Construction Projects over $10 million

As directed in the FY 2018 National Defense Authorization Act, this section provides the requested project information for projects with a total project cost (TPC) over $10 million.

Project	Site	Project Description	TPC ($k)	Project Milestones		
				Start	Design Complete	Project Finish
Y12 PIDAS Vehicle Barriers	Y12	Due to weather fluctuations, the CASS barrier suffers from tension problems, which have damaged the structural integrity of the mounting posts as well as the barrier's capability. Heavy sustained rainfall and water pooling is causing erosion damage.	11,250	FY2020	FY2020	FY2021
Zone 12 PIDAS Vehicle Barriers, PX	PX	Install a robust Vehicle Barrier System to replace the current cable barrier that is on the security fence with a new standalone barrier on the secure side of the PIDAS.	11,250	FY2020	FY2020	FY2024
Pantex Zone 4 PIDAS Vehicle Barriers	PX	Install a robust Vehicle Barrier System to replace the current cable barrier that is on the security fence with a new standalone barrier on the secure side of the PIDAS.	11,250	FY2022	FY2020	FY2025

Defense Nuclear Security
Construction Projects Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
17-D-710, West End Protected Area Reduction (WEPAR), Y-12						
Total Estimated Cost (TEC)	142,810	2,500	53,600	0	0	+0
Other Project Cost (OPC)	10,940	0	0	0	0	+0
Total Project Cost, 17-D-710, West End Protected Area Reduction (WEPAR), Y-12	**153,750**	**2,500**	**53,600**	**0**	**0**	**+0**
14-D-710, DAF Argus, NNSS						
Total Estimated Cost (TEC)	29,633	29,633	0	0	0	+0
Other Project Cost (OPC)	4,917	3,867	1,050	0	0	+0
Total Project Cost, 14-D-710, DAF Argus, NNSS	**34,550**	**33,500**	**1,050**	**0**	**0**	**+0**
Total All Construction Projects						
Total Estimated Cost (TEC)	172,443	32,133	53,600	0	0	+0
Other Project Cost (OPC)	15,857	3,867	1,050	0	0	+0
Total Project Cost (TPC) All Construction Projects	**188,300**	**36,000**	**54,650**	**0**	**0**	**+0**

Outyears to Completion for Defense Nuclear Security

	(Dollars in Thousands)			
	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
17-D-710, West End Protected Area Reduction (WEPAR), Y-12				
Total Estimated Cost (TEC)	36,000	41,900	8,810	0
Other Project Cost (OPC)	3,000	3,500	3,590	850
Total Project Cost, 17-D-710, West End Protected Area Reduction (WEPAR), Y-12	**39,000**	**45,400**	**12,400**	**850**
Total All Construction Projects				
Total Estimated Cost (TEC)	36,000	41,900	8,810	0
Other Project Cost (OPC)	3,000	3,500	3,590	850
Total Project Cost (TPC) All Construction Projects	**39,000**	**45,400**	**12,400**	**850**

Defense Nuclear Security
Other Information

Full Cost Recovery Estimates

The FY 2020 Budget Request provides direct funding for mission-based programs for DNS. Strategic Partnership Projects (formerly known as Work for Others (WFO) Projects) will continue to fund an allocable share of the base program through full cost recovery. Extraordinary security requirements for Strategic Partnership Projects, such as dedicated security for special projects or exercises on an extended basis, will be a direct charge to those customers.

(Dollars in Thousands)

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Site				
Kansas City National Security Campus	687	696	629	- 67
Lawrence Livermore National Laboratory	9,200	9,200	9,200	+0
Los Alamos National Laboratory	5,445	5,455	5,200	- 255
NNSA Production Office	2,433	3,063	2,574	- 489
Sandia National Laboratories	23,100	23,657	22,571	- 1,086
Total	**40,865**	**42,071**	**40,174**	**- 1,897**

Information Technology and Cybersecurity

Overview

The Office of the Associate Administrator for Information Management and Chief Information Officer (CIO) is responsible for information sharing and information safeguarding to support the mission of NNSA. The Office of Chief Information Officer (OCIO) supports Information Technology (IT) and cybersecurity solutions, including continuous monitoring, cloud-based technologies, and enterprise security technologies (i.e., identity, credential, and access management to help meet security challenges. The Information Technology and Cybersecurity Program is firmly based on practical principles that will provide superior information management support to current operations while implementing unclassified and classified cloud-based technologies to support the NNSA Nuclear Security Enterprise (NSE). The program collaborates and coordinates with the DOE Office of the Chief Information Officer (OCIO) on the development and implementation of cybersecurity and information technology solutions providing protection of NNSA information and information assets. The requested funds for the Information Technology and Cybersecurity Program operate cyber infrastructure at NNSA sites, implement requirements for the classified computing environment directed by the Committee on National Security Systems (CNSS), and execute Public Key Infrastructure (PKI) capabilities for authentication to unclassified and classified networks and applications.

The NNSA Information Technology and Cybersecurity Program focuses on the development of integrated IT initiatives that provide an effective technology infrastructure and support to the NNSA NSE shared services. These initiatives will fundamentally redesign the NNSA IT environments to provide a more secure set of capabilities including unified communication, agile cloud infrastructure, and next-generation collaboration services across the NSE which includes headquarters, laboratories, and plants. The approach will provide commodity services that can be used in the future with NNSA Management and Operating (M&O) partners to improve security of sensitive unclassified and classified NNSA data, lower IT costs, and host shared services.

The Information Technology and Cybersecurity Program sets forth goals and objectives to guide the execution of the NNSA Information Management Program in support of the NNSA mission and objectives. By achieving these goals and objectives, NNSA will improve protection of information and information assets, counter new and evolving threats, educate and aid its workforce, and support the development of mission-oriented requirements that effectively integrate security into everyday operations.

Achieving and maintaining a secure NNSA information environment for the enterprise requires an approach that combines defense-in-depth and defense-in-breadth principles with essential guiding tenets that align the Information Technology and Cybersecurity Program with NNSA cultural and business drivers. The underlying set of four guiding tenets of risk management, agility, trust, and partnership align with the people, processes, and technology elements to support the defense-in-depth values of achieving mission effectiveness and are integral to the success of the Information Technology and Cybersecurity Program.

While facing the current challenges, the NNSA Information Technology and Cybersecurity Program will continue to focus on improving both the performance of its staff and the security of the IT environment across the NSE. The program will also continue maintaining and modernizing the IT and cybersecurity infrastructure that supports mission activities within the weapons program classified information processing environment, nuclear material transport, weapon modernization, and incident response. The NNSA Information Technology and Cybersecurity Program will continue to evaluate risk and allocate resources to reduce threats and support the mission of the NNSA NSE.

Information Technology and Cybersecurity
Funding

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
				(Dollars in Thousands)
Information Technology and Cybersecurity				
Cybersecurity				
Site Infrastructure	0	0	92,432	+92,432
Infrastructure Program	122,528	155,175	0	-155,175
Enterprise Operations	0	0	115,458	+115,458
Technology Applications Development	4,000	4,000	0	-4,000
Subtotal, Cybersecurity	**126,528**	**159,175**	**207,890**	**+48,715**
Enterprise Secure Computing	23,700	25,500	0	-25,500
Information Technology	0	0	101,472	+101,472
Federal Unclassified Information Technology	36,500	36,500	0	-36,500
Total, Information Technology and Cybersecurity	**186,728**	**221,175**	**309,362**	**+88,187**

Outyears for Information Technology and Cybersecurity
Funding

(Dollars in Thousands)

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Information Technology and Cybersecurity				
Cybersecurity				
Site Infrastructure	94,363	96,335	98,348	100,413
Enterprise Operations	99,099	104,601	110,478	111,948
Total, Cybersecurity	**193,462**	**200,936**	**208,826**	**212,361**
Information Technology	87,761	89,287	102,845	103,435
Total, Information Technology and Cybersecurity	**281,223**	**290,223**	**311,671**	**315,796**

Information Technology and Cybersecurity
Comparable Budget

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Request	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Information Technology and Cybersecurity						
Cybersecurity						
Site Infrastructure	81,432	92,432	94,363	96,335	98,348	100,413
Enterprise Operations	90,595	115,458	99,099	104,601	110,478	111,948
Total, Cybersecurity	**172,027**	**207,890**	**193,462**	**200,936**	**208,826**	**212,361**
Information Technology	49,148	101,472	87,761	89,287	102,845	103,435
Total, Information Technology and Cybersecurity	**221,175**	**309,362**	**281,223**	**290,223**	**311,671**	**315,796**

Information Technology and Cybersecurity
Proposed Budget Structure Changes

In FY 2020, the Information Technology and Cybersecurity Program will make scope and funding adjustments to its existing reporting structure to better allocate and differentiate the aspects of cybersecurity and IT that exist amongst all requirements. This change stems in part from implementing the results that were driven by a zero-based security review that was performed in 2016. The new reporting structure will split cybersecurity into two main areas named Site Infrastructure and Enterprise Operations. By doing so, aspects of Enterprise Secure Computing that belong to Cybersecurity and Information Technology will be appropriately allocated, and the Information Technology subprogram will include both unclassified and classified requirements. These changes will not require a modification to the Information Technology and Cybersecurity Program's respective Government Performance and Reporting Act (GRPA) unit. The FY 2020 Budget Structure table provides the crosswalk as a basis to show comparability of scope and funding between the FY 2019 budget structure and the new budget structure for FY 2020 and beyond.

FY 2020 Budget Structure

	Cybersecurity		Information Technology	Total
	Site Infrastructure	Enterprise Operations		
FY 2019 Budget Structure				
Information Technology and Cybersecurity				-
Cybersecurity			**-**	**-**
Infrastructure Program	92,432	88,258	-	180,690
Technology Application Development	-	4,000	-	4,000
Total, Cybersecurity	**92,432**	**92,258**	**-**	**184,690**
Enterprise Secure Computing	-	23,200	21,000	44,200
Federal Unclassified Information Technology	-	-	80,472	80,472
Total, Information Technology and Cybersecurity	**92,432**	**115,458**	**101,472**	**309,362**

Information Technology and Cybersecurity
Explanation of Major Changes
(Dollars in Thousands)

	FY 2020 Request vs FY 2019 Enacted
Information Technology and Cybersecurity	
Cybersecurity: The increase for Site Infrastructure and Enterprise Operations signifies the continuation of cybersecurity modernization at the M&O's and the NNSA Information Assurance Response Center. The increase also represents the offset of transferring Technology Application Development and the Cybersecurity elements of the Enterprise Secure Computing program into Enterprise Operations, which includes implementing the cybersecurity requirements of a modernized network solution to address current supply chain and software assurance issues.	**+35,863**
Information Technology: The increase for Information Technology signifies the continuation of the IT modernization effort. The increase also represents the offset of transferring the classified Information Technology elements of the Enterprise Secure Computing program into information technology, which includes implementing the IT requirements to enhance the network solution to address current supply chain and software assurance issues.	**+52,324**
Total, Information Technology and Cybersecurity	**+88,187**

Information Technology and Cybersecurity
Cybersecurity

Description

The highly complex and global nature of the NNSA mission environment makes it critically important that information and information assets are managed and protected using an effective risk management approach. Well-informed management decisions require a systematic understanding of the risks inherent in the use of information systems. The entirety of information collected, created, processed, transmitted, stored, disseminated by or on behalf of the NNSA on automated information systems requires a level of protection commensurate with the risk to the information and the associated information processing systems. The information systems and networks facilitating these activities must also be protected according to National Institute of Standards and Technology (NIST) and Committee on National Security Systems (CNSS) requirements.

The Infrastructure subprogram supports the cybersecurity operations and activities at NNSA M&O and federal sites. The Site Infrastructure program is built around a defense-in-depth approach for achieving cybersecurity in a highly networked environment. The defense-in-depth approach is a combination of known best practices and cost strategy that relies on the intelligent application of techniques and technologies that exist today to address the increasing number and complexity of cybersecurity threats, vulnerabilities, and risks.

Enterprise Operations provides essential cybersecurity support and operations to the NNSA enterprise through the IARC monitoring services including audits, assessments, policy, management, planning and training. The procurement of cybersecurity tools supports intrusion prevention and the detection and prevention of unauthorized users and systems from gaining access to NNSA networks and data. Furthermore, Enterprise Operations is also responsible for developing and advancing policies and initiatives that support short and long-term solutions to specific cybersecurity needs at NNSA sites and headquarters locations. Enterprise Operations also focuses on emerging technologies and leveraging existing technology resources to create a more secure environment.

The protection of the core information exchange networks includes an enterprise-level identity model, strong (two-factor) authentication, and a centralized monitoring and analysis capability. These two components provide the necessary secure infrastructure and cybersecurity systems required to support the science-based stockpile stewardship program with a modeling and simulation-based science and engineering environment. The protected networks provide a broad base of security and network services that include application integration, authentication services, directory services, enterprise data resource management, IARC Security Operations Center and Network Operations Center, Identity and Access Management, PKI, and security monitoring and intrusion detection. An example of this is the ongoing project to deploy and implement PKI smart cards. This effort will result in the issuance of tokens, enabling network login to the Department of Energy (DOE) Secret Fabric users to meet CNSS requirements.

Highlights of the FY 2020 Budget Request

In FY 2020, the Information Technology and Cybersecurity Program plans to:

- Continue modernization of the Enterprise Secure Network (ESN) by enhancing the core services and collaborative capabilities and consolidating disparate networks.
- Bolster the enterprise network security posture by addressing capability gaps or shortfalls at the NNSA Information Assurance Response Center (IARC) as a result of technologies that continue to strengthen the M&O Cyber operations at each NNSA site.
- Enhance the IARC cybersecurity infrastructure, comprised of almost 100 sensors and over 70 data acquisition servers dispersed nationwide. The IARC is responsible for providing 24/7/365 cybersecurity services to NNSA and DOE networking enclaves. The IARC's services and service levels meet strict federal requirements that permit sites to maintain mission-essential access to the federal classified networks, Secret Internet Protocol Router Network (SIPRNET), and ESN. The IARC also provides near real-time network defense and incident response services that protect these classified and unclassified enclaves and information from attacks. As a participant with the Integrated Joint Cybersecurity Coordination Center (iJC3) Program, the IARC also supports enterprise-level cyber threat management and situational awareness for the Department.

- Implement the NNSA Application Modernization Strategy, which seeks to minimize the number of disparate NNSA federal business and mission support IT applications in favor of a platform-based approach. The strategy facilitates the use of cloud based technologies. The strategy is also an organized effort to cultivate enterprise-wide adoption of shared infrastructure capabilities by the NNSA federal and M&O communities.
- Continue to mature the Continuous Monitoring capabilities across the NNSA NSE in order to provide strong cybersecurity situational awareness to NNSA senior leadership.
- Implement a Telecommunications Security Program within NNSA to deliver more effective oversight, greatly reducing negative impacts to the mission programs while increasing visibility, oversight of risks, and governance of this critical function.

FY 2021 – FY 2024 Key Milestones

- Implement solutions for audit recommendation identified during the Defense Information Systems Agency (DISA) Cyber Security Service Provider (CSSP) assessment;
- Implement an IT Modernization strategy which will incorporate an NNSA managed model that will enable and support new technologies;
- Develop the architecture of the classified wireless network for non-pit production facilities and complete phase I security architecture of the Wireless Pit Production Network;
- Development and implementation of the Department of Homeland Security Continuous Diagnostics Program dashboard;
- Complete security architecture of classified wireless;
- Initiate Joint Development Environment to facilitate strategic partnerships;
- Develop Cyber Program Budget Re-baseline Analysis, and;
- Establish Centers of Excellence to improve and enhance cybersecurity operations throughout the NNSA nuclear security enterprise.

FY 2018 Accomplishments

Major accomplishments contributing to program effectiveness in FY 2019 include**:**

- Designed, and deployed, and enhanced sensor platform;
- Worked with DOE OCIO to establish Data Taxonomy Framework;
- Established Centers of Excellence to improve and enhance cybersecurity operations through the NNSA NSE;
- Implemented the Joint Development Environment to facilitate strategic partnerships with the United Kingdom;
- Led the cybersecurity and IT Mission Focus Areas (MFA) for the Plutonium Pit Production Project;
- Provided the cybersecurity MFA Implementation Plan Pit Production content and ensured it is in alignment with the goals and objectives of the Plutonium Pit Production Program Office;
- Establishment of department-wide cybersecurity sensor platform solution to enhance capabilities and functionality;
- Consolidation of Cybersecurity Awareness Training across the NNSA nuclear security enterprise into a single offering;
- Evaluate and mitigate software and hardware with supply chain concerns;
- Cybersecurity recapitalization of the ESN;
- Deliver classified unified communications;
- Implement an enterprise classified electronic records system service; Implement a full operating capability for cybersecurity to include Intrusion Detection Systems (IDS), Intrusion Prevention Systems (IPS), Continuous Diagnostic and Mitigation (CDM), Digital Rights Management (DRM) and Data Loss Prevention (DLP) capabilities, and;
- Implement an automated authorization by leveraging CDM capabilities for non-national security systems.

Cybersecurity

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Cybersecurity $172,027,000	**Cybersecurity $207,890,000**	**Cybersecurity +$35,863,000**
Site Infrastructure $81,432,000	**Site Infrastructure $92,432,000**	**Site Infrastructure +$11,000,000**
• Supported cybersecurity operations of the M&O's to include management, policy and planning, host based defenses, application defenses, data loss prevention, disaster recovery, Continuity of Operations (COOP), vulnerability scans, Identity Credential Access Management (ICAM), Configuration and change control management, audits, incident detection, incident response, media protection, system protection, telecommunications security, and training; • Initiated modernization of the Cybersecurity programs at the national security laboratories, plants, and sites to defend against increasingly adaptive threats; and • Strengthened the M&O Cyber operations at each NNSA site along the defense-in-depth approach.	• Funding supports cybersecurity operations of the M&O's; • Continues modernization of the Cybersecurity programs at the national security laboratories, plants, and sites to defend against increasingly adaptive threats; and • Further strengthens the M&O Cyber operations at each NNSA site along the defense-in-depth approach.	• Increase signifies second phase of cybersecurity modernization, to include further strengthening the cybersecurity operations of the M&O's in the realm of management policy and planning, and telecommunications security; and • Initiates maintenance on the FY 2019 enhancements that commenced in FY 2019 across the M&Os.
Enterprise Operations $90,595,000	**Enterprise Operations $115,458,000**	**Enterprise Operations +$24,863,000**
• Supported the Enterprise Operations and procurement of cybersecurity tools for protection of the NNSA Cybersecurity Infrastructure; • Bolstered the enterprise network security posture by addressing known critical capability gaps at the IARC; and • Provided efforts that primarily focuses on the implementation and integration of leveraging existing industry solutions to NNSA's network security enterprise and program mission to include enterprise efficiency pilots on enhanced secure protocol standards specifically designed for Restricted Data in transmission and at rest.	• Supports the Enterprise Operations and procurement of cybersecurity tools for protection of the NNSA Cybersecurity Infrastructure; • Bolsters the enterprise network security posture by continuing to address known critical capability gaps at the IARC; • Initiates modern cross-domain solution to replace the last legacy gateways currently in production; and • Expands the application of Digital Rights Management (DRM)/Data Loss Protection (DLP) Technology.	• Increase signifies second phase of cybersecurity modernization, to include further strengthening the cybersecurity capability of the NNSA Information Assurance Response Center; • Initiates maintenance on the FY 2019 enhancements that were initiated at the IARC; and • Supports cybersecurity implementation of a modernized network solution to address current supply chain and software assurance issues.

Information Technology and Cybersecurity
Information Technology

Description

Information Technology provides enterprise-level classified computing infrastructure, and unclassified commodity and applications services to NNSA federal staff in support of the NNSA mission. Information Technology leverages cloud based solution whenever possible to support infrastructure hosting and application development, operations and maintenance. Commodity IT services provided includes but is not limited to application hosting, unified communications, and desktop services.

Information Technology classified computing has two main components that enables DOE/NNSA laboratories and sites to communicate and share information regarding NNSA's mission.

- The NNSA Secret Network (NSN) supports the processing of Secret/National Security Information (NSI) and the interconnection with the Department of Defense (DOD) SIPRNET.
- The ESN operates at the Secret/Restricted Data level and consists of independent site installations of standardized hardware and software integrated through a common infrastructure and shared policies and procedures.

In order to think, behave, and respond as one cohesive agency with a shared, critical national security mission, it is necessary to re-engineer the telecommunications networks and continuously improve service offerings to remove technical barriers to collaboration and outfit employees with effective communication tools to maximize efficiency and lower operational costs. To that end, the Information Technology program continually looks to enhance enterprise services to support emerging technologies and the NNSA mission. Classified computing is currently deployed at NNSA and multiple DOE sites, other departments and organizations, and select allied nations. The footprint of the enterprise networks continue to expand as NNSA's mission needs increase and/or change.

The ESN serves as the base network for the classified commodity services, which entails an approach to classified collaborative computing that uses a secure virtual desktop infrastructure (VDI) to facilitate information sharing among disparate DOE/NNSA entities. The Information Technology program consistently evaluates the site installations for areas that can be consolidated to enterprise services and could be centrally hosted and managed. This approach continue to provide the NNSA Information Technology and Cybersecurity Program the ability to more effectively manage the information security posture for the agency and maximize investment allocation across multiple program areas.

Unclassified federal IT provides commodity-based computing infrastructure, which seeks to facilitate effective collaboration and information sharing necessary for NNSA federal employees and support contractors to execute the NNSA mission. Through regular communication with DOE/NNSA leadership, DOE IT organizations, contract partners in the labs and field, and associates across the federal IT community, NNSA has identified an opportunity to push modernization efforts to implement an IT strategy that leverage managed services and cloud technologies. Our focus on a managed service model enables NNSA to take advantage of new and emerging technologies while maximizing budget and resources. The strategy presents many opportunities to participate in economies of scale and rely on industry's rapid development and testing practices to ensure NNSA is using secure, modern technology.

FY 2021 – FY 2024 Key Milestones

- Delivery of classified unified communications;
- Implementation of an enterprise classified electronic records system service;
- Implement an IT Modernization strategy which will incorporate an NNSA managed model that will enable and support new technologies; and
- Implement a modernized network solution to address current supply chain and software assurance issues.

FY 2018 Accomplishments

- Implemented the Joint Development Environment to facilitate strategic partnerships with the United Kingdom;
- Continued infrastructure recapitalization of the Enterprise Secure Network;
- Continued application modernization efforts for integration with other enterprise applications, such as Portfolio Analysis and Management System (PAMS) 2.0;

- Initiated pilot for modernization of the federal unclassified IT environment to offer desktop services through NNSA;
- Developed an IT Modernization architecture, began planning for a production pilot of the Microsoft G5 Tenant, and completed an independent analysis led by Gartner;
- Completed an enterprise solution for email marking and document marking known as TITUS; and
- Developed an e-licensing and case management web portal specific to the Part 810 licensing process that has both internet and intranet components.

Information Technology

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Information Technology $49,148,000	**Information Technology $101,472,000**	**Information Technology +$52,324,000**
• Continued to support the deployment of information technology enhancements that facilitate effective collaboration and information sharing necessary for NNSA federal employees and support contractors to carry out the NNSA's mission; • Coordinated and oversaw the delivery of federal desktop and video teleconferencing services; • Continued to provide IT technical services, incidental advisory, and assistance services; • Continued to oversee the implementation of hardware and software licensing, maintenance, and refresh; • Continued to provide funding for NNSA field office IT services provisioned by M&O partners; • Continued to provide oversight of the M&O partners' unclassified IT programs; • Continued implementation of the application modernization project; • Began implementation of Enterprise VoIP as a service; • Provided oversight of activities related to, and ensure agency compliance with, the provisions of FITARA; • Enabled IT operations and maintenance of the Secret and Restricted Data infrastructure, Enterprise Secure Network, NNSA Secret Network, and utilization of the ESNet infrastructure for the network transport layer, and; • Continued to upgrade and enhance classified applications and services to improve collaboration and information sharing.	• Continue to support the deployment of information technology enhancements that facilitate effective collaboration and information sharing necessary for NNSA federal employees and support contractors to carry out the NNSA's mission; • Continue to provide IT technical services, incidental advisory, and assistance services; • Continue to oversee the implementation of hardware and software licensing, maintenance, and refresh; • Continue providing funding support for NNSA field office IT services provisioned by M&O partners; • Continue oversight of the M&O partners' unclassified IT programs; • Continue implementation of the application modernization project; • Continue implementation of Enterprise VoIP as a service; • Provide oversight of activities related to, and ensure agency compliance with, the provisions of FITARA, and; • Enable IT operations and maintenance of the Secret and Restricted Data infrastructure, Enterprise Secure Network, NNSA Secret Network, and utilization of the ESNet infrastructure for the network transport layer.	• Continue modernization of the federal unclassified IT environment by offering desktop services through NNSA; • Lead the development and implementation of the Microsoft G5 solution, which will support Office 365, SharePoint Online, Skype for Business, and email, and; • Initiate implementation of a modernized network solution to address current supply chain and software assurance issues.

Information Technology and Cybersecurity
Other Information

Full Cost Recovery Estimates

The FY 2020 Budget Request provides direct funding for mission-driven activities focused on research and development of IT and cybersecurity solutions. Because some support is directed to other programs for materials and services provided to agencies outside the Department, these costs will be allocated to the Strategic Partnership Program (SPP) customers (formerly known as Work for Others (WFO) customers) as work is accomplished at the contractor site. The table below provides an estimate of costs that will be recovered from SPP customers.

	(Dollars in Thousands)			
	FY 2018 Enacted	FY 2019 Request	FY 2020 Request	FY 2020 Request vs FY 2019 Request
Site				
Kansas City National Security Campus	400	250	350	+100
Lawrence Livermore National Laboratory	3,200	2,500	2,500	+0
Los Alamos National Laboratory	1,400	1,000	1,200	+200
Nevada National Security Site	600	500	400	- 100
Pantex	80	60	70	+10
Sandia National Laboratories	8,000	6,000	5,000	- 1,000
Total	**13,680**	**10,310**	**9,520**	**- 790**

Department Of Energy

FY 2020 Congressional Budget

Funding by Appropriation by Site

($K)

Weapons Activities	**FY 2018 Total Enacted**	**FY 2019 Enacted**	**FY 2020 Request**
Argonne National Laboratory			
Science			
Science Campaign	820	532	300
Advanced Simulation & Computing			
Advanced Simulation & Computing Campaign	500	0	0
Infrastructure and Operations			
Infrastructure and Operations	1,650	1,650	0
Total, Argonne National Laboratory	**2,970**	**2,182**	**300**
Bettis Atomic Power Laboratory			
Infrastructure and Operations			
Infrastructure and Operations	508	0	0
Total, Bettis Atomic Power Laboratory	**508**	**0**	**0**
Brookhaven National Laboratory			
Infrastructure and Operations			
Infrastructure and Operations	262	325	391
Total, Brookhaven National Laboratory	**262**	**325**	**391**
Chicago Operations Office			
Advanced Simulation & Computing			
Advanced Simulation & Computing Campaign	2,000	2,000	0
Total, Chicago Operations Office	**2,000**	**2,000**	**0**
Consolidated Business Center			
Infrastructure and Operations			
Infrastructure and Operations	559	0	0
Total, Consolidated Business Center	**559**	**0**	**0**
General Atomics Site			
Inertial Confinement Fusion Ignition High Yield			
Inertial Confinement Fusion Ignition High Yield Campaign	14,700	0	0
Total, General Atomics Site	**14,700**	**0**	**0**
Idaho National Laboratory			
Directed Stockpile Work			
Directed Stockpile Work	2,815	2,398	1,770
Infrastructure and Operations			
Infrastructure and Operations	1,031	0	0
Total, Idaho National Laboratory	**3,846**	**2,398**	**1,770**

Department Of Energy

FY 2020 Congressional Budget

Funding by Appropriation by Site

($K)

Weapons Activities	**FY 2018 Total Enacted**	**FY 2019 Enacted**	**FY 2020 Request**
Kansas City National Security Complex (KCNSC)			
Directed Stockpile Work			
Directed Stockpile Work	477,718	536,388	761,108
Science			
Science Campaign	1,132	1,521	1,100
Engineering			
Engineering Campaign	3,665	3,203	6,639
Advanced Simulation & Computing			
Advanced Simulation & Computing Campaign	750	1,250	0
Defense Nuclear Security			
Defense Nuclear Security	12,039	12,692	12,946
Information technology and Cybersecurity			
Information technology and Cybersecurity	6,605	5,882	7,217
Infrastructure and Operations			
Infrastructure and Operations	102,509	128,735	121,752
Secure Transportation Asset			
Secure Transportation Asset	21,551	20,277	19,376
Advanced Manufacturing Development			
Advanced Manufacturing Development	13,900	13,728	9,731
Total, Kansas City National Security Complex (KCNSC)	**639,869**	**723,676**	**939,869**
Kansas City Site Office			
Information technology and Cybersecurity			
Information technology and Cybersecurity	0	0	130
Infrastructure and Operations			
Infrastructure and Operations	37,974	0	0
Total, Kansas City Site Office	**37,974**	**0**	**130**
Knolls Atomic Power Laboratory			
Infrastructure and Operations			
Infrastructure and Operations	0	0	547
Total, Knolls Atomic Power Laboratory	**0**	**0**	**547**
Lawrence Berkeley National Laboratory			
Information technology and Cybersecurity			
Information technology and Cybersecurity	547	650	650
Infrastructure and Operations			
Infrastructure and Operations	1,100	0	0
Total, Lawrence Berkeley National Laboratory	**1,647**	**650**	**650**

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Funding by Appropriation by Site

($K)

Weapons Activities	**FY 2018 Total Enacted**	**FY 2019 Enacted**	**FY 2020 Request**
Lawrence Livermore National Laboratory			
Directed Stockpile Work			
Directed Stockpile Work	280,989	335,223	416,482
Science			
Science Campaign	130,003	125,368	158,336
Engineering			
Engineering Campaign	27,808	36,914	49,977
Inertial Confinement Fusion Ignition High Yield			
Inertial Confinement Fusion Ignition High Yield Campaign	344,000	344,000	295,664
Advanced Simulation & Computing			
Advanced Simulation & Computing Campaign	310,093	210,721	277,736
Defense Nuclear Security			
Defense Nuclear Security	56,331	67,162	67,135
Information technology and Cybersecurity			
Information technology and Cybersecurity	16,115	14,122	18,515
Infrastructure and Operations			
Infrastructure and Operations	237,601	202,943	219,935
Advanced Manufacturing Development			
Advanced Manufacturing Development	10,307	8,207	7,796
Total, Lawrence Livermore National Laboratory	**1,413,247**	**1,344,660**	**1,511,576**
Livermore Site Office			
Infrastructure and Operations			
Infrastructure and Operations	846	0	0
Total, Livermore Site Office	**846**	**0**	**0**

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Funding by Appropriation by Site

($K)

Weapons Activities	FY 2018 Total Enacted	FY 2019 Enacted	FY 2020 Request
Los Alamos National Laboratory			
Directed Stockpile Work			
Directed Stockpile Work	683,924	692,467	770,398
Science			
Science Campaign	152,772	152,691	225,054
Engineering			
Engineering Campaign	32,221	42,342	49,360
Inertial Confinement Fusion Ignition High Yield			
Inertial Confinement Fusion Ignition High Yield Campaign	18,500	18,500	15,000
Advanced Simulation & Computing			
Advanced Simulation & Computing Campaign	199,048	205,752	191,740
Defense Nuclear Security			
Defense Nuclear Security	100,921	112,475	112,430
Information technology and Cybersecurity			
Information technology and Cybersecurity	17,195	17,716	17,760
Infrastructure and Operations			
Infrastructure and Operations	583,041	640,693	576,889
Advanced Manufacturing Development			
Advanced Manufacturing Development	6,285	7,179	8,778
Total, Los Alamos National Laboratory	**1,793,907**	**1,889,815**	**1,967,409**
Los Alamos Site Office			
Information technology and Cybersecurity			
Information technology and Cybersecurity	0	0	51
Total, Los Alamos Site Office	**0**	**0**	**51**
National Energy Technology Lab			
Directed Stockpile Work			
Directed Stockpile Work	30,128	19,071	31,113
Science			
Science Campaign	540	550	550
Engineering			
Engineering Campaign	690	188	0
Advanced Manufacturing Development			
Advanced Manufacturing Development	1,212	295	0
Total, National Energy Technology Lab	**32,570**	**20,104**	**31,663**
Naval Reactors Laboratory Field Office			
Infrastructure and Operations			
Infrastructure and Operations	523	0	0
Total, Naval Reactors Laboratory Field Office	**523**	**0**	**0**

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Funding by Appropriation by Site

($K)

Weapons Activities	**FY 2018 Total Enacted**	**FY 2019 Enacted**	**FY 2020 Request**
Naval Research Laboratory			
Science			
Science Campaign	3,350	3,750	3,000
Inertial Confinement Fusion Ignition High Yield			
Inertial Confinement Fusion Ignition High Yield Campaign	8,000	6,500	0
Advanced Simulation & Computing			
Advanced Simulation & Computing Campaign	250	0	0
Total, Naval Research Laboratory	**11,600**	**10,250**	**3,000**
Nevada Field Office			
Directed Stockpile Work			
Directed Stockpile Work	0	1,350	0
Defense Nuclear Security			
Defense Nuclear Security	79,074	80,559	80,527
Information technology and Cybersecurity			
Information technology and Cybersecurity	1,091	0	79
Total, Nevada Field Office	**80,165**	**81,909**	**80,606**
Nevada National Security Site			
Directed Stockpile Work			
Directed Stockpile Work	52,026	30,485	57,775
Science			
Science Campaign	52,719	43,904	67,960
Information technology and Cybersecurity			
Information technology and Cybersecurity	4,191	4,337	6,622
Infrastructure and Operations			
Infrastructure and Operations	211,423	197,707	236,514
Total, Nevada National Security Site	**320,359**	**276,433**	**368,871**

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($K)

Weapons Activities	**FY 2018 Total Enacted**	**FY 2019 Enacted**	**FY 2020 Request**
NNSA Albuquerque Complex			
Directed Stockpile Work			
Directed Stockpile Work	319,256	417,096	328,214
Science			
Science Campaign	55,150	75,578	36,556
Engineering			
Engineering Campaign	40,909	24,738	15,352
Inertial Confinement Fusion Ignition High Yield			
Inertial Confinement Fusion Ignition High Yield Campaign	18,171	25,463	14,973
Advanced Simulation & Computing			
Advanced Simulation & Computing Campaign	17,750	9,750	0
Defense Nuclear Security			
Defense Nuclear Security	7,533	7,573	7,767
Infrastructure and Operations			
Infrastructure and Operations	101,789	73,083	0
Secure Transportation Asset			
Secure Transportation Asset	86,922	101,421	110,163
Advanced Manufacturing Development			
Advanced Manufacturing Development	2,018	2,891	13,770
Total, NNSA Albuquerque Complex	**649,498**	**737,593**	**526,795**
NNSA Production Office (NPO)			
Directed Stockpile Work			
Directed Stockpile Work	0	0	4,000
Infrastructure and Operations			
Infrastructure and Operations	7,200	0	0
Total, NNSA Production Office (NPO)	**7,200**	**0**	**4,000**
Oak Ridge Institute for Science & Education			
Science			
Science Campaign	200	100	100
Inertial Confinement Fusion Ignition High Yield			
Inertial Confinement Fusion Ignition High Yield Campaign	60	260	260
Total, Oak Ridge Institute for Science & Education	**260**	**360**	**360**

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Funding by Appropriation by Site

($K)

Weapons Activities	**FY 2018 Total Enacted**	**FY 2019 Enacted**	**FY 2020 Request**
Oak Ridge National Laboratory			
Directed Stockpile Work			
Directed Stockpile Work	42,515	46,807	38,700
Science			
Science Campaign	262	160	200
Advanced Simulation & Computing			
Advanced Simulation & Computing Campaign	180	30	0
Infrastructure and Operations			
Infrastructure and Operations	16,594	13,660	5,033
Total, Oak Ridge National Laboratory	**59,551**	**60,657**	**43,933**
Office of Scientific & Technical Information			
Science			
Science Campaign	220	212	220
Information technology and Cybersecurity			
Information technology and Cybersecurity	213	213	213
Total, Office of Scientific & Technical Information	**433**	**425**	**433**
Pacific Northwest National Laboratory			
Directed Stockpile Work			
Directed Stockpile Work	37,093	40,728	58,099
Science			
Science Campaign	0	350	500
Engineering			
Engineering Campaign	0	0	1,500
Infrastructure and Operations			
Infrastructure and Operations	8,367	6,275	3,150
Total, Pacific Northwest National Laboratory	**45,460**	**47,353**	**63,249**

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FY 2020 Congressional Budget

Funding by Appropriation by Site

($K)

Weapons Activities	**FY 2018 Total Enacted**	**FY 2019 Enacted**	**FY 2020 Request**
Pantex Plant			
Directed Stockpile Work			
Directed Stockpile Work	381,312	387,562	440,968
Engineering			
Engineering Campaign	2,212	2,212	5,054
Defense Nuclear Security			
Defense Nuclear Security	132,744	138,903	138,847
Information technology and Cybersecurity			
Information technology and Cybersecurity	6,862	6,765	7,573
Infrastructure and Operations			
Infrastructure and Operations	260,370	273,885	348,773
Secure Transportation Asset			
Secure Transportation Asset	7,726	7,317	7,761
Advanced Manufacturing Development			
Advanced Manufacturing Development	629	863	1,187
Total, Pantex Plant	**791,855**	**817,507**	**950,163**
Sandia National Laboratories			
Directed Stockpile Work			
Directed Stockpile Work	1,064,834	1,184,044	1,219,017
Science			
Science Campaign	48,663	44,460	52,649
Engineering			
Engineering Campaign	69,510	74,499	92,827
Inertial Confinement Fusion Ignition High Yield			
Inertial Confinement Fusion Ignition High Yield Campaign	57,480	63,100	66,931
Advanced Simulation & Computing			
Advanced Simulation & Computing Campaign	173,022	167,314	159,801
Defense Nuclear Security			
Defense Nuclear Security	66,266	65,884	67,088
Information technology and Cybersecurity			
Information technology and Cybersecurity	19,720	16,707	25,872
Infrastructure and Operations			
Infrastructure and Operations	225,572	210,193	222,412
Secure Transportation Asset			
Secure Transportation Asset	69,364	47,597	72,202
Advanced Manufacturing Development			
Advanced Manufacturing Development	7,703	7,372	11,975
Total, Sandia National Laboratories	**1,802,134**	**1,881,170**	**1,990,774**

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FY 2020 Congressional Budget

Funding by Appropriation by Site

($K)

Weapons Activities	**FY 2018 Total Enacted**	**FY 2019 Enacted**	**FY 2020 Request**
Sandia Site Office			
Information technology and Cybersecurity			
Information technology and Cybersecurity	0	0	1,017
Total, Sandia Site Office	**0**	**0**	**1,017**
Savannah River Operations Office			
Directed Stockpile Work			
Directed Stockpile Work	1,619	1,159	2,250
Information technology and Cybersecurity			
Information technology and Cybersecurity	0	0	50
Total, Savannah River Operations Office	**1,619**	**1,159**	**2,300**
Savannah River Site			
Directed Stockpile Work			
Directed Stockpile Work	117,676	131,713	407,553
Science			
Science Campaign	660	0	850
Engineering			
Engineering Campaign	1,706	1,706	1,832
Defense Nuclear Security			
Defense Nuclear Security	4,906	7,537	7,688
Information technology and Cybersecurity			
Information technology and Cybersecurity	4,831	5,554	6,786
Infrastructure and Operations			
Infrastructure and Operations	156,878	148,726	174,248
Advanced Manufacturing Development			
Advanced Manufacturing Development	3,640	5,096	5,936
Total, Savannah River Site	**290,297**	**300,332**	**604,893**
SLAC National Accelerator Laboratory			
Science			
Science Campaign	90	90	90
Total, SLAC National Accelerator Laboratory	**90**	**90**	**90**
Undesignated Lab/Plant/Installation			
Legacy Contractor Pensions			
Legacy Contractor Pensions	232,050	162,292	91,200
Total, Undesignated Lab/Plant/Installation	**232,050**	**162,292**	**91,200**
University of Rochester			
Inertial Confinement Fusion Ignition High Yield			
Inertial Confinement Fusion Ignition High Yield Campaign	75,000	80,000	80,000
Total, University of Rochester	**75,000**	**80,000**	**80,000**

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FY 2020 Congressional Budget

Funding by Appropriation by Site

($K)

Weapons Activities	**FY 2018 Total Enacted**	**FY 2019 Enacted**	**FY 2020 Request**
Washington Headquarters			
Directed Stockpile Work			
Directed Stockpile Work	90,030	270,758	325,246
Science			
Science Campaign	27,266	30,966	38,746
Engineering			
Engineering Campaign	2,070	1,989	7,018
Inertial Confinement Fusion Ignition High Yield			
Inertial Confinement Fusion Ignition High Yield Campaign	9,023	7,111	7,767
Advanced Simulation & Computing			
Advanced Simulation & Computing Campaign	42,151	119,802	210,572
Defense Nuclear Security			
Defense Nuclear Security	95,582	30,321	116,320
Information technology and Cybersecurity			
Information technology and Cybersecurity	102,495	142,464	209,255
Infrastructure and Operations			
Infrastructure and Operations	121,899	156,120	226,821
Secure Transportation Asset			
Secure Transportation Asset	105,600	102,022	107,660
Advanced Manufacturing Development			
Advanced Manufacturing Development	1,800	1,351	4,107
Total, Washington Headquarters	**597,916**	**862,904**	**1,253,512**
Y-12 National Security Complex			
Directed Stockpile Work			
Directed Stockpile Work	427,512	561,017	563,664
Science			
Science Campaign	677	252	350
Engineering			
Engineering Campaign	2,332	2,332	4,395
Advanced Simulation & Computing			
Advanced Simulation & Computing Campaign	500	500	0
Defense Nuclear Security			
Defense Nuclear Security	215,181	167,532	167,465
Information technology and Cybersecurity			
Information technology and Cybersecurity	6,863	6,765	7,572
Infrastructure and Operations			
Infrastructure and Operations	1,040,107	1,033,857	1,071,977
Secure Transportation Asset			
Secure Transportation Asset	5	5	0
Advanced Manufacturing Development			
Advanced Manufacturing Development	38,046	34,576	73,628
Total, Y-12 National Security Complex	**1,731,223**	**1,806,836**	**1,889,051**

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FY 2020 Congressional Budget

Funding by Appropriation by Site

($K)

Weapons Activities	FY 2018 Total Enacted	FY 2019 Enacted	FY 2020 Request
Total, Weapons Activities	10,642,138	11,113,080	12,408,603

Defense Nuclear Nonproliferation

Defense Nuclear Nonproliferation

FY 2020 Congressional Budget Justification

Defense Nuclear Nonproliferation

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Defense Nuclear Nonproliferation
Proposed Appropriation Language

For Department of Energy expenses, including the purchase, construction, and acquisition of plant and capital equipment and other incidental expenses necessary for defense nuclear nonproliferation activities, in carrying out the purposes of the Department of Energy Organization Act (42 U.S.C. 7101 et seq.), including the acquisition or condemnation of any real property or any facility or for plant or facility acquisition, construction, or expansion, and the purchase of not to exceed three aircraft; [$1,949,000,000]*$1,993,302,000*, to remain available until expended[:***Provided***, That of such amount, $25,000,000 shall be made available for design activities supporting the dilute and dispose strategy for plutonium disposition: *Provided further*, That none of the funds made available under this heading shall be made available for the construction activities or acquisition of equipment for the Surplus Plutonium Disposition Project: *Provided further*, That of the unobligated balances from prior year appropriations available under this heading, $19,000,000 is hereby rescinded: *Provided further*, That no amounts may be rescinded from amounts that were designated by the Congress as an emergency requirement pursuant to the Concurrent Resolution on the Budget or the Balanced Budget and Emergency Deficit Control Act of 1985].

Explanation of Change

The FY 2020 Budget Request for Defense Nuclear Nonproliferation (DNN) reflects a 3.3% increase from the FY 2019 Enacted levels. This increase is mainly due to the initiation of an enhanced directed render safe capability for fourteen Stabilization regions offset by a decrease in University of California legacy pension payments.

Public Law Authorizations

- P.L. 106-65, National Nuclear Security Administration Act, as amended
- P.L. 115-244, Energy and Water, Legislative Branch, and Military Construction and Veterans Affairs Appropriations Act, 2019
- P.L. 115-232, John S. McCain National Defense Authorization Act for Fiscal Year 2019

Defense Nuclear Nonproliferation

(Dollars in Thousands)

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Defense Nuclear Nonproliferation	2,048,219	1,974,000	1,993,302	+19,302
Use of prior year balances	0	-25,000	0	+25,000
Rescission of Prior Year Balances	-49,000	-19,000	0	+19,000
Total, Defense Nuclear Nonproliferation	**1,999,219**	**1,930,000**	**1,993,302**	**+63,302**

Overview

NNSA's nonproliferation and counterterrorism activities extend the nation's defenses far beyond America's borders. These programs help keep America safe by preventing adversaries from acquiring nuclear weapons or weapons-usable materials, technology, and expertise; countering efforts to acquire such weapons or materials; and responding to nuclear or radiological accidents and incidents domestically and abroad. NNSA programs share the United States' long experience in managing special nuclear materials with partners around the world to achieve international nonproliferation and counterterrorism goals. NNSA leverages the knowledge that underpins the stockpile stewardship program for a range of nonproliferation missions, from assessing foreign weapons programs and potential terrorist devices to managing the proliferation risks posed by civil nuclear applications. By limiting the number of nuclear-capable states and preventing terrorist access to materials and technology that can threaten the United States and its allies, NNSA plays an important role in enhancing global stability and constrains the range of potential threats facing the nation, our allies, and partners.

This appropriation funds the core Defense Nuclear Nonproliferation (DNN) program and the Nuclear Counterterrorism and Incident Response (NCTIR) program. DNN and NCTIR have a primary role in the United States' approach for reducing nuclear security risks. These two programs, as part of a whole-of-government approach, provide policy and technical leadership to prevent or limit the spread of materials, technology, and expertise related to weapons of mass destruction (WMD); develop technologies to detect nuclear proliferation; secure or eliminate inventories of nuclear weapons-related materials and infrastructure; and ensure a technically trained emergency management response is available both domestically and worldwide to nuclear and radiological incidents. DNN's efforts reduce the danger that hostile nations or terrorist groups may acquire nuclear devices, radiological dispersal devices, weapons-usable material, nuclear and dual-use commodities and technology, or nuclear-related expertise. DNN's mission is complementary to Defense Programs' Stockpile Stewardship Program at NNSA. Together, they form the basis of providing a strong nuclear deterrent, as called for in the 2018 Nuclear Posture Review (NPR). The 2017 National Security Strategy (NSS) and NPR reinforce the important work of NNSA's nonproliferation programs, including committing to "augment measures to secure, eliminate, and prevent the spread of WMD and related materials."

These activities are carried out within a dynamic global security environment, as described in NNSA's annual report *Prevent, Counter, and Respond–A Strategic Plan to Reduce Global Nuclear Threats*. [1]

This environment is characterized by the persistent threat of state and non-state actors seeking to obtain nuclear and radioactive materials; state actors potentially undermining arms control agreements to which the United States is adherent and nonproliferation regimes. There is also an increased risk of the availability of nuclear and radioactive materials as a result of the global expansion of nuclear power and possible spread of fuel cycle technology, increased opportunities for illicit nuclear material trafficking and sophisticated procurement networks, and technology advances (including cyber-related tools) that may shorten nuclear weapon development timelines and complicate nuclear safeguards and security missions.

DNN and NCTIR execute their mission in partnership with other U.S. Government agencies, most notably the Departments of State, Defense, Homeland Security, and the Nuclear Regulatory Commission. Internationally, DNN has a strong and long-established partnership with the International Atomic Energy Agency (IAEA). NNSA has active bilateral and multilateral program coordination, through forums such as the Nuclear Security Conference (held biennially by the IAEA), the Global

[1] https://www.energy.gov/nnsa/downloads/prevent-counter-and-respond-strategic-plan-reduce-global-nuclear-threats-npcr

Initiative to Combat Nuclear Terrorism, and the Global Partnership against the Spread of Weapons and Materials of Mass Destruction.

In carrying out nuclear threat reduction, DNN and NCTIR depend on the scientific and technical expertise of the Department and its National Laboratories, as well as the capacity for international outreach, engagement and project management, implementation, and policy expertise. DNN also relies on competencies of other elements of NNSA and Department of Energy (DOE), particularly the Office of Nuclear Energy, the Office of Environmental Management, and the Office of Science.

The major elements of the appropriation account include the following:

Material Management and Minimization (M^3)
M^3 programs minimize and, when possible, eliminate weapons-usable nuclear material around the world to achieve permanent threat reduction. The FY 2020 Budget Request funds the conversion or shut-down of research reactors and isotope production facilities that use highly enriched uranium (HEU), the continued support of non-HEU-based Molybdenum-99 (Mo-99) production facilities in the United States, the removal and disposal of weapons-usable nuclear material, the continuation of activities to implement the dilute and dispose strategy for plutonium disposition, and costs to downblend HEU.

Global Material Security (GMS)
The FY 2020 GMS Program prevents terrorists and other actors from obtaining nuclear and radioactive material to use in an improvised nuclear device (IND) or a radiological dispersal device (RDD) by working with partner countries to improve the security of vulnerable materials and facilities and to improve partners' capacity to detect, disrupt, and investigate illicit trafficking of these materials. GMS works extensively with and through multilateral partners such as the IAEA and International Criminal Police Organization (INTERPOL). As part of an ongoing strategic analysis process, GMS is also exploring innovative approaches, technologies, and tools to adapt to emerging threats. GMS supports national security priorities to reduce global nuclear security threats, and is a key component of DOE/NNSA's integrated nonproliferation, counterterrorism, and emergency response strategy.

Nonproliferation and Arms Control (NPAC)
NPAC supports activities to prevent the proliferation of WMD by state and non-state actors. The FY 2020 Budget Request funds efforts to develop and implement programs and strategies to strengthen international nuclear safeguards; control the spread of dual-use WMD material, equipment, technology, and expertise; verify nuclear reductions and compliance with nonproliferation and arms control treaties and agreements; and address enduring and emerging nonproliferation and arms control challenges and opportunities.

Defense Nuclear Nonproliferation Research and Development (DNN R&D)
DNN R&D drives the innovation of U.S. technical capabilities to detect nuclear detonations; foreign nuclear weapons programs' activities; and the presence, movement, or diversion of special nuclear materials. To meet national and departmental nuclear security requirements, DNN R&D leverages the unique facilities and scientific skills of DOE, academia, and industry to perform research, conduct technology demonstrations, develop prototypes, and produce and deliver sensors for integration into operational systems. The FY 2020 Budget Request includes planned activities for early detection of proliferation-related R&D and continued production of nuclear detonation detection satellite payloads. The request also supports efforts to establish a nonproliferation stewardship initiative to build and sustain requisite technical competencies, based on enabling infrastructure, science and technology, and workforce expertise, that are needed to support policymakers and future nonproliferation missions.

Nonproliferation Construction
Nonproliferation Construction consolidates construction costs for DNN projects. The FY 2020 Budget Request supports the continuation of termination activities for the MOX project and continues to pursue the dilute and dispose strategy. The request will support the continuation of preliminary design for the Surplus Plutonium Disposition (SPD) project, as well as long lead procurements. The SPD project will add additional glovebox capacity at the Savannah River Site to accelerate plutonium dilution and aid in the removal of plutonium from the State of South Carolina.

Nuclear Counterterrorism and Incident Response Program (NCTIR)
NCTIR sustains the United States' operational nuclear incident and accident response capability, while supporting DOE's all-hazards emergency management capability. Additionally, NCTIR provides the nation's technical capability to understand and defeat Nuclear Threat Devices (NTDs), including INDs and lost or stolen foreign nuclear weapons. In support of this mission, the FY 2020 Request for NCTIR supports programs to strategically manage and deploy expert scientific teams and equipment to provide a technically trained, rapid response to nuclear or radiological incidents and accidents worldwide and to educate international partners to effectively respond to nuclear or radiological incidents in their countries.

Additionally, NCTIR executes DOE/NNSA's Comprehensive Emergency Management System program that administers implementation and support of emergency management for all DOE/NNSA offices and sites and manages the DOE/NNSA Consolidated Emergency Operations Center, Emergency Communications Network (ECN), Emergency Management Policy, Training, Exercises, and Continuity Program activities.

Highlights and Major Changes in the FY 2020 Budget
The FY 2020 budget request for DNN programs is $1.6 billion and is effectively flat at $19 million, or 1.1%, less than the FY 2019 enacted level. This change is a result of the difference between a one-time increase of $130 million provided by the FY 2019 enacted appropriation in the Material Management and Minimization and Global Material Security programs versus an increase of $111 million in FY 2020 for the base DNN program.

The FY 2020 budget request for NCTIR is $372 million and is an increase of $53 million, or 16.6%, from the FY 2019 enacted level.

The FY 2020 budget request for Legacy Contractor Pensions is $14 million and is a decrease of $15 million, or 52.2%, from the FY 2019 enacted level.

Since the FY 2020 budget request includes no use of prior year balances or rescissions, this results in an overall increase of $63 million for the DNN Appropriation from the FY 2019 enacted level.

The DNN FY 2020 Budget Request supports the following key priorities:

Defense Nuclear Nonproliferation Programs
- Convert and/or verify the shutdown of two research reactors and isotope production facilities
- Identify and eliminate excess HEU and plutonium, including removing and/or disposing of 40 kilograms of material
- Continue to pursue the dilute and dispose strategy to dispose of 34 metric tons of plutonium
- Lead high priority nuclear security initiatives to improve cyber security for nuclear facilities, mitigate insider threats, and improve transportation security practices
- Secure an additional 80 buildings with high-priority radioactive sources (40 domestic buildings and 40 international buildings)
- Deploy mobile detection systems and equip priority border crossing points with radiation detection systems, and provide associated training and maintenance support, to help counter the threat of illicit trafficking of special nuclear material
- Transfer financial responsibility for training and maintenance of 65 radiation detection systems and maintain engagements to encourage continued commitment
- Provide critical mission support to the IAEA, including strengthening the international nuclear safeguards system and supporting their expanding nuclear security activities
- Facilitate legitimate U.S. trade by annually providing roughly 6,000 technical reviews of U.S. export license applications, and technical support and training to U.S. law enforcement to help prevent the exploitation of the U.S. industrial base;
- Work with roughly 35 countries each year to build global export control capacity through training, technical exchanges and train-the-trainer approaches
- Demonstrate new U.S. capabilities for detecting foreign material and weapons production processes
- Demonstrate new capabilities for weapons and material security applications, including detecting special nuclear material movement and diversion and nuclear safeguards

- Sustain and improve U.S. capabilities in nuclear explosion monitoring, including delivering the nation's space-based nuclear detonation detection payloads and related activities that support treaty monitoring and military missions
- Support efforts to establish a nonproliferation stewardship initiative, which will build and sustain the requisite technical competencies needed to support policymakers and future nonproliferation missions

Nuclear Counterterrorism and Incident Response Program

- Provide expertise and equipment to 1) detect and identify nuclear or radiological materials during high-profile events or in response to a threat; 2) rapidly respond to disable a potentially yield producing nuclear device; and 3) lead the Federal Government's monitoring and technical assessment efforts after a nuclear or radiological incident or accident, saving lives
- Detect, measure, and track radioactive material in an emergency to determine contamination levels through the Aerial Measuring System (AMS). The AMS Recapitalization project will procure two rotary wing aircraft in FY 2020, following the procurement of three fixed-wing aviation platforms in FY 2019 to replace the aging fleet and meet future needs
- Conduct Stabilization Operations activities that provide technical assistance to the FBI to respond to nuclear threat devices by providing specialized technology and training for regional teams. The increased funding in this budget request will incorporate directed render safe capabilities in existing Stabilization teams, address the need for enhanced training and equipment procurement, and increase the number of total Stabilization teams. This effort includes training facility upgrades, applied science, and technical bench depth building
- Provide technical expertise, facilities, and equipment to examine interdicted nuclear devices or materials; collect and process debris samples following an IND nuclear detonation; support device assessment and reverse engineering; and begin to identify, consolidate, and analyze historical nuclear material samples of value to the technical nuclear forensics program and make progress towards establishing the National Nuclear Materials Archive within NNSA
- Advance the nation's technical capability to understand and defeat NTDs, including INDs, and lost or stolen nuclear weapons; advise on protection requirements for nuclear materials; and prevent nuclear terrorism through Nuclear Threat Reduction channels with the United Kingdom and France
- Strengthen U.S. national security by increasing partner capabilities to counter and respond to radiological and nuclear incidents and accidents worldwide through policy, training, exercises, technical exchanges, and equipment provisioning
- Strengthen U.S. national security by increasing reliability and sustainability of the ECN though completion of the transition to the SWITCH Super NAP 9 Data Center

Major Outyear Priorities and Assumptions

Outyear funding levels for the Defense Nuclear Nonproliferation appropriation total $8,193,088 for FY 2021 through FY 2024, based on the following priorities and assumptions.

Defense Nuclear Nonproliferation Programs

- Play a key role in the domestic and international effort to secure vulnerable nuclear and radioactive materials around the world, promote material security best practices, prevent illicit trafficking, and promote long-term risk reduction through alternatives to radioisotopic source-based devices and technologies
- Cooperate with private industry and international partners, such as the Global Partnership, the IAEA, INTERPOL, and the Global Initiative to Combat Nuclear Terrorism, and implement an engagement strategy with partner countries that carefully balances threats and indigenous resources
- Develop approaches, technology, human capital and international infrastructure to strengthen the international nuclear safeguards system and provide the IAEA with necessary resources to implement the evolving nuclear safeguards regime
- Work with foreign partners at all stages of nuclear development to enhance their ability to meet their safeguards and security obligations
- Work domestically and abroad to minimize and, when possible, eliminate nuclear and radioactive materials and ensure sound management principles for materials that remain
- Facilitate legitimate nuclear cooperation by building domestic and global capacity to detect and prevent illicit transfers of WMD-related materials, equipment, and technology by providing technical reviews of U.S. export licenses; conducting technical analyses of interdiction cases; providing technical support to multilateral nonproliferation export control regimes (such as the Nuclear Suppliers Group, the Australia Group, and the Missile Technology Control Regime); and working with foreign partners to strengthen their national systems of export control

- Develop and demonstrate U.S. capabilities in DOE laboratories, academia, and industry for detecting nuclear material production and weapons development, monitoring nuclear explosions, preparing for future arms control, supporting nuclear security broadly, and producing the nation's space-based global nuclear detonation detection capability as required by law

Nuclear Counterterrorism and Incident Response Program

- Maintain and strengthen nuclear/radiological incident response capabilities, Emergency Operations Center, and the Department's capabilities to manage accidents and emergencies at all DOE/NNSA headquarters and field sites
- Sustain existing deployable capabilities, understanding and adapting to changes in proliferation and nuclear terrorism threats, and sustaining unique modeling and device assessment capabilities
- Build and sustain classified emergency response communications network, interconnected to the Federal Government for critical real-time operational information sharing
- Transition mature diagnostics, high explosives, and nuclear material science research and development into validated operational capabilities beginning in FY 2021. In FY 2016, $28.1 million of research for nuclear and energetic materials characterization experiments and development of advanced diagnostic equipment development were transferred from NCTIR to DNN R&D as part of the larger program realignment of NCTIR and CTCP activities, previously funded in the Weapons Activities appropriation, to the Defense Nuclear Nonproliferation appropriation. Based on the progress accomplished in each area, activities will transition from R&D for incorporation into NCTIR validated capabilities to understand and defeat nuclear threat devices (NTDs)
- Continue Stabilization Operations activities to include training facility upgrades, applied science, and technical bench depth building
- Sustain existing nuclear counterterrorism capabilities in 11 cities (Stabilization), and establish the capability in one additional city each year
- Continue implementation and sustainment of Capability Forward, resulting in a sustained 14 cities with directed render safe capability
- Enhance international nuclear/radiological preparedness and response training programs and support, including implementation of the 2019 Nuclear Threat Reduction (NTR) Work Plan with United Kingdom and France, and sharing of best practices to domestic and foreign partners to reduce terrorism risks to nuclear material and facilities
- Sustain the technical nuclear forensics capabilities by leveraging expertise from the national laboratories to analyze and determine the origin of interdicted nuclear materials and nuclear devices, and in the case of a nuclear attack, the device design and origin of the nuclear materials used

FY 2021 - FY 2024 Key Milestones

- (2021) Complete the conversion of all the major global producers of Mo-99
- (2021) Identify National Nuclear Materials Archive (NNMA) items to protect from disposal
- (2022) Complete the Tier Threat Modeling Archive Validation project to assess the national 3-D predictive modeling capability using four different experimental series in support of nuclear incident response requirements.
- (2023) Complete security upgrades at a total of 2,766 buildings that contain radioactive material
- (2023) Complete nuclear forensics capacity building engagements with a total of 59 partner countries
- (2023) Complete curriculum development at Kazakhstan's Nuclear Security Training Center
- (2023) Demonstrate new capabilities for early detection of special nuclear material (SNM) production
- (2023) Demonstrate new capabilities for detecting the presence, movement and diversion of SNM, including through remote detection and advanced nuclear safeguards
- (2024) Complete the Area 5 De-inventory (A5D) and Building 9212 low equity discards at Y-12
- (2024) Consolidate NNMA high priority items at disposal risk to DOE/NNSA material vaults
- Conduct six to eight physical security assessment visits per year for U.S.-obligated nuclear materials at foreign facilities
- Transfer five safeguards tools per year to foreign partners or international organization to meet identified safeguards deficiencies
- In partnership with the Department of State's Export Control and Related Border Security program, engage 25 to 35 foreign partners per year to strengthen national systems of export control and prevent illicit trafficking in nuclear and dual-use commodities through export licensing and enforcement training programs, and advancing sustainability through train-the-trainer approaches

- Perform approximately 6,000 technical reviews per year of U.S. export licenses for nuclear and dual-use commodities
- Provide approximately 3,000 real time technical analyses to the U.S. enforcement community per year for interdiction cases
- Conduct three monitoring visits per year in Russia under the terms of the Plutonium Production Reactor Agreement (PPRA) to ensure the non-weapons use of Russian plutonium oxide and non-operational status of shutdown Russian plutonium production reactors and host Russian monitors on their annual monitoring visit to U.S. facilities falling under the PPRA
- Process 40 to 50 Part 810 specific authorization applications and requests for amendments per year and review over 100 Part 810 general authorization reports for compliance with Part 810 regulations per year
- Produce nuclear detonation detection satellite payloads in accordance with the negotiated schedule with the United States Air Force (USAF).

DOE Working Capital Fund (WCF) Support

The NNSA Defense Nuclear Nonproliferation appropriation projected contribution to the DOE WCF for FY 2020 is $5,892,000. This funding covers shared enterprise activities including managing enterprise-wide systems and data, telecommunications, and supporting the integrated acquisition environment.

Legacy Contractor Pensions

Funding provides the annual DNN share of the DOE's reimbursement of payments made to the University of California (UC) Retirement Plan (UCRP) for former UC employees and annuitants who worked at the Lawrence Livermore National Laboratory (LLNL) and Los Alamos National Laboratory (LANL). The UCRP benefit for these individuals is a legacy cost and DOE's annual payment to the UC is required by contract. The amount of the annual payment is based on the actuarial valuation report and is covered by the terms described in the contracts. NNSA's budget request supports a readjusted the split between Weapons and DNN to reflect the changes in relative shares of total NNSA funding in FY 2020. These contracts will be paid through the Legacy Contractor Pension line item.

Entry Level Hires

NNSA supports a variety of programs to help train and recruit the next generation of leaders in managing the nuclear stockpile, nonproliferation, nuclear security, and international security, such as the NNSA Graduate Fellowship Program (NGFP), and, where appropriate, the Presidential Management Fellows (PMF) program. These programs foster the pipeline of qualified professionals who will sustain expertise in these areas through future employment within the nuclear security enterprise. In FY 2020, the DNN appropriation projects providing $3,300,000 for NGFP support and development activities.

Defense Nuclear Nonproliferation
Funding by Congressional Control

(Dollars in Thousands)

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Defense Nuclear Nonproliferation Appropriation				
Defense Nuclear Nonproliferation				
Material Management and Minimization				
HEU Reactor Conversion	0	0	114,000	+114,000
Nuclear Material Removal	32,925	32,925	32,925	+0
Material Disposition	183,669	225,869	186,608	-39,261
Laboratory and Partnership Support	92,000	35,000	0	-35,000
Total, Material Management and Minimization	**308,594**	**293,794**	**333,533**	**39,739**
Global Material Security				
International Nuclear Security	46,339	46,339	48,839	+2,500
Domestic Radiologic Security	110,433	127,433	90,513	-36,920
International Radiological Security	78,907	78,907	60,827	-18,080
Nuclear Smuggling Detection	154,429	154,429	142,171	-12,258
International Contributions *[non-add]	[12,101]	0	0	+0
Total, Global Material Security	**390,108**	**407,108**	**342,350**	**-64,758**
Nonproliferation and Arms Control	**134,703**	**129,703**	**137,267**	**+7,564**
Defense Nuclear Nonproliferation R&D				
Proliferation Detection	278,255	281,521	304,040	+22,519
Nuclear Detonation Detection	195,749	195,749	191,317	-4,432
Nonporliferation Fuels Development	82,500	98,300	0	-98,300
Total, Defense Nuclear Nonproliferation R&D	**556,504**	**575,570**	**495,357**	**-80,213**
Nonproliferation Construction				
99-D-143 Mixed Oxide (MOX) Fuel Fabrication Facility, SRS	335,000	220,000	220,000	+0
18-D-150, Surplus Plutonium Disposition Project	0	0	79,000	+79,000
Total, Nonproliferation Construction	**335,000**	**220,000**	**299,000**	**79,000**
Total, Defense Nuclear Nonproliferation Programs	**1,724,909**	**1,626,175**	**1,607,507**	**-18,668**
Nuclear Counterterrorism Incident Response Program	**282,360**	**319,185**	**372,095**	**+52,910**

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 vs FY 2019
	(Dollars in Thousands)			
Legacy Contractor Pensions	**40,950**	**28,640**	**13,700**	**-14,940**
Subtotal, Defense Nuclear Nonproliferation Appropriation	**2,048,219**	**1,974,000**	**1,993,302**	**+19,302**
Use of Prior Year Balances	**0**	**-25,000**	**0**	**+25,000**
Recission of Prior Year Balances	**-49,000**	**-19,000**	**0**	**+19,000**
Total, Defense Nuclear Nonproliferation Appropriation	**1,999,219**	**1,930,000**	**1,993,302**	**+63,302**

***** The international contributions received by the GMS program shown in the FY 2018 Enacted column are a non-add to the FY 2018 Appropriation. The amount received in FY 2018 totaled $12,101,233, including $8,192,659 from Canada, $304,715 from Finland, $3,453,859 from the United Kingdom, and $150,000 from New Zealand.

SBIR/STTR:
- FY 2018 Transferred: SBIR: $8,545; STTR: $1,202
- FY 2019 Projected: SBIR: $9,118; STTR: $1,282
- FY 2020 Request: SBIR: $8,680; STTR: $1,221
- FY 2021 - FY 2024 Request: SBIR: $35,466; STTR: $4,987

Outyears for Defense Nuclear Nonproliferation
Funding by Congressional Control

(Dollars in Thousands)

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Defense Nuclear Nonproliferation				
Material Management and Minimization	437,401	510,621	514,146	511,736
Global Material Security	367,290	375,006	382,881	390,921
Nonproliferation and Arms Control	138,700	141,508	144,374	147,301
Defense Nuclear Nonproliferation R&D	487,278	496,089	504,402	514,478
Nonproliferation Construction				
99-D-143 Mixed Oxide (MOX) Fuel Fabrication Facility, SRS	109,382	0	0	0
18-D-150, Surplus Plutonium Disposition Project	65,000	74,750	62,000	62,000
21-D-xxx, LANL Project	16,517	50,000	66,000	82,000
Total, Nonproliferation Construction	**190,899**	**124,750**	**128,000**	**144,000**
Total, Defense Nuclear Nonproliferation Programs	**1,621,568**	**1,647,974**	**1,673,803**	**1,708,436**
Nuclear Counterterrorism Incident Response Program	**371,703**	**370,153**	**371,931**	**379,320**
Legacy Contractor Pensions	**11,800**	**11,800**	**12,300**	**12,300**
Subtotal, Defense Nuclear Nonproliferation Appropriation	**2,005,071**	**2,029,927**	**2,058,034**	**2,100,056**
Use of Prior Year Balances	**0**	**0**	**0**	**0**
Recission of Prior Year Balances	**0**	**0**	**0**	**0**
Total, Defense Nuclear Nonproliferation Appropriation	**2,005,071**	**2,029,927**	**2,058,034**	**2,100,056**

Research and Development

The Office of Management and Budget (OMB) Circular No. A-11, "Preparation, Submission, and Execution of the Budget," requires the reporting of research and development (R&D) data. Consistent with this requirement, R&D activities funded by NNSA Defense Nuclear Nonproliferation programs are displayed below.

(Dollars in Thousands)

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Research and Development (R&D)				
Basic	111,531	125,821	134,766	+8,945
Applied	162,171	171,205	148,955	-22,250
Development	74,961	66,277	70,673	+4,396
Subtotal, R&D	**348,663**	**363,303**	**354,394**	**-8,909**
Equipment	0	0	0	0
Construction	0	0	0	0
Total, R&D	**348,663**	**363,303**	**354,394**	**-8,909**

Material Management and Minimization

Overview

The Material Management and Minimization (M^3) program aims to minimize and, when possible, eliminate nuclear materials and ensure sound management principles for materials that remain. This includes minimizing the civilian use of highly enriched uranium (HEU); removing or eliminating the world's most vulnerable weapons-usable nuclear material; and disposing of excess nuclear material in the United States. The M^3 Budget Request presents an integrated approach to addressing the persistent threat posed by the global stockpile of nuclear materials.

M^3 directly contributes to and plays a critical role in reducing global nuclear security threats and promoting U.S. national security. The M^3 program is a key component of DOE/NNSA's integrated nonproliferation, counterterrorism, and emergency response strategies. M^3 makes these strategic contributions through the conversion of research reactors and medical isotope production facilities from the use of HEU to the use of low enriched uranium (LEU) fuels and targets, the removal of excess HEU and separated plutonium, and the disposition of HEU and plutonium.

The M^3 FY 2020 Budget Request conforms with the program's traditional budget structure. The request includes funds for activities associated with the HEU Conversion Program; in FY 2019, those activities were funded in the DNN Research and Development (R&D) program. Detailed program explanations are provided in the "Explanation of Changes" section.

Material Management and Minimization
Funding

	(Dollars in Thousands)			
	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Material Management and Minimization				
HEU Reactor Conversion	0	0	114,000	+114,000
Nuclear Material Removal	32,925	32,925	32,925	+0
Material Disposition	183,669	225,869	186,608	-39,261
Laboratory and Partnership Support	92,000	35,000	0	-35,000
Total, Material Management and Minimization	**308,594**	**293,794**	**333,533**	**+39,739**

Outyears for Material Management and Minimization
Funding

	(Dollars in Thousands)			
	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Material Management and Minimization				
HEU Reactor Conversion	119,845	116,046	115,198	117,652
Nuclear Material Removal	60,879	62,193	63,534	64,903
Material Disposition	256,677	332,382	335,414	329,181
Laboratory and Partnership Support	0	0	0	0
Total, Material Management and Minimization	**437,401**	**510,621**	**514,146**	**511,736**

Material Management and Minimization
Explanation of Major Changes
(Dollars in Thousands)

	FY 2020 Request vs FY 2019 Enacted
Material Management and Minimization	
HEU Reactor Conversion: The increase in funding primarily reflects the realignment of the HEU Reactor Conversion Program in this Budget Request rather than being split between M^3 and the DNN Research and Development (R&D) program as appropriated in FY 2019. In true comparison between FY 2019 and FY 2020 for this program, there is a slight overall decrease of $2.3 million due to completion of awarding the new Molybdenum-99 (Mo-99) cooperative agreements.	+114,000
Nuclear Material Removal: No change.	N/A
Material Disposition: The overall decrease primarily reflects the transition of the effort to increase capability for the dilute and dispose approach to the Surplus Plutonium Disposition project in FY 2020, the one-time increase from Congress in FY 2019 to support the design activities for the dilute and dispose approach, and the completion of layup activities on HB-Line at SRS.	-39,261
Laboratory and Partnership Support: The decrease reflects the realignment of these activities to the HEU Reactor Conversion program.	-35,000
Total, Material Management and Minimization	**+39,739**

Material Management and Minimization
HEU Reactor Conversion

Description

The HEU Reactor Conversion subprogram, referred to as the Convert subprogram, supports the conversion of domestic and international civilian research reactors and isotope production facilities to non-weapons usable nuclear materials. These efforts result in permanent threat reduction by minimizing and, to the extent possible, eliminating the use of HEU in civilian applications. This includes working with global Mo-99 producers to convert their existing operations to use LEU targets and accelerating the development of new non-HEU-based Mo-99 production capabilities in the United States.

The Energy and Water, Legislative Branch, and Military Construction and Veterans Affairs Appropriations Act, 2019, transferred domestic and international civilian research reactor conversion work to DNN R&D because the committees determined the U.S. High Performance Research Reactor (USHPRR) program was in the research and development phase based on a 2014 report. While there was some R&D work being performed in 2014, on fabricating a new, high-density LEU fuel, the USHPRR program is no longer doing any R&D work. The USHPRR program has now established a commercial fabrication process and is now in the demonstration and deployment phase. The USHPRR program, as well as all other research reactor conversion work, belongs in M^3 because the goals of the program are directly aligned with two of M^3's key missions: minimization of the use of HEU in civilian applications, and the management of NNSA's limited supply of HEU and high-assay LEU used to fuel research reactors. Therefore, the Convert subprogram will continue pursuing reactor conversions and verifying shutdowns both domestically and abroad. Currently, the program has converted or verified the shutdown of 103 HEU research reactors and isotope production facilities worldwide. In support of this effort, the program will continue its work to qualify a high-density LEU fuel and to demonstrate the fabrication capability necessary to convert six U.S. high performance research reactors from HEU to LEU fuel. These high performance research reactors cannot convert with existing LEU fuels. FY 2020 funding will support critical activities that will demonstrate fabrication processes at a commercial fuel fabricator and confirm that the high-density LEU fuel performs satisfactorily when irradiated. The Convert subprogram will support a Major Item of Equipment (MIE) at Idaho National Laboratory (INL) to increase fuel fabrication capacity at the commercial fabricator. In addition, the Convert subprogram will monitor and evaluate results from initial tests at the Transient Reactor Test Facility (TREAT) reactor to better understand the reactor's performance requirements prior to conversion to LEU fuel.

FY 2020 funding will allow the Convert subprogram to continue to provide laboratory support to accelerate the establishment of new, non-HEU-based Mo-99 production facilities in the United States. The Convert subprogram anticipates awarding new cooperative agreements in FY 2019, consistent with prior year direction from Congress. Previous cooperative agreement funding helped one domestic producer enter the U.S. Mo-99 market in 2018. Building on prior-year support, the Convert subprogram's cooperative agreement partners continue to make progress toward commercially producing Mo-99 in the United States without the use of HEU.

The Convert subprogram will continue to support the implementation of key international nuclear nonproliferation activities addressing HEU and/or plutonium threat reduction. The subprogram has primary responsibility for verifying that the research reactor designs continue to meet all nonproliferation goals as the design matures.

In FY 2020, Laboratory and Partnership Support (LAPS) activities, as well as elements from the Nonproliferation Fuels Development program within DNN R&D, are being realigned back into the HEU Reactor Conversion subprogram.

Highlights of the FY 2020 Budget Request

- The HEU Reactor Conversion subprogram will continue the pursuit of research reactor and isotope production facility conversions and/or verification of shutdowns. Two facilities will be converted or verified as shutdown in FY 2020.
- The HEU Reactor Conversion subprogram will enhance its support of domestic Mo-99 commercial partners to establish a reliable commercial supply of Mo-99 produced without HEU and assist global Mo-99 production facilities to eliminate the use of HEU targets.
- The HEU Reactor Conversion subprogram will support the implementation of key international nuclear nonproliferation activities addressing HEU and/or plutonium threat reduction.

HEU Reactor Conversion

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
HEU Reactor Conversion (Laboratory and Partnership Support) $35,000,000	**HEU Reactor Conversion $ 114,000,000**	**HEU Reactor Conversion +$79,000,000**
• Continue to convert and/or verify the shutdown of facilities. • Provide technical and financial support to the U.S. private sector to accelerate establishment of a reliable domestic production capability for Mo-99 without the use of HEU and to existing global Mo-99 producers to convert from the use of HEU to LEU targets.	• Continue activities to support converting and/or verify the shutdown of facilities for out years. • Provide technical and financial support to the U.S. private sector to accelerate establishment of a reliable domestic production capability for Mo-99 without the use of HEU and to existing global Mo-99 producers to convert from the use of HEU to LEU targets. • Continue irradiation of mini-plate experiment in the Advanced Test Reactor in support of qualifying a new high-density LEU fuel that can convert the U.S. High Performance Research Reactors (USHPRRs). • Continue fabrication of key full-size irradiation test plates for the new, high-density LEU fuel, and continue LEU fuel plate and assembly fabrication demonstration activities in support of converting USHPRRs.	• The increase in funding primarily reflects the inclusion of the Reactor Conversion Program in this Budget Request rather than in the DNN R&D program as appropriated in FY 2019.

Material Management and Minimization
Nuclear Material Removal

Description

The Nuclear Material Removal subprogram, referred to as the Remove subprogram, supports the removal, consolidation, and disposal of the world's most vulnerable weapons-usable nuclear material. Each kilogram of excess nuclear material from civilian sites worldwide that is removed reduces the risk of a terrorist acquiring the material for use in a nuclear weapon.

This subprogram supports the removal, consolidation, and disposal of HEU and plutonium from civilian facilities around the world. This material includes Russian-origin HEU and plutonium and 'Gap' material which includes U.S.-origin HEU, HEU of non-U.S. and non-Russian-origin, and separated plutonium. On a case-by-case basis in support of nonproliferation objectives, some U.S.-origin HEU and LEU spent fuel may still be able to be returned under this subprogram, pending National Environmental Policy Act (NEPA) review. The Remove subprogram will continue to remove Gap materials and Russian-origin HEU and plutonium from third-party countries. In FY 2019, the Remove program plans to analyze the possibility of developing additional capabilities to treat weapons-usable nuclear material in situ, allowing for the elimination of tranches of material that the subprogram has not been able to address to date. This capability could result in a minor construction project or a major item of equipment (MIE) purchase.

This subprogram continues to evaluate all excess nuclear material to identify and prioritize candidates for removal or disposition. The Remove subprogram evaluates material attractiveness, site and country level threats, and other factors to determine materials that are most at-risk and prioritize them for removal or disposal. Furthermore, the subprogram works with foreign partners to obtain regulatory permits; characterize, stabilize, package, and transport material; and provide replacement LEU, or other incentives for other-than-high-income-economy-countries, to encourage elimination of these dangerous materials. The subprogram also coordinates all future U.S. return projects with relevant DOE stakeholders, including the Office of Environmental Management (EM), to enable long-term planning and appropriate resource allocation.

In addition, as part of its mission to address emerging threats, the Remove subprogram will continue to develop the capability to promptly respond, if asked, to support the removal of nuclear material from countries of concern (e.g., Libya 2004). This includes in-country stabilization, packaging, and removal of nuclear materials (focusing on HEU and plutonium) through the deployment of self-sufficient, trained teams and mobile facilities. The Remove subprogram is planning to conduct a mock deployment of the emerging threats capabilities in late FY 2020. This mock deployment will test equipment capabilities and increase personnel proficiency while working alongside other DOE/NNSA and interagency partners.

Highlights of the FY 2020 Budget Request

- The Nuclear Material Removal subprogram will continue to identify and eliminate excess HEU and plutonium, including removing and/or disposing of 40 kilograms of material.

Nuclear Material Removal

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Nuclear Material Removal $32,925,000	**Nuclear Material Removal $32,925,000**	**Nuclear Material Removal $0**
• Remove and/or confirm the disposition of an additional 375 kilograms of HEU and/or plutonium for a cumulative total of 7,100 kilograms.	• Remove and/or confirm the disposition of an additional 40 kilograms of HEU and/or plutonium for a cumulative total of 7,140 kilograms. • Conduct an emerging threats mock deployment exercise to ensure a short-term readiness posture to respond to an urgent nuclear material removal mission.	• No change

Material Management and Minimization
Material Disposition

Description

The Material Disposition subprogram, referred to as the Dispose subprogram, is responsible for disposing of excess nuclear material in the United States and managing the provision of nuclear material for peaceful uses.

The Dispose subprogram includes activities that are necessary to support the overall program to dispose of surplus weapon-grade plutonium including surveillance, monitoring, and packaging of surplus pits at Pantex and surplus nuclear weapon pit disassembly and conversion of resultant metal to oxide, which is being conducted in the Advanced Recovery and Integrated Extraction System (ARIES) at LANL.

In FY 2020, the Dispose subprogram includes approximately $45 million to continue activities to expedite the removal of plutonium from the state of South Carolina by expanding current downblending operations, which requires hiring, training, and ensuring the appropriate clearance qualifications of additional employees. In support of expedited plutonium removal activities and increased staffing in K-Area, NNSA is evaluating the need for improvements of the entry control facility to the material access area in the K-Area Complex to enhance personnel entry and material movements. This improvement could result in a minor construction project that could start early in FY 2020 as planning continues. In addition, approximately $55 million will also continue to support plutonium oxide production at ARIES in LANL.

Consistent with the requirement in the FY 2018 NDAA and certified in the May 2018 Secretarial wavier, the MOX fuel approach was terminated and the subprogram will continue with the dilute and dispose strategy to fulfill the United States' commitment to dispose of 34 metric tons of plutonium. The dilute and dispose strategy consists of blending plutonium with an inert mixture, packaging, and disposing of it in a geologic repository. In FY 2019, the Dispose subprogram completed an independent validation of a detailed lifecycle cost estimate (LCCE) for the dilute and dispose alternative. The estimate included all aspects of the program to implement the dilute and dispose strategy, including surveillance and packaging of surplus pits, pit disassembly and oxide conversion, dilution and disposal of the plutonium, all projects at the various sites needed to execute the program, and any other supporting costs required to implement the program. The U.S. Army Corps of Engineers issued the Independent Validation Report in late November 2019 and concluded that the processes used to develop the Dilute and Dispose LCCE comply with the GAO best practices.

DOE/NNSA continues program management and integration, technology maturation, and the environmental analyses for the disposal of surplus plutonium as required by the National Environmental Policy Act (NEPA). In addition, the Dispose program will support multiple Major Items of Equipment (MIEs) at LANL to improve operational and storage efficiency for the existing oxide production infrastructure.

The Dispose subprogram is also responsible for preparation of the Japan Fast Critical Assembly (FCA) plutonium fuel plates for disposition. In FY 2018, NNSA completed the refinement of the FY 2017 alternatives evaluation, which provided results of research and development activities and updated cost and schedule ranges. The alternatives evaluation resulted in the identification of the use of the electrolytic dissolution in H Canyon as the preferred disposition approach for the FCA fuel plates. Furthermore, in early 2019, an independent Business Case Analysis validated the alternatives evaluation approach and the results. In FY 2019, DOE/NNSA will implement the selected technology and will continue implementing the electrolytic dissolution approach in FY 2020, utilizing the funds provided by Japan.

Over the past decade, NNSA has eliminated more than 161 metric tons (MT) of weapons-usable HEU by downblending it (or shipping it for downblending) to low enriched uranium (LEU) for use in power and research reactors in the United States and abroad. The program has substantially reduced excess holdings of HEU throughout the DOE/NNSA complex, an amount sufficient to produce 6,375 weapons. The program's primary downblending campaign will end in FY 2019 and will be replaced by the Down-blending Offering for Tritium (DBOT) contract, which will run from FY 2019 through FY 2025. Although DBOT is primarily a Weapons Activities contract, the Dispose subprogram is responsible for managing and funding a portion of the DBOT contract to support HEU disposition. In addition, Dispose will also support development of a material disposition capability.

The Dispose subprogram manages enriched uranium supply and demand needs in support of DNN statutory obligations, international commitments or assurances, and mission goals to support the provision of material for Peaceful Uses. This includes oversight of contractor management of LEU fuel for the American Assured Fuel Supply (AAFS), high assay LEU fuel for research reactors that have been converted to use LEU instead of HEU, and high assay LEU targets for medical isotope production.

The Dispose subprogram will disposition legacy material and low equity discards stored at Y-12 in order to reduce risk due to the aging infrastructure and to support the transition to the Uranium Processing Facility (UPF). The Building 9206 discards will be complete by the end of FY 2022, and the Area 5 De-inventory (A5D) and Building 9212 discards will be accelerated to allow for completion by the end of FY 2024.

The Dispose subprogram will continue the Uranium Lease and Take Back (ULTB) program that was required by the American Medical Isotopes Production Act of 2012.

Furthermore, the Dispose subprogram will focus on the development of international plutonium management strategies with countries other than Russia, by developing bi-lateral and multi-lateral working arrangements. Participating countries will work together at a technical level to support efforts to manage plutonium inventories in a way that minimizes the stockpiles of excess plutonium and maximizes the security and protection of the material.

Highlights of the FY 2020 Budget Request

- The Material Disposition subprogram will continue efforts to expedite the removal of plutonium from the state of South Carolina and continue the dilute and dispose strategy to fulfill the United States' commitment to dispose of 34 metric tons of surplus plutonium.
- The Material Disposition subprogram will continue to eliminate surplus HEU by downblending to LEU, or through direct disposal with a priority on legacy material to reduce operating risk in aging infrastructure.

Material Disposition

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Material Disposition $225,869,000	**Material Disposition $186,608,000**	**Material Disposition -$39,261,000**
U.S. Plutonium Disposition $183,869,000	**U.S. Plutonium Disposition $138,449,000**	**U.S. Plutonium Disposition -$45,420,000**
• Continue to provide surveillance and packaging capabilities for surplus pits and plutonium. • Continue pit disassembly and oxide conversion activities to prepare plutonium for disposition. • Complete an independent validation of the lifecycle estimate for the dilute and dispose program for surplus plutonium disposition. • Continue activities associated with expediting the removal of 1MT of plutonium from the state of South Carolina. • Continue transition to the dilute and dispose strategy, including technical development and analysis. • Continue planning and design activities to support the dilute and dispose approach (Surplus Plutonium Disposition (SPD) project). • Continue the NEPA process for the dilute and dispose program. • Maintain the WSB facility in a lay-up configuration while the Department determines options for future use. • Pursue selected technology for the disposition of Japan FCA fuel plates, utilizing funds from Japan, as appropriate. • Support the ongoing maintenance of critical programmatic documents including the Program Execution Plan, integrated schedules, performance measures, memoranda of agreement, analysis for plutonium disposition, and interface control documents; minimal required infrastructure and erosion control maintenance required to comply with safety and	• Continue to provide surveillance and packaging capabilities for surplus pits and plutonium. • Continue pit disassembly and oxide conversion activities to prepare plutonium for disposition. • Continue expediting the removal of plutonium from the state of South Carolina. • Continue transition to the dilute and dispose strategy, including technical development and analysis. • Continue the NEPA process for the dilute and dispose program. • Maintain the WSB facility in a lay-up configuration while the Department determines options for future use. • Support the ongoing maintenance of critical programmatic documents including the Program Execution Plan, integrated schedules, performance measures, memoranda of agreement, analysis for plutonium disposition, and interface control documents; and minimal required infrastructure and erosion control maintenance required to comply with safety and environmental standards.	• The decrease primarily reflects the transition of the effort to increase capability for the dilute and dispose approach to the SPD project as well as completing the layup activities in HB-Line at SRS.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
environmental standards; and DNN's portion of the SRS-wide common infrastructure maintenance activities including site roads.		
U.S. Uranium Disposition $42,000,000	**U.S. Uranium Disposition $47,159,000**	**U.S. Uranium Disposition +$5,159,000**
• Down-blend or ship for downblending HEU to produce LEU consistent with specifications. • Continue to downblend HEU into high assay LEU metal for research reactor fuel and for Mo-99 targets, in support of replacing current HEU demand for research reactor fuel and medical isotope production with LEU-based solutions. • Continue implementing the ULTB program. • Continue cleanup of legacy material in Y-12's Building 9206, Building 9212 and the Area 5 De-inventory (A5D) to reduce risk. • Support tracking and analyzing enriched uranium supply and demand needs and commitments of DNN mission goals.	• Down-blend or ship for downblending HEU to produce LEU consistent with specifications. • Continue to downblend HEU into high assay LEU metal for research reactor fuel and for Mo-99 targets, in support of replacing current HEU demand for research reactor fuel and medical isotope production with LEU-based solutions. • Continue implementing the ULTB program. • Accelerate cleanup of legacy material in Y-12's Building 9206, Building 9212 and the Area 5 De-inventory (A5D) to reduce risk. • Support tracking and analyzing enriched uranium supply and demand needs and commitments of DNN mission goals. • Support development of a material disposition capability.	• The increase supports the accelerlation to deinventory Area 5 at the Y-12 National Security Complex and low-equity discards, as well as support the development of a material disposition capability.
International Plutonium Disposition $0	**International Plutonium Disposition $1,000,000**	**International Plutonium Disposition +$1,000,000**
• Continue to implement plutonium management strategies with international partners. (Funding enacted under the Nuclear Material Removal Program.)	• Continue to implement plutonium management strategies with international partners.	• Although the FY 2020 request for the program equals a $1 million increase, there is no change to the funding request level for this program. In FY 2019 the program previously received $1 million under the Nuclear Material Removal program. In FY 2020 the program will be realigned to the Material Disposition program.

Material Management and Minimization
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	1,750	1,750	1,789	23,128	21,339
Minor Construction	N/A	N/A	2,000	2,000	19,000	26,533	7,533
Total, Capital Operating Expenses	N/A	N/A	**3,750**	**3,750**	**20,789**	**49,661**	**+28,872**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	1,750	1,750	1,789	14,128	+12,339
Replace DMO-2 Capability, LANL	13,000		0	0	0	4,000	+4,000
Material Intro Hood #1, LANL	5,000		0	0	0	5,000	+5,000
Material Intro Hood #2, LANL	5,000		0	0	0	0	+0
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**1,750**	**1,750**	**1,789**	**23,128**	**+21,339**

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A					+0
Down Blend Process Optimization , SRS	10,000		1,000	1,000	7,000	2,000	-5,000
Characterizaton and Storage Pad, SRS	19,500		1,000	1,000	12,000	6,500	-5,500
105-K Entry Control Facility Expansion, SRS	13,000		0	0	0	13,000	+13,000
Mobile Melt-Consolidate System, SRS	10,633		0	0	0	5,033	+5,033
Total, Minor Construction Projects	**N/A**	**N/A**	**2,000**	**2,000**	**19,000**	**26,533**	**+7,533**
Total, Capital Summary	**N/A**	**N/A**	**3,750**	**3,750**	**20,789**	**49,661**	**+28,872**

Outyears for Material Management and Minimization

	(Dollars in Thousands)				
	FY 2021 Estimate	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	11,868	5,909	1,951	1,994	0
Minor Construction	5,600	0	0	0	0
Total, Capital Operating Expenses	**17,468**	**5,909**	**1,951**	**1,994**	**0**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	1,868	1,909	1,951	1,994	N/A
Replace DMO-2 Capability, LANL	5,000	4,000	0	0	
Material Intro Hood #2, LANL	5,000	0	0	0	
Total, Capital Equipment (including MIE)	**11,868**	**5,909**	**1,951**	**1,994**	**0**
Minor Construction Projects (Total Estimated Cost (TEC)					
Total Minor Construction Projects (TEC <$5M)					
Mobile Melt-Consolidate System, SRS	5,600	0	0	0	0
Total, Minor Construction Projects	**5,600**	**0**	**0**	**0**	**0**
Total, Capital Summary	**17,468**	**5,909**	**1,951**	**1,994**	**0**

Global Material Security

Overview

Global Material Security (GMS) directly contributes to national security efforts to reduce global nuclear security threats. The GMS Program focuses on preventing terrorists and other actors from obtaining nuclear and radioactive material to use in an improvised nuclear device (IND) or a radiological dispersal device (RDD). GMS works with partner countries to improve the security of vulnerable materials and facilities and to improve partners' capacity to detect, disrupt, and investigate illicit trafficking of these materials. GMS promotes long-term sustainability of its capacity-building support by working with partners to develop their own regulations and inspections processes, training infrastructure, maintenance approaches, exercise and performance testing programs, life-cycle planning, and nuclear security culture. To enhance its reach and effectiveness, GMS provides technical and policy support to multilateral organizations, including the International Atomic Energy Agency (IAEA) and International Criminal Police Organization (INTERPOL). As part of an ongoing strategic analysis process, GMS is also exploring innovative approaches, technologies, and tools to adapt to emerging threats.

As a result of numerous project efforts that span multiple fiscal years, GMS routinely carries large uncosted balances tied to active contracts for a wide array of overseas projects. GMS requires all work to be fully completed and verified before funds are expended. In the past, the termination of some work and slowed project implementation also resulted in greater than normal uncosted balances that were not associated with contracts. Those funds have largely been re-distributed and expended to date. However, in accordance with Congressional and GAO guidance, GMS remains committed to reducing its uncosted balances and continues to factor this consideration into its budget planning.

GMS consists of three subprograms: International Nuclear Security, Radiological Security, and Nuclear Smuggling Detection and Deterrence.

Global Material Security
Funding

(Dollars in Thousands)

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Global Material Security				
International Nuclear Security	46,339	46,339	48,839	2,500
Radiological Security				
Domestic Radiological Security	110,433	127,433	90,513	-36,920
International Radiological Security	78,907	78,907	60,827	-18,080
Nuclear Smuggling Detection and Deterrence	154,429	154,429	142,171	-12,258
International Contributions (non-add)[a]	0	0	0	0
Total, Global Material Security	**390,108**	**407,108**	**342,350**	**-64,758**

Outyears for Global Material Security
Funding

(Dollars in Thousands)

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Global Material Security				
International Nuclear Security	50,391	51,449	52,529	53,632
Radiological Security				
Domestic Radiological Security	96,000	98,016	100,074	102,176
International Radiological Security	65,340	66,712	68,113	69,543
Nuclear Smuggling Detection and Deterrence	155,559	158,829	162,165	165,570
Total, Global Material Security	**367,290**	**375,006**	**382,881**	**390,921**

[a] The international contributions received by the GMS program shown in the FY 2018 Enacted column are a non-add to the FY 2018 Appropriation. The amount received in FY 2018 totaled $12,101,236 including $8,192,662 from Canada, $3,453,859 from the United Kingdom, $304,715 from Finland, and $150,000 from New Zealand.

Global Material Security
Explanation of Major Changes
(Dollars in Thousands)

	FY 2020 Request vs FY 2019 Enacted
Global Material Security:	
International Nuclear Security: The increase supports bilateral and regional workshops to mitigate insider and cyber security threats to nuclear and radiological material and facilities.	**+2,500**
Domestic Radiological Security: The decrease reflects a return to the baseline budget after a one-time increase in the FY 2019 Congressional appropriation to make procurements to secure cesium-based devices.	**-36,920**
International Radiological Security: The decrease reflects a return to the baseline budget after a one-time increase in the FY 2019 Congressional appropriation to make procurements to secure cesium-based devices and invest in physical protection upgrades for priority projects.	**-18,080**
Nuclear Smuggling Detection and Deterrence: The decrease reflects a one-time increase in the FY 2019 Congressional appropriation which accelerated FY 2020 counter nuclear smuggling efforts near unofficial border crossings, targeted operations along air traffic and unregulated maritime pathways, and with interior security services.	**-12,258**
Total, Global Material Security	**- 64,758**

Global Material Security
International Nuclear Security

Description

The mission of the International Nuclear Security (INS) subprogram is to lead U.S. international nuclear security efforts by working with partner countries, international organizations, and non-governmental organizations to protect nuclear material and nuclear facilities worldwide.

For more than 20 years, INS has leveraged the expertise of the U.S. National Laboratories to mitigate the risks of terrorists acquiring nuclear material. While these efforts have dramatically improved nuclear security around the world, gaps remain. Global expansion of the civilian nuclear fuel cycle, evolving adversary capabilities and tactics, and the availability of technologies to execute attacks presents a significant concern for global nuclear security.

INS is evolving along with these threats and risks. While highly enriched uranium and weapons-grade plutonium remain a top priority, INS is also concerned with other high-risk materials and the impacts of attacks on facilities that could adversely impact U.S. national security. INS is also examining emerging issues and technologies that could raise concerns or benefits for nuclear security in the future, and is developing innovative approaches to integrate these findings into partner country engagements.

Accordingly, INS works across the globe to secure:

- Nuclear weapons and components
- Weapons-usable nuclear materials
- Nuclear fuel cycle facilities
- Non-power reactors
- Materials in transit

Across all of these areas, INS employs a risk-informed approach to prioritize engagements with partner countries to identify and reduce threats and risks by enhancing or building effective and comprehensive nuclear security regimes with its partners. Effective and comprehensive nuclear security regimes must include laws, regulations, procedures, people, organizations, training, and technologies, all of which must be integrated with operations, safety, the public, and the international community.

Based on a careful assessment of threats and vulnerabilities, INS implements nuclear security upgrades in select partner countries. INS also assists partner countries with developing and implementing effective nuclear security regulations, training and educational programs, secure transportation, protective force capabilities, material accounting and measurement capabilities, cyber security programs, and strong nuclear security culture. INS also partners to develop nuclear security support centers that help maintain expertise and serve as resources for nuclear security capacity building.

INS leverages a variety of partnerships in pursuit of its mission, including partnerships with the IAEA, the World Institute for Nuclear Security, the Global Partnership against the Spread of Weapons and Materials of Mass Destruction, and several non-government organizations. Partnership with the IAEA is of key importance to ensure that global norms and standards are strong and reinforce the risk-reduction work done bilaterally. INS works with the IAEA on the development of nuclear security guidance documents, training, advisory missions, and technical meetings.

Highlights of the FY 2020 Budget Request

- Lead U.S. initiatives to mitigate insider threats, improve cyber security for nuclear facilities, and strengthen transportation security practices.
- Implement security upgrades at nuclear facilities in top 10 priority countries.
- Work with more than 35 countries to implement training, exercises, technology, and other tools necessary for effective and comprehensive nuclear security regimes, to include legislation, regulations and inspection programs.
- Develop approaches to integrate nuclear security during the design phase for new civilian nuclear energy systems.
- Partner with the IAEA to strengthen nuclear security guidance, training, advisory missions, educational programs, and subject matter expert assistance to build sustainable, effective global nuclear security.

International Nuclear Security

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
International Nuclear Security $46,339,000	**International Nuclear Security $48,839,000**	**International Nuclear Security +$2,500,000**
• Support courses at partner country nuclear security support centers. • Continue ongoing capacity building cooperation on the nuclear security recommendations in INFCIRC 225/Rev 5. • Continue to support the IAEA to further nuclear security initiatives, such as development of Nuclear Security Series documents, IPPAS missions, and strengthening of nuclear facility best practices, including cybersecurity best practices and capacity building with international partners. • Continue providing sustainability support to nuclear sites with nuclear security upgrades including support for training, procedures, maintenance, equipment repair, critical spare parts, performance testing, and other activities. • Continue support for enhanced nuclear security culture, promoting the importance of personal responsibility for nuclear security with bilateral partner countries and in cooperation with the IAEA.	• Lead high priority nuclear security initiatives to improve cyber security for nuclear facilities, mitigate insider threats, and improve transportation security practices with over 40 countries. • Provide upgrades to nuclear security facilities in 10 priority partner countries, based on thorough assessments of threats and vulnerabilities. • Engage with 35 countries to develop effective and comprehensive nuclear security regimes. • Develop approaches to integrate nuclear security during the design phase for new civilian nuclear energy systems. • Continue partnering with the IAEA to strengthen nuclear security guidance, training, advisory missions, educational programs, and subject matter expert assistance to build sustainable, effective global nuclear security.	• The increase supports bilateral and regional workshops to mitigate insider and cyber security threats.

Description

The Radiological Security (RS) subprogram supports U.S. national security and plays an important role in preventing radiological terrorism at home and abroad by working with partners to secure high risk radioactive materials that could be used in act of terrorism. Radioactive materials are used worldwide to diagnose and treat diseases such as cancer, sterilize medical instruments, and monitor the structural integrity of materials. These same radioactive materials, if not adequately protected, pose a risk to the safety and security of our Nation.

RS reduces the risk of radioactive materials falling into the wrong hands and being used in a radiological dispersal device (RDD)—better known as a "dirty bomb." An RDD could have devastating economic and psychological consequence for our country and create panic. To mitigate that risk, RS takes a "cradle-to-grave" approach to source security by addressing vulnerabilities during all phases of the life cycle of radioactive sources including production, transportation, use, and end-of-life management. RS leverages the unique technical capabilities of the Department of Energy National Laboratories to develop and implement sustainable security solutions that take into consideration the needs of radioactive source users. RS has developed an integrated and comprehensive approach to security by working closely with government partners, the response community, and the private sector.

To mitigate the risk of radiological terrorism, RS employs a three-pronged strategy, which includes **protecting** high-activity sources, **removing** disused or orphaned sources, and **reducing** the reliance on radioactive sources to achieve permanent risk reduction.

RS protects high-activity radioactive materials located at vulnerable locations (e.g. hospitals, universities, etc.) in the United States and in other high priority countries worldwide. RS works in close cooperation with national, regional, and local partners and the IAEA. RS implements state-of-the art security solutions to protect radioactive material at volunteer sites. Additionally, RS deploys mobile source transit systems for sources used in the well-logging and radiography industries.

RS addresses the vulnerabilities of disused or orphaned radioactive sources by removing, consolidating into secure storage and, if possible, disposing of those sources. On a case-by-case basis, RS also repatriates high-risk U.S.-origin sources.

RS reduces the reliance on radioactive sources by encouraging the transition away from radioactive sources to more secure alternatives. This permanently reduces risk either by eliminating high activity sources or by obviating the need to introduce sources in the first place. Technologies for alternatives are maturing, and new technologies are entering the market. RS works to disseminate information on these alternative technologies and provides cost-sharing incentives to volunteer organizations willing to transition away from cesium irradiators to non-radioisotopic technologies. RS is on track to achieve its goal of voluntarily eliminating cesium-137 blood irradiators in the United States by 2027, as outlined in the FY 2019 National Defense Authorization Act. As the program is voluntary, RS continues to conduct outreach and provide cost-sharing incentives to encourage participation.

In 2020, RS will continue prioritizing its efforts to protect, remove, and reduce high-activity cesium-137 worldwide through its Global Cesium Security Initiative. Additionally, RS will continue prioritizing radiological security enhancements in major cities where the effects of radiological terrorism would be most acute through the program's domestic 2020 Cities Initiative. Under this initiative, RS will work to secure the most at-risk radioactive material in U.S. high-threat urban areas, enhance local law enforcement response, and encourage the use of technologies that do not pose a dirty bomb risk.

Highlights of the FY 2020 Budget Request

- Maintain focus on securing cesium-based devices under the program's 2020 Cities Initiative and the Global Cesium Security Initiative; maintain focus on enhancing law enforcement response and encouraging alternative technologies under 2020 Cities Initiative.
- Secure an additional 80 buildings with high-priority radioactive sources (40 domestic sites and 40 international sites).
- Recover an additional 1,100 disused and unwanted radioactive sealed sources from locations throughout the United States.

- Replace 80 devices that use high-activity radioactive sources with non-radioisotopic alternative technologies (70 replacements in the United States and 10 internationally). Expand education and outreach to encourage a broader adoption of technologies that do not use high activity radioactive sources.

Radiological Security

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Radiological Security $206,340,000	**Radiological Security $151,340,000**	**Radiological Security -$55,000,000**
Domestic Radiological Security $127,433,000 **International Radiological Security $78,907,000**	**Domestic Radiological Security $90,513,000** **International Radiological Security $60,827,000**	**Domestic Radiological Security -$36,920,000** **International Radiological Security -$18,080,000**
• Under the Global Cesium Security Initiative, focus on securing and eliminating cesium-based devices in priority countries worldwide through tailored protect, remove or reduce strategies. • Replace 44 cesium devices in the U.S., which use high-activity radioactive sources, with those that use alternative non-radioisotopic technologies. • Under the 2020 Cities Initiative, secure by 2020 the remaining buildings with high risk quantities of cesium-137 and cobalt-60 in major metropolitan areas of the United States. • Expand education and outreach to encourage a broader adoption of alternative non-radioisotopic technologies. • Continue to support the deployment of mobile source tracking systems for field deployed sources. • Secure 100 additional buildings that contain high priority radiological material including 55 buildings in the United States and 45 buildings in other high priority countries. • Continue to collaborate with industry on “security by design” to make source-based devices inherently more secure in the manufacturing process. • Work with appropriate authorities and sites to sustain previously installed security upgrades domestically and internationally. • Remove an additional 1,100 excess and unwanted sealed sources from locations throughout the United States.	• Under the Global Cesium Security Initiative, focus on securing and eliminating cesium-based devices in priority countries worldwide through tailored protect, remove, or reduce strategies. • Replace 80 devices that use high-activity radioactive sources with non-radioisotopic alternative technologies (70 replacements domestically and 10 internationally). • Expand education and outreach to encourage a broader adoption of technologies that do not use high activity radioactive sources. • Under the 2020 Cities Initiative, secure the remaining buildings with high risk quantities of cesium-137 and cobalt-60 in major metropolitan areas of the United States. • Deploy the mobile source tracking systems for use on field-deployed sources. • Secure an additional 80 buildings with high-priority radioactive sources (40 domestic sites and 40 international sites). • Continue to collaborate with industry on “security by design” to make source-based devices and facilities inherently more secure in the manufacturing process. • Work with appropriate authorities and sites to sustain previously installed security upgrades domestically and internationally. • Continue the removal of an additional 1,100 excess and unwanted sealed sources from locations throughout the United States.	• The decrease reflects a return to the baseline budget after a one-time increase in the FY 2019 Congressional appropriation to make procurements to secure cesium-based devices and invest in physical protection upgrades for priority projects.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
• Recover and dispose or securely store disused or orphaned radioactive sources in other countries. • Domestically, in the top 20 highest priority areas, increase coordination between sites that have high-priority radiological material and local law enforcement agencies responsible for protecting those sites.	• Recover and dispose or securely store disused or orphaned radioactive sources in other countries. • Domestically, in the top 20 highest priority areas, increase coordination between sites that have high-priority radioactive material and local law enforcement agencies responsible for protecting those sites.	

Global Material Security
Nuclear Smuggling Detection and Deterrence

Description

The Nuclear Smuggling Detection and Deterrence (NSDD) subprogram works with partners to detect, disrupt, and investigate nuclear and radiological smuggling. NSDD provides partners with tailored radiation detection systems based on assessments of high risk smuggling pathways and operational environments. NSDD partners include international law enforcement, intelligence, and border security. To facilitate long term use of systems, NSDD works with partners to indigenize capabilities in the areas of operation and management, training, and maintenance. NSDD coordinates closely with other U.S. Government agencies (e.g. Departments of Homeland Security, State, Defense, and Justice) to maximize the impact of U.S. Government resources, and collaborates with international organizations such as INTERPOL, IAEA, and the Global Initiative to Combat Nuclear Terrorism (GICNT) to promote consistency in global efforts to counter nuclear smuggling.

Going forward, NSDD will continue to address remaining gaps and respond to emerging threats by providing detection capability to partner country mobile detection teams; patrol and interdiction teams along vulnerable areas between official crossing points (i.e. green borders); intelligence and law enforcement agencies responding to information alerts and investigations; security agencies at high risk airports; and in support of small vessel interdiction and inspection in the Indian Ocean. NSDD will conduct operator trainings; technical training on equipment maintenance repair; and topical workshops, drills, exercises, and similar events designed to test, evaluate, and improve system performance and effectiveness.

NSDD will continue to work to transition responsibility for operation and maintenance to host country partner organizations and maintain existing relationships with partners, sharing best practices related to operation and maintenance.

NSDD will continue efforts to strengthen foreign partner nuclear forensics analytical capability and best practices, to give partners the tools to identify interdicted materials. These tools are integral to a robust program to deter illicit trafficking. NSDD will also work multilaterally with the IAEA and the GICNT on the development of international guidance documents and events to advance partner country technical expertise in nuclear forensics.

Highlights of the FY 2020 Budget Request

- Deploy mobile detection systems and equip priority border crossing points with radiation detection systems, and provide associated training and maintenance support to help counter the threat of illicit trafficking of special nuclear material. The bulk of these systems will be deployed in countries in Eastern Europe, Central Asia, and Africa.
- Deploy flexible radiation detection capabilities at strategic airports in the Middle East, the Caucasus, and Southeast Asia. These systems perform targeted screening of commercial air traffic arriving from countries of concern.
- Strengthen radiation detection and interdiction capabilities of green border security teams and improve surveillance capabilities near sensitive and high risk areas on green borders.
- Enhance the counter nuclear smuggling capability of interior law enforcement and intelligence agencies responding to information alerts and investigations.
- Deploy identification, inspection, and radiation detection tools for interdiction of small maritime vessels in the Indian Ocean and Arabian Sea.
- Build capacity and transfer responsibility for training and maintenance of radiation detection systems at 65 international locations, bringing the cumulative number of indigenously sustained systems to 786.

Nuclear Smuggling Detection and Deterrence

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Nuclear Smuggling Detection and Deterrence $154,429,000	**Nuclear Smuggling Detection and Deterrence $142,171,000**	**Nuclear Smuggling Detection and Deterrence -$12,258,000**
• Provide ten additional mobile and man-portable systems for use by law enforcement at internal checkpoints in countries along known smuggling routes. • Establish ten new bilateral partner country engagements to strengthen nuclear forensics capabilities, bringing total nuclear forensics engagement count to 39 partner countries. • Equip an additional 28 official crossing points to close key gaps in the global nuclear detection architecture. • Provide flexible radiation detection capabilities for targeted screening at high-priority airports in the Middle East, the Caucasus, and Southeast Asia. • Continue connecting radiation detection sites to national communications systems in six countries. • Continue to support capacity building activities in countries where systems have been installed but are not indigenously sustained. • Transition 57 radiation detection systems to indigenous sustainment. • Maintain engagements to encourage continued commitment, maintain visibility, and share best practices. • Conduct approximately 50 events, workshops, or exercises to advance partner country capabilities in radiation detection, equipment maintenance, and forensics.	• Provide 28 additional mobile and man-portable systems for use at internal checkpoints in countries along known smuggling routes. • Strengthen radiation detection and interdiction capabilities of green border security teams and improve surveillance capabilities near sensitive and high risk areas on green borders. • Provide enhanced capabilities to interior law enforcement and intelligence agencies responding to counter smuggling information alerts and investigations. • Provide radiation detection capabilities for targeted screening at high-risk airports in the Middle East, the Caucasus, and Southeast Asia. • Provide identification, inspection, and radiation detection tools for interdiction of small maritime vessels in the Indian Ocean and the Arabian Sea. • Establish five new bilateral partner country engagements to strengthen nuclear forensics capabilities, bringing total nuclear forensics engagement count to 44 partner countries. • Equip an additional 27 official crossing points to close key gaps in the global nuclear detection architecture in eight countries and continue connecting radiation detection sites to national communications systems in three countries. • Continue to support capacity building activities in prioritized countries where systems have been installed, but are not indigenously sustained. • Transition 65 radiation detection systems to indigenous sustainment and maintain engagements to encourage continued	• The decrease reflects a one-time increase in the FY 2019 Congressional appropriation which accelerated FY 2020 counter nuclear smuggling efforts near unofficial border crossings, targeted operations along air traffic and unregulated maritime pathways, and with interior security services.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
	commitment, maintain visibility, and share best practices. • Conduct approximately 60 events, workshops, or exercises to advance partner country capabilities in radiation detection, equipment maintenance, and forensics.	

Global Material Security
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	1,901	1,901	1,943	1,986	43
Minor Construction	N/A	N/A	0	0	0	0	0
Total, Capital Operating Expenses	N/A	N/A	**1,901**	**1,901**	**1,943**	**1,986**	**+43**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	1,901	1,901	1,943	1,986	+43
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**1,901**	**1,901**	**1,943**	**1,986**	**+43**

Outyears for Global Material Security

(Dollars in Thousands)

	FY 2021 Estimate	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	2,030	2,075	2,121	2,168	0
Minor Construction	0	0	0	0	0
Total, Capital Operating Expenses	**2,030**	**2,075**	**2,121**	**2,168**	**0**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	2,030	2,075	2,121	2,168	N/A
Total, Capital Equipment (including MIE)	**2,030**	**2,075**	**2,121**	**2,168**	**0**

Nonproliferation and Arms Control

Overview

The Nonproliferation and Arms Control (NPAC) program enhances U.S. national security and facilitates legitimate civil nuclear cooperation by reducing global nuclear proliferation threats. NPAC applies the unique technical and policy expertise that resides in NNSA to support U.S. nonproliferation and arms control objectives to prevent proliferation, ensure peaceful nuclear uses, and enable verifiable nuclear reductions. The NPAC program pursues these objectives through four subprograms: (1) International Nuclear Safeguards; (2) Nuclear Export Controls; (3) Nuclear Verification; and (4) Nonproliferation Policy, that respectively: strengthen international nuclear safeguards; control the proliferation of nuclear material, equipment, technology, and expertise; verify nuclear reductions and compliance with nonproliferation and arms control treaties and agreements; and develop programs and strategies to anticipate and address nuclear nonproliferation and arms control challenges and opportunities. Across these programmatic functions, NPAC continues to play a leading role in addressing current threats while also drawing upon its expertise to anticipate emerging nonproliferation challenges and develop technical approaches and potential policy solutions.

Nonproliferation and Arms Control
Funding

(Dollars in Thousands)

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Nonproliferation and Arms Control				
International Nuclear Safeguards	54,313	52,429	55,962	3,533
Nuclear Export Controls	35,437	34,134	35,500	1,366
Nuclear Verification	33,482	32,273	33,208	935
Nonproliferation Policy	11,471	10,867	12,597	1,730
Total, Nonproliferation and Arms Control	**134,703**	**129,703**	**137,267**	**+7,564**

Outyears for Nonproliferation and Arms Control
Funding

(Dollars in Thousands)

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Nonproliferation and Arms Control				
International Nuclear Safeguards	56,551	57,696	58,865	60,060
Nuclear Export Controls	35,869	36,594	37,337	38,093
Nuclear Verification	33,547	34,228	34,918	35,626
Nonproliferation Policy	12,733	12,990	13,254	13,522
Total, Nonproliferation and Arms Control	**138,700**	**141,508**	**144,374**	**147,301**

Nonproliferation and Arms Control
Explanation of Major Changes
(Dollars in Thousands)

	FY 2020 Request vs FY 2019 Enacted
Nonproliferation and Arms Control	
International Nuclear Safeguards: The increase in funding establishes and maintains a nonproliferation enrichment testing and training platform that develops and tests nonproliferation technologies and approaches in cooperation with International Atomic Energy Agency (IAEA) and select foreign partners.	**+3,533**
Nuclear Export Controls: The increase in funding will advance and complete development of the new Export Compliance Assistance Program (ECAP) to deploy export control training across DOE and NNSA facilities targeted at the Federal workforce and coordinated with the local Export Control Compliance Officers at each National Laboratory.	**+1,366**
Nuclear Verification: The increase in funding will support the development of U.S. field verification capability to confirm whether a suspect event is an underground nuclear explosion, and if so, determine and assess key event parameters.	**+935**
Nonproliferation Policy: The increase in funding supports the implementation of the new 10 CFR Part 810 civil penalty authority.	**+1,730**
Total, Nonproliferation and Arms Control	**+7,564**

Nonproliferation and Arms Control
International Nuclear Safeguards

Description

The International Nuclear Safeguards (NS) subprogram strengthens the international nuclear safeguards regime and the IAEA's ability to verify peaceful uses of nuclear materials and facilities and detect non-compliance. NS manages programs to strengthen the technology and human capital base to support safeguards, oversees activities of the U.S. Support Program (USSP) to IAEA Safeguards, collaborates with the IAEA and other partners to enhance the implementation of safeguards norms and best practices, oversees implementation of U.S. Additional Protocol (AP) and Voluntary Offer Agreement (VOA) safeguards requirements and activities at DOE sites and facilities, and assesses the physical protection of U.S.-obligated nuclear materials overseas. NS also provides support to the IAEA to monitor Iran's compliance with applicable United Nations Security Council resolutions.

Highlights of the FY 2020 Budget Request

- Implement ongoing DOE/NNSA statutory and treaty/agreement obligations and authorities, including: (a) Physical security assessment visits for U.S.-obligated materials at foreign facilities; (b) Implementing U.S. safeguards obligations under the U.S. Voluntary Offer Agreement/Additional Protocol; and (c) International safeguards training.
- Support effective IAEA safeguards of Iran's nuclear program in accordance with applicable United Nations Security Council resolutions.
- Initiate development of a nonproliferation enrichment testing and training platform for the development and testing of technologies approaches for transfer to the IAEA.
- Strengthen the U.S. safeguards technology and human capital base to meet projected U.S. and IAEA resource requirements.
- Promote universal adherence to the international standard of IAEA Safeguards Agreements: a Comprehensive Safeguards Agreement, an Additional Protocol, and a modified Small Quantities Protocol (where applicable).
- Field test and finalize advanced safeguards approaches for the IAEA for Gas Centrifuge Enrichment Plants (GCEPs).
- Facilitate legitimate nuclear cooperation and minimize the proliferation risks of the expansion of civil nuclear power through capacity building in nuclear safeguards.

International Nuclear Safeguards

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
International Nuclear Safeguards $52,429,000	**International Nuclear Safeguards $55,962,000**	**International Nuclear Safeguards +$3,533,000**
• Develop safeguards technologies and approaches to: (1) address electrochemical processing based on R&D conducted with international partners; (2) improve efficiencies of safeguards; and (3) enhance inspector capabilities in high-priority areas such as enhanced in-field collection analysis and detection of undeclared activities at declared facilities. • Transfer five safeguards tools to foreign partners or international organizations to meet identified safeguards deficiencies. • Continue field testing of advanced safeguards approaches for GCEPs for transfer to the IAEA. • Improve safeguards concepts and approaches for new facilities and fuel cycles; strengthen Safeguards by Design approaches directly with designers and nuclear industry; analyze the implications of emerging technology to international safeguards applications. • Develop implementation plans for a safeguards experimental laboratory at a U.S. nuclear facility to serve as a safeguards training and education center for U.S. Government staff and graduate students, and a proving ground for nascent safeguards technologies and concepts. • Partner with the IAEA and advanced nuclear partners to field test advanced safeguards technologies to enhance state declarations and optimize safeguards resource allocations. • Promote universal adherence to IAEA safeguards agreements and modify Small Quantities Protocols (where applicable), and good practices in safeguards implementation by providing	• Continue developing safeguards technologies and approaches to: (1) address electrochemical processing based on R&D conducted with international partners; (2) improve efficiencies of safeguards; and (3) enhance inspector capabilities in high-priority areas such as enhanced in-field collection analysis and detection of undeclared activities. • Transfer five safeguards tools to foreign partners or international organizations to meet identified safeguards deficiencies. • Initiate development of a nonproliferation enrichment testing and training platform for the development and testing of technologies approaches for transfer to the IAEA. • Improve safeguards concepts and approaches for new facilities and fuel cycles; strengthen Safeguards by Design approaches directly with designers and nuclear industry; analyze the implications of emerging technology to international safeguards applications. • Enhance partnerships with the IAEA and advanced nuclear partners to field test advanced safeguards technologies to enhance state declarations and optimize safeguards resource allocations. • Expand and enhance efforts to promote universal adherence to IAEA safeguards agreements and good practices in safeguards implementation by providing customized training and outreach to more than 50 countries.	• The increase in funding establishes and maintains a nonproliferation enrichment testing and training platform to develop and test nonproliferation technologies and approaches for transfer to the IAEA and in collaboration with select foreign partners.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
customized training and outreach to more than 45 countries. • Maintain support for accredited IAEA Network of Analytical Laboratories at U.S. National Laboratories. • Maintain qualified and knowledgeable safeguards staff at the U.S. National Laboratories and IAEA through early and mid-career safeguards positions at U.S. National Laboratories, and safeguards training courses. • Increase availability of reference materials for U.S. and IAEA analytical services for evaluations of safeguards samples. • Cooperate with Department of State, Department of Defense, the Nuclear Regulatory Commission and the IAEA to develop guidelines and policies to help prioritize the allocation of safeguards resources in ways that will strengthen the IAEA's ability to detect, deter, and investigate undeclared nuclear activities. • Continue to provide, on an as requested basis, technical and technology assistance to the IAEA to monitor Iran's nuclear program. • Implement U.S.-IAEA safeguards obligations at DOE facilities including annual reporting requirements as required by U.S. law and treaty obligations. • Lead six to eight U.S. Government assessments of the physical protection of U.S.-obligated nuclear materials at foreign facilities.	• Maintain support for accredited IAEA Network of Analytical Laboratories at U.S. National Laboratories. • Maintain qualified and knowledgeable safeguards staff at the U.S. National Laboratories and IAEA through maintenance of early and mid-career safeguards positions at U.S. National Laboratories and safeguards training courses. • Cooperate with Department of State, Department of Defense, the Nuclear Regulatory Commission and the IAEA to develop guidelines and policies to help prioritize the allocation of safeguards resources in ways that will strengthen the IAEA's ability to detect, deter, and investigate undeclared nuclear activities. • Continue to provide, on an as-requested basis, technical and technology assistance to the IAEA to monitor Iran's nuclear program, and to prepare for possible involvement in denuclearization activities in DPRK. • Implement U.S.-IAEA safeguards obligations at DOE facilities including annual reporting requirements as required by U.S. law and treaty obligations. • Lead six to eight U.S. Government assessments of the physical protection of U.S.-obligated nuclear materials at foreign facilities.	

Nonproliferation and Arms Control
Nuclear Export Controls

Description

The Nuclear Export Controls (NC) subprogram facilitates peaceful nuclear cooperation by strengthening domestic and global capacity to detect and prevent the illicit transfer of nuclear and dual-use materials, equipment, and technology. NC implements and oversees programs that: provide technical and end-user evaluations of U.S. export license applications; provide technical support that enhances the U.S. Government's capacity to detect and interdict illicit nuclear and dual-use commodity technology transfers to foreign programs of concern; provide technical support to the multilateral nonproliferation export control regimes; and strengthen foreign partner national systems of export control consistent with U.S. policy and the multilateral supplier regimes.

Highlights of the FY 2020 Budget Request

- Implement ongoing DOE/NNSA statutory and treaty/agreement obligations and authorities, including U.S. nonproliferation and export control activities (export license reviews and interdiction case technical reviews).
- At the request of the Department of State, support effective IAEA export control activities with Iran in accordance with applicable United Nations Security Council resolutions.
- Engage approximately 35 foreign partners to strengthen national systems of export control and prevent illicit trafficking in nuclear and dual-use commodities through export licensing and enforcement training programs.
- Facilitate legitimate nuclear cooperation and minimize the proliferation risks of the expansion of civil nuclear power through international capacity-building and engagement in export controls.
- Provide nonproliferation assessments of emerging nuclear technologies and other emerging strategic risks and challenges to anticipate and prevent nuclear technological surprises.
- Complete development of the new Export Compliance Assistance Program (ECAP) to deploy export control awareness training across DOE and NNSA facilities.

Nuclear Export Controls

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Nuclear Export Controls $34,134,000	**Nuclear Export Controls $35,500,000**	**Nuclear Export Controls +$1,366,000**
• Engage approximately 35 foreign partners on a bilateral and regional basis to strengthen their national export control systems to help prevent illicit trafficking in nuclear and WMD-related dual-use materials, commodities and technology; exchange export control best practices; and build the capacity of key countries to serve as trainers for their region. • Train U.S. export enforcement officials in partnership with the Export Enforcement Coordination Center (E2C2) to familiarize them with controlled nuclear and dual-use material, equipment, and technology, which could be used for WMD purposes, and collaborate with the Custom and Border Protection (CBP's) National Targeting Center. E2C2 coordinates and deconflicts enforcement activities among federal agencies. • Perform approximately 6,000 technical reviews of U.S. export licenses for nuclear and dual-use commodities, continue to provide state-of-the-art technology assessments to the multilateral control regimes, and provide training courses for DOE and other U.S. Government officials regarding evolving export controlled technologies and proliferation concerns. • Support the U.S. Government enforcement community by providing approximately 3,000 technical analyses for interdiction cases per year and unique analytical products regarding proliferation trends. • Maintain and support information technology systems to support export control licensing,	• Engage approximately 35 foreign partners on a bilateral and regional basis to strengthen their national export control systems to help prevent illicit trafficking in nuclear and WMD-related materials, commodities and technology; exchange export control best practices; and build the capacity of key countries to serve as trainers for their region. • Train U.S. export enforcement officials in partnership with the E2C2 to familiarize them with controlled nuclear and dual-use material, equipment, and technology, which could be used for WMD purposes, and collaborate with the CBP's National Targeting Center. E2C2 coordinates and deconflicts enforcement activities among federal agencies. • Perform approximately 6,000 technical reviews of U.S. export licenses for nuclear and dual-use commodities, continue to provide state-of-the-art technology assessments to the multilateral control regimes, and provide training courses for DOE and other U.S. Government officials regarding evolving export controlled technologies and proliferation concerns. • Support the U.S. Government enforcement community by providing approximately 3,000 technical analyses for interdiction cases per year and unique analytical products regarding proliferation trends. • Maintain and support information technology systems to support export control licensing, interdiction analysis, and the multilateral nonproliferation export control regimes.	• The increase in funding will advance and complete development of the new Export Compliance Assistance Program (ECAP) to deploy export control awareness training across DOE and NNSA facilities targeted at the Federal workforce, and coordinated with the local Export Control Compliance Officers at each National Laboratory.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
interdiction analysis, and the multilateral nonproliferation export control regimes. • Continue to provide technical reviews of proposed transfers of items, materials, goods, and technology to Iran in accordance with applicable United Nations Security Council resolutions. • Develop the Export Compliance Assistance Program (ECAP), a new initiative to deploy export control awareness training across DOE and NNSA facilities, targeted at the Federal workforce and coordinated with the local Export Control Compliance Officers at each National Laboratory.	• In coordination with Department of State, provide technical reviews of proposed transfers of items, materials, goods, and technology to Iran in accordance with applicable United Nations Security Council resolutions. • Complete development of the new ECAP to deploy export control awareness training across DOE and NNSA facilities targeted at the Federal workforce, and coordinated with the local Export Control Compliance Officers at each National Laboratory.	

Nonproliferation and Arms Control
Nuclear Verification

Description

The Nuclear Verification (NV) subprogram reduces proliferation concerns by enabling verifiable arms reductions, including through support for negotiation and implementation of U.S. nonproliferation and arms control treaties and agreements. The NV subprogram conducts applied technology development, testing, evaluation, and deployment of monitoring technologies and develops verification approaches that are informed through analysis of the potential impacts of initiatives on DOE and NNSA National Laboratories, Plants and Sites. Additionally, the NV subprogram maintains technical readiness to negotiate and implement future nuclear fuel cycle transparency agreements and conducts U.S.-led missions to monitor and verify, dismantle, and disable proliferant nuclear fuel cycle programs around the world. The subprogram performs monitoring activities under existing agreements and supports U.S. Government review of other countries' compliance with their treaty and agreement obligations. The subprogram also contributes to U.S. policy development for treaty and agreement implementation while ensuring U.S. requirements for maintaining a safe, secure, and reliable nuclear weapons stockpile are met.

Highlights of the FY 2020 Budget Request

- Implement ongoing DOE/NNSA treaty/agreement obligations and authorities, including implementing DOE obligations under the Plutonium Production Reactor Agreement (PPRA), Chemical Weapons Convention, and the Treaty on the Non-Proliferation of Nuclear Weapons (NPT).
- Support compliance analysis and implementation of the New START Treaty and the Open Skies Treaty.
- Maintain technical and manpower readiness for future U.S.-led monitoring and verification of denuclearization activities.
- Develop a U.S. field verification capability to confirm whether a suspect event is an underground nuclear explosion, and if so to determine and assess key event parameters.

Nuclear Verification

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Nuclear Verification $32,273,000	**Nuclear Verification $33,208,000**	**Nuclear Verification +$935,000**
• Support U.S. implementation, compliance analyses, and policy development for the New START Treaty and the Open Skies Treaty, and ensure DOE/NNSA equities and interests are protected. • Under the terms of the PPRA, conduct three monitoring visits in Russia to ensure that Russian plutonium oxide is stored securely and that shutdown Russian plutonium production reactors remain in a non-operational status, and host Russian monitors on annual PPRA monitoring visit to shutdown U.S. plutonium production reactors at the Savannah River and Hanford Sites. • Continue national security and nuclear nonproliferation activities related to nuclear testing limitations, including those that support monitoring and verification capabilities under the Comprehensive Nuclear-Test-Ban Treaty (CTBTO) and its International Monitoring System to complement and strengthen U.S. nuclear explosion monitoring and verification capabilities. • Provide seismic monitoring capacity-building training under the Seismic Cooperation Program to foreign partner institutions to enhance their abilities to detect and analyze possible nuclear explosions, as well as mitigate geophysical hazards. • Develop, test, and evaluate verification procedures and technologies; train and exercise specialized U.S. verification teams; and conduct operations planning to maintain short-notice readiness for U.S.-led monitoring and verification of nuclear weapons material production	• Support U.S. implementation and compliance analyses and policy development for the New START Treaty and the Open Skies Treaty, and ensure DOE/NNSA equities and interests are protected. • Under the terms of the PPRA, conduct up to three monitoring visits in Russia to ensure that Russian plutonium oxide is stored securely and that shutdown Russian plutonium production reactors remain in a non-operational status, and host Russian monitors on annual PPRA monitoring visit to shutdown U.S. plutonium production reactors at the Savannah River and Hanford Sites. • Continue national security and nuclear nonproliferation activities related to nuclear testing limitations, including those that support monitoring and verification capabilities under the CTBTO, specifically its International Monitoring System and International Data Center that complement and strengthen U.S. nuclear explosion monitoring and verification capabilities. • Provide seismic monitoring capacity-building training under the Seismic Cooperation Program to foreign partner institutions to enhance their abilities to detect and analyze possible nuclear explosions, as well as mitigate geophysical hazards. • Develop, test, and evaluate verification procedures and technologies; train and exercise specialized U.S. verification teams; and conduct operations planning to maintain short-notice readiness for U.S.-led monitoring and verification	• The increase in funding will support development of a U.S. field verification capability to confirm whether a suspect event is an underground nuclear explosion, and if so to determine and assess key event parameters.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
programs and associated denuclearization efforts around the world. • Develop, test, and evaluate warhead and weapons material monitoring and verification procedures and technologies, and support international technical engagements to address long-term verification challenges. • Collaborate with the United Kingdom under the 1958 Mutual Defense Agreement and with other partner countries to develop potential common approaches to nuclear verification issues. • Implement U.S. and DOE legal obligations under the Chemical Weapons Convention, including maintaining accreditation of the Organization for the Prohibition of Chemical Weapons (OPCW) laboratory at Lawrence Livermore National Laboratory (LLNL).	of nuclear weapons material production programs and associated denuclearization efforts around the world. • Develop, test, and evaluate warhead and weapons material monitoring and verification procedures and technologies, and support international technical engagements to address long-term verification challenges. • Collaborate with the United Kingdom under the 1958 Mutual Defense Agreement and with other partner countries to develop potential common approaches to nuclear verification issues. • Implement U.S. and DOE legal obligations under the Chemical Weapons Convention, including maintaining accreditation of the Organization for the Prohibition of Chemical Weapons (OPCW) laboratory at LLNL. • Develop a U.S. field verification capability to confirm whether a suspect event is an underground nuclear explosion, and if so to determine and assess key event parameters.	

Nonproliferation and Arms Control
Nonproliferation Policy

Description

The Nonproliferation Policy (NP) subprogram continues its longstanding role in developing and implementing programmatic efforts that anticipate and address enduring and emerging nuclear nonproliferation challenges and opportunities. NP continues to serve as the DOE/NNSA lead in supporting the negotiation and implementation of nonproliferation agreements and requirements set forth in the Atomic Energy Act of 1954, as amended, and stemming from national nonproliferation initiatives, agreements, and treaties, including the Nuclear Non-Proliferation Treaty. In addition, the NP subprogram continues to lead efforts to develop DOE/NNSA nonproliferation policy guidance on nuclear technology transfer and nuclear fuel cycle issues, undertakes activities to improve and update multilateral nuclear supplier arrangements, and identifies supplier vulnerabilities and potential gaps in supplier arrangements, including specific analysis and implementation of 10 CFR Part 810 (Part 810). The Part 810 regulation implements section 57 b (2) of the Atomic Energy Act of 1954, as amended, and controls the export of unclassified nuclear technology and assistance. The NP subprogram also supports a subprogram focused on reducing the danger of nuclear war and preventing the proliferation of nuclear weapons in critical regions, and undertakes studies and analyses focused on enduring and evolving proliferation challenges, supporting DOE/NNSA efforts to anticipate nuclear surprises on the horizon and evolve programmatic responses accordingly.

Highlights of the FY 2020 Budget Request

- Implement ongoing DOE/NNSA statutory obligations and authorities, including: U.S. nonproliferation and export control activities (123 Agreements, and 10 CFR Part 810 authorizations)
- Provide technical leadership as part of the U.S. delegation in the Nuclear Suppliers Group (NSG) through the provision of technical expertise to ensure NSG controls keep pace with technological, industry, and proliferation developments.
- Develop technical-based policy solutions that support the implementation of high-level Administration initiatives that address pressing proliferation concerns, including the effective implementation of the Nuclear Non-Proliferation Treaty and related elements of the nonproliferation regime.
- Facilitate legitimate nuclear cooperation and minimize the proliferation risks of the expansion of civil nuclear power through international outreach.
- Provide nonproliferation assessments of emerging nuclear technologies and other emerging strategic risks and challenges.
- Implement the new 10 CFR Part 810 civil penalty authority.

Nonproliferation Policy

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Nonproliferation Policy $10,867,000	**Nonproliferation Policy $12,597,000**	**Nonproliferation Policy $1,730,000**
• Provide technical assistance to the negotiation of potential Section 123 Agreements for Cooperation and their corresponding administrative arrangements. • Conduct analyses of accountancy information in support of the implementation of twenty three 123 Agreements. • Develop technical elements of the Nuclear Proliferation Assessment Statement that is submitted by the President along with each new 123 Agreement for congressional review. • Lead efforts to implement the U.S.-Republic of Korea 123 Agreement under the High Level Bilateral Commission's Nuclear Exports and Export Control Cooperation Working Group. • Support technical assessments of the IAEA Technical Cooperation projects. • Work with the NSG to strengthen controls on nuclear exports, including amendments of the NSG Guidelines and control lists, consistent with technology and commercial advancements and proliferation trends. • Support the NSG Consultative Group Chair's implementation and industry outreach agenda through sustained dialog with industry, events, and targeted guidance products. • Conclude work on and deploy version 1.0 of the NSG Information Sharing System (NISS) Web Application. Launch development of the NISS Web and Mobile Applications, versions 1.1 and 1.0. • Process 40-50 Part 810 specific authorization applications and requests for amendments,	• Process 40-50 Part 810 specific authorization applications and requests for amendments, including end-use and technical reviews. Review specific authorization reports and notifications for compliance with Part 810 and the scope of the existing license. • Review hundreds of Part 810 general authorization reports for compliance with Part 810 regulations and respond to requests for determination. • Continue Part 810 Process Improvement procedures, focusing on expanding external outreach and reducing processing times. • Conduct Track 1.5 engagements with India, Pakistan, Saudi Arabia, Egypt, Burma, and China, to reduce the danger of nuclear war and discourage the spread of nuclear weapons in critical regions. • Grow South Asia-focused social media and web-based projects to promote U.S. interests in the region. • Continue work with NSG to strengthen controls on nuclear exports, including amendments of the NSG Guidelines and control lists, consistent with advancements in the technology, commercial, and proliferation domains. • Launch a U.S.-led advanced nuclear technology review of the NSG control lists. • Expand NSG industry outreach activities to establish a consistent dialog with industry on the impacts of technological and commercial developments on the NSG Guidelines.	• The increase in funding supports the implementation of the new 10 CFR Part 810 civil penalty authority.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
including end-use and technical reviews. Review specific authorization reports and notifications for compliance with Part 810 and the scope of the existing license. • Review hundreds of Part 810 general authorization reports for compliance with Part 810 regulations and respond to requests for determination. • Continue to develop the e-810 system for online submission and review of Part 810 requests and reports. • Continue Part 810 Process Improvement procedures, focusing on expanding external outreach and reducing processing times. • Conduct analyses of the impact of NPT-related developments on U.S .nonproliferation interests, promote DOE/NNSA interests in NPT, and support U.S. deliverables for the 2020 NPT Review Conference and 50th Anniversary of the NPT entry into force. • Analyze impacts to DOE/NNSA complex of a potential Fissile Material Cut-off Treaty verification regime. • Conduct Track 1.5 engagements with India, Pakistan, Saudi Arabia, and Burma, to reduce the danger of nuclear war and discourage the spread of nuclear weapons in critical regions. • Grow South Asia-focused social media and web-based projects to promote U.S. interests in the region. • Conduct long-term analyses of evolving and emerging proliferation threats and their implications for the DNN mission.	• Conclude work on the NISS Web and Mobile Applications, versions 1.1 and 1.0. • Conduct analyses of the impact of NPT-related developments on U.S. nonproliferation interests. • Support U.S. deliverables for the 2020 NPT Review Conference and 50th Anniversary of the NPT entry into force, including a peaceful use package and a “Creating the Conditions Working Group” to examine conditions for nuclear disarmament. • Provide technical assistance to the negotiation of potential Section 123 Agreements for Cooperation and their corresponding Administrative Arrangements. • Lead the preparations for the U.S.-Republic of Korea 123 Agreement under the High Level Bilateral Commission. • Conduct analyses of accountancy information in support of the implementation of twenty three 123 Agreements. • Implement the new 10 CFR Part 810 civil penalty authority.	

Defense Nuclear Nonproliferation Research and Development

Overview

The Defense Nuclear Nonproliferation Research and Development (DNN R&D) program directly contributes to nuclear security by developing U.S. capabilities to detect and characterize global nuclear security threats in full coordination with the goals and priorities of U.S. Government mission stakeholders. Specifically, the DNN R&D program makes these strategic contributions through the innovation of U.S. technical capabilities to detect, identify, locate, and characterize: 1) foreign nuclear material production and weapons development activities; 2) movement and illicit diversion of special nuclear materials; and 3) global nuclear detonations. These foundational capabilities are either advanced to higher maturities, transitioned to stakeholders for further development for mission-specific applications, or transferred to operational performers. The DNN R&D program also supports foundational capabilities that can be leveraged across nonproliferation, counterterrorism, and emergency response mission areas.

To meet national and Departmental nuclear security requirements, DNN R&D leverages the unique facilities and scientific skills of DOE, academia, and industry to perform research and demonstrate advances in capabilities, develop prototypes, and produce sensors for integration into operational systems.

The FY 2020 Budget Request transfers funding for Reactor Conversion activities back to the Materials Management and Minimization program. Excluding funding for these activities, the FY 2020 Budget Request for DNN R&D is $1.1 million above the FY 2019 enacted level.

Defense Nuclear Nonproliferation Research and Development (DNN R&D)
Funding

(Dollars in Thousands)

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Defense Nuclear Nonproliferation R&D				
Proliferation Detection	278,255	281,521	304,040	+22,519
Nuclear Detonation Detection	195,749	195,749	191,317	-4,432
Nonproliferation Fuels Development	82,500	98,300	0	-98,300
Total, Defense Nuclear Nonproliferation R&D	**556,504**	**575,570**	**495,357**	**-80,213**

Outyears for Defense Nuclear Nonproliferation Research and Development (DNN R&D)
Funding

(Dollars in Thousands)

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Defense Nuclear Nonproliferation R&D				
Proliferation Detection	296,089	307,429	315,432	321,536
Nuclear Detonation Detection	186,895	188,660	188,970	192,942
Nonproliferation Fuels Development	4,294	0	0	0
Total, Defense Nuclear Nonproliferation R&D	**487,278**	**496,089**	**504,402**	**514,478**

Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR):

- FY 2018 Transferred: SBIR: $8,546; STTR: $1,202
- FY 2019 Projected: SBIR: $9,118; STTR: $1,282
- FY 2020 Request: SBIR: $9,150; STTR: $1,287
- FY 2021 - FY 2024 Request: SBIR: $35,466; STTR: $4,987

Defense Nuclear Nonproliferation Research and Development
Explanation of Major Changes
(Dollars in Thousands)

	FY 2020 Request vs FY 2019 Enacted
Defense Nuclear Nonproliferation Research and Development	
Proliferation Detection (PD): The increase supports efforts to establish a nonproliferation stewardship initiative, including strategic review of current capabilities, long-term planning, and initial testbed development to build critical capabilities in support of nonproliferation missions.	**+22,519**
Nuclear Detonation Detection (NDD): The decrease reflects that final funding was provided in FY 2019 for long-lead procurements to mitigate potential impacts of supply-chain interruptions. No further funding is requested in FY 2020 for that effort. This reduction is partially offset by an increase in integration costs required due to launch delays for the next geosynchronous satellite (a U.S. Air Force responsibility), and an increase associated with the transition of microsystem fabrication facilities to a larger wafer size.	**-4,432**
LEU Fuels Development: The decrease in funding reflects the transfer of Reactor Conversion activities back to DNN's Material Management and Minimization program.	**-98,300**
Total, Defense Nuclear Nonproliferation Research and Development	**-80,213**

Description

The Proliferation Detection (PD) R&D subprogram develops technologies to: detect foreign nuclear weapons programs; support nuclear arms control treaty verification by improving compliance monitoring capabilities; and support national nuclear security, nuclear counterterrorism, incident response, and interdiction of nuclear materials outside of regulatory control. PD efforts are aligned along these major functional areas: (1) Nuclear Weapons Development and Material Production Detection efforts targeted toward the detection, identification, location, and characterization of foreign nuclear weapons program activities; (2) Nuclear Weapons and Material Security efforts targeted toward nuclear security and nuclear arms control treaty monitoring and verification tools and applications, operational interdiction, radiological source replacement, and nuclear security efforts across NNSA; and (3) Nonproliferation Enabling Capabilities efforts supporting a broad R&D base to bring new, cross-cutting technologies to multi-use applications across NNSA and the interagency community, including a field experiment and demonstration program and university research program. The field demonstration program integrates research and experimental testbed activities to advance technology in support of the Nation's treaty verification and monitoring needs. This R&D subprogram also supports the nuclear counterterrorism and incident response mission area. PD's university program is comprised of three consortia which link universities and DOE National Laboratories to address basic research shortfalls in nuclear nonproliferation and security and treaty compliance monitoring. Beginning in FY 2020, PD also supports efforts to establish a nonproliferation stewardship initiative. This long-term stewardship initiative will build and sustain the requisite technical competencies, based on enabling infrastructure, science and technology, and workforce expertise, that are needed to support policymakers and future nonproliferation missions.

Highlights of the FY 2020 Budget Request

- Advance U.S. detection and characterization capabilities of foreign nuclear weapons production activities through 2026;
- Achieve improvements in U.S. capabilities in nuclear weapons and material security applications, including detecting special nuclear material (SNM) and its movement, incident response, and nuclear safeguards;
- Continue programmatic activities for nonproliferation and foreign weapons program activity monitoring through continued execution and development of national testbeds for validation of new sensors, equipment, and capabilities.
- Provide a broad, underlying set of technical capabilities that support nuclear nonproliferation and nuclear security, including those for addressing counterterrorism/incident response requirements.
- Continue to align with the developing interagency requirements for early detection of nuclear proliferation, including low-yield nuclear explosion monitoring, SNM production, and cross-cutting data science.
- Support efforts to establish a nonproliferation stewardship initiative, which will build and sustain the requisite technical competencies needed to support policymakers and future nonproliferation missions.

Proliferation Detection

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Proliferation Detection $281,521,000	**Proliferation Detection $304,040,000**	**Proliferation Detection +$22,519,000**
• Demonstrate advances in U.S. capabilities to detect and characterize foreign nuclear programs, especially in denied areas as follows: advance sensor and algorithm development and demonstrate technologies and methods in operational testbed environments for SNM production detection, including the development of a new reactor monitoring testbed; advance stand-off detection methods for weaponization activities to monitor the potential technical breakout of foreign weapons programs; innovate new analytic approaches to move proliferation detection to earlier timelines and close information gaps in denied areas. • Demonstrate advances in U.S. capabilities to strengthen nuclear security across the threat spectrum as follows: advance detection and imaging for SNM detection, and incident response, including device diagnostics and stabilization tools with improved understanding of improvised nuclear device performance; address nuclear data gaps in support of nuclear security. • Develop testbeds and demonstrate new predictive capabilities to detect, identify, locate, and characterize nuclear explosions as follows: complete execution of remaining Phase II of seismic source physics experiments; advance low yield nuclear explosion monitoring through development of new signatures, local sensors, and dynamic network analysis; and begin development of final (Phase III) testbed for field experiments.	• Continue to develop and demonstrate advances in U.S. capabilities to detect and characterize foreign nuclear programs, especially in denied areas as follows: advance sensor and algorithm development and demonstrate technologies and methods in operational testbed environments for SNM production detection, including the continued development of a new reactor monitoring testbed; understand the impact of alternative manufacturing techniques and advance stand-off detection methods for weaponization activities to monitor the potential technical breakout of foreign weapons programs; innovate new analytic approaches to move proliferation detection to earlier timelines and close information gaps in denied areas. • Continue to develop and demonstrate advances in U.S. capabilities to strengthen nuclear security across the threat spectrum as follows: advance detection and imaging for SNM detection, and incident response, including device diagnostics and stabilization tools with improved understanding of improvised nuclear device performance, focusing on both high explosives and nuclear materials; and address nuclear data gaps in support of nuclear security. • Begin development of a new testbed to support field experiments associated with the Low Yield Nuclear Monitoring effort, designed to improve U.S. capabilities to detect and characterize low yield, and evasively conduct underground nuclear explosions.	• The increase is to support efforts to establish a nonproliferation stewardship initiative. In the initial phase, funds will support program planning, a strategic review of current capabilities, and establishment of an implementation plan to build and sustain nonproliferation competencies. Funds will also support initial testbed development needed to address immediate capability shortfalls in support of nonproliferation missions.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
• Support the NNSA's portion of the Integrated University Program to address basic gaps in nuclear nonproliferation and treaty compliance monitoring.	• Continue to support the NNSA's portion of the Integrated University Program to address basic gaps in nuclear nonproliferation and treaty compliance monitoring. • Establish a nonproliferation stewardship initiative to build and sustain requisite technical competencies, based on enabling infrastructure, science and technology, and workforce expertise, that are needed to support policymakers and future nonproliferation missions. Conduct strategic review and long-term planning, and begin funding initial testbed development to close critical nonproliferation capability gaps in foundational technical competencies, including an expert workforce in special nuclear materials (SNM) and weapons development and the infrastructure needed to equip, inform, and develop it.	

Description

The Nuclear Detonation Detection (NDD) subprogram develops and builds space sensors for the nation's operational nuclear test treaty monitoring and Integrated Threat Warning/Attack Assessment capabilities; conducts R&D to advance analytic forensic capabilities related to nuclear detonations and interdicted samples; and produces and updates the regional geophysical datasets and analytical understanding of waveform and radionuclide signatures to enable operation of the nation's ground-based nuclear detonation monitoring networks.

Highlights of the FY 2020 Budget Request

- Produce nuclear detonation detection satellite payloads in accordance with the negotiated schedule with the United States Air Force (USAF).
- Support the payload-side technical integration, pre-launch, and on-orbit testing activities for previously delivered payloads in accordance with host satellite schedules.
- Conduct research in seismic, radionuclide, and detonation forensics to support national capability in terrestrial and airborne monitoring and analysis methods.

Nuclear Detonation Detection

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Nuclear Detonation Detection $195,749,000	**Nuclear Detonation Detection $191,317,000**	**Nuclear Detonation Detection -$4,432,000**
• Design and fabricate Global Burst Detector (GBD) nuclear detonation detection payloads for GPS block III satellites in accordance with the negotiated schedule with the USAF. Support payload-side technical integration, pre-launch, and on-orbit testing activities for previously delivered payloads. Continue development and production of sensor-laden payloads for launch into geosynchronous orbit. Continue required engineering development work and satellite interface coordination to support payload design updates for future satellite blocks for GBDs and other U.S. Nuclear Detonation Detection System payloads. • Improve pre- and post-detonation technical nuclear forensic capabilities, including the technical means to assess bulk samples of SNM. Address research priorities that undergird the technical capability of operational assets and that support verification and validation activities. • Improve capabilities of geophysical models of seismic signals from underground detonations and improve technologies to detect radionuclide releases, including integrating products of field and laboratory test campaigns into methods to improve event discrimination and yield estimation.	• Continue to fabricate GBD nuclear detonation detection payloads and test assets for GPS block III satellites in accordance with the negotiated schedule with the USAF. Support payload-side technical integration, pre-launch, and on-orbit testing activities for previously delivered payloads. Continue development and production of sensor-laden payloads for launch into geosynchronous orbit. Continue required engineering development work and satellite interface coordination to support payload design updates for future satellite blocks for GBDs and other U.S. Nuclear Detonation Detection System payloads. • Improve pre- and post-detonation technical nuclear forensic capabilities, including the technical means to assess bulk samples of SNM, and the technical preparedness for scenarios of surface-interacting nuclear detonations. Address research priorities that undergird the technical capability of operational assets and that support verification and validation activities. • Improve capabilities of geophysical models, datasets, and analyses of seismic signals from underground detonations and improve technologies to detect radionuclide releases, including integrating products of field and laboratory test campaigns into methods to improve event discrimination and yield estimation.	• The decrease reflects that final funding was provided in FY 2019 for long-lead procurements to mitigate potential impacts of supply-chain interruptions. No further funding is requested in FY 2020 for this effort. • The reduction is partially offset by an increase in integration costs required due to launch delays for the next geosynchronous payload, and an increase associated with the transition of microsystem fabrication facilities to a larger wafer size.

Nonproliferation Fuels Development

Description

Reactor Conversion activities within the Nonproliferation Fuels Development subprogram are transferred to the Material Management and Minimization program within DNN. DNN R&D efforts to design and develop new high-density, high-assay LEU fuels are concluded with FY 2019 funding.

Nonproliferation Fuels Development

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Nonproliferation Fuels Development $98,300,000	**Nonproliferation Fuels Development $0**	**Nonproliferation Fuels Development -$98,300,000**
• Continue Reactor Conversion Activities, including the U.S. high performance research reactors (USHPRR) program, international conversion efforts, and other activities. • Continue to design and develop new high-density, high-assay LEU fuels that further U.S. nonproliferation goals.	• No funding requested.	• The decrease reflects the transfer of Reactor Conversion activities back to DNN's Material Management and Minimization program.

Defense Nuclear Nonproliferation Research and Development
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	35,564	35,564	36,346	42,146	800
Minor Construction	N/A	N/A	0	0	0	17,900	17,900
Total, Capital Operating Expenses	N/A	N/A	**35,564**	**35,564**	**36,346**	**60,046**	**+18,700**
Capital Equipment > $500K (including MIE)							
Material Intro Hood #1	5,000					5,000	
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	35,564	35,564	36,346	37,146	+800
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**35,564**	**35,564**	**36,346**	**42,146**	**+800**

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A					+0
Nonproliferation Testbed Tunnel Excavation	17,900					17,900	+17,900
Total, Minor Construction Projects	**N/A**	**N/A**	**0**	**0**	**0**	**17,900**	**+17,900**
Total, Capital Summary	**N/A**	**N/A**	**35,564**	**35,564**	**36,346**	**60,046**	**+18,700**

Outyears for Defense Nuclear Nonproliferation Research and Development

(Dollars in Thousands)

	FY 2021 Estimate	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	42,963	38,798	39,652	40,524	0
Minor Construction	0	0	0	0	0
Total, Capital Operating Expenses	**42,963**	**38,798**	**39,652**	**40,524**	**0**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	37,963	38,798	39,652	40,524	N/A
Material Intro Hood #2	5,000				N/A
Total, Capital Equipment (including MIE)	**42,963**	**38,798**	**39,652**	**40,524**	**0**

Nonproliferation Construction

Overview

The Nonproliferation Construction Program consolidates construction projects that directly contribute to reducing global nuclear security threats and is a key component of DOE/NNSA's integrated nonproliferation, counterterrorism, and emergency response strategies.

Highlights of the FY 2020 Budget Request

In FY 2020, the Administration is continuing termination activities for the Mixed Oxide Fuel Fabrication (MFFF) project and continuing to pursue a dilute and dispose strategy to fulfill the United States' commitment to dispose of 34 metric tons of plutonium. The dilute and dispose strategy consists of blending plutonium with an inert mixture, packaging for safe storage and transport, and disposing of it in a geologic repository. The Surplus Plutonium Disposition (SPD) project will add additional glovebox capacity at the Savannah River Site to accelerate plutonium dilution and aid in the removal of plutonium from the State of South Carolina.

Nonproliferation Construction
Funding

	(Dollars in Thousands)			
	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Nonproliferation Construction				
U.S. Construction				
18-D-150, Surplus Plutonium Disposition Project (SPD), SRS				
SPD Total Estimated Cost (TEC)	0	0	54,000	+54,000
SPD Other Project Costs (OPC)	0	0	25,000	+25,000
Subtotal, 18-D-150, Surplus Plutonium Disposition Project (SPD), SRS	**0**	**0**	**79,000**	**+79,000**
99-D-143 Mixed Oxide (MOX) Fuel Fabrication Facility, SRS				
MFFF Total Estimated Cost (TEC)	320,000	70,000	0	-70,000
MFFF Other Project Costs (OPC)	15,000	150,000	220,000	+70,000
Subtotal, 99-D-143 Mixed Oxide (MOX) Fuel Fabrication Facility, SRS	**15,000**	**220,000**	**220,000**	**+0**
Subtotal, U.S. Construction	**335,000**	**220,000**	**299,000**	**79,000**
Total, Nonproliferation Construction	**335,000**	**220,000**	**299,000**	**79,000**

Outyears for Nonproliferation Construction
Funding

(Dollars in Thousands)

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Nonproliferation Construction				
U.S. Construction				
18-D-150, Surplus Plutonium Disposition Project (SPD), SRS				
SPD Total Estimated Cost (TEC)	60,000	69,750	55,000	55,000
SPD Other Project Costs (OPC)	5,000	5,000	7,000	7,000
Subtotal, 18-D-150, Surplus Plutonium Disposition Project (SPD), SRS	**65,000**	**74,750**	**62,000**	**62,000**
21-D-xxx, LANL Project	**16,517**	**50,000**	**66,000**	**82,000**
99-D-143 Mixed Oxide (MOX) Fuel Fabrication Facility, SRS				
MFFF Total Estimated Cost (TEC)	0	0	0	0
MFFF Other Project Costs (OPC)	109,382	0	0	0
Subtotal, 99-D-143 Mixed Oxide (MOX) Fuel Fabrication Facility, SRS	**109,382**	**0**	**0**	**0**
Subtotal, U.S. Construction	**190,899**	**124,750**	**128,000**	**144,000**
Total, Nonproliferation Construction	**190,899**	**124,750**	**128,000**	**144,000**

Nonproliferation Construction Projects
Explanation of Major Changes
(Dollars in Thousands)

	FY 2020 Request vs FY 2019 Enacted
Nonproliferation Construction Projects	
U.S. Construction:	
18-D-150, Surplus Plutonium Disposition (SPD) Project: The increase reflects the request to fund the line item project for the dilute and dispose strategy to support design activities, early site preparations, and long lead procurements.	+79,000
99-D-143, Mixed Oxide (MOX) Fuel Fabrication Facility: No change.	0
Total, Nonproliferation Construction Projects	**+79,000**

Nonproliferation Construction
U.S. Construction

Description

On May 10, 2018, in accordance with Section 3121 of the National Defense Authorization Act for Fiscal Year 2018 (FY 2018 NDAA) and Section 309 of the Consolidated Appropriations Act, 2018, the Department notified Congress that the Secretary of Energy exercised authority to waive the requirement to use funds to construct the Mixed Oxide (MOX) facility. However, on June 7, 2018, the U.S. District Court granted the State of South Carolina's motion for a Preliminary Injunction and required the Department to continue construction. On October 9, 2018, the U.S. Court of Appeals lifted the Preliminary Injunction, allowing the Department to move forward with termination of construction of the MOX facility. On January 8, 2019, the U.S. Court of Appeals issued its decision to stay the preliminary injunction on termination issued earlier by the Federal Court in Aiken County, SC. This final ruling holds that the State of South Carolina lacks standing to challenge the decision to terminate the MOX Project. The Nonproliferation Construction program will continue termination activities of the Mixed Oxide Fuel Fabrication (MFFF) facility and continue to pursue the dilute and dispose strategy to fulfill the United States' commitment to dispose of 34 metric tons of plutonium. The dilute and dispose strategy consists of blending plutonium with an inert mixture, packaging it for safe storage and transport, and disposing of it in a geologic repository. The Surplus Plutonium Disposition (SPD) project will add additional glovebox capacity at the Savannah River Site to accelerate plutonium dilution and aid in the removal of plutonium from the State of South Carolina.

On October 10, 2018, NNSA notified the MOX prime contractor that its contract was terminated. NNSA continues termination of the MOX prime contract and transition of the stewardship and disposition of the project's two billion dollars worth of property, plant, equipment and records by the M&O contractor. The prime contract termination includes safe and secure lay-up of the facilities, including inventorying and securing information, materials, and equipment at the job site to protect government assets. The prime contractor will also terminate sub-contracts and leases and transfer those where appropriate to the M&O. Four phases of Worker Adjustment and Retraining Notification (WARN) Act personnel notifications have been planned and aligned with the approved termination scope. NNSA received, reviewed and is executing termination and transition plans from the prime contractor and M&O contractor. A final termination settlement proposal for final contract closure is due from the prime contractor by October 10, 2019. Final project termination and asset disposition will be completed by FY 2021.

In FY 2020, the Surplus Plutonium Disposition (SPD) project request funds support activities such as long-lead procurements and demolition and removal of existing, unnecessary equipment in the K-Area Reactor Facility. In order to achieve plutonium disposition mission needs and remove plutonium from South Carolina as quickly as possible, the project must capitalize on opportunities to reduce the construction schedule. This necessitates procurement of long lead equipment early in construction. It also requires security modifications to the facility to allow construction forces access, upon CD-3A approval. Furthermore, FY 2020 scope continues the development of the preliminary design for the major systems supporting the plutonium processing gloveboxes (i.e., ventilation, electrical, security, etc.), structural analysis, design safety analysis, and security vulnerability assessment. The project will also continue supporting National Environmental Policy Act (NEPA) requirements, technology maturation, risk management, project management, and baseline development.

Other Project Cost (OPC)

This activity supports all other costs related to a project that are not included in the total estimated cost (TEC). OPCs include, but are not limited to: research and development, conceptual design and conceptual design report, cold start-up and commissioning costs, NEPA documentation, project data sheet preparation, siting, and permitting requirements. These costs are part of the approved baseline and the total project cost (TPC) of the project. In addition, OPCs for the MOX project will also include termination activities such as the prime contract settlement activities, MOX property, plant, equipment and records stewardship, demolition and disposition activites, DCAA financial audit support activities and Department of Justice prime contract litigation and support activities.

Total Estimated Costs (TEC)

This activity supports the design, long-lead equipment procurement, site preparation, and construction of the project.

U.S. Construction

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
U.S. Construction $220,000,000	**U.S. Construction $299,000,000**	**U.S. Construction +$79,000,000**
18-D-150, Surplus Plutonium Disposition (SPD) Project $0	**18-D-150, Surplus Plutonium Disposition (SPD) Project $79,000,000**	**18-D-150, Surplus Plutonium Disposition (SPD) Project +$79,000,000**
SPD OPC $0	**SPD OPC $25,000,000**	**SPD OPC +$25,000,000**
• N/A	• Support activities such as project management and project controls support, procurement support, design authority activities, operations and security support, and start-up planning.	• The increase reflects the request to fund the line item project for the dilute and dispose strategy.
SPD TEC $0	**SPD TEC $54,000,000**	**SPD TEC +$54,000,000**
• N/A	• Support Preliminary Design. • Continue design of gloveboxes and specialized engineered electrical equipment. • Initiate early site preparations and long-lead procurements of gloveboxes and specialized engineered electrical equipment upon CD-3A approval.	• The increase reflects the request to fund the line item project for the dilute and dispose strategy to support preliminary design upon completion of CD-1 - Approve Alternative Selection and Cost Range and a CD-3A to initiate early site preparations and long lead procurements.
MOX Fuel Fabrication Facility (MFFF) $220,000,000	**MOX Fuel Fabrication Facility (MFFF) $220,000,000**	**MOX Fuel Fabrication Facility (MFFF) $0**
MFFF OPC $220,000,000	**MFFF OPC $220,000,000**	**MFFF OPC $0**
• Support termination activities.	• Continue termination activities such as continued demolition and disposition of facilities/equipment/materials/records, transition of the MFFF into a layup condition, and activities to maintain and perserve facilities and assets in a safe state in support of a future mission, litigation and financial audits. Project closeout documents will also be developed.	• No change
MFFF TEC $0	**MFFF TEC $0**	**MFFF TEC $0**
• N/A	• N/A	• No change

Nonproliferation Construction
Construction Projects Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
18-D-150, Surplus Plutonium Disposition Project, SR							
Total Estimated Cost (TEC)	0	0	0	0	0	54,000	+54,000
Other Project Cost (OPC)	0	0	0	0	0	25,000	+25,000
Total, 18-D-150, Surplus Plutonium Disposition Project, SR	**0**	**0**	**0**	**0**	**0**	**79,000**	**+79,000**
99-D-143, MOX Fuel Fabrication Facility (MFFF), SR							
Total Estimated Cost (TEC)	0	0	320,000	320,000	70,000	0	-70,000
Other Project Cost (OPC)	0	0	15,000	15,000	150,000	220,000	+70,000
Total Project Cost, 99-D-143, MOX Fuel Fabrication Facility (MFFF), SR	**0**	**0**	**335,000**	**335,000**	**220,000**	**220,000**	**+0**
Total All Construction Projects							
Total Estimated Cost (TEC)	0	0	320,000	320,000	70,000	54,000	-16,000
Other Project Cost (OPC)	0	0	15,000	15,000	150,000	245,000	95,000
Total Project Cost (TPC) All Construction Projects	**0**	**0**	**335,000**	**335,000**	**220,000**	**299,000**	**79,000**

[a] Total amount shown for the MOX project ($17.2 billion) reflects the 2016 updated performance baseline.

Outyears to Completion for Nonproliferation Construction

	(Dollars in Thousands)			
	FY 2021 Estimate	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate
18-D-150, Surplus Plutonium Disposition Project, SR				
Total Estimated Cost (TEC)	60,000	69,750	55,000	55,000
Other Project Cost (OPC)	5,000	5,000	7,000	7,000
Total, 18-D-150, Surplus Plutonium Disposition Project, SR	**65,000**	**74,750**	**62,000**	**62,000**
21-D-xxx, LANL Project	**16,517**	**50,000**	**66,000**	**82,000**
99-D-143, MOX Fuel Fabrication Facility (MFFF), SR				
Total Estimated Cost (TEC)	109,382	0	0	0
Other Project Cost (OPC)	0	0	0	0
Total Project Cost, 99-D-143, MOX Fuel Fabrication Facility (MFFF), SR	**109,382**	**0**	**0**	**0**
Total All Construction Projects				
Total Estimated Cost (TEC)	185,899	119,750	121,000	137,000
Other Project Cost (OPC)	5,000	5,000	7,000	7,000
Total Project Cost (TPC) All Construction Projects	**190,899**	**124,750**	**128,000**	**144,000**

18-D-150, Surplus Plutonium Disposition (SPD)
Savannah River Site, Aiken, South Carolina
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2020 Request for the Surplus Plutonium Disposition project is $79,000K. The preliminary cost range for this project is $200 million - $589 million, with Critical Decision 4 (CD-4) projected for FY 2027 to FY 2028, based on the conceptual design cost and schedule range. The most recent Department of Energy (DOE) approved CD for the project is CD-0[a], Approve Mission Need, which was approved on October 31, 1997. The SPD Program mission need was to be implemented utilizing the Mixed Oxide (MOX) Fuel approach. In FY 2018, in accordance with Section 3121 of the National Defense Authorization Act for Fiscal Year 2018 (FY 2018 NDAA) and Section 309 of the Consolidated Appropriations Act, 2018, the Secretary exercised authority to waive the requirement to use funds to construct the Mixed Oxide Fuel Fabrication Facility (MFFF) project and pursue the dilute and dispose strategy to fulfill the United States' commitment to dispose of 34 metric tons of plutonium. The dilute and dispose strategy will support the expedited removal of plutonium from the State of South Carolina, and is therefore a key objective of the program.

The dilute and dispose strategy utilizes mature plutonium processing technologies currently in use at DOE facilities. However in order to disposition 34 metric tons of plutonium in a timely manner and expedite the removal of plutonium from the State of South Carolina, additional throughput capacity to dilute the plutonium oxide with an inhibitor material is required. This project will install new gloveboxes, associated process and process support equipment and security upgrades.

Funding for this project is controlled at the Total Project Cost (TPC) level. All appropriations may be used for either design, construction, or other project costs.

Significant Changes[b]
This Construction Project Data Sheet (CPDS) is an update of the Fiscal Year (FY) 2019 CPDS. Because Congress appropriated no funding in FY 2019, this is a new start for the budget year.

As part of the lifecycle cost estimate (LCCE) for the dilute and dispose approach, the range for the SPD project was updated to include realized rate changes. The previous cost estimate range was developed using a flat 3% escalation rate. Since then, the National Nuclear Security Administration Office of Acquisition and Project Management has set the escalation rate for projects at a compounded 4% which is higher than the pre-conceptual estimate. The 4% escalation is consistent with the value used for the LCCE for the Surplus Plutonium Disposition Program using the Dilute and Dispose approach. In addition, the actual unit rates for engineering in development of conceptual design were higher than expected. Due to the continuing market trends, the higher unit rates were used in the conceptual design estimate. In addition, because Congress appropriated no line item funding in FY 2019 for the project but did appropriate the funding in the program to continue design, design is being advanced to 30% complete prior to CD-1 approval. This has resulted in a shift between other project costs (OPC) and total estimated costs (TEC). Design costs after CD-1 approval are typically TEC.

The FY 2020 request for this project supports activities such as long-lead procurements and demolition and removal of existing, unnecessary equipment in the K-Area Reactor Facility. In order to achieve plutonium disposition mission needs and remove plutonium from South Carolina as quickly as possible, the project must capitalize on opportunities to reduce the construction schedule. This necessitates receipt and installation of long lead procurements early in construction. It also requires security modifications to the facility to allow construction forces access, upon CD-3A approval.

A Federal Project Director (FPD) has not been assigned to this project, but an FPD will be assigned prior to CD-1 approval.

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[a] The Department confirmed that the existing CD-0 milestone approving mission need for plutonium disposition would apply to the Surplus Plutonium Disposition (SPD) Project.
[b] Funding and schedules shown throughout the CPDS are estimates and consistent with the high end of the cost range. No construction will be performed beyond approved CD-3A scope until the project performance baseline has been validated and CD-3 has been approved.

As required by DOE Order 413.3B, an independent Analysis of Alternatives (AoA) was completed. Based on the results, the Department Project Management Executive, with concurrence from the SPD AoA Steering Committee, selected the K-Area Reactor Facility at the Savannah River Site (SRS), Aiken, South Carolina as the preferred location. A CD-1 approval is expected the 1st quarter of FY 2020.

In FY 2020, the project will complete the final design activities required to support a CD-3A, *Approve Long Lead Procurements*. Approval of partial critical decisions will allow the project to execute early site preparations and long lead procurements for the Safety Significant gloveboxes for downblending of plutonium, diesel generator, and HEPA filter housings. Based on information obtained from prospective manufacturers/suppliers during the development of the conceptual design, it is estimated that 33 months are required for the procurement, manufacturing and delivery. Utilization of partial critical decisions will allow the project to execute the procurements in parallel with the completion of the Preliminary/Final design. In addition, the completion of early site preparation activities is necessary to enable CD-3 construction activities to start and progress as planned. All required dismantlement and removal of equipment and security modifications necessary to allow construction work force access would be completed prior to CD-3 construction start. Without partial critical decisions to execute early site preparations and long lead procurements, CD-4 will be delayed by 16 months. The CD-3A will include the final design documents, equipment specifications, all required project management documentation to include safety document maturity, and a baseline estimate and schedule for the early construction activities.

The FY 2020 work scope continues the maturation of the design for the major systems supporting the plutonium processing gloveboxes (i.e., ventilation, electrical, security, etc.), structural analysis, design safety analysis, and security vulnerability assessment. The project will also continue supporting National Environmental Policy Act (NEPA) requirements, risk management, project management, and baseline development.

The funding profile for future years will be updated when the estimates are validated and a baseline has been approved as part of the critical decision process.

<u>Critical Milestone History</u>

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2018	10/31/1997	2/2/2017	3QFY2018	1QFY2022	4QFY2021	1QFY2022	N/A	4QFY2027
FY 2019	10/31/1997	2/2/2017	4QFY2018	4QFY2022	4QFY2021	4QFY2022	N/A	4QFY2027
FY 2020	10/31/1997	2/2/2017	1QFY2020	4QFY2022	4QFY2021	4QFY2022	N/A	4QFY2028

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete (d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

Fiscal Quarter or Date

Fiscal Year	Performance Baseline Validation	CD-3A	CD-3B
FY 2018	1QFY2022	1QFY2020	N/A
FY 2019	4QFY2022	4QFY2019	N/A
FY 2020	4QFY2022	2QFY2020	N/A

CD-3A – Early site preparations and long lead procurement for glovebox and specialized engineered equipment.

Project Cost History

Fiscal Quarter or Date

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2018	165,000	255,000	420,000	80,000	N/A	80,000	500,000
FY 2019	154,820	261,780	416,600	83,400	N/A	83,400	500,000
FY 2020	71,044	365,440	436,484	152,319	N/A	152,319	588,803

2. Project Scope and Justification

Scope

The SPD Project will implement the dilute and dispose strategy in the K-Area Facility at SRS. New gloveboxes and associated process and process support equipment for dilution of plutonium oxide will be provided in the K-Area Facility. Containers of plutonium oxide will be opened in the new gloveboxes; the oxide will be size reduced as necessary and then measured into a blend can already containing inhibitor material to dilute the plutonium oxide. The inhibitor is an inert powder mixture utilized to make the recovery of plutonium more difficult and allowing for the termination of safeguards. The blend cans will be mechanically manipulated to homogenize the content. The blend cans will be removed from the glovebox, assayed, and packaged into a Criticality Control Overpack (CCO).

Approximately 15,000 ft^2 of processing space in the existing Hazard Category 2 K-Area Facility will be required for the project. In addition, a 10,000 ft^2 support building will be located adjacent to the existing structure. To increase dilution throughput capacity, gloveboxes, equipment, and support systems (i.e., glovebox ventilation, fire suppression, glovebox rooms with airlocks, material control and accountability equipment, monitoring equipment, lag storage, etc.) will be installed in the K-Area Facility.

Justification

The mission of the dilute and dispose strategy is to expedite removal of plutonium from the State of South Carolina by providing processing, characterization, and storage capabilities to efficiently and permanently dispose of 34 metric tons of plutonium, thereby eliminating excess nuclear weapons materials.

It is a Departmental priority to remove certain inventories of plutonium from the State of South Carolina. Therefore, expediting removal of plutonium from SRS for final disposition is a key objective of the program. Although the dilute and dispose strategy utilizes mature technologies currently in use at DOE facilities, additional capacity is required to increase throughput in order to expedite removal of plutonium from SRS and disposition the full 34 metric tons of plutonium in a timely manner. The additional capacity will be provided by the SPD Project. The project will include new gloveboxes and associated process and process support equipment and security features for the diluted plutonium product until eventual characterization, packaging, and shipment for disposal.

A quantitative risk analysis was completed to confirm a bounding cost range based on 10% conceptual design. A Risk Management Plan (RMP) and a Risk and Opportunity Assessment Report (ROAR) have been prepared for the project. The contingency included in this data sheet is consistent with the criteria found in the Association for Advancement of Cost Engineering International (AACEI) recommended practices and DOE G 413.3-21 for a Class 4 estimate.
In accordance with DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, an appropriate NEPA review is required to support the Project. DOE Order 413.3B requires final NEPA documentation prior to CD-2 for the project with a Record of Decision after CD-2 approval but prior to CD-3. In April 2015, DOE issued the *Surplus*

Plutonium Disposition Supplemental Environmental Impact Statement (SPD SEIS, DOE/EIS-0283-S2). Although the SPD SEIS ROD does not contain a reference to installation of any specific number of gloveboxes for the purpose of implementing the Dilute and Dispose approach for the 6 MT of non-pit plutonium, the information contained in the *Savannah River Site and Los Alamos National Laboratory Timing and Throughput Assumptions Used for the Surplus Plutonium Disposition Supplemental EIS* (April 2015) clearly indicates that installation and operation of three (3) additional glovebox lines were analyzed as part of the development of the SPD Supplemental EIS. Because the installation of three (3) additional glovebox lines for implementing the Dilute and Dispose approach for the 6 MT of non-pit plutonium was previously analyzed and is consistent with the conceptual design for the SPD Project, no additional NEPA analyses or decisions are required to design, procure, and construct the SPD Project.
The SPD project is being conducted in accordance with the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets, and all appropriate project management requirements have been met.

Key Performance Parameters (KPPs)
The Threshold KPPs, represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The Objective KPPs represent the desired project performance. The preliminary KPPs in the Program Requirements Document developed CD-0 are:

1. Manage all projects within the DOE approved cost performance baseline defined as part of CD-2.
2. Employ an Earned Value Management System for projects in accordance with DOE Order 413.3B. The system shall be certified per EIA-748 for reporting and monitoring progress, variances and trend analysis, and for initiating mitigation/recovery actions as necessary.
3. Use a disciplined change control process to manage all changes to the project which impact the DOE approved performance management baseline.
4. Establish a resource loaded, fully Integrated Project Schedule at CD-2 for each project or subproject.
5. Manage all projects within the DOE approved schedule performance baseline established at CD-2. Prior to CD-2, management will follow the low range schedule.
6. Design and construct projects to provide safe work places and processes.
7. Achieve zero fatalities and a Total Recordable Case rate of less than four per 200,000 work-hours during construction.Evaluate occurrences during start-up to assure incidents do not escalate or repeat.

Performance Measure[a]	Threshold	Objective
N/A	N/A	N/A

3, Financial Schedule

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 2018	N/A	N/A	N/A
FY 2019	N/A	N/A	N/A
FY 2020	N/A	N/A	35,076
FY 2021	N/A	N/A	28,122
FY 2022	N/A	N/A	7,846
Total Design	N/A	N/A	71,044
Construction			
FY 2019	N/A	N/A	N/A
FY 2020	N/A	N/A	18,900
FY 2021	N/A	N/A	22,239

[a] Key Performance Parameters will be finalized upon approval of the project baseline.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2022	N/A	N/A	56,355
FY 2023	N/A	N/A	59,818
FY 2024	N/A	N/A	57,314
FY 2025	N/A	N/A	146,198
FY 2026	N/A	N/A	4,616
Total, Construction	**N/A**	**N/A**	**365,440**
Total Estimated Costs (TEC)			
FY 2018	N/A	N/A	N/A
FY 2019	N/A	N/A	N/A
FY 2020	N/A	N/A	53,976
FY 2021	N/A	N/A	50,361
FY 2022	N/A	N/A	64,201
FY 2023	N/A	N/A	59,818
FY 2024	N/A	N/A	57,314
FY 2025	N/A	N/A	146,198
FY 2026	N/A	N/A	4,616
Total TEC	N/A	N/A	436,484
Other Project Costs[a]			
FY 2017	5,750	5,750	3,796
FY 2018	6,732	6,732	8,147
FY 2019	25,000	25,000	25,500
FY 2020	N/A	N/A	24,662
FY 2021	N/A	N/A	14,115
FY 2022	N/A	N/A	10,777
FY 2023	N/A	N/A	2,172
FY 2024	N/A	N/A	4,307
FY 2025	N/A	N/A	30,355
FY 2026	N/A	N/A	18,279
FY 2027	N/A	N/A	7,349
FY 2028	N/A	N/A	2,860
Total OPC	**TBD**	**TBD**	**152,319**
Total Project Costs (TPC)			
FY 2017	5,750	5,750	3,796
FY 2018	6,732	6,732	8,147
FY 2019	25,000	25,000	25,500
FY 2020[b]	79,000	79,000	78,638
FY 2021	65,000	65,000	64,476
FY 2022	74,750	74,750	74,978
FY 2023	62,000	62,000	61,990
FY 2024	62,000	62,000	61,621
FY 2025	183,000	183,000	176,553
FY 2026	16,000	16,000	22,895

[a] Appropriated funds shown for FY 2017 through FY 2019 for other project costs were appropriated in the Material Management and Minimization program authorized to support planning and design activities for the dilute and dispose strategy.

[b] Includes funds for early procurement of engineered equipment.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2027	9,571	9,571	7,349
FY 2028	0	0	2,860
Grand Total	**588,803**	**588,803**	**588,803**

4. Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	46,234	102,000	N/A
Contingency	24,810	52,820	N/A
Total, Design[a]	**71,044**	**154,820**	**N/A**
Construction			
Site Work	35,299	5,000	N/A
Long Lead Equipment	23,530	20,000	N/A
Equipment	22,753	17,000	N/A
Other Construction	149,640	115,050	N/A
Contingency	134,218	104,730	N/A
Total, Construction	**365,440**	**261,780**	**N/A**
Other TEC (if any)			
Cold Startup	N/A	N/A	N/A
Contingency	N/A	N/A	N/A
Total, Other TEC	**N/A**	**N/A**	**N/A**
Total Estimated Cost	**436,484**	**416,600**	**N/A**
Contingency, TEC	**159,028**	**157,550**	**N/A**
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	2,340	2,340	N/A
Conceptual Design	34,927	10,000	N/A
Other OPC Costs	76,175	49,455	N/A
Contingency	38,877	21,605	N/A
Total, OPC	**152,319**	**83,400**	**N/A**
Contingency, OPC	38,877	21,605	N/A
Total Project Cost	**588,803**	**500,000**	**N/A**
Total Contingency (TEC+OPC)	**197,905**	**179,155**	**N/A**

[a] For a typical nuclear construction project at SRS, design costs are roughly 40 percent of the TPC.

5. Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Total
FY 2018	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	15,000	47,000	46,000	56,000	85,000	62,000	500,000
FY 2019	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	14,750	59,000	59,000	59,000	74,750	62,000	500,000
FY 2020	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TPC	37,482	79,000	65,000	74,750	62,000	62,000	588,803

6. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy (fiscal quarter or date)	4Q FY 2028
Expected Useful Life (number of years)	20 years
Expected Future Start of D&D of this capital asset (fiscal quarter)	4Q FY 2048

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance[a]	122.1	58.3	2,441.2	1,166.3

The lifecycle O&M costs have been updated to reflect the recent completion of an independent validation of a detailed lifecycle cost estimate (LCCE) for the dilute and dispose alternative. The U.S. Army Corps of Engineers issued the Independent Validation Report in late November which concluded that the processes used to develop the Dilute and Dispose LCCE complies with the GAO best practices. The estimate included all aspects of the program to implement the dilute and dispose strategy, including surveillance and packaging of surplus pits, pit disassembly and oxide conversion, dilution and disposal of the plutonium, all projects at the various sites needed to execute the program, and any other supporting costs required for the program baseline. The current total estimate is based on the validated LCCE, adjusted to current year dollars.

7. D&D Information

Approximately 15,000 ft^2 of processing space in the existing Hazard Category 2 K-Area Facility will be required for the project. In addition, a 10,000 ft^{-2} new support building will be located adjacent to the existing structure. The new square footage is reported below.

	Square Feet
New area being constructed by this project at Savannah River Site (K-Area).	10,000
Area of D&D in this project at Savannah River Site (K-Area).	N/A

[a] The previous estimate was based on the rough order of magnitude estimate developed for the AoA.. The current estimate is based on the LCCE for dilute and dispose. The scope of the project under the AoA included characterization and packaging, but since the project scope no longer includes those capabilities, the O&M costs have also been adjusted to reflect the change in scope. The O&M cost also does not include management reserve, contingencency, or deactivation costs. The current annual cost was developed by taking the LCCE current total estimate and divided by the projected 20 years of operations.

	Square Feet
Area at Savannah River Site (K-Area)to be transferred, sold, and/or D&D outside the project, including area previously "banked"	N/A
Area of D&D in this project at other sites	N/A
Area at other sites to be transferred, sold, and/or D&D outside the project, including area previously "banked"	N/A
Total area eliminated	N/A

8. Acquisition Approach

The Acquisition strategy will be developed as part of the CD-1 development scheduled to be completed in early FY 2020.

99-D-143, Mixed Oxide (MOX) Fuel Fabrication Facility,
Savannah River Site (SRS), Aiken, South Carolina
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary: The FY 2020 Request for the Mixed Oxide (MOX) Fuel Fabrication Facility project is $220,000K to continue termination activities. DOE approved Order 413.3B's Critical Decision (CD) -3, Start of Construction on April 11, 2007, with a Total Project Cost (TPC) of $4,814,329K and CD-4 of FY 2016. Construction began on August 1, 2007, as directed by the Revised Continuing Appropriations Resolution, 2007, Public Law 110-5. A revised baseline change was approved on December 17, 2008, with a TPC of $4,857,129K and CD-4 of FY 2017. The project cost has exceeded the 2008 TPC and has not been re-baselined. Since 2012, the Department has requested multiple independent cost estimates. The most recent Performance Baseline update was completed in 2016 by the DOE Office of Project Management Oversight in partnership with the U.S. Army Corps of Engineers (USACE). This update, determined reliable by the GAO, estimated a TPC of $17,169,258K and CD-4 of FY 2048.

A Department budgetary planning level estimate and schedule range was prepared and provided to OMB and Congress for termination of the project. The top end of the estimate range indicated the termination costs could be as much as $1 billion and take up to four years to complete.

Significant Changes:
This construction Project Data Sheet (CPDS) is an update of the Fiscal Year (FY) 2019 CPDS and does not include a new start for the budget year.

On May 10, 2018, in accordance with Section 3121 of the National Defense Authorization Act for Fiscal Year 2018 (FY 2018 NDAA) and Section 309 of the Consolidated Appropriations Act, 2018, the Department notified Congress that the Secretary of Energy exercised authority to waive the requirement to use funds to construct the Mixed Oxide (MOX) facility. However, on June 7, 2018, the U.S. District Court granted the State of South Carolina's motion for a Preliminary Injunction and required the Department to continue construction. On October 9, 2018, the U.S. Court of Appeals lifted the Preliminary Injunction, allowing the Department to move forward with termination of construction of the MOX facility. On January 8, 2019, the U.S. Court of Appeals issued its decision to stay the preliminary injunction on termination issued earlier by the Federal Court in Aiken County, SC. This final ruling holds that the State of South Carolina lacks standing to challenge the decision to terminate the MOX Project.

On October 10, 2018, NNSA notified the MOX prime contractor that its contract was terminated. NNSA continues termination of the MOX prime contract and transition of the stewardship and disposition of the project's two billion dollars worth of property, plant, equipment and records by the M&O contractor. The prime contract termination includes safe and secure lay-up of the facilities, including inventorying and securing information, materials, and equipment at the job site to protect government assets. The prime contractor will also terminate sub-contracts and leases and transfer those where appropriate to the M&O. Four phases of Worker Adjustment and Retraining Notification (WARN) Act personnel notifications have been planned and aligned with the approved termination scope. NNSA received, reviewed and is executing termination and transition plans from the prime contractor and M&O contractor. A final termination settlement proposal for final contract closure is due from the prime contractor by October 10, 2019. Final project termination, including demolition and disposition of property is estimated to be completed by FY 2021.

In FY 2020, the Administration will continue with termination activities for the MOX project. The termination activities will include the prime contract settlement activities, MOX property, plant, equipment and records stewardship, demolition and disposition activites, DCAA financial audit support activities and Department of Justice prime contract litigation and support activities

A Federal Project Director (FPD) has been assigned to this project and has approved this CPDS.

Critical Milestone History

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2000	N/A		2QFY1999	N/A	4QFY2001	1QFY2002	N/A	4QFY2005
FY 2001	N/A		2QFY1999	N/A	3QFY2002	4QFY2002	N/A	1QFY2006
FY 2002	N/A		2QFY1999	N/A	4QFY2002	2QFY2003	N/A	1QFY2007
FY 2003	N/A		2QFY1999	N/A	4QFY2003	2QFY2004	N/A	4QFY2007
FY 2004	N/A		2QFY1999	N/A	1QFY2004	2QFY2004	N/A	4QFY2007
FY 2005	N/A		2QFY1999	N/A	3QFY2004	3QFY2005	N/A	2QFY2009
FY 2006	N/A		2QFY1999	N/A	1QFY2005	3QFY2005	N/A	TBD
FY 2007 PB	N/A		2QFY1999	N/A	4QFY2009	2QFY2007	N/A	4QFY2014
FY 2008	1QFY1997		2QFY1999	2QFY2007	2QFY2011	2QFY2007	N/A	4QFY2013
FY 2009	1QFY1997		03/22/1999	04/11/2007	2QFY2013	04/11/2007[a]	N/A	4QFY2016
FY 2010	1QFY1997		03/22/1999	04/11/2007	2QFY2013	04/11/2007	N/A	1QFY2017
FY 2011	1QFY1997		03/22/1999	04/11/2007	2QFY2013	04/11/2007	N/A	1QFY2017
FY 2012	1QFY1997		03/22/1999	04/11/2007	2QFY2013	04/11/2007	N/A	1QFY2017
FY 2013	1QFY1997		03/22/1999	04/11/2007	2QFY2013	04/11/2007	N/A	1QFY2017
FY 2014	1QFY1997		03/22/1999	04/11/2007	4QFY2014	04/11/2007	N/A	TBD
FY 2015	1QFY1997		03/22/1999	04/11/2007	4QFY2016	04/11/2007	N/A	TBD
FY 2016	1QFY1997	10/31/1997	03/22/1999	04/11/2007	4QFY2016	04/11/2007	N/A	4QFY2031
FY 2017	1QFY1997	10/31/1997	03/22/1999	04/11/2007	4QFY2016	04/11/2007	N/A	N/A
FY 2018	1QFY1997	10/31/1997	03/22/1999	04/11/2007	TBD[b]	04/11/2007	N/A	4QFY2048
FY 2019	1QFY1997	10/31/1997	03/22/1999	04/11/2007	TBD[b]	04/11/2007	N/A	4QFY2048
FY 2020	1QFY1997	10/31/1997	03/22/1999	04/11/2007	TBD[b]	04/11/2007	N/A	N/A

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed (if applicable)
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete (d)
CD-3 – Approve Start of Construction
D&D Complete – Completion of D&D work
CD-4 – Approve Start of Operations or Project Closeout

[a] The Department approved CD-3 (Start of Construction) on April 11, 2007; however, as directed by the Revised Continuing Appropriations Resolution, 2007, Public Law 110-5, construction began on August 1, 2007.

[b] The project is being terminated in FY 2019.

Fiscal Quarter or Date

Fiscal Year	Performance Baseline Validation	CD-2A/3A	CD-2B/3B
FY 2005	N/A	09/30/2005	N/A
FY 2006	07/07/2006	N/A	N/A
FY 2007	N/A	N/A	04/06/2006

CD 2A/3A - Approval to start Site Preparation
CD 2B/3B - Approval to begin long lead procurements ("trapped" tanks, steel embeds, reinforcing steel, barrier doors)

Project Cost History

Fiscal Quarter or Date

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2000	TBD	TBD	383,186	0	N/A	TBD	N/A
FY 2001	TBD	TBD	383,186	0	N/A	TBD	N/A
FY 2002	TBD	TBD	TBD	TBD	N/A	TBD	N/A
FY 2003	TBD	TBD	TBD	TBD	N/A	TBD	N/A
FY 2004	TBD	TBD	TBD	TBD	N/A	TBD	N/A
FY 2005	TBD	TBD	TBD	TBD	N/A	TBD	N/A
FY 2006	TBD	TBD	TBD	TBD	N/A	TBD	N/A
FY 2007 PB	TBD	TBD	3,277,984	354,108	N/A	354,108	3,632,092
FY 2008	TBD	TBD	3,868,628	830,701	N/A	830,701	4,699,329
FY 2009	TBD	TBD	3,938,628	875,701	N/A	875,701	4,814,329
FY 2010	TBD	TBD	3,975,828	881,301	N/A	881,301	4,857,129
FY 2011	960,925	3,014,903	3,975,828	881,301	N/A	881,301	4,857,129
FY 2012	978,073	2,997,755	3,975,828	881,301	N/A	881,301	4,857,129
FY 2013	994,073	2,981,755	3,975,828	881,301	N/A	881,301	4,857,129
FY 2014	TBD	TBD	TBD	TBD	N/A	TBD	TBD
FY 2015	TBD	TBD	TBD	TBD	N/A	TBD	TBD
FY 2016	1,072,430	9,179,089	10,251,519	2,439,333	N/A	2,439,333	12,690,852
FY 2017	TBD[a]	TBD[a]	TBD[a]	TBD[a]	N/A	TBD[a]	TBD[a]
FY 2018[a]	TBD[a]	TBD[a]	TBD[a]	TBD[a]	N/A	TBD[a]	17,169,258[b]
FY 2019[a]	TBD[a]	TBD[a]	TBD[a]	TBD[a]	N/A	TBD[a]	17,169,258[b]
FY 2020[a]	N/A[a]	N/A[a]	N/A[a]	N/A[a]	N/A	N/A[a]	N/A

2. Project Scope and Justification

Scope

The MOX Fuel Fabrication Facility (MFFF) project is being terminated in FY 2019, and termination activities will continue into FY 2021. Funds appropriated may be used for contracted support services to the Federal Project Director to support oversight of termination and transition scope, technical and business performance supporting MOX project property demolition and disposition, and NNSA litigation and financial audits.

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[a] The MFFF project is terminated and transition scope, schedule, and costs will be refined in subsequent budget submission upon the Department's approval of the termination and transition plans for the MFFF project.

[b] This updated TPC reflects the 2016 updated performance baseline developed by the DOE Office of Project Management Oversight in partnership with USACE.

Justification
The MOX Fuel Fabrication Facility (MFFF) project is being terminated in FY 2019, and termination activities will continue into FY 2021. The MOX Project has over two billion dollars of government property, plants, equipment and records including 12 permanent facilities, 30+ temporary facilities, 350,000 SF of warehouse equipment and material inventory, 35 acres of fabricated materials/equipment, 230 Terabytes of electronic information, 10,000 boxes of information/records and thousands of other forms of government records captured on electronic media such as harddrives, CDs, etc. Funding will support continued demolition and disposition of facilities/equipment/materials/records, transition of the MFFF into a layup condition, and activities to maintain and perserve facilities and assets in a safe state in support of a future mission, litigation and financial audits. Project closeout documents will also be developed.

Key Performance Parameters (KPPs)
The MFFF project is being terminated in FY 2019.

Performance Measure	Threshold	Objective
Project is being terminated in FY 2019.		

3. Project Cost and Schedule

Financial Schedule

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Design			
FY 1999	N/A	N/A	2,545
FY 2000	N/A	N/A	33,512
FY 2001	N/A	N/A	29,938
FY 2002	N/A	N/A	52,513
FY 2003	N/A	N/A	82,022
FY 2004	N/A	N/A	93,457
FY 2005	N/A	N/A	216,801
FY 2006	N/A	N/A	165,618
FY 2007	N/A	N/A	62,342
FY 2008[a]	N/A	N/A	58,958
FY 2009[b]	N/A	N/A	68,395
FY 2010	N/A	N/A	65,056
FY 2011	N/A	N/A	50,757
FY 2012	N/A	N/A	34,642
FY 2013	N/A	N/A	24,445
FY 2014 Reprogramming	N/A	N/A	0
FY 2014	N/A	N/A	19,789
FY 2015	N/A	N/A	24,895
FY 2016	N/A	N/A	14,758

[a] Includes $31M for long-lead procurements.
[b] Includes $37.6M for long-lead procurements.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2017	N/A	N/A	13,623
FY 2018	N/A	N/A	7,266
FY 2019	N/A	N/A	201
Total Design	**N/A**	**N/A**	**1,121,533**
Construction			
FY 2004	N/A	N/A	0
FY 2005	N/A	N/A	0
FY 2006	N/A	N/A	15,210
FY 2007	N/A	N/A	115,065
FY 2008[a]	N/A	N/A	209,174
FY 2008 (rescinded PY unobligated balance)	N/A	N/A	0
FY 2009[b]	N/A	N/A	301,323
FY 2010	N/A	N/A	429,326
FY 2011	N/A	N/A	482,330
FY 2012	N/A	N/A	671,212
FY 2013	N/A	N/A	476,204
FY 2014 Reprogramming	N/A	N/A	0
FY 2014	N/A	N/A	301,777
FY 2015	N/A	N/A	309,403
FY 2016	N/A	N/A	323,048
FY 2017	N/A	N/A	277,219
FY 2018	N/A	N/A	233,749
FY 2019	N/A	N/A	10,743
FY 2020	N/A	N/A	N/A
FY 2021	N/A	N/A	N/A
FY 2022	N/A	N/A	N/A
FY 2023	N/A	N/A	N/A
FY 2024	N/A	N/A	N/A
Total Construction	**N/A**	**N/A**	**4,155,783**
TEC			
FY 1999	N/A	9,600	2,545
FY 2000	N/A	30,775	33,512
FY 2001	N/A	25,943	29,938
FY 2002	N/A	65,993	52,513
FY 2003	N/A	92,088	82,022
FY 2004	N/A	81,081	93,457

[a] Includes $31M for long-lead procurements.

[b] Includes $37.6M for long-lead procurements.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2005	N/A	295,295	216,801
FY 2006	N/A	337,322	180,828
FY 2007	N/A	262,500	177,407
FY 2008	N/A	346,184	268,132
FY 2008 (rescinded PY unobligated balance)	N/A	0	0
FY 2009	N/A	467,808	369,718
FY 2010	N/A	504,238	494,382
FY 2011	N/A	501,788	533,087
FY 2012	N/A	435,172	705,854
FY 2013	N/A	400,990	500,649
FY 2014 Reprogramming	N/A	59,242	0
FY 2014	N/A	343,500	321,566
FY 2015	N/A	335,000	334,298
FY 2016	N/A	334,000	337,806
FY 2017	N/A	320,000	290,842
FY 2018	N/A	275,097	241,015
FY 2019	0	0	10,944
FY 2020	0	0	0
FY 2021	N/A	N/A	N/A
FY 2022	N/A	N/A	N/A
FY 2023	N/A	N/A	N/A
FY 2024	N/A	N/A	N/A
Total TEC	**N/A**	**5,323,616**	**5,277,316**
Other Project Costs			
FY 1999	5,000	5,000	4,500
FY 2000	5,000	5,000	4,500
FY 2001	5,000	5,000	5,000
FY 2002	5,000	5,000	5,000
FY 2003	8,000	8,000	5,000
FY 2004	9,292	9,292	11,500
FY 2005	N/A	9,357	3,749
FY 2006	N/A	21,300	7,023
FY 2007	N/A	7,792	9,278
FY 2008[a]	N/A	47,068	15,746
FY 2009[b]	N/A	0	21,451
FY 2010	N/A	56,466	19,344

[a] Includes $31M for long-lead procurements.

[b] Includes $37.6M for long-lead procurements.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2011	N/A	4,000	50,211
FY 2012	N/A	47,024	33,142
FY 2013	N/A	40,003	35,065
FY 2014	N/A	39,973	34,582
FY 2015	N/A	9,681	15,463
FY 2016	N/A	5,956	22,296
FY 2017	N/A	14,966	18,270
FY 2018	N/A	14,201	20,170
FY 2019	N/A	220,000	47,618
FY 2020	N/A	220,000	TBD
FY 2021	N/A	109,382	TBD
FY 2022	N/A	N/A	TBD
FY 2023	N/A	N/A	TBD
FY 2024	N/A	N/A	TBD
Total OPC	**TBD**	**904,461**	**388,908**
Total Project Costs (TPC)			
FY 1999	33,000	14,600	7,045
FY 2000	17,375	35,775	38,012
FY 2001	30,943	30,943	34,938
FY 2002	70,993	70,993	57,513
FY 2003	100,088	100,088	87,022
FY 2004	369,566	90,373	104,957
FY 2005	374,444	304,652	220,550
FY 2006	246,000	358,622	187,851
FY 2007[a]	263,415	270,292	186,685
FY 2008[bc]	278,789	393,252	283,878
FY 2008 (rescinded PY unobligated balance)	-115,000	0	0
FY 2009[de]	467,808	467,808	391,169
FY 2010[f]	560,704	560,704	513,726
FY 2011[g]	505,788	505,788	583,298
FY 2012	482,207	482,196	738,996
FY 2013	440,990	440,993	535,714

[a] Includes $31M for long-lead procurements.
[b] Includes $37.6M for long-lead procurements.
[c] MOX funded within the Nuclear Energy appropriation.
[d] MOX funded within the Other Defense Activities appropriation.
[e] Includes $177.4M for long-lead procurements.
[f] Includes $167.9M for long-lead procurements.
[g] Includes $67.1M for long-lead procurements.

	Budget Authority (Appropriations)	Obligations	Costs
FY 2014 Reprogramming	59,242	59,242	0
FY 2014	383,500	383,473	356,148
FY 2015	345,000	344,681	349,761
FY 2016	340,000	339,956	360,102
FY 2017	335,000	334,966	309,112
FY 2018	335,000	289,298	261,185
FY 2019 (directed use of PY unobligated balance)[a]	-25,000	0	0
FY 2019	220,000	220,000	58,562
FY 2020	220,000	220,000	TBD
FY 2021	109,382	109,382	TBD
FY 2022	N/A	N/A	TBD
FY 2023	N/A	N/A	TBD
FY 2024	N/A	N/A	TBD
Grand Total[b]	TBD	TBD	5,666,224

[a] The Conference Report for the Energy and Water, Legislative Branch, and Military Construction and Veterans Affairs Appropriations Act, 2019 (Public Law 115-244) directed NNSA to use $25M in prior year balances to offset FY 2019 needs.
[b] Scope, schedule and costs will be refined in subsequent budget submissions upon the Department's approval of the termination plan for the MFFF project.

Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate[a]	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	TBD	1,072,430	916,148
Contingency	0	0	0
Total, Design	TBD	1,072,430	916,148
Construction			
Site Work	TBD	39,957	39,929
Equipment	TBD	800,000	251,791
Construction	TBD	7,209,398	2,067,639
Other, as needed	TBD	0	0
Contingency	TBD	1,129,734	663,121
Total, Construction	TBD	9,179,089	3,022,480
Other TEC (if any)			
Cold Startup	N/A	N/A	N/A
Contingency	N/A	N/A	N/A
Total, Other TEC	N/A	N/A	N/A
Total Estimated Cost	TBD	10,251,519	3,938,628
Contingency, TEC	TBD	1,129,734	663,121
Other Project Cost (OPC)			
OPC except D&D			
R&D	0	0	0
Conceptual Planning	TBD	37,723	37,723
Conceptual Design	0	0	0
Other OPC Costs	TBD	1,931,344	650,468
Contingency	TBD	470,266	187,510
Total, OPC	**TBD**	**2,439,333**	**875,701**
Contingency, OPC	TBD	470,266	187,510
Total Project Cost	17,169,258[b]	12,690,852	4,814,329
Total Contingency (TEC+OPC)	TBD	1,600,000	850,631

[a] Scope, schedule and costs will be refined in subsequent budget submissions upon the Department's approval of the termination plan for the MFFF project. The current total estimate shown reflects the high end range from the USACE estimate.

[b] This updated TPC reflects the 2016 updated performance baseline developed by the DOE Office of Project Management Oversight in partnership with USACE.

Schedule of Appropriations Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2015 [a]	FY 2016 [b]	FY 2017 [b]	FY 2018 [b]	FY 2019 [b]	FY 2020 [b]	FY 2021 [b]	Outyears [b]	Total
FY 2009	TEC	3,512,050	125,611	300,967	0	0	0	0	0	0	3,938,628
	OPC	781,998	85,771	7,932	0	0	0	0	0	0	875,701
	TPC	4,294,048	211,382	308,899	0	0	0	0	0	0	4,814,329
FY 2010	TEC	3,812,250	125,773	37,805	0	0	0	0	0	0	3,975,828
	OPC	783,699	91,603	5,999	0	0	0	0	0	0	881,301
	TPC	4,595,949	217,376	43,804	0	0	0	0	0	0	4,857,129
FY 2011 [c d]	TEC	3,812,250	125,773	37,805	0	0	0	0	0	0	3,975,828
	OPC	783,699	91,603	5,999	0	0	0	0	0	0	881,301
	TPC	4,595,949	217,376	43,804	0	0	0	0	0	0	4,857,129
FY 2012	TEC	3,812,250	125,773	37,805	0	0	0	0	0	0	3,975,828
	OPC	783,699	91,603	5,999	0	0	0	0	0	0	881,301
	TPC	4,595,949	217,376	43,804	0	0	0	0	0	0	4,857,129
FY 2013	TEC	3,963,250	9,773	2,805	0	0	0	0	0	0	3,975,828
	OPC	632,699	207,603	40,999	0	0	0	0	0	0	881,301
	TPC	4,595,949	217,376	43,804	0	0	0	0	0	0	4,857,129
FY 2014	TEC	4,213,622	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	OPC	310,333	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TPC	4,523,955	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
FY 2014 Reprogramming	TEC	3,916,020	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	OPC	270,333	0	0	0	0	0	0	0	0	270,333
	TPC	4,186,353	0	0	0	0	0	0	0	0	TBD
FY 2015	TEC	4,259,520	196,000	196,000	196,000	196,000	196,000	196,000	196,000	TBD	TBD
	OPC	310,333	25,000	25,000	25,000	25,000	25,000	25,000	25,000	TBD	TBD
	TPC	4,569,853	221,000	221,000	221,000	221,000	221,000	221,000	221,000	TBD	TBD
FY 2016	TEC	4,259,520	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10,251,519
	OPC	310,333	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2,439,333
	TPC	4,569,853	345,000	345,000	221,000	221,000	221,000	221,000	221,000	6,891,999	12,690,852
FY 2017	TEC	4,259,520	335,000	330,000	255,000	171,000	71,000	0	0	0	TBD
	OPC	310,333	10,000	10,000	15,000	50,000	150,000	221,000	221,000	TBD	TBD
	TPC	4,569,853	345,000	340,000	270,000	221,000	221,000	221,000	221,000	TBD	TBD
FY 2018	TEC	4,259,520	335,000	334,000	310,000	255,000	TBD	TBD	TBD	TBD	TBD
	OPC	310,333	10,000	6,000	25,000	15,000	TBD	TBD	TBD	TBD	TBD
	TPC	4,569,853	345,000	340,000	335,000	270,000	TBD	TBD	TBD	TBD	TBD
FY 2019	TEC	4,259,520	335,000	334,000	320,000	255,000	70,000	70,000	TBD	TBD	TBD
	OPC	310,333	10,000	6,000	15,000	15,000	150,000	150,000	TBD	TBD	TBD
	TPC	4,569,853	345,000	340,000	335,000	270,000	220,000	220,000	TBD	TBD	TBD
FY 2020	TEC	4,259,520	335,000	334,000	320,000	255,000	0	0	0	0	TBD
	OPC	310,333	10,000	6,000	15,000	15,000	220,000	220,000	109,382	0	TBD
	TPC	4,569,853	345,000	340,000	335,000	270,000	220,000	220,000	109,382	0	TBD

4. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy (fiscal quarter or date)	N/A[d]
Expected Useful Life (number of years)	N/A[a]
Expected Future Start of D&D of this capital asset (fiscal quarter)	N/A[a]

[a] These numbers reflect the slow-down of the current plutonium disposition strategy while assessing alternative strategies.

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Security	0	543.2	0	8,209.3

Lifecycle cost estimate shown has not been updated since the FY 2014 budget submittal. The MOX project is being terminated in FY 2019.

5. D&D Information

The new area being constructed in this project is not replacing existing facilities.

	Square Feet
New area being constructed by this project	N/A
Area of D&D in this project	N/A
Area to be transferred, sold, and/or D&D outside the project, including area previously "banked"	N/A
Area of D&D in this project at other sites	N/A
Area at other sites to be transferred, sold, and/or D&D outside the project, including area previously "banked"	N/A
Total area eliminated	N/A

Acquisition Approach

The procurement strategy for the MOX facility involved awarding a base contract to Duke Cogema Stone & Webster (now MOX Services) in March 1999 for design, licensing, and irradiation services associated with fuel qualification activities and reactor licensing. Three options were included in the base contract for: (1) construction and management oversight; (2) hot start-up, operations, and irradiation services; and (3) deactivation—which can be awarded separately. Option 1 was exercised by DOE in May 2008..

CB&I AREVA MOX Services (MOX Services) is a Limited Liability Company (LLC) comprised of Chicago Bridge and Iron (CB&I) Company and the French company, AREVA. In February 2013 CB&I completed its acquisition of the previous LLC member, The Shaw Group. Since CB&I is a foreign-based company, a proxy company has been formed to address U.S. government foreign ownership and control regulations. As a result, a proxy company under CB&I named CB&I Project Services Group, LLC, was formed to oversee CB&I's security-sensitive work such as the MFFF Project. In May 2018, McDermott International, Inc., a Panamanian company acquired CB&I in a business combiniation transaction in which CB&I is now an indirect subsidiary of McDermott This transaction along with the associated foreign ownership and control requirements have yet to be concurred by DOE and NRC.

Up to the time of termination, construction of the MOX facility was being performed through a combination of fixed-price/cost-plus sub-contracts and MOX Services' direct managed construction craft personnel. A combination of award fees and incentive fees were included in the overall contract with MOX Services to reward performance within established project baselines.

[a] Scope, schedule and costs will be refined in subsequent budget submissions upon the Department's approval of the termination plan for the MFFF project.
[b] FY 2011 OPC appropriations were only $4 million vs. $30 million planned.
[c] FY 2011 TEC appropriations were increased by $26 million.
[d] Project is being terminated.

On October 10, 2018, NNSA notified the MOX prime contractor that its contract was terminated. NNSA is working to complete termination of the MOX prime contract and transition of the maintenance and property, plant, equipment and record disposition activities. To guide the termination activities, the Department utilized lessons learned captured by the Defense Acquisition University Smart ShutDown Guidebook and other lessons learned from termination of other Major System Acquisition Projects. Four phases of the Worker Adjustment and Retraining Notification (WARN) Act personnel notifications have been planned and aligned with the prime contract termination scope. NNSA has received, reviewed and are executing termination and transition plans from the prime contractor and M&O contractor. A final termination settlement proposal for final contract closure is due from the prime contractor by October 10, 2019. The project will continue to focus on demolition and disposition of facilities/equipment/materials/records, transition of the MFFF into a layup condition, and activities to maintain and perserve facilities and assets in a safe state in support of a future mission, litigation, financial audits and project closeout documents. Final project termination and asset disposition is estimated to be completed by FY 2021.

Nuclear Counterterrorism and Incident Response Program

Overview

One of NNSA's enduring missions is to help protect our Nation and its citizens from the threat of nuclear terrorism or an accident or incident involving the release of nuclear or radiological material. The NNSA Nuclear Counterterrorism and Incident Response (NCTIR) Program evaluates and assesses nuclear or radiological threats and leverages that knowledge to support interagency policy, contingency planning, training, and capacity building in order to strengthen national and international radiological and nuclear counterterrorism, counterproliferation, and incident response capabilities NCTIR also includes the Emergency Operations subprogram, which ensures a comprehensive and integrated approach to emergency management, including planning, mitigation, preparedness, response, and recovery. Emergency Operations also ensure DOE/NNSA will be ready to respond promptly, efficiently and effectively to any emergency involving or affecting National equities worldwide by applying the necessary resources to mitigate impacts, respond to consequences, and protect workers, the public, the environment, and national security. The NCTIR Program includes the following subprograms:

- The **Emergency Operations** (EO) subprogram develops all-hazards emergency management policy and programs, provides incident management training and exercise planning, staffs and executes the 24/7/365 alert, warning and notification function, and manages the Emergency Communications Network (ECN) capability for the Department. EO assists NNSA and DOE sites and deployable teams with implementation of emergency management policies, practices, and technical support. EO manages the Department's Continuity of Operations and Continuity of Government Programs.

- The **Counterterrorism and Counterproliferation** (CTCP) subprogram reduces the threat of nuclear proliferation and nuclear and radiological terrorism through innovative science, technology, and policy solutions. Further, CTCP maintains the capability to respond to, manage, avert, and mitigate the consequences of nuclear and radiological incidents in the United States and elsewhere in the world, and provides nuclear forensics capability to support material and attack attribution. The following subprograms support CTCP:

    - <u>The Nuclear Incident Response subprogram</u> provides a flexible and effective response capability for any nuclear/radiological incident in the United States or abroad by applying the unique technical expertise within NNSA's nuclear security enterprise. This is accomplished by ensuring personnel have received essential training and specialized technical equipment and are ready to deploy to provide an integrated response for radiological search, render safe, and consequence management for nuclear/radiological emergencies, national exercises, and security operations for National Security Special Events and other large special events.

    - <u>The National Technical Nuclear Forensics (NTNF) subprogram</u> supports the larger interagency National Technical Nuclear Forensics mission with technical and analytical capabilities. Technical nuclear forensics (TNF) maintains the capability to analyze and determine the origin of interdicted nuclear materials and nuclear devices, and in the case of a nuclear attack, the device design and origin of the nuclear materials used. TNF leverages expertise at the National Laboratories to maintain a laboratory and field response capability in the event of an incident requiring nuclear forensics analysis capabilities in which the responders integrate with their interagency partners to provide a whole of government response.

    - <u>The Counterterrorism Response and Capacity Building subprogram</u> leverages NCTIR's technical expertise to strengthen preparedness and capabilities to respond to all radiological or nuclear incidents, accidents, and terror threats posing a potential risk to the United States, its citizens, or its interests. These activities exercise and expand state and local radiological and nuclear incident response capabilities and enable key international partners to effectively address radiological or nuclear incidents in their region--with or without U.S. involvement--as far from U.S. territory as possible.

    - <u>The Nuclear Counterterrorism (NCT) Assessment subprogram</u> provides the nation's technical capability to understand and defeat nuclear threat devices, including Improvised Nuclear Devices (INDs) and lost or stolen foreign nuclear weapons, and to develop foundational technologies supporting nuclear counterproliferation efforts. NCT maintains this technical capability by 1) assessing nuclear threat device concepts; 2) assessing protection requirements for nuclear materials; 3) implementing the classified Nuclear Threat Reduction (NTR) channels with the United Kingdom and France; and 4) improving predictive render safe capabilities. Technical work on device assessment also supports the Department of Defense (DOD), Federal Bureau of Investigation (FBI), and Intelligence Community in policy, planning, and operational capabilities.

AMS Recapitalization

The DOE/NNSA Aerial Measuring System (AMS) detects, measures, and tracks radioactive material in an emergency to determine contamination levels. The AMS mission has two operational modes with unique requirements: 1) rapid On-Call Response to provide coarse characterization of contamination; and 2) Radiation Mapping, to provide detailed mapping of the contamination. The AMS Recapitalization subprogram will procure aviation platforms that meet the future needs of the AMS Program. In accordance with the conclusions of the completed Analysis of Alternatives (AoA), three fixed-wing aircraft will be procured in FY 2019, and two rotary-wing aircraft will be procured in FY 2020 to recapitalize the current AMS fleet.

Nuclear Counterterrorism and Incident Response Program
Funding

(Dollars in Thousands)

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Nuclear Counterterrorism & Incident Response Program				
Emergency Operations	35,515	35,574	35,545	-29
Counterterrorism and Counterproliferation				
Emergency Response/Nuclear Incident Response	161,045	162,570	202,149	+39,579
National Technical Nuclear Forensics	14,600	15,181	19,110	+3,929
Counterterrorism Response & Capacity Building	8,100	8,210	9,105	+895
Nuclear Counterterrorism Assessment	63,100	65,150	70,686	+5,536
AMS Recapitalization	0	32,500	35,500	+3,000
Subtotal, Counterterrorism and Counterproliferation	246,845	283,611	336,550	+52,939
Total, Nuclear Counterterrorism & Incident Response Program	**282,360**	**319,185**	**372,095**	**+52,910**

Outyears for Nuclear Counterterrorism and Incident Response Program
Funding

(Dollars in Thousands)

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Nuclear Counterterrorism Incident Response Program				
Emergency Operations	36,000	36,500	37,000	37,777
Counterterrorism and Counterproliferation				
Emergency Response/Nuclear Incident Response	212,303	207,983	208,937	213,372
National Technical Nuclear Forensics	20,650	21,300	21,400	21,750
Counterterrorism Response & Capacity Building	10,750	11,100	11,100	11,300
Nuclear Counterterrorism Assessment	92,000	93,270	93,494	95,121
AMS Recapitalization	0	0	0	0
Subtotal, Counterterrorism and Counterproliferation	335,703	333,653	334,931	341,543
Total, Nuclear Counterterrorism Incident Response Program	**371,703**	**370,153**	**371,931**	**379,320**

Nuclear Counterterrorism and Incident Response Program
Explanation of Major Changes
(Dollars in Thousands)

	FY 2020 Request vs FY 2019 Enacted
Nuclear Counterterrorism and Incident Response Program	
Emergency Operations: No significant change.	-29
Counterterrorism and Counterproliferation: Increase provides funding to begin procurement of the two rotary-wing aircraft in FY 2020 for the Aerial Measuring System (AMS) (+$3M), as follow-on to procurement of the three fixed-wing aircraft in FY 2019; begins the Capability Forward initiative of enhanced training and equipment procurement to transition fourteen Stabilization regions to directed render safe teams, includes funding for training facility upgrades, applied science, and expert team expansion (+$39.5M); provides increased support for the National Nuclear Materials Archive (NNMA) to begin to identify, consolidate and analyze historical nuclear material samples of value to the technical nuclear forensics program and continues enhancements to post detonation device assessment (+$3.9M); advances the nation's technical capability to understand and defeat nuclear threat devices (+$5.5M).	+52,939
Total, Nuclear Counterterrorism and Incident Response Program	**+52,910**

Nuclear Counterterrorism and Incident Response Program
Emergency Operations

Description

The Emergency Operations subprogram is focused on emergency preparedness, emergency management policy, and incident response to sustain the DOE/NNSA mission, maintain readiness, and ensure a fully implemented and integrated comprehensive emergency management enterprise system throughout the Department.

The FY 2020 Budget Request will continue to focus on complex wide integration and enhancement of Emergency Operations activities.

To strengthen emergency preparedness across DOE/NNSA, this subprogram develops and implements specific programs, processes, and concepts to minimize the impacts of emergencies on worker and public health and safety, the environment, and national security. This is accomplished by promulgating appropriate departmental policies and implementing requirements and guidance; developing and conducting training and other emergency preparedness activities; supporting DOE/NNSA readiness assurance activities and participating in interagency emergency planning and coordination activities. EO will also develop standards for exercises and provide training to support an all hazards emergency management capability.

This subprogram operates the DOE/NNSA Consolidated Emergency Operations Center (CEOC) and manages the Emergency Communications Network (ECN). The DOE/NNSA CEOC provides the core functions of supporting department command, control, communications, Geographic Information System (GIS) data, and situational intelligence requirements for all categories of DOE emergency response situations at all times. The DOE/NNSA CEOC will broaden and strengthen all its hazards incident support effectiveness through training, exercises, improvements and efficiencies.

The ECN is the Department's high-reliability communication system that supports collecting, processing, and disseminating emergency related information from multiple sources. The ECN ensures DOE/NNSA decision-makers have a common operating picture for real-time situation awareness during the management and support of operational emergencies, energy emergencies, and emergency assistance including national and international counterterrorism and COOP related events. The network supports classified and unclassified voice, video, and data transmissions. The system is expected to grow from 82 sites to over 110 sites by the end of FY 2020. ECN provides continuous effective and secure network services for DOE/NNSA response components to include COOP, Response/Render Safe, forensics, and Counterterrorism missions. The expansion has included the installation of nodes into other government agencies and other countries.

The Continuity of Operations Program (COOP), supports all aspects identified in: Presidential Policy Directive 40 (PPD-40), *National Continuity Policy;* Federal Continuity Directive (FCD) 1, Federal Executive Branch National Continuity Program Requirements; FCD 2 Federal Executive Branch Mission Essential National Continuity Program Requirements; and Office of Science and Technology Policy (OSTP)/OMB D-16-1, Minimum Requirements for Federal Executive Branch Continuity Communications Capabilities. The Emergency Operations subprogram also supports training and exercises, equipment, maintenance and upgrades to classified facilities along with a Headquarters continuity facility and a devolution facility outside of the National Capital Region.

Emergency Operations

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Emergency Operations $35,574,000	**Emergency Operations $35,545,000**	**Emergency Operations -$29,000**
• Administer the Department's Comprehensive Emergency Management System. • Manage the Department's Continuity Programs. • Provide for program's share of support to the Department's emergency operations. • Provide for required contract support, ensure adequate training, and support NEP exercises needed to support emergency operations at full capacity. • Manage the Department's CEOC and ECN.	• Continuity of Operations and Government Programs • Unified Coordination Structure Full Operational Capability by end of Calendar Year 2020 • ECN provides dedicated communications capabilities in support of the global emergency management and response mission of the DOE/NNSA and its Government partners. • CEOC which manages the 24-hours/day, 7 days/week, 365 days/year (24/7/365) single-point-of-contact for Departmental and interagency notifications regarding situations requiring unified coordination. • Ensure all DOE/NNSA Headquarters/ Labs/ Plants/ Sites for Emergency Management Programs will be ready to guarantee a comprehensive and integrated approach to emergency management, including planning, mitigation, preparedness, response, and recovery.	• No significant change from the $29K decrease.

Nuclear Counterterrorism and Incident Response Program
Counterterrorism and Counterproliferation

Description

The Counterterrorism and Counterproliferation (CTCP) subprogram is focused on providing expertise, practical tools, and technically informed policy recommendations required to advance U.S. nuclear counterterrorism and counterproliferation objectives. CTCP focuses on nuclear and radiological incidents and accidents, with the core mission to prepare for, respond to and successfully resolve such events.

The **Nuclear Incident Response (NIR)/Nuclear Emergency Support Team (NEST)** subprogram serves as the last line of national defense in the face of a nuclear or radiological incident or accident. The mission is to apply the unique technical expertise within NNSA's nuclear security enterprise to prepare, prevent, mitigate, and respond to a nuclear or radiological incident domestically or abroad with responsive, flexible and effective nuclear/radiological incident response capabilities. The strategic approach for incident response activities is to ensure a central point of contact and an integrated response to all emergencies involving radionuclides.

This subprogram works closely with other DOE elements as well as other federal organizations, including Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA), Environmental Protection Agency (EPA), Nuclear Regulatory Commission (NRC), DOD and FBI to provide technical assistance to respond domestically or abroad to incidents, including terrorist threats, involving nuclear materials and to conduct exercises and provide support to the NEST programs to ensure safe incident resolution and the protection of public safety and the environment. This is accomplished by ensuring the appropriate infrastructure is in place to provide command, control, coordination, and communications of the NNSA nuclear incident response teams. It is also essential that response personnel are properly organized, trained, and equipped to rapidly deploy and successfully resolve an incident.

The specialized assets Accident Response Group (ARG), Radiological Assistance Program (RAP), Nuclear/Radiological Advisory Team (NRAT) and Joint Technical Operations Team (JTOT) search for, identify, characterize, render safe, and take possession of any nuclear device and support efforts to recover nuclear material outside of regulatory control as well as provide preventive radiological and nuclear detection support to federal, state, and local public safety organizations for major public events. Stabilization assets provide technical support to the FBI to respond to nuclear threat devices, including specialized technology and training for regional teams to locate and identify radiological/nuclear devices and prevent these devices from detonating. The increased funding in this budget request will provide the enhanced training and equipment needed to transition these teams to an initial render safe capability, while increasing the number of U.S. cities covered by this capability. This includes training facility upgrades, applied science, and technical bench depth building.

Consequence management assets provide assistance to federal, state and local entities to respond to accidents and incidents involving the potential or actual release of nuclear or radiological materials. Consequence management teams provide technical analysis to support protective action guidance – such as evacuation, shelter-in place, and medical treatment - during a radiological response. DOE/NNSA analysis is based on predictive modeling of atmospheric dispersal, real-time radiological measurements, and the latest medical science.

The **National Technical Nuclear Forensics (NTNF)** subprogram maintains the operational capability for the pre-detonation device technical nuclear forensics program and provides operational support to the post-detonation and Bulk Special Nuclear Materials (SNM) Analysis technical nuclear forensics programs. The NTNF subprogram is outlined in Presidential Policy Directive/PPD-42 ("Preventing and Countering Weapons of Mass Destruction Proliferation, Terrorism, and Use"), which maintains mission readiness, institutionalizes roles and responsibilities, and provides operational support for pre-detonation and post-detonation nuclear forensics and attribution programs. NNSA work in this area includes training and exercises for responders, equipment procurement, maintenance, logistics, technical integration, readiness to deploy pre- and post-detonation response teams, readiness of device assessment teams, and readiness to conduct bulk actinide laboratory analysis. This nuclear forensics funding also allows for further development of the National Nuclear Materials Archive (NNMA) so that historical samples of nuclear materials of value may be identified, stored, and analyzed. Comparative analysis of these materials may significantly aid the evaluation of interdicted pre-detonation materials or post-detonation samples and thus enhance technical nuclear forensics capabilities for attribution.

The **Counterterrorism Response and Capacity Building** subprogram mission is to strengthen preparedness for all radiological or nuclear incidents, accidents, and terror threats posing a potential risk to the United States territory, citizens, or its interests. To execute this mission, this subprogram works domestically with federal, state, and local officials to expand their capabilities to contribute to the national response to a radiological or nuclear terrorist threat or incident in the United States. As part of a robust strategy to protect America from potential radiological or nuclear threats, this program also cooperates with key international partners to strengthen their ability to effectively address radiological or nuclear incidents in their region—with or without U.S. involvement—as far from U.S. territory as possible.

The Counterterrorism Response and Capacity Building subprogram activities include technical exchanges, joint technical experiments, workshops, exercises, technical assistance and support, and training with partners. These activities address the full range of potential radiological or nuclear threats. This subprogram annually assesses global security trends, risks, and requirements in order to plan, prioritize, and implement radiological/nuclear counterterrorism and incident response joint activities.

The **Nuclear Counterterrorism (NCT) Assessment** subprogram provides the nation's technical capability to understand and defeat nuclear threat devices including Improvised Nuclear Devices (INDs) and lost or stolen foreign nuclear weapons. NCT maintains and advances this technical capability through partnerships with the NNSA nuclear weapons design laboratories and production facilities and through technically-informed exchanges with the United Kingdom and France. Collectively, this work shapes our understanding of nuclear terrorism threats. This understanding is used to support policies and procedures to improve nuclear material protection and the technical capabilities available for crisis operations. The NCT Assessment subprogram informs policies and procedures across multiple departments and agencies and is coordinated across NNSA and within the U.S. interagency process, to ensure maximum alignment with agreed-upon joint goals and ongoing programs.

This FY 2020 Budget Request sustains NNSA's laboratory capabilities (modeling/simulation, tools, expertise) for highly specialized nuclear threat science assessments, while incrementally improving predictive capabilities in support of crisis operations. NCT Assessment will support the requirement to perform technical assessments in support of the 2016 Design Basis Threat (DBT) that governs DOE's nuclear material security posture. Similar technical expertise will continue to support Defense Nuclear Nonproliferation international nuclear security engagements by providing technical inputs for risk prioritization. This budget Request also enables implementation of the technical work plans under the bilateral and trilateral classified channels that enable the sharing of best practices with foreign partners to reduce nuclear terrorism risks; and will provide funding to use current capabilities to develop innovative technologies to address emerging nuclear threats.

The **AMS Recapitalization** efforts have begun with the procurement of three fixed-wing Aerial Measuring System (AMS) aircraft in FY 2019 and will procure two rotary-wing aircraft in FY 2020. These aviation platforms will meet the future needs of the AMS Program. In February 2016, a mission needs statement identified the current aging fleet of aircraft as a capability gap because 1) the current fleet has surpassed optimum economic and operational cost-effectiveness, based on OMB standards, 2) increased incidence of age-related unscheduled maintenance and reduced availability of parts is materially impacting readiness to respond, 3) recurring findings in Office of Aviation Management audits express age-related safety and human factors concerns with sustained operations with these aircraft, and 4) obsolete avionics will require complete and costly replacement by January 1, 2020 to remain compliant with Federal Aviation Administration (FAA) regulations.

CTCP Highlights of the FY 2020 Budget Request

- Conduct Stabilization Operations activities and implement the Capability Forward initiative to provide technical assistance to the FBI to respond to nuclear threat devices by providing specialized technology and training for regional teams. The increased funding in this budget request will transition existing Stabilization teams to incorporate initial render safe capabilities through enhance training and equipment procurement, as well as increasing the number of total teams. This includes training facility upgrades, applied science, and technical bench depth building;
- Provide expertise and equipment to 1) detect and identify nuclear or radiological materials during high-profile events or in response to a threat; 2) rapidly respond to and disable a potentially yield producing nuclear device; and 3) lead the Federal Government's monitoring and technical assessment efforts after a nuclear or radiological incident or accident, saving lives;
- Enables procurement of mission critical equipment to recapitalize equipment that has exceeded its useful life, including recapitalization of the two rotary-wing aircraft in FY 2020 for the Aerial Measuring System (AMS), as follow-on to the FY 2019 procurement of the three fixed-wing aircraft. The DOE/NNSA AMS detects, measures, and tracks radioactive material in an emergency to determine contamination levels;
- Begin to identify, consolidate and analyze historical nuclear material samples of value to the technical nuclear forensics program and make progress towards establishing the National Nuclear Materials Archive (NNMA) within NNSA;
- Advance the nation's technical capability to: understand and defeat nuclear threat devices, including Improvised Nuclear Devices (INDs), and lost or stolen nuclear weapons; advise on protection requirements for nuclear materials; and, prevent nuclear terrorism through Nuclear Threat Reduction channels with the United Kingdom and France;
- Strengthen U.S. national security by increasing partner capabilities to counter and respond to radiological and nuclear incidents and accidents worldwide through: policy, training, exercises, technical exchanges, and equipment provisioning.

CTCP FY 2018 Accomplishments

- Maintained readiness to respond to a nuclear/radiological emergency.
- Completed AMS recapitalization plan.
- Developed a National Nuclear Materials Archive (NNMA) program plan which provides technical requirements and evaluations criteria and defines consensus policy on selection prioritization, technical analysis, and anticipated management of NNMA materials.
- Completed initial 3-year scientific exploration to assess NNSA's standoff disablement capabilities.
- Held five technical exchange workshops to advance understanding of radiological/nuclear incident preparedness issues and conducted two scenario based policy discussions focusing on counterterrorism and counter nuclear smuggling with international partners.
- Established new classification communication infrastructure to support Nuclear Threat Reduction exchanges with United Kingdom and France.
- Deployed Top Secret/Sensitive Compartmented Information communications in support of National and International Level Exercises, in conjunction with mission partners.
- Completed the Tactical Radiological Nuclear Search Operations Concept of Operations.
- Completed Render Safe/Joint Technical Operations Team response posture analysis.
- Conducted new training for Silent Thunder TTX domestic participants on radiation hazards, operations, and communications during an R/N incident.
- Continued deployment and limited production of the Multiplicity Counter-15 to the field, satisfying 100% of the Joint Technical Operations Team and 30% of the Stabilization mission requirements.
- Successfully reduced backlog of equipment recapitalization needs.

Counterterrorism and Counterproliferation

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Counterterrorism and Counterproliferation $283,611,000	**Counterterrorism and Counterproliferation $336,550,000**	**Counterterrorism and Counterproliferation +$52,939,000**
Nuclear Incident Response/Nuclear Emergency Support Team $162,570,000	**Nuclear Incident Response/Nuclear Emergency Support Team $202,149,000**	**Nuclear Incident Response/Nuclear Emergency Support Team +$39,579,000**

• Provide technical assistance to federal, state, tribal, local, and international government agencies to deal with incidents, including terrorist threats that involve potential use of nuclear materials.
• Provide technical assistance to a Lead Federal Agency to search for or detect illicit radiological or nuclear material.
• Continue collection and expert analysis of radiological material signatures through DOE Radiological Triage Program.
• Support lead federal agencies to address threats posed by domestic and foreign terrorists likely to have both the will and means to employ nuclear devices and weapons-usable nuclear materials.
• Sustain Render Safe capabilities for an identified critical mission area. This effort includes predictive capability.
• Provide DOE/NNSA technical assistance for the planning, execution, and evaluation of national level exercises, including but not limited to: Marble Challenge, Nuclear Weapons Accident/Incident Exercises (NUWAIX), and other DOD-led exercises in which DOE/NNSA is not the lead.
• Implement advanced training for consequence management response teams and home teams based on requirements of updated mission
	• Provide technical assistance to federal, state, tribal, local, and international government agencies to deal with incidents, including terrorist threats that involve potential use of nuclear materials.
	• Provide technical assistance to a Lead Federal Agency to search for or detect illicit radiological or nuclear material.
	• Continue collection and expert analysis of radiological material signatures through DOE Radiological Triage Program.
	• Support lead federal agencies to address threats posed by domestic and foreign terrorists likely to have both the will and means to employ nuclear devices and weapons-usable nuclear materials.
	• Sustain Render Safe capabilities for an identified critical mission area. This effort includes predictive capability.
	• Provide DOE/NNSA technical assistance for the planning, execution, and evaluation of national level exercises, including but not limited to: Marble Challenge, NUWAIX, and other DOD-led exercises in which DOE/NNSA is not the lead.
	• Implement advanced training for consequence management response teams and home teams based on requirements of updated mission analyses that reflect lessons from responses and exercises. Sustain data communications systems
		• Increase funds an improved Stabilization operations capability that provides enhanced training and equipment to eleven Stabilization teams and adds one Stabilization team - with plans for one additional team per year through FY 2022 - in designated cities for a total of fourteen teams with enhanced directed render safe capability to respond to a nuclear terrorism threat:
		  ○ Funding this requirement will bring the DOE budget in alignment with the FBI's funding profile for Capability Forward.
		  ○ The initiative will bring an uplift in the: 1) procurement of new, specialized equipment to enable directed render safe capability; 2) directed render safe training and associated consumable equipment; 3) training, applied science and technical bench depth building for required expertise to enable directed render safe capability across the national laboratory enterprise; and 4) use of applied science to develop and characterize new directed render safe technologies to expand the applicability of the technical tool set.
		  ○ Reflects an internal realignment of readiness workforce requirements to respond and sustain technical support to a major consequence management radiological or nuclear incident.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
analyses that reflect lessons from responses and exercises. Sustain data communications systems for communications between the field teams and home teams. • Provide continued decision support tools to radiological response efforts, in the event of the intentional or accidental release of radiological or nuclear material, as well as, informing recovery planning efforts. • Improve clarity of guidance provided to public health officials on evacuation recommendations and health effects from the accidental or intentional release of radiological materials based on the latest science. • Work jointly with the federal coordinating agency, which is usually DHS/FEMA, during any radiological accident or incident. • Coordinate with the EPA/NRC and other elements within DOE, to provide support to safeguard the public and environment and mitigate the effects of a nuclear or radiological accident or incident. • Continue recapitalization efforts for critical incident response equipment that is beyond its planned life cycle.	for communications between the field teams and home teams. • Provide continued decision support tools to radiological response efforts, in the event of the intentional or accidental release of radiological or nuclear material, as well as, informing recovery planning efforts. • Improve clarity of guidance provided to public health officials on evacuation recommendations and health effects from the accidental or intentional release of radiological materials based on the latest science. • Work jointly with the federal coordinating agency, which is usually DHS/FEMA, during any radiological accident or incident. • Coordinate with the EPA/NRC and other elements within DOE, to provide support to safeguard the public and environment and mitigate the effects of a nuclear or radiological accident or incident. • Continue recapitalization efforts for critical incident response equipment that is beyond its planned life cycle. • Sustain capability for existing and increased number of stabilization cities including training and equipment maintenance. • Deploy to additional cities and upgrade infrastructure and specialized technical equipment, as needed.	o Addresses need for improved organizational readiness capability and the Incident Response Readiness Index performance metric shortfall.
National Technical Nuclear Forensics $15,181,000	**National Technical Nuclear Forensics $19,110,000**	**National Technical Nuclear Forensics +$3,929,000**
• Provide technical and operational capabilities in support of the U.S. Government interagency NTNF program. Improve efficiencies and	• Provide technical and operational capabilities in support of the U.S. Government interagency NTNF program.	• Provides funding for the National Nuclear Materials Archive (NNMA) to identify, consolidate and analyze historical nuclear

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
oversight by consolidating all NCTIR forensics activities. • Maintain readiness to respond to pre- and post- detonation nuclear events. • Participate in one Ground Collection Task Force field exercise and one enhanced training event. • Fully support two Post-Detonation device reconstruction training and exercises. • Conduct two DFEAT exercises. • Continue preventative and corrective facility maintenance at P-Tunnel, NNSS for support to the Pre-Detonation Device Program. Continue to address broader infrastructure improvements at the NNSS. • Continue LANL PF4/TA-55 plans and procedure development in support of Pre-Detonation Device Program requirements. • Enhance operational capability for Bulk Special Nuclear Materials Analysis Program and begin planning for the National Nuclear Materials Archives. • Lead U.S. nuclear forensics technical collaboration efforts with the UK under the Nuclear Threat Reduction channel.	• Maintain readiness to respond to pre- and post-detonation nuclear events. • Participate in one Ground Collection Task Force field exercise and one enhanced training event. • Fully support two Post-Detonation device reconstruction drill/exercise events. • Conduct two DFEAT exercises. • Continue preventative and corrective facility maintenance at P-Tunnel, NNSS for support to the Pre-Detonation Device Program. Continue to address broader infrastructure improvements at the NNSS. • Continue LANL PF4/TA-55 plans and procedure development in support of Pre-Detonation Device Program requirements. • Continue operational capability enhancements for BSAP. • Identify, consolidate, and analyze historical nuclear material samples for the NNMA. • Lead U.S. nuclear forensics technical collaboration efforts with the UK under the Nuclear Threat Reduction channel.	material samples of value to the technical nuclear forensics program. • Supports base program activities to include enhancements to device assessment, operational training and readiness, equipment recapitalization, and communications upgrades.
Counterterrorism Response and Capacity Building $8,210,000	**Counterterrorism Response and Capacity Building $9,105,000**	**Counterterrorism Response and Capacity Building +$895,000**
• Design and conduct seven *Silent Thunder* domestic WMD counterterrorism tabletop exercises with additional seminars. • Design and conduct seven *Eminent Discovery* international radiological/nuclear terrorism interdiction response tabletop exercises.	• Design and conduct seven *Silent Thunder* domestic WMD counterterrorism tabletop exercises with additional seminars. • Design and conduct seven *Eminent Discovery* international radiological/nuclear terrorism interdiction response tabletop exercises.	• Enables planned increase in base program activities to include conducting operational training and support missions for foreign major public events and improving public messaging regarding nuclear or radiological incidents.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
• Conduct four international incident preparedness and response technical exchange workshops. • Conduct four joint IAEA training courses on incident and nuclear security preparedness and response. • Support international policy development and execution with IAEA to strengthen global harmonization and coordination on nuclear and radiological incident preparedness and response.	• Conduct four international incident preparedness and response technical exchange workshops. • Engage key international partners bilaterally to coordinate nuclear and radiological incident preparedness and response. • Conduct four joint IAEA training courses on incident and nuclear security preparedness and response. • Support international policy development and execution with IAEA to strengthen global harmonization and coordination on nuclear and radiological incident preparedness and response, including public messaging. • Conduct operational training and support missions for foreign major public events.	
Nuclear Counterterrorism Assessment $65,150,000	**Nuclear Counterterrorism Assessment $70,686,000**	**Nuclear Counterterrorism Assessment +$5,536,000**
• Perform high-precision threat device modeling and experiments. • Continue Tier Threat Modeling Archive Validation project. • Conduct technical assessment in support of USG nuclear material security efforts.	• Perform high-precision threat device modeling and experiments. • Continue Tier Threat Modeling Archive Validation project. • Conduct technical assessment in support of USG nuclear material security efforts.	• Reflects the use of applied science to characterize new directed technologies to address emerging nuclear threats.
AMS Recapitalization $32,500,000	**AMS Recapitalization $35,500,000**	**AMS Recapitalization +$3,000,000**
• Commence targeted recapitalization efforts for the three Aerial Measuring Systems (AMS) aircraft that are near the end of their effective life cycle in accordance with completed Analysis of Alternatives.	• Begin AMS procurement of two rotary-wing AMS aircraft.	• Continues recapitalization efforts for the AMS fleet of aircraft as follow-on to the FY 2019 purchase of three fixed-wing aircraft.

Nuclear Counterterrorism and Incident Response Program
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment >$500K (including MIE)	N/A	N/A	1,900	1,900	1,942	1,985	43
Minor Construction	N/A	N/A	0	0	0	7,400	7,400
Total, Capital Operating Expenses	N/A	N/A	**1,900**	**1,900**	**1,942**	**9,385**	**+7,443**
Capital Equipment > $500K (including MIE)							
Total Non-MIE Capital Equipment (>$500K)	N/A	N/A	1,900	1,900	1,942	1,985	+43
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**1,900**	**1,900**	**1,942**	**1,985**	**+43**

(Dollars in Thousands)

	Total	Prior Years	FY 2018 Enacted	FY 2018 Actuals	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Minor Construction Projects (Total Estimated Cost (TEC)							
Total Minor Construction Projects (TEC <$5M)	N/A	N/A					+0
New Stabilization Training Facility (9940 Site), SNL	7,400					7,400	+7,400
Total, Minor Construction Projects	**N/A**	**N/A**	**0**	**0**	**0**	**7,400**	**+7,400**
Total, Capital Summary	**N/A**	**N/A**	**1,900**	**1,900**	**1,942**	**9,385**	**+7,443**

Outyears for Nuclear Counterterrorism and Incident Response Program

	FY 2021 Estimate	FY 2022 Estimate	FY 2023 Estimate	FY 2024 Estimate	Outyears
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	2,029	2,074	2,120	2,167	0
Minor Construction	0	0	0	0	0
Total, Capital Operating Expenses	**2,029**	**2,074**	**2,120**	**2,167**	**0**
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment (>$500K)	2,029	2,074	2,120	2,167	N/A
Total, Capital Equipment (including MIE)	**2,029**	**2,074**	**2,120**	**2,167**	**0**

Department Of Energy

FY 2020 Congressional Budget

Funding by Appropriation by Site

($K)

Defense Nuclear Nonproliferation	**FY 2018 Total Enacted**	**FY 2019 Enacted**	**FY 2020 Request**
Argonne National Laboratory			
Defense Nuclear Nonproliferation R&D			
Defense Nuclear Nonproliferation R&D	9,723	24,375	3,807
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	3,056	3,325	3,486
Global Material Security			
Global Material Security	2,036	2,236	1,687
Material Management and Minimization			
Material Management and Minimization	19,611	5,903	28,584
Nonproliferation and Arms Control			
Nonproliferation and Arms Control	9,484	9,100	9,677
Total, Argonne National Laboratory	**43,910**	**44,939**	**47,241**
Brookhaven National Laboratory			
Defense Nuclear Nonproliferation R&D			
Defense Nuclear Nonproliferation R&D	1,175	1,119	718
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	2,896	2,519	2,595
Global Material Security			
Global Material Security	1,350	1,381	1,216
Material Management and Minimization			
Material Management and Minimization	0	0	400
Nonproliferation and Arms Control			
Nonproliferation and Arms Control	2,942	3,900	3,964
Total, Brookhaven National Laboratory	**8,363**	**8,919**	**8,893**
Consolidated Business Center			
Material Management and Minimization			
Material Management and Minimization	100	0	0
Total, Consolidated Business Center	**100**	**0**	**0**
Idaho National Laboratory			
Defense Nuclear Nonproliferation R&D			
Defense Nuclear Nonproliferation R&D	42,596	43,196	10,909
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	3,720	4,609	4,747
Global Material Security			
Global Material Security	13,683	15,098	12,036
Material Management and Minimization			
Material Management and Minimization	9,391	12,350	43,061
Nonproliferation and Arms Control			
Nonproliferation and Arms Control	1,614	2,400	2,463
Total, Idaho National Laboratory	**71,004**	**77,653**	**73,216**

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Funding by Appropriation by Site
($K)

Defense Nuclear Nonproliferation	FY 2018 Total Enacted	FY 2019 Enacted	FY 2020 Request
Kansas City National Security Complex (KCNSC)			
Defense Nuclear Nonproliferation R&D			
Defense Nuclear Nonproliferation R&D	534	275	286
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	27,347	25,274	52,032
Material Management and Minimization			
Material Management and Minimization	0	1,250	0
Nonproliferation and Arms Control			
Nonproliferation and Arms Control	3,341	2,961	3,404
Total, Kansas City National Security Complex (KCNSC)	**31,222**	**29,760**	**55,722**
Lawrence Berkeley National Laboratory			
Defense Nuclear Nonproliferation R&D			
Defense Nuclear Nonproliferation R&D	7,564	7,423	7,708
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	0	430	443
Nonproliferation and Arms Control			
Nonproliferation and Arms Control	613	590	631
Total, Lawrence Berkeley National Laboratory	**8,177**	**8,443**	**8,782**
Lawrence Livermore National Laboratory			
Defense Nuclear Nonproliferation R&D			
Defense Nuclear Nonproliferation R&D	53,640	50,898	55,513
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	43,633	42,791	48,016
Global Material Security			
Global Material Security	8,960	8,981	7,986
Material Management and Minimization			
Material Management and Minimization	70	100	0
Nonproliferation and Arms Control			
Nonproliferation and Arms Control	20,109	22,000	23,231
Total, Lawrence Livermore National Laboratory	**126,412**	**124,770**	**134,746**

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FY 2020 Congressional Budget

Funding by Appropriation by Site

($K)

Defense Nuclear Nonproliferation	FY 2018 Total Enacted	FY 2019 Enacted	FY 2020 Request
Los Alamos National Laboratory			
Defense Nuclear Nonproliferation R&D			
Defense Nuclear Nonproliferation R&D	119,986	108,569	120,837
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	48,656	43,062	48,353
Global Material Security			
Global Material Security	41,474	44,618	35,978
Material Management and Minimization			
Material Management and Minimization	41,282	48,989	57,270
Nonproliferation and Arms Control			
Nonproliferation and Arms Control	22,132	21,881	22,484
Total, Los Alamos National Laboratory	**273,530**	**267,119**	**284,922**
Nevada Field Office			
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	50	50	50
Total, Nevada Field Office	**50**	**50**	**50**
Nevada National Security Site			
Defense Nuclear Nonproliferation R&D			
Defense Nuclear Nonproliferation R&D	34,779	20,930	30,539
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	57,329	56,123	59,041
Global Material Security			
Global Material Security	1,515	1,515	1,168
Nonproliferation and Arms Control			
Nonproliferation and Arms Control	157	271	296
Total, Nevada National Security Site	**93,780**	**78,839**	**91,044**
NNSA Albuquerque Complex			
Defense Nuclear Nonproliferation R&D			
Defense Nuclear Nonproliferation R&D	43,258	24,563	25,576
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	5,015	289	298
Global Material Security			
Global Material Security	96,329	98,232	86,575
Material Management and Minimization			
Material Management and Minimization	19,946	20,850	2,000
Nonproliferation and Arms Control			
Nonproliferation and Arms Control	2,403	2,438	2,487
Nonproliferation Construction			
Nonproliferation Construction	7,770	8,086	0
Total, NNSA Albuquerque Complex	**174,721**	**154,458**	**116,936**

Department Of Energy

FY 2020 Congressional Budget

Funding by Appropriation by Site

($K)

Defense Nuclear Nonproliferation	FY 2018 Total Enacted	FY 2019 Enacted	FY 2020 Request
NNSA Production Office (NPO)			
Material Management and Minimization			
Material Management and Minimization	42,190	9,090	10,250
Total, NNSA Production Office (NPO)	**42,190**	**9,090**	**10,250**
Oak Ridge Institute for Science & Education			
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	4,156	1,860	1,916
Total, Oak Ridge Institute for Science & Education	**4,156**	**1,860**	**1,916**
Oak Ridge National Laboratory			
Defense Nuclear Nonproliferation R&D			
Defense Nuclear Nonproliferation R&D	30,843	32,429	34,417
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	3,396	4,555	7,191
Global Material Security			
Global Material Security	18,607	19,281	16,163
Material Management and Minimization			
Material Management and Minimization	6,641	7,441	11,350
Nonproliferation and Arms Control			
Nonproliferation and Arms Control	22,178	20,849	22,622
Total, Oak Ridge National Laboratory	**81,665**	**84,555**	**91,743**
Office of Scientific & Technical Information			
Defense Nuclear Nonproliferation R&D			
Defense Nuclear Nonproliferation R&D	38	40	42
Total, Office of Scientific & Technical Information	**38**	**40**	**42**
Pacific Northwest National Laboratory			
Defense Nuclear Nonproliferation R&D			
Defense Nuclear Nonproliferation R&D	58,098	51,330	35,282
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	4,934	3,935	3,808
Global Material Security			
Global Material Security	136,508	141,201	119,961
Material Management and Minimization			
Material Management and Minimization	8,452	5,680	44,165
Nonproliferation and Arms Control			
Nonproliferation and Arms Control	22,668	21,907	23,116
Total, Pacific Northwest National Laboratory	**230,660**	**224,053**	**226,332**

Department Of Energy

FY 2020 Congressional Budget

Funding by Appropriation by Site

($K)

Defense Nuclear Nonproliferation	FY 2018 Total Enacted	FY 2019 Enacted	FY 2020 Request
Pantex Plant			
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	1,431	2,456	2,530
Material Management and Minimization			
Material Management and Minimization	2,000	5,100	6,736
Total, Pantex Plant	**3,431**	**7,556**	**9,266**
Princeton Plasma Physics Laboratory			
Defense Nuclear Nonproliferation R&D			
Defense Nuclear Nonproliferation R&D	164	170	177
Total, Princeton Plasma Physics Laboratory	**164**	**170**	**177**
Richland Operations Office			
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	6,937	1,804	1,858
Total, Richland Operations Office	**6,937**	**1,804**	**1,858**
Sandia National Laboratories			
Defense Nuclear Nonproliferation R&D			
Defense Nuclear Nonproliferation R&D	125,599	123,944	136,604
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	35,610	43,182	48,476
Global Material Security			
Global Material Security	56,224	59,551	48,130
Material Management and Minimization			
Material Management and Minimization	561	1,035	800
Nonproliferation and Arms Control			
Nonproliferation and Arms Control	7,936	7,674	8,099
Total, Sandia National Laboratories	**225,930**	**235,386**	**242,109**
Savannah River Operations Office			
Material Management and Minimization			
Material Management and Minimization	336	1,627	100
Nonproliferation Construction			
Nonproliferation Construction	277,450	196,500	190,000
Total, Savannah River Operations Office	**277,786**	**198,127**	**190,100**

Department Of Energy

FY 2020 Congressional Budget

Funding by Appropriation by Site

($K)

Defense Nuclear Nonproliferation	FY 2018 Total Enacted	FY 2019 Enacted	FY 2020 Request
Savannah River Site			
Defense Nuclear Nonproliferation R&D			
Defense Nuclear Nonproliferation R&D	6,420	6,770	8,579
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	2,288	3,489	3,594
Global Material Security			
Global Material Security	190	190	200
Material Management and Minimization			
Material Management and Minimization	69,663	114,273	73,208
Nonproliferation and Arms Control			
Nonproliferation and Arms Control	4,886	4,728	4,969
Nonproliferation Construction			
Nonproliferation Construction	4,097	10,800	79,000
Total, Savannah River Site	**87,544**	**140,250**	**169,550**
SLAC National Accelerator Laboratory			
Defense Nuclear Nonproliferation R&D			
Defense Nuclear Nonproliferation R&D	50	1,762	1,833
Total, SLAC National Accelerator Laboratory	**50**	**1,762**	**1,833**
Undesignated Lab/Plant/Installation			
Legacy Contractor Pensions			
Legacy Contractor Pensions	40,950	28,640	13,700
Total, Undesignated Lab/Plant/Installation	**40,950**	**28,640**	**13,700**
Washington Headquarters			
Defense Nuclear Nonproliferation R&D			
Defense Nuclear Nonproliferation R&D	15,572	75,209	21,023
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	29,161	76,456	80,596
Global Material Security			
Global Material Security	2,913	3,077	2,617
Material Management and Minimization			
Material Management and Minimization	56,006	20,498	12,361
Nonproliferation and Arms Control			
Nonproliferation and Arms Control	10,813	5,379	6,338
Nonproliferation Construction			
Nonproliferation Construction	45,683	4,614	30,000
Total, Washington Headquarters	**160,148**	**185,233**	**152,935**

Department Of Energy

FY 2020 Congressional Budget

Funding by Appropriation by Site

($K)

Defense Nuclear Nonproliferation	FY 2018 Total Enacted	FY 2019 Enacted	FY 2020 Request
Waste Isolation Pilot Plant			
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	56	38	39
Material Management and Minimization			
Material Management and Minimization	7,201	9,722	9,500
Nonproliferation and Arms Control			
Nonproliferation and Arms Control	0	325	0
Total, Waste Isolation Pilot Plant	**7,257**	**10,085**	**9,539**
Y-12 National Security Complex			
Defense Nuclear Nonproliferation R&D			
Defense Nuclear Nonproliferation R&D	6,465	2,568	1,507
Nuclear Counterterrorism and Incident Response			
Nuclear Counterterrorism Incident Response	2,689	2,938	3,026
Global Material Security			
Global Material Security	10,319	11,747	8,633
Material Management and Minimization			
Material Management and Minimization	25,144	29,886	33,748
Nonproliferation and Arms Control			
Nonproliferation and Arms Control	3,427	3,300	3,486
Total, Y-12 National Security Complex	**48,044**	**50,439**	**50,400**
Total, Defense Nuclear Nonproliferation	**2,048,219**	**1,974,000**	**1,993,302**

Naval Reactors

Naval Reactors

Naval Reactors
Proposed Appropriation Language

For Department of Energy expenses necessary for Naval Reactors' activities to carry out the Department of Energy Organization Act (42 U.S.C. 7101 et seq.), including the acquisition (by purchase, condemnation, construction, or otherwise) of real property, plant, and capital equipment, facilities, and facility expansion, [$1,788,618,000]*$1,648,396,000* to remain available until expended, of which, $85,500,000 shall be transferred to "Department of Energy–Energy Programs–Nuclear Energy," for the Advanced Test Reactor: *Provided*, That [$48,709,000]*$50,500,000* shall be available until September 30, [2020]2021 for program direction.

Explanation of Changes

Change from the language proposed in FY 2019 consists of a change to the requested funding amount and the period of availability of program direction funding. The FY 2020 Budget Request reflects a 7.8% reduction from FY 2019 Enacted levels. Reduced funding in FY 2020 relative to FY 2019 is primarily due to the Columbia-Class Reactors Systems Development, S8G-Prototype Refueling Overhaul, and Spent Fuel Handling Recapitalization Project funding profiles.

Public Law Authorizations

- P.L. 83-703, "Atomic Energy Act of 1954"
- Executive Order 12344 (42 U.S.C. 7158), "Naval Nuclear Propulsion Program"
- P.L. 106-65, National Nuclear Security Administration Act, as amended
- P.L. 115-244, Energy and Water, Legislative Branch, and Military Construction and Veterans Affairs Appropriations Act, 2019
- P.L. 115-232, John S. McCain National Defense Authorization Act for Fiscal Year 2019

Naval Reactors

(Dollars in Thousands)

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Naval Reactors[a]	1,620,000	1,788,618	1,648,396	-140,222

Overview

The Naval Reactors (NR) appropriation includes funding for activities that respond directly to the National Security Strategy of the United States, and are central to the Department of Energy's pursuit of its Strategic Vision goal of Nuclear Security. Specifically, NR is responsible for U.S. Navy nuclear propulsion work, beginning with reactor plant technology development and design, continuing through reactor plant operation and maintenance, and ending with final disposition of naval spent nuclear fuel. The program ensures the safe and reliable operation of reactor plants in nuclear-powered submarines and aircraft carriers (constituting about 45% of the Navy's major combatants) and fulfills the Navy's requirements for new nuclear propulsion plants that meet current and future national defense requirements.

Naval Reactors' mission includes ensuring the safety of reactors and associated naval nuclear propulsion plants, and control of radiation and radioactivity associated with naval nuclear propulsion activities, including prescribing and enforcing standards and regulations for these areas, as they affect the environment and the safety and health of workers, operators, and the public. Naval Reactors maintains oversight in areas such as security, nuclear safeguards and transportation, radiological controls, public information, procurement, logistics, and fiscal management.

As part of the National Nuclear Security Administration (NNSA), Naval Reactors is working to provide the U.S. Navy with nuclear propulsion plants that are capable of responding to the challenges of the 21st century security environment.

Highlights of the FY 2020 Budget Request

Naval Reactors' request of $1,648,396,000 in FY 2020 is for continued achievement of its core objective of ensuring the safe and reliable operation of the Nation's nuclear fleet.

Major Outyear Priorities and Assumptions

The outyear funding (FY 2021 through FY 2024) for Naval Reactors is $6,925,689,000. Outyear funding supports Naval Reactors' core mission of providing proper maintenance and safety oversight, and addressing emergent operational issues and technology obsolescence for 97 operating reactor plants. This includes 68 submarines, 11 aircraft carriers, and 4 research, development, and training platforms (including the land-based prototypes). Outyear funding also supports Naval Reactors' continued achievement of ongoing new plant design projects, as well as continued achievement of its legacy responsibilities, such as ensuring proper management of naval spent nuclear fuel, prudent recapitalization of aging facilities, and cleanup of environmental liabilities.

Department of Energy (DOE) Working Capital Fund (WCF) Support

The Naval Reactors appropriation projected contribution to the DOE WCF for FY 2020 is $2,350,000. This funding covers certain shared enterprise activities including managing enterprise-wide systems and data, telecommunications, and supporting the integrated acquisition environment.

Contractor Pensions

In FY 2020, for the Bettis and Knolls Laboratories, Naval Reactors' planned DOE-funded qualified contractor pension contribution is $35,420,000 and non-qualified contractor pension contribution is $1,143,260.

Rickover Fellowship Program

Naval Reactors manages the fellowship to attract and develop technical leaders in the areas of reactor technology and design as it pertains to naval nuclear propulsion. NR anticipates spending $1,394,722 in FY 2020 to support this program.

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[a] Amounts do not reflect the transfer of funding to the Office of Nuclear Energy for maintenance and operation of the Advanced Test Reactor in FY 2018 and FY 2019.

Naval Reactors
Funding by Congressional Control

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Naval Reactors			
Naval Reactors Operations and Infrastructure	525,764	553,591	+27,827
Naval Reactors Development	514,951	531,205	+16,254
S8G Prototype Refueling	250,000	155,000	-95,000
Columbia-Class Replacement Reactor Systems Development	138,000	75,500	-62,500
Program Direction	48,709	50,500	+1,791
Construction	311,194	282,600	-28,594
Total, Naval Reactors	**1,788,618**	**1,648,396**	**-140,222**

Outyears for Naval Reactors
Funding

(Dollars in Thousands)

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Naval Reactors				
Naval Reactors Operations and Infrastructure	596,194	699,900	754,721	743,778
Naval Reactors Development	603,129	666,684	766,816	782,915
S8G Prototype Refueling	50,000	0	0	0
Columbia-Class Replacement Reactor Systems Development	64,700	55,000	53,900	52,900
Program Direction	51,700	52,800	53,900	55,032
Construction	318,100	236,720	117,700	149,100
Total, Naval Reactors	**1,683,823**	**1,711,104**	**1,747,037**	**1,783,725**

[a] Amounts do not reflect the transfer of funding to the Office of Nuclear Energy for maintenance and operation of the Advanced Test Reactor in FY 2018 and FY 2019.

Naval Reactors
Funding

	(Dollars in Thousands)		
	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Naval Reactors			
Naval Reactors Operations and Infrastructure			
Research Reactor Facility Operations & Maintenance	107,531	122,580	+15,049
MARF Defueling and Layup	4,982	6,954	+1,972
Laboratory Facility Regulation, Compliance, & Protection	135,260	132,463	-2,797
Nuclear Spent Fuel Management	127,495	136,437	+8,942
Radiological/Environmental Remediation & Demolition	94,540	103,877	+9,337
Capital Equipment	2,000	2,000	+0
General Plant Projects	53,956	49,280	-4,676
Total, Naval Reactors Operations and Infrastructure	**525,764**	**553,591**	**+27,827**
Naval Reactors Development			
Ship Construction & Maintenance Support	40,168	46,067	+5,899
Nuclear Reactor Technology	165,663	165,458	-205
Reactor Systems & Component Technology	208,120	210,300	+2,180
Advanced Test Reactor Operations	85,500	85,480	-20
Capital Equipment	15,500	23,900	+8,400
Total, Naval Reactors Development	**514,951**	**531,205**	**+16,254**
S8G Prototype Refueling	**250,000**	**155,000**	**-95,000**
Columbia-Class Reactor Systems Development	**138,000**	**75,500**	**-62,500**
Program Direction	**48,709**	**50,500**	**+1,791**
Construction	**311,194**	**282,600**	**-28,594**
Total, Naval Reactors	**1,788,618**	**1,648,396**	**-140,222**

Outyears for Naval Reactors
Funding

	(Dollars in Thousands)			
	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Naval Reactors				
Naval Reactors Operations and Infrastructure				
Research Reactor Facility Operations & Maintenance	124,093	128,897	120,938	112,792
MARF Defueling and Layup	14,998	55,993	86,054	83,953
Laboratory Facility Regulation, Compliance, & Protection	146,939	145,517	154,677	155,193
Nuclear Spent Fuel Management	147,713	172,746	189,299	199,516
Radiological/Environmental Remediation & Demolition	116,526	128,087	143,993	153,124
Capital Equipment	2,000	0	0	800
General Plant Projects	43,925	68,660	59,760	38,400
Total, Naval Reactors Operations and Infrastructure	**596,194**	**699,900**	**754,721**	**743,778**
Naval Reactors Development				
Ship Construction & Maintenance Support	53,299	55,235	61,024	54,125
Nuclear Reactor Technology	198,403	238,375	270,757	264,442
Reactor Systems & Component Technology	248,752	274,866	333,445	358,849
Advanced Test Reactor Operations	87,275	89,108	90,890	92,799
Capital Equipment	15,400	9,100	10,700	12,700
Total, Naval Reactors Development	**603,129**	**666,684**	**766,816**	**782,915**
S8G Prototype Refueling	**50,000**	**0**	**0**	**0**
Columbia-Class Reactor Systems Development	**64,700**	**55,000**	**53,900**	**52,900**
Program Direction	**51,700**	**52,800**	**53,900**	**55,032**
Construction	**318,100**	**236,720**	**117,700**	**149,100**
Total, Naval Reactors	**1,683,823**	**1,711,104**	**1,747,037**	**1,783,725**

Naval Reactors
Explanation of Major Changes
(Dollars in Thousands)

	FY 2020 Request vs FY 2019 Enacted
Naval Reactors	
Naval Reactors Operations and Infrastructure: This increase (+5%) supports prototype maintenance activities, remediation of legacy environmental liabilities, and defueling and layup preparation for the MARF prototype, and increased decontamination and demolition efforts.	**+27,827**
Naval Reactors Development: This increase (+3%) supports unique technologies that are critical to delivering improvements in reactor performance and reliability and provide continuous support to U.S. Navy fleet operations.	**+16,254**
S8G Prototype Refueling: This decrease (-38%) is consistent with the project's planned funding profile and supports refueling overhaul execution.	**-95,000**
***Columbia*-Class Reactor Systems Development:** This decrease (-45%) is consistent with the project's planned funding profile and supports FY 2020 production, analysis, and testing execution.	**-62,500**
Program Direction: This funding increase (+4%) includes general inflationary increases for benefit related costs and travel requirements.	**+1,791**
Construction: This decrease (-9%) matches NR's program of record as detailed in the Ten-Year Facilities Plan and supports construction ramp-up for the Spent Fuel Handling Recapitalization Project.	**-28,594**
Total, Naval Reactors	**-140,222**

Naval Reactors
Naval Reactors Operations and Infrastructure

Description

The Naval Reactors Operations and Infrastructure resources ensure Naval Reactors maintains an integrated and effective enterprise across program sites located in Pennsylvania, New York, and Idaho, to provide safe and environmentally conscious operation of the nuclear fleet. The Naval Reactors Operations and Infrastructure program includes work efforts associated with the operation of two land-based nuclear prototypes at the Kesselring Site located in West Milton, NY; two dedicated, government-owned, contractor-operated laboratory facilities, Knolls and Bettis located in Schenectady, NY and West Mifflin, PA, respectively; and naval spent nuclear fuel handling facilities and operations at the Naval Reactors Facility at the Idaho National Laboratory in Idaho. These resources fund work that ensures unique Naval Reactors' infrastructure and advanced naval nuclear capabilities are maintained well into the future. These efforts include:

1. Operation and maintenance of the DOE land-based prototypes supporting technology development and nuclear operator training.

2. Planning and preparations to defuel the Modifications and Additions to Reactor Facilities (MARF) prototype and perform the necessary work to leave the plant in a benign condition for eventual disassembly.

3. Activities to ensure Naval Reactors program operations meet or exceed applicable federal, state, and local standards and requirements.

4. Disposition of naval spent nuclear fuel from the inactivation and refueling of ships.

5. Remediation, dismantlement, and disposal of inactive Naval Reactors program systems, facilities, and areas.

6. Design and procurement of capital equipment.

7. Design and construction of facilities and infrastructure to provide for capacity, security, safety, environmental, and obsolescence needs.

Research Reactor Facility Operations & Maintenance

The mission of this subprogram is to support the two land-based operating prototypes located at the Kesselring Site in New York through the following work efforts: (1) Test and examine reactor materials, components, systems, and new design applications under actual operating conditions. (2) Provide a ship-like operating platform to train nuclear operators. (3) Support improved design activities for the operating prototypes and perform systematic preventive maintenance, corrective maintenance, upgrades, and modifications on the prototypes and their support equipment. (4) Evaluate problems using engineering tests and other troubleshooting techniques. (5) Procure and maintain adequate spare parts, material, specialized tools and instrumentation for troubleshooting and prototype testing.

MARF Defueling and Layup

The mission of this subprogram is to support development of design documents, planning, and preparations necessary to defuel and layup the MARF prototype, in order to place the plant in a safe and benign condition, for eventual dismantlement and off-site disposal. The request funds: (1) Advance planning including long lead material ordering and facilities preparations. (2) Work integration and scheduling. (3) Preparation and placement of contracts and management of subcontracted work. (4) Procurement of required services and shipment of required equipment and materials.

Laboratory Facility Regulation, Compliance & Protection

The mission of this subprogram is to ensure that Naval Reactors operations and design activities meet or exceed applicable federal, state, and local standards and requirements, such as Radiological Controls, Environmental, Safety and Health, Quality Assurance, and Nuclear Materials Management. This is accomplished by: (1) Personnel training, instruction, supervision, independent oversight, and formal auditing. (2) Extensive personnel and environmental sampling and monitoring programs to ensure operations have no discernible impact on human health or the environment. (3) Prepare and issue numerous reports required by federal, state, and local regulations and requirements. (4) Review of new and existing nuclear plant design and the related procurement of nuclear fuel and new project equipment.

Nuclear Spent Fuel Management
The mission of this subprogram is to fulfill Naval Reactors' cradle-to-grave responsibility for aspects of naval nuclear propulsion by properly managing naval spent nuclear fuel (NSNF). Specifically, resources in this subprogram support: (1) safely receive, handle, prepare, package and temporarily store NSNF coming from the nuclear powered fleet, prototypes and the Advanced Test Reactor. This includes fuel-handling operations at Department of Energy facilities; mechanically processing NSNF at the Naval Reactors Facility (NRF) in the State of Idaho; packaging the NSNF for dry storage in a geologic repository or interim storage facility, and disposing of the radiological waste by-products produced by these processes. (2) Support nuclear powered warship deployments by managing Naval Reactors NSNF shipping container capacity for aircraft carrier and submarine refueling overhauls and defueling inactivation operations. (3) Conduct destructive and non-destructive examinations of expended naval cores and irradiated test specimens from the Advanced Test Reactor located at the Idaho National Laboratory. (4) Manage the construction of projects that directly support improvements to the NSNF receiving, processing, packaging, and disposal efforts, reducing radiological risks at the NRF.

Radiological/Environmental Remediation & Demolition
The mission of this subprogram is to remediate, dismantle, and dispose of inactive Naval Reactors systems, facilities, and areas that once supported research and development, design, testing, training, and prototype operations. Requirements are prioritized based on a criteria model that ensures currently available funding is provided to projects most critical to Naval Reactors with emphasis on balancing factors such as risk reduction and inactive facility lifecycle costs. Naval Reactors' radiological workforce is a highly trained group, capable of responding in the event of a radiological accident, as well as supporting routine radiological operations.

Capital Equipment
The mission of this subprogram is to provide the critical technical tools and equipment to ensure that Naval Reactors can achieve its mission. Capital equipment is defined as non-construction related equipment, computer systems, tooling, and furniture or fixtures having useful life of two or more years and costing greater than $500,000. The tools and equipment are required to support the other work efforts within the sub-categories of Naval Reactors Operations and Infrastructure (e.g. operator training and facilities maintenance).

General Plant Projects
The mission of this subprogram is to execute minor new construction projects of a general nature, the Total Estimated Cost of which may not exceed the established minor construction threshold. General Plant Projects are necessary to adapt facilities to new or improved production techniques, to effect economies of operations, and to reduce or eliminate health, fire, and security vulnerabilities. These projects provide for design and construction, additions, and improvements to land, buildings, and utility systems, and they may include construction of small new buildings, additions to roads, and general area improvements. Funding is derived from established site construction plans and may be used for emergent and unforeseen infrastructure needs.

FY 2021-FY 2024 Key Milestones

Research Reactor Facility Operations and Maintenance

- Obtain core depletion data in the land-based prototype to validate designs and methods of current operating fleet cores.
- Perform maintenance on the land-based prototype, including replacement of major reactor plant, steam plant, and safety system components.
- Conduct core test programs and evaluations on the land-based prototype to validate current and future fleet core designs/methods as well as prototype reactor core performance.
- Conduct testing of electronic power generation and conversion units now deployed in the fleet and provide test bed for software and hardware upgrades prior to fleet deployment to ensure that problems with new technologies and designs are resolved before broader application and do not affect the deployed nuclear fleet.
- Develop technology for future fleet deployment with the use of chemistry automation testing that provides improved data and reduced time and exposure requirements for future fleet application.

- Operate and maintain Engineered Safety Features System.
- Identify and develop Rotatable Pool Assets and subsequent refurbishments to reduce maintenance costs, schedules and rework.

MARF Defueling and Layup
- Complete site modifications to provide foundational support for reactor servicing facilities.
- Conduct planning activities for defueling and layup.
- Complete Reactor Servicing Planning Letter.
- Complete Reactor Servicing Safety Report.
- Transport, assemble, test, and certify the Heavy Lift Crane.

Laboratory Facility Regulation, Compliance & Protection
- Ensure that permits and reports such as monthly reports on water discharges, quarterly reports on corrective measures, and annual reports on non-radiological air emissions, radiological discharges, radiological exposure monitoring, hazardous waste management, work on asbestos containing materials, chemicals stored on site, and results of monitoring of groundwater required by regulatory agencies are updated to reflect new guidance and direction.
- Ensure operations and fleet support testing is conducted in compliance with applicable federal and state requirements.
- Provide quality assurance support for acquisition of equipment needed for ongoing fleet operations and new projects. Examples include auditing vendors for capability and quality systems (approved vendor list); providing quality and technical support for procurement of complex equipment (reactor system valve procurements, uniquely designed pressure vessels).
- Support new plant designs, such as the *Columbia*-Class, and fleet support technical processes and knowledge through implementation of quality standards and application of engineering metrics.
- Plan and participate in a biennial emergency response to a simulated accident involving naval spent nuclear fuel as part of NR's outreach program.

Nuclear Spent Fuel Management
- Package spent fuel canisters of NSNF into dry storage to support an agreement with the State of Idaho for NSNF located in water pool storage prior to January 1, 2017 to be removed from water pool storage no later than January 1, 2023.
- Mechanically process NSNF modules for placement into dry storage to support legal requirements in the agreement with the State of Idaho.
- Load sleeves of NSNF for packaging method B disposal to support legal requirements in the agreement with the State of Idaho.
- Receive, unload, and return for next use or ultimate disposal, shipping containers of NSNF to support aircraft carrier and submarine refuelings/defuelings and inactivation operations.
- Deliver processing and packaging hardware, fuel handling equipment, and fuel handling procedures in support of S3G, A1G, S8G, D1G, A1W, Advanced Submarine Nuclear Propulsion Plant, and Packaging Method B dry storage campaigns.
- Train personnel and checkout equipment/procedures for commencement of operations in the Naval Spent Fuel Handling Facility (NSFHF).

Radiological/Environmental Remediation & Demolition

All sites:
- Conduct remediation of inactive NR Program contaminated systems, facilities, and areas to reduce potential environmental liabilities.

Bettis Laboratory:
- Complete demolition of Waste Processing Building.
- Complete planning and Critical Decision package development for, and commence demolition of W4R, W5R, and Rotoclone Buildings.

Naval Reactors Facility:
- Complete remediation of the Expended Core Facility (ECF) Chemistry Wing and trenches.
- Continue remediation of Off-Hull systems associated with the S1W and A1W prototypes, respectively.
- Commence remediation of the ECF Decon Shop and UC Room.

- Commence remediation of the Hot Cell Loading Area (HCLA) and High Bay trenches.

Knolls Laboratory:

- Continue environmental remediation to support United States EPA and New York State Department of Environmental Conservation (NYSDEC) initiative for having site wide remedies in place on or before 2020 for Solid Waste Management Units (SWMUs) and Area of Concerns (AOCs) identified. Environmental remediation projects are in accordance with NYSDEC approved Corrective Action work schedules.
- Commence characterization and remediation for Building G1 chemistry laboratories.
- Complete capping of the Knolls Laboratory Land Disposal Area and prepare required regulatory reports.
- Abate Building K4 Boiler House.
- Commence F Complex demolition.
- Complete ceramics development source term reduction.
- Complete remediation and demolition of 20,000 square foot Q-Complex.

Kesselring Site:

- Complete D1G D&D
- Complete remediation and demolition of D1G support facilities and systems.

Capital Equipment

- Laboratory Network Upgrades; replaces network infrastructure which provides basic connectivity for every IT system used in the NR Program. Nearly every enterprise application, database, file repository, website, etc. is connected through this network infrastructure.

General Plant Projects

- BL BRES / Fitness Center Complex
- BL Training Facility
- BL AMTL Upgrade EMTF Infrastructure
- BL A7 Building
- NRF Office Building #3
- NRF Boiler House
- NRF Northeast Boundary Area
- KL Crafts Facility
- KL Legacy Eliminating Office Bldg
- KL RML HVAC Upgrade
- KS Building 83 Upgrade
- KS Service Water and Sanitary Sewer Upgrade
- KS S8G Weather Resistant Enclosure
- KS Natural Gas Infrastructure
- KS High Yard 30 Upgrade

Naval Reactors
Naval Reactors Development

Description
The Naval Reactors Development resources fund work that ensures the current and future fleet is the most advanced, well-maintained, and capable nuclear fleet in the world. This funding supports unique technologies used only in naval reactors that are crucial to delivering superior navy fleet operations. These efforts include:

1. Supporting the fleet and ensuring safe reactor operations by engineering solutions to emergent reactor issues, supporting equipment replacement and maintenance, and tracking reactor performance over time.

2. Developing and enhancing the fundamental methods, modeling, and materials used in reactor cores and plants, which lowers operating costs and improves performance.

3. Designing and maintaining the major reactor plant components and plant systems required for naval nuclear propulsion.

4. Operation of the Advanced Test Reactor (performed by DOE Office of Nuclear Energy) and performance of irradiation testing for ongoing evaluation of new material applications and core designs.

5. Design and procurement of capital equipment.

Ship Construction & Maintenance Support
The mission of this subcategory is to support both the operation and new construction of the nuclear powered fleet. Operating reactors require continuous mechanical, thermal, hydraulic, materials, and chemistry analyses to fully evaluate the impact of existing design features, core materials, and system modifications on reactor performance and to ensure safe operation throughout the life of the core. Maintenance of the reactor plants involves designing equipment and systems to handle new fuel, highly radioactive spent fuel, and components safely.

Nuclear Reactor Technology
The mission of this subcategory is to develop and apply core material systems that will improve nuclear safety, stealth capability, tactical ability, and reactor plant performance; to support the qualification of the manufacture of those systems at the core vendor; and to deploy these systems in Prototype reactors. The materials testing covered under Nuclear Reactor Technology forms the bedrock of naval nuclear propulsion, providing Naval Reactors with the research and development capacity to fully understand and respond to issues in the operating fleet at the elemental level and enabling Naval Reactors to remain at the forefront of nuclear reactor operations. This subcategory supports the Rickover Fellowship program as well as fuel and poison development efforts, including the examination of expended fuel modules and irradiated core components at the ECF located at the Naval Reactors Facility, which is part of the Idaho National Laboratory (INL).

Reactor Systems & Component Technology
The mission of this subcategory is to provide Naval Reactors with the technology for major reactor plant components (e.g., steam generators) as well as plant systems (e.g., instrumentation and control). This subcategory provides the support and expertise necessary to ensure the satisfactory operation of steam generators in the naval nuclear fleet and prototypes and for design and implementation of the *Virginia*-Class and *Ford*-Class steam generators as well as the heat exchanger applications for the *Columbia*-Class. The major objective of instrumentation and control component and system development is to deliver the next generation of instrumentation, control, and electrical equipment for naval nuclear applications.

Advanced Test Reactor Operations
The mission of this subprogram is to test and qualify reactor materials and fuels to be incorporated into nuclear fleet applications. Funding in this subprogram provides for operation, engineering, maintenance, and other support activities associated with the Advanced Test Reactor (ATR) at the Idaho National Laboratory (INL). While ATR is a facility owned by the

Office of Nuclear Energy and operated by their contractor, Naval Reactors funds a portion of the cost of base operations, as well as Naval Reactors-specific testing.

Capital Equipment
The mission of this subprogram is to provide the critical technical tools and equipment to ensure that Naval Reactors can achieve its mission. Capital equipment is non-construction related equipment, computer systems, tooling, and furniture or fixtures having a useful life of two or more years and costing greater than $500,000. The tools and equipment are required to support other work efforts within the subcategories of Naval Reactors Development (e.g., designing and testing of reactor plant systems, and development of new technologies).

FY 2021-FY 2024 Key Milestones
Ship Construction & Maintenance Support
- Perform material testing to establish new products and technologies.
- Core design and analysis support for continued safe and reliable operation of *Los Angeles*-Class ships.
- Core design and analysis support for continued safe and reliable operation of *Ohio*-Class ships.
- Core design and analysis support for continued safe and reliable operation of *Virginia*-Class ships.
- Core design and analysis support for continued safe and reliable operation of *Nimitz*-Class ships.
- Core design and analysis support for continued safe and reliable operation of *Ford*-Class ships.
- Support resolution of fabrication or shipyard issues for reactor equipment in production.

Nuclear Reactor Technology
- Utilize key corrosion testing data to support core design needs and improved understanding of the corrosion process.
- Implement Electro-Discharge Machining equipment as a replacement for ECF underwater milling equipment.
- Perform materials examinations of components removed from operating rector plants to obtain material performance data.
- Operate, upgrade, and maintain material testing and examination capabilities and facilities.
- Fabricate model fuel elements and support irradiation testing and manufacturing studies.
- Complete D2W core physics exams.
- Complete conceptual planning for a new examination facility to provide long-term capabilities to perform testing of naval spent fuel, plant components, and test specimens.

Reactor Systems & Component Technology
- Provide test data to qualify analysis tools used to design steam generators.
- Develop Predictive Methodologies and Data Analytics for evaluation of in-service components.
- Research, develop, and test new technologies and sensors for integration into existing and future propulsion plants.
- Implement advanced controls in fleet applications as necessary.
- Perform a Reactor Systems Performance Analysis for new plant designs.
- Develop and improve design and analysis for new plant designs.
- Develop radiation shield methods for each new plant design and radioactive material handling facility and verify their effectiveness through shield surveys during initial operation.
- Maintain and enhance legacy reactor design software as required.
- Provide structural analyses and assessments for new designs and existing fleet.
- Develop, deploy, and continue enhancement and support of integrated reactor design Advanced Simulation tools.
- Perform testing and analysis of noise sources in components and develop tests to improve propulsion plant acoustics.
- Provide shielding analysis to support defueling of MARF.

Advanced Test Reactor Operations
- Perform operations, maintenance, and engineering support work for the ATR including four 50-day irradiation test cycles per year and two transient tests.

- Safely handle, ship, and receive 18 NR program irradiation test trains per year.
- Procurement of nuclear fuel and spare parts to support ATR operations.
- Operate fifty drop-in experiment positions per year.
- Perform core internals change-outs including engineering and design work to ensure temporary deactivations and reactivations of the ATR occur without any adverse effects on the environment and human health.
- Decontaminate and refurbish flowing water loops

Capital Equipment

- High Performance Computing; enables existing and planned design workload to be completed at a much lower cost than physical tests.
- Analytical Electrical Microscope (AEM); for microanalysis in support of NR program materials characterization and research.
- RML High Radiation SEM Replacement; to safely analyze radioactive materials.
- Gas Tungsten Arc Welding; for protecting areas from contamination during welding.

Naval Reactors
S8G Prototype Refueling

Description

The land-based prototype located at the Kesselring Site in West Milton, New York serves as a critical operating reactor to demonstrate technology advancements for fleet application. The land-based prototype requires a refueling overhaul, beginning in FY 2018. Originally built as a prototype for the *Ohio*-Class submarine propulsion plant, this testing platform has been integral to the development of technologies used for the *Virginia*-Class and *Seawolf*-Class, which have resulted in improved performance and reliability while reducing lifecycle costs. Continued operation of this land-based prototype and development of advanced core technology will enable extended core lifetimes, more efficient use of nuclear fuel, greater compactness, and cross-platform adaptability. By constructing the replacement Technology Demonstration Core (TDC) for the prototype with technologies planned for the *Columbia*-Class, technical, cost, and schedule risks to the ship construction program will be mitigated. The manufacturing development, technology demonstration, and new core technologies development began in FY 2010.

Overhaul of reactor and steam plant systems will be performed in conjunction with the land-based prototype refueling overhaul. System overhaul includes the required preventative and corrective maintenance to support subsequent plant operations. In addition, establishing critical site infrastructure to support the Land-based Prototype Refueling Overhaul is required to enable safe and efficient execution of the overhaul.

The land-based prototype reactor plant provides a cost-effective test and evaluation platform, for new technologies, materials, and components before they are introduced to the fleet, and a vital training platform for reactor plant operators. To preserve this critical research and development asset for the long-term and to achieve a life-of-ship core for the *Columbia*-Class, the refueling overhaul execution effort must continue in FY 2020 in order to complete in FY 2021 to support operator training and proof-of-concept for the *Columbia*-Class core. NR requests $155,000,000 in FY 2020.

FY 2021-FY 2024 Key Milestones

<u>S8G Prototype Refueling</u>

- Begin and complete the S8G Prototype test program.
- Complete the land-based prototype Safety Analysis Report (SAR) update.
- Complete turn-over of the prototype for critical operation and student training.
- Completion of the S8G Prototype Refueling Overhaul Project.

Naval Reactors
Columbia-Class Reactor Systems Development

Description

Ohio-Class ballistic missile submarines (SSBNs) have been the backbone of the Nation's sea-based strategic deterrent since the early-1980s. Recapitalization of this strategic asset is required as *Ohio*-Class retires. With the *Columbia*-Class, the Navy plans to maintain our sea-based strategic deterrent force with a class of 12 ships, two fewer than today's *Ohio*-Class due in part to a life-of-ship-core. This new life-of-ship core will eliminate the need for mid-life reactor refuelings (mid-life refueling overhauls are an over three-year evolution during which the ship is unavailable for service). By increasing the operational availability of the class, development of a new reactor plant for the *Columbia*-Class will permit 12 *Columbia*-Class submarines to do the work of 14 *Ohio*-Class submarines–an operational and sustainment savings of over $40 billion over the life of the class.

Research, development, and design for the *Columbia*-Class SSBN began in FY 2010. The new design will leverage *Virginia*-Class technology, as well as manufacturing development and demonstration efforts being performed as part of the land-based Prototype Refueling Overhaul program. NR must design a new reactor plant to meet the Navy's required capabilities, maximize operational availability, and reduce acquisition and lifecycle costs. The DOE reactor plant design and development work for the *Columbia*-Class will continue in FY 2020 and beyond to mature the design for initial fabrication and procurement of long-lead nuclear components.

Work to support the *Columbia*-Class SSBN is tightly synchronized with Navy-funded propulsion plant work. The DOE-funded design work includes reactor plant component design and development, core design analysis and manufacturing development, reactor plant instrumentation and control design and development, reactor plant configuration, reactor systems development and integration, and reactor performance, analysis, and validation. The FY 2020 production, analysis, and testing work is essential to maintaining schedule aligned to execute ship construction start in FY 2021. NR requests $75,500,000 for this effort in FY 2020.

Naval Reactors
Program Direction

Description
Due to the essential nature of nuclear reactor work, Naval Reactors provides centrally controlled, technical management of program operations. Federal employees directly oversee and set policies and procedures for developing new reactor plants, operating existing reactor plants, facilities supporting these plants, contractors, and the Bettis and Knolls Atomic Power Laboratories. In addition, these employees interface with other DOE offices and local, state, and Federal regulatory agencies.

Naval Reactors' Federal employees are typically recruited from a community of highly trained military engineers who have completed a rigorous five-year on-the-job training program unique to Naval Reactors. This training program has groomed engineers with skill sets far beyond that of nuclear engineers found in the commercial and Federal sectors.

Travel funds are used to perform oversight activities of facilities located worldwide that require comprehensive audits and in-person visits to ensure compliance and safety. Additionally, Naval Reactors Representative positions at the field sites (to include locations in the United Kingdom, Japan, Hawaii, and the continental United States) rotate periodically due to retirements, attrition, and succession planning.

Other Related Expenses includes the maintenance of Naval Reactors' IT hardware, engineering software, working capital funding, and related licenses supporting mission-essential technical work. Additionally, these funds will support planned upgrades and maintenance of video teleconferencing equipment, security investigations of Federal personnel, and training requirements.

Highlights of the FY 2020 Budget Request
The Naval Reactors Program Direction budget reflects general inflationary increases for personnel and pay related costs. Despite recent and planned retirements that have resulted in a loss of NR's engineering experience, in FY 2020 NR will continue to reshape the workforce to manage knowledge transfer to ensure the accomplishment of the NR mission.

FY 2021-FY 2024 Key Milestones
NR plans to continue developing its highly technical workforce to ensure the NR mission is preserved well into the future.

Program Direction
Funding

(Dollars in Thousands)

	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Naval Reactors			
Headquarters			
Salaries and Benefits	23,500	24,000	+500
Travel	1,000	1,250	+250
Other Related Expenses	3,043	3,360	+317
Total, Headquarters	**27,543**	**28,610**	**+1,067**
Naval Reactors Laboratory Field Office			
Salaries and Benefits	18,200	18,650	+450
Travel	937	1,000	+63
Other Related Expenses	2,029	2,240	+211
Total, Naval Reactors Laboratory Field Office	**21,166**	**21,890**	**+724**
Total Program Direction			
Salaries and Benefits	41,700	42,650	+950
Travel	1,937	2,250	+313
Other Related Expenses	5,072	5,600	+528
Total, Program Direction	**48,709**	**50,500**	**+1,791**
Federal FTEs	**246**	**246**	**+0**

Outyears Program Direction for Naval Reactors
Funding

	(Dollars in Thousands)			
	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Naval Reactors				
Headquarters				
Salaries and Benefits	24,500	25,000	25,500	26,000
Travel	1,200	1,300	1,300	1,300
Other Related Expenses	3,700	3,800	3,800	3,800
Total, Headquarters	**29,400**	**30,100**	**30,600**	**31,100**
Naval Reactors Laboratory Field Office				
Salaries and Benefits	19,000	19,400	19,800	20,300
Travel	1,100	1,100	1,200	1,200
Other Related Expenses	2,200	2,200	2,300	2,432
Total, Naval Reactors Laboratory Field Office	**22,300**	**22,700**	**23,300**	**23,932**
Total Program Direction				
Salaries and Benefits	43,500	44,400	45,300	46,300
Travel	2,300	2,400	2,500	2,500
Other Related Expenses	5,900	6,000	6,100	6,232
Total, Program Direction	**51,700**	**52,800**	**53,900**	**55,032**
Federal FTEs	**246**	**246**	**246**	**246**

Program Direction
Other Related Expenses

	(Dollars in Thousands)		
	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Other Related Expenses			
Transportation	800	900	+682
Communications, Utilities and Miscellaneous Charges	430	475	+45
Other Services from Federal Sources	682	750	+68
Advisory and Assistance Services	180	200	+20
Operation and Maintenance of Facilities	270	310	+40
Operations and Maintenance of Equipment	670	740	+70
Supplies and Materials	300	335	+35
Equipment	870	940	+70
Working Capital Fund	870	950	+80
Total, Other Related Expenses	**5,072**	**5,600**	**+528**

Outyears Other Related Expenses for Naval Reactors

	(Dollars in Thousands)			
	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Other Related Expenses				
Transportation	870	890	900	912
Communications, Utilities and Miscellaneous Charges	480	480	490	500
Other Services from Federal Sources	820	830	840	850
Advisory and Assistance Services	210	210	220	230
Operation and Maintenance of Facilities	300	300	310	320
Operations and Maintenance of Equipment	720	740	750	760
Supplies and Materials	360	370	380	400
Equipment	1,230	1,260	1,280	1,320
Working Capital Fund	910	920	930	940
Total, Other Related Expenses	**5,900**	**6,000**	**6,100**	**6,232**

Program Direction

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Salaries and Benefits $41,700,000	**Salaries and Benefits $42,650,000**	**Salaries and Benefits +$950,000**
• Federal salaries and benefits for employees that directly oversee and set policies and procedures for developing new reactor plants, operating existing reactor plants, facilities supporting these plants, contractors, and the Bettis and Knolls Atomic Power Laboratories.	• Federal salaries and benefits for employees that directly oversee and set policies and procedures for developing new reactor plants, operating existing reactor plants, facilities supporting these plants, contractors, and the Bettis and Knolls Atomic Power Laboratories.	• Reflects a general inflationary increase for costs of benefits.
Travel $1,937,000	**Travel $2,250,000**	**Travel +$313,000**
• Perform oversight activities of facilities located worldwide that require comprehensive audits and in-person visits to ensure compliance and safety. • Rotation of Naval Reactors Representatives at the field sites (U.K., Japan, Hawaii, and the continental United States) due to retirement, attrition, and succession planning.	• Perform oversight activities of facilities located worldwide that require comprehensive audits and in-person visits to ensure compliance and safety. • Rotation of Naval Reactors Representatives at the field sites (U.K., Japan, Hawaii, and the continental United States) due to retirement, attrition, and succession planning.	• Reflects expected travel requirement to execute oversight activities.
Other Related Expenses $5,072,000	**Other Related Expenses $5,600,000**	**Other Related Expenses +$528,000**
• Maintenance of Naval Reactors' IT hardware, engineering software, and related licenses supporting mission essential technical work. • Support planned upgrades and maintenance of video teleconferencing equipment, security investigation of Federal personnel, and training requirements.	• Maintenance of Naval Reactors' IT hardware, engineering software, and related licenses supporting mission essential technical work. • Support planned upgrades and maintenance of video teleconferencing equipment, security investigation of federal personnel, and training requirements.	• Reflects a general inflationary increase to support IT and maintenance operations.

Naval Reactors
Capital Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Capital Operating Expenses Summary (including Major Items of Equipment (MIE))					
Capital Equipment >$500K (including MIE)	N/A	N/A	17,500	25,900	+8,400
Plant Projects (GPP and IGPP)	N/A	N/A	53,956	49,280	-4,676
Total, Capital Operating Expenses	**N/A**	**N/A**	**71,456**	**75,180**	+3,724
Capital Equipment > $500K (including MIE)					
Total Non-MIE Capital Equipment >$500K	N/A	N/A	12,000	25,900	+13,900
High Performance Computer (FY 2019 Buy)	5,500	N/A	5,500	0	-5,500
Total, Capital Equipment (including MIE)	**N/A**	**N/A**	**17,500**	**25,900**	+8,400
Plant Projects (GPP and IGPP)					
Total Plant Projects (GPP/IGPP) Total Estimated Cost (TEC) <$5M	N/A	N/A	51,037	17,217	-33,820
KS Service Water and Sanitary Sewer Upgrade	6,754	N/A	469	6,285	+5,816
KS S8G Weather Resistant Enclosure	7,700	N/A	750	6,450	+5,700
KS Building 83 Upgrade	5,905	N/A	0	525	+525
KS High Yard 30 Upgrade	8,209	N/A	0	623	+623
KS Natural Gas Infrastructure	7,346	N/A	0	655	+655
NRF Northeast Boundary Area	13,700	N/A	1,200	12,500	+11,300
BL AMTL Upgrade EMTF Infrastructure	7,900	N/A	500	3,080	+2,580
KL RML HVAC Upgrade Design	18,230	N/A	0	1,945	+1,945
Total, Plant Projects (GPP/IGPP)	**N/A**	**N/A**	**53,956**	**49,280**	-4,676
Total, Capital Summary	**N/A**	**N/A**	**71,456**	**75,180**	+3,724

Outyears for Naval Reactors

	(Dollars in Thousands)			
	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Capital Operating Expenses Summary (including Major Items of Equipment (MIE))				
Capital Equipment >$500K (including MIE)	17,400	9,100	10,700	13,500
Plant Projects (GPP and IGPP)	43,925	68,660	59,760	38,400
Total, Capital Operating Expenses	**61,325**	**77,760**	**70,460**	**51,900**
Capital Equipment > $500K (including MIE)				
Total Non-MIE Capital Equipment >$500K	11,900	2,100	3,200	7,000
High Performance Computer (FY 2021 Buy)	5,500			
High Performance Computer (FY 2022 Buy)		5,500		
High Performance Computer (FY 2023 Buy)			5,500	
High Performance Computer (FY 2024 Buy)				5,500
RML High Radiation Scanning Electron Microscope Replacement		1,500	2,000	1,000
Total, Capital Equipment (including MIE)	**17,400**	**9,100**	**10,700**	**13,500**

Outyears for Naval Reactors

	(Dollars in Thousands)			
	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request
Plant Projects (GPP and IGPP)				
Total Plant Projects (GPP/IGPP) Total Estimated Cost (TEC) <$5M	5,509	22,089	23,000	22,115
BL BRES / Fitness Center Complex	10,370	0	0	0
BL Training Facility	0	6,200	0	0
BL AMTL Upgrade EMTF Infrastructure	0	560	3,760	0
BL A7 Building	0	19,000	0	0
NRF Office Building #3	0	8,700	0	0
NRF Boiler House	1,400	0	14,000	0
KL Crafts Facility	0	0	19,000	0
KL Legacy Eliminating Office Bldg	19,000	0	0	0
KL RML HVAC Upgrade	0	0	0	16,285
KS Building 83 Upgrade	0	5,420	0	0
KS Natural Gas Infrastructure	0	6,691	0	0
KS High Yard 30 Upgrade	7,646	0	0	0
Total, Plant Projects (GPP/IGPP)	**43,925**	**68,660**	**59,760**	**38,400**
Total, Capital Summary	**61,325**	**77,760**	**70,460**	**51,900**

Naval Reactors
Construction Projects Summary

(Dollars in Thousands)

	Total	Prior Years	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
14-D-901, Spent Fuel Handling Recapitalization Project					
Total Estimated Cost (TEC)	1,512,400	401,200	287,000	238,000	-49,000
Other Project Cost (OPC)	174,100	174,100	0	0	+0
TPC, 14-D-901, Spent Fuel Handling Recapitalization Project[a]	**1,686,500**	**575,300**	**287,000**	**238,000**	-49,000
15-D-904, NRF Overpack Storage Expansion 3					
Total Estimated Cost (TEC)	15,700	2,000	0	0	+0
Other Project Cost (OPC)	400	250	150	0	-150
TPC, 15-D-904, NRF Overpack Storage Expansion 3	**16,100**	**2,250**	**150**	**0**	-150
17-D-911, BL Fire System Upgrade					
Total Estimated Cost (TEC)	14,600	1,400	13,200	0	-13,200
Other Project Cost (OPC)	2,941	1,600	0	0	+0
TPC, 17-D-911, BL Fire System Upgrade	**17,541**	**3,000**	**13,200**	**0**	-13,200
19-D-930, KS Overhead Piping					
Total Estimated Cost (TEC)	31,894	0	10,994	20,900	+9,906
Other Project Cost (OPC)	2,384	0	1,069	430	-639
TPC, 19-D-930, KS Overhead Piping	**34,278**	**0**	**12,063**	**21,330**	+9,267
20-D-931, KL Fuel Development Laboratory					
Total Estimated Cost (TEC)	23,700	0	0	23,700	+23,700
Other Project Cost (OPC)	2,777	0	0	1,263	+1,263
TPC, 20-D-931, KL Fuel Development Laboratory	**26,477**	**0**	**0**	**24,963**	+24,963
Total All Construction Projects					
Total Estimated Cost (TEC)	1,598,294	404,600	311,194	282,600	-28,594
Other Project Cost (OPC)	182,602	175,950	1,219	1,693	+474
TPC, All Construction Projects	**1,792,609**	**580,550**	**312,413**	**284,293**	**-28,120**

[a] The Consolidated and Further Continuing Appropriation Act, 2015 provided funding for Other Project Costs (OPC) within project funds beginning in FY 2015. All prior year funding was OPC. The total amount of the SFHP Project entries is $1,646,500, but the total is stated as $1,686,500 to reflect the TPC that was established with the CD-2/3 Performance Baseline. Policy decisions on the additional $40 million will be reflected in the FY 2021 budget.

Outyears to Completion for Naval Reactors

(Dollars in Thousands)

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request	Outyears to Completion
14-D-901, Spent Fuel Handling Recapitalization Project					
Total Estimated Cost (TEC)	239,000	193,000	47,700	32,900	33,600
Other Project Cost (OPC)	0	0	0	0	0
TPC, 14-D-901, Spent Fuel Handling Recapitalization Project	**239,000**	**193,000**	**47,700**	**32,900**	**33,600**
17-D-911, BL Fire System Upgrade					
Total Estimated Cost (TEC)	0	0	0	0	0
Other Project Cost (OPC)	500	400	141	0	0
TPC, 17-D-911, BL Fire System Upgrade	**500**	**400**	**141**	**0**	**0**
19-D-930, KS Overhead Piping					
Total Estimated Cost (TEC)	0	0	0	0	0
Other Project Cost (OPC)	732	96	57	0	0
TPC, 19-D-930, KS Overhead Piping	**732**	**96**	**57**	**0**	**0**
20-D-XXX, KL Fuel Development Laboratory					
Total Estimated Cost (TEC)	0	0	0	0	0
Other Project Cost (OPC)	198	277	1,039	0	0
TPC, 20-D-XXX, KL Fuel Development Laboratory	**198**	**277**	**1,039**	**0**	**0**
21-D-XXX, NRF Medical Science Complex					
Total Estimated Cost (TEC)	30,800	0	0	0	0
Other Project Cost (OPC)	0	240	600	0	0
TPC, 21-D-XXX, NRF Medical Science Complex	**30,800**	**240**	**600**	**0**	**0**
21-D-XXX, KL Steam and Condensate Upgrades					
Total Estimated Cost (TEC)	4,000	0	0	46,200	0
Other Project Cost (OPC)	80	1,050	1,050	160	480
TPC, 21-D-XXX, KL Steam and Condensate Upgrades	**4,080**	**1,050**	**1,050**	**46,360**	**480**

Outyears to Completion for Naval Reactors

(Dollars in Thousands)

	FY 2021 Request	FY 2022 Request	FY 2023 Request	FY 2024 Request	Outyears to Completion
21-D-XXX, BL Component Test Complex					
Total Estimated Cost (TEC)	44,300	0	0	0	0
Other Project Cost (OPC)	50	0	6,500	193	480
TPC, 21-D-XXX, BL Component Test Complex	**44,350**	**0**	**6,500**	**193**	**480**
22-D-XXX, KL Chemistry and Radiological Health Building					
Total Estimated Cost (TEC)	0	41,620	0	0	0
Other Project Cost (OPC)	5	100	107	214	1,106
TPC, 22-D-XXX, KL Chemistry and Radiological Health Building	**5**	**41,720**	**107**	**214**	**1,106**
22-D-XXX, KL Security Upgrades					
Total Estimated Cost (TEC)	0	2,100	0	0	24,530
Other Project Cost (OPC)	1,201	0	0	0	136
TPC, 22-D-XXX, KL Security Upgrades	**1,201**	**2,100**	**0**	**0**	**24,666**
23-D-XXX, Naval Examination Acquisition Project[a]					
Total Estimated Cost (TEC)	0	0	70,000	70,000	TBD
Other Project Cost (OPC)[b]	15,300	26,500	25,300	8,800	TBD
TPC, 23-D-XXX, Naval Examination Acquisition Project	**15,300**	**26,500**	**95,300**	**78,800**	**TBD**
Total All Construction Projects					
Total Estimated Cost (TEC)	318,100	236,720	117,700	149,100	54,596
Other Project Cost (OPC)	17,866	28,263	34,653	9,367	2,206
TPC, All Construction Projects	**335,966**	**264,983**	**152,353**	**158,467**	**56,802** a

[a] Critical Decision – 0, *Mission Need Statement*, was issued in January 2018 and established a cost range $0.5 billion - $1.266 billion (in FY 2018 constant dollars).
[b] Pre-Conceptual and Conceptual Design is estimated to exceed $5 million.

Research and Development

The Office of Management and Budget (OMB) Circular No. A-11, "Preparation, Submission, and Execution of the Budget," dated July 2013, requires the reporting of research and development (R&D) data. Consistent with this requirement, R&D activities funded by NNSA are displayed below.

(Dollars in Thousands)

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Research and Development (R&D)				
Basic	0	0	0	0
Applied	0	0	0	0
Development	1,205,838	1,225,928	1,186,739	-39,189
Subtotal, R&D	**1,205,838**	**1,225,928**	**1,186,739**	**-19,099**
Equipment	17,200	17,500	25,900	+8,400
Construction	197,000	287,000	261,700	-25,300
Total, R&D	**1,420,038**	**1,530,428**	**1,474,339**	**-35,999**

[a] Amounts do not reflect the transfer of funding to the Office of Nuclear Energy for maintenance and operation of the Advanced Test Reactor in FY 2019.

20-D-931 KL Fuel Development Laboratory
Knolls Atomic Power Laboratory, Schenectady, NY
Project is for Construction Only

1. Summary, Significant Changes, and Schedule and Cost History

<u>**Summary**</u>
The FY 2020 Request for the KL Fuel Development Laboratory is $23,700K. The total project cost (TPC) is $26,477K, approved at Critical Decision (CD) CD-1 on November 29, 2018 with a CD-4 of 4Q FY 2023.

<u>**Significant Changes**</u>
This Construction Project Data Sheet (CPDS) is new and will include a new start for the budget year.

A Federal Project Manager has been assigned to this project and has approved this CPDS. This project provides facilities to support development of advanced fuels. In FY 2020, funds requested for this project will be used for construction efforts.

Critical Milestone History[a]

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2020	12/30/2014	5/30/2018	11/29/2018	2Q FY 2020	4Q FY 2021	2Q FY 2020	N/A	4Q FY 2023

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete/d
CD-3 – Approve Start of Construction/Execution
D&D Complete –Completion of D&D work (see Section 9)
CD-4 – Approve Start of Operations or Project Completion

Project Cost History[b]

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC Except D&D	OPC, D&D	OPC, Total	TPC
FY 2020	N/A	23,700	23,700	2,777	0	2,777	26,477

2. Project Scope and Justification

<u>**Scope**</u>
This project will construct an extension to the existing Ceramic Development Laboratory (CDL) Building C6 to increase the space available to support development of advanced fuels, and to collocate and consolidate radiological operations in the CDL. The extension will bring like operation and technologies from other subdivisions under one roof, and will reduce radiological material handling and transporting, reducing the Program's risk profile. The extension will provide a structure and all utilities, including hot / cold water, chilled water, fire protection water, electrical power, inert process gases, compressed air, and radiological ventilation to fully support the equipment systems to be located within the building. Construction design is estimated to be less than $2 million and is funded out of operating funds.

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[a] Schedules are only estimates and consistent with the high end of the schedule ranges.
[b] Figures are only estimates and consistent with the high end of the cost ranges.

Justification

Reactor fuel manufacturing and development is unique to and is an essential element of Naval Reactors Program technology. The CDL currently has inadequate space to support development needs for advanced fuel systems to meet the future needs of the NR Program. An extension of the current Building C6 is required to make additional space available for additional equipment and capability. The extension will also consolidate facilities and equipment currently spread across at least nine separate facility areas, eliminating handling of fissile material in and between these locations. The physical and administrative tasks associated with movement of nuclear materials between facilities are estimated to be more than $1 million per year in manpower costs. This consolidation will remove the legacy radiological concerns and continued maintenance costs associated with the spaces to be vacated, resulting in decreased annual cost and improved radiological safety. The extension needs to be completed as early as possible given the age of the current facilities and their excessive annual maintenance requirements, as well as to support fuel development efforts that require a 10 - 20-year development-to-fleet application cycle. If this project is not completed on time, the NR Program may not be able to meet the nuclear fuel needs of the Navy for the next ship-class design. Further, relying on the aging infrastructure presents a risk to adequately answering fleet and/or vendor production concerns in a timely manner, thus increasing the risk of unacceptable shutdowns of production and/or fleet operations.

The project has an equivalency to the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets. The project is being conducted in accordance with the NR Implementation Bulletin for DOE O 413.3B, and all appropriate project management requirements have been met.

Key Performance Parameters (KPPs)

The Threshold KPPs represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The KPPs will be finalized with CD-2 approval.

Performance Measure	Threshold	Objective
N/A	N/A	N/A

3. Project Cost and Schedule

Financial Schedule

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Construction			
FY 2020	23,700	19,048	4,626
FY 2021	0	1,417	9,623
FY 2022	0	1,250	7,380
FY 2023	0	1,985	2,071
Total, TEC	23,700	23,700	23,700
Other Project Cost (OPC)			
FY 2020	1,263	1,263	714
FY 2021	198	198	447
FY 2022	277	277	577
FY 2023	1,039	1,039	1,039
Total OPC	2,777	2,777	2,777
Total Project Cost (TPC)			
FY 2020	24,963	20,311	5,340
FY 2021	198	1,615	10,070

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
FY 2022	277	1,527	7,957
FY 2023	1,039	3,024	3,110
Grand Total	26,477	26,477	26,477

Details of Project Cost Estimate

Overall Project

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Construction			
Construction	19,797	N/A	N/A
Equipment	2,310	N/A	N/A
Contingency	1,593	N/A	N/A
Total, Construction	23,700	N/A	N/A
Other TEC			
Contingency	N/A	N/A	N/A
Total, Other TEC			
Total Estimated Cost	23,700	N/A	N/A
Contingency, TEC	1,593	N/A	N/A
Other Project Cost (OPC)			
OPC Except D&D			
OPC	2,598	N/A	N/A
Contingency	179	N/A	N/A
D&D	0	N/A	N/A
Total, OPC	2,777	N/A	N/A
Contingency, OPC	179	N/A	N/A
Total Project Cost	26,477	N/A	N/A
Total, Contingency (TEC+OPC)	1,772	N/A	N/A

Schedule of Appropriation Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Outyears	Total
FY 2020	TEC	0	0	23,700	0	0	0	0	0	23,700
	OPC	0	0	1,263	198	277	1,039	0	0	2,777
	TPC	0	0	24,963	198	277	1,039	0	0	26,477

4. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	4Q FY 2023
Expected Useful Life	40 years
Expected Future Start of D&D of this capital asset	4Q FY 2063

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	N/A	0.621	N/A	24.840

5. D&D Information

The new area being constructed in this project is not replacing existing facilities.

	Square Feet
New area being constructed by this project at Knolls.	12,400
Area of D&D in this project at Knolls.	0
Area at Knolls to be transferred, sold, and/or D&D outside the project including area previously "banked"	4,329
Area of D&D in this project at other sites	0
Area at other sites to be transferred, sold, and/or D&D outside the project including area previously "banked"	8,071
Total area eliminated ………………………..…………………………….	12,400

6. Acquisition Approach

The procurement strategy being evaluated for the materials storage vault is Design-Bid-Build. All contracts will be negotiated procurements and the basis of the award will be a determination of best value through a formalized selection process.

19-D-930, KS Overhead Piping
Kesselring Site, West Milton, NY
Project is for Construction Only

1. Summary, Significant Changes, and Schedule and Cost History

Summary

The FY 2020 Request for the KS Overhead Piping project is $20,900K. The total project cost (TPC) is $34,278K, approved at Critical Decision (CD) CD-1 on June 5, 2017 with a CD-4 of 1Q FY 2023.

Significant Changes

This Construction Project Data Sheet (CPDS) is an update of the FY 2019 CPDS and does not include a new start for the budget year.

A Federal Project Manager has been assigned to this project and has approved this CPDS. This project provides critical utilities for the east and west sides of the Kesselring Site. In FY 2020, funds requested for this project will be used for West Side piping construction efforts.

Critical Milestone History[a]

Overall KS Overhead Piping (19-D-930)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2019	3/9/2016	11/30/2016	6/5/2017	2Q FY 2019	1Q FY 2020	2Q FY 2020	1Q FY 2022	1Q FY 2023
FY 2020	3/9/2016	11/30/2016	6/5/2017	2Q FY 2019	1Q FY 2020	2Q FY 2020	1Q FY 2022	1Q FY 2023

Overhead Piping East Side (19-D-930-01)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2019	3/9/2016	11/30/2016	6/5/2017	1Q FY 2019	9/7/2018	1Q FY 2019	1Q FY 2020	1Q FY 2022
FY 2020	3/9/2016	11/30/2016	6/5/2017	1/17/2019	9/7/2018	1/17/2019	1Q FY 2020	1Q FY 2022

Overhead Piping West Side (19-D-930-02)

Fiscal Quarter or Date

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete	CD-4
FY 2019	3/9/2016	11/30/2016	6/5/2017	2Q FY 2019	1Q FY 2020	2Q FY 2020	1Q FY 2022	1Q FY 2023
FY 2020	3/9/2016	11/30/2016	6/5/2017	2Q FY 2019	1Q FY 2020	2Q FY 2020	1Q FY 2022	1Q FY 2023

CD-0 – Approve Mission Need for a construction project with a conceptual scope and cost range
Conceptual Design Complete – Actual date the conceptual design was completed
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated/Actual date the project design will be/was complete/d
CD-3 – Approve Start of Construction/Execution

[a] Schedules for the West Side subproject (-02) are only estimates and consistent with the high end of the schedule ranges.

D&D Complete –Completion of D&D work (see Section 9)
CD-4 – Approve Start of Operations or Project Completion

Project Cost History[a]
Overall KS Overhead Piping (19-D-930)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC Except D&D	OPC, D&D	OPC, Total	TPC
FY 2019	N/A	31,894	31,894	0	420	420	32,314
FY 2020[b]	N/A	31,894	31,894	1,964	420	2,384	34,278

Overhead Piping East Side (19-D-930-01)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC Except D&D	OPC, D&D	OPC, Total	TPC
FY 2019	N/A	10,994	10,994	0	210	210	11,204
FY 2020[b]	N/A	10,994	10,994	1,046	210	1,256	12,250

Overhead Piping West Side (19-D-930-02)

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC Except D&D	OPC, D&D	OPC, Total	TPC
FY 2019	N/A	20,900	20,900	0	210	210	21,110
FY 2020[b]	N/A	20,900	20,900	918	210	1,128	22,028

2. Project Scope and Justification

Scope
This project will construct a replacement overhead piping utility distribution system for the Kesselring Site in West Mifflin, New York. The distribution systems will include as a minimum: steam, condensate, compressed air, and demineralized water. The new distribution will provide for the future needs and development for the Kesselring site as well as address all potential life cycle cost and maintenance savings for the ensuing 40 years beyond installation.

The overhead piping systems are made up of east and west loops, which can be independently isolated from each other. This project includes two subprojects, one for each loop. Completion of one subproject is not dependent upon completion of the other subproject. D&D efforts supporting construction will be completed using operating funds.

Justification
The majority of the piping systems and support structures on the Kesselring Site are over 50 years old and are subject to frequent leaks and emergent maintenance that affects the reliable delivery of mission critical system services. In specific sections, a conditional assessment has validated the overhead piping systems have degraded and have reached or exceeded their useful life. In some areas the piping distribution systems have inadequate capacity to support current and future site needs. In addition to recapitalizing infrastructure and accommodating capacity issues, the distribution system must be reconfigured for ease of maintenance without interruption of system services.

The project has an equivalency to the project management requirements in DOE O 413.3, Program and Project Management for the Acquisition of Capital Assets. The project is being conducted in accordance with the NR Implementation Bulletin for DOE O 413.3, and all appropriate project management requirements have been met.

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[a] Amounts for the West Side subproject (-02) are only estimates and consistent with the high end of the cost range.
[b] The FY 2020 CPDS is updated to show OPC post CD-3.

Key Performance Parameters (KPPs)

The Threshold KPPs represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The KPPs were formally established as part of the Performance Baseline and approval of CD-2/3 for the East Side subproject.

Performance Measure	**Threshold**	**Objective**
ASME Compliant High Pressure Steam sectored loop distribution system (Insulated/Aluminum Jaketed) which is adequately sized to support KS for the foreseeable future.	3,700 LF	3,700 LF
ASME Compliant High Pressure Condensate sectored loop return system (Insulated/Aluminum Jaketed) which is adequately sized to support KS for the foreseeable future.	3,800 LF	3,800 LF
ASME Compliant High Pressure Return System (Insulated/Aluminum Jaketed) which is adequately sized to support KS for the foreseeable future.	1,300 LF	1,300 LF
Addition Steam Flask Tanks to support enhanced reliability of the Steam Distribution System.	8 EA	8 EA
Addition Condensate Pump/Receivers to support enhanced reliability of the Steam Distribution System.	2 EA	2 EA
ASME Compliant Site Air Piping Distribution System which is adequately sized to support KS for the foreseeable future.	1,250 LF	1,250 LF
ASME Compliant Site Demineralized Water Piping System which is adequately sized to support KS for the foreseeable future.	1,250 LF	1,250 LF
New Concrete Foundations that minimize pipe distribution systems within the buildings and eliminates current pipe distribution design issues.	64 EA	64 EA
Modified Existing Concrete Foundations that minimize pipe distribution systems within the buildings and eliminates current pipe distribution design issues.	25 EA	25 EA
Structural Bridges that minimize pipe distribution systems within the buildings and eliminates current pipe distribution design issues.	24 EA	24 EA
Structural Beams that minimize pipe distribution systems within the buildings and eliminates current pipe distribution design issues.	71 EA	71 EA
Structural Pipe Stanchions that minimize pipe distribution systems within the buildings and eliminates current pipe distribution design issues.	89 EA	89 EA

3. Project Cost and Schedule

Financial Schedule

Overhead Piping East Side (19-D-930-01)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Construction			
FY 2019	N/A	N/A	1,007
FY 2020	N/A	N/A	4,508
FY 2021	N/A	N/A	4,500
FY 2022	N/A	N/A	979
Total, Construction	N/A	N/A	10,994
Total Estimated Costs (TEC)			
FY 2019	10,994	10,994	1,007
FY 2020	0	0	4,508
FY 2021	0	0	4,500
FY 2022	0	0	979
Total TEC	10,994	10,994	10,994
Other Project Costs (OPC)			
OPC Except D&D			
FY 2019	647	647	647
FY 2020	323	323	323
FY 2021	76	76	76
Total, OPC Except D&D	1,046	1,046	1,046
D&D			
FY 2019	210	210	210
Total, D&D	210	210	210
Total, OPC	1,256	1,256	1,256
Total Project Costs (TPC)			
FY 2019	11,851	11,851	1,864
FY 2020	323	323	4,831
FY 2021	76	76	4,576
FY 2022	0	0	979
FY 2023	0	0	0
Grand Total	12,250	12,250	12,250

Overhead Piping West Side (19-D-930-02)

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
Construction			
FY 2020	N/A	N/A	1,000
FY 2021	N/A	N/A	4,409
FY 2022	N/A	N/A	6,712
FY 2023	N/A	N/A	8,779
Total, Construction	N/A	N/A	20,900
Total Estimated Costs (TEC)			

	(Dollars in Thousands) Budget Authority (Appropriations)	Obligations	Costs
FY 2020	20,900	20,900	1,000
FY 2021	0	0	4,409
FY 2022	0	0	6,712
FY 2023	0	0	8,779
Total, TEC	20,900	20,900	20,900
Other Project Cost (OPC)			
OPC Except D&D			
FY 2019	212	212	212
FY 2020	107	107	107
FY 2021	446	446	446
FY 2022	96	96	96
FY 2023	57	57	57
Total, OPC Except D&D	918	918	918
D&D			
FY 2021	210	210	210
Total, D&D	210	210	210
Total, OPC	1,128	1,128	1,128
Total Project Cost (TPC)			
FY 2019	212	212	212
FY 2020	21,007	21,007	1,107
FY 2021	656	656	5,065
FY 2022	96	96	6,808
FY 2023	57	57	8,836
Grand Total	22,028	22,028	22,028

Overall Project

	(Dollars in Thousands) Budget Authority (Appropriations)	Obligations	Costs
Total Estimated Cost (TEC)			
Construction			
FY 2019	N/A	N/A	1,007
FY 2020	N/A	N/A	5,508
FY 2021	N/A	N/A	8,909
FY 2022	N/A	N/A	7,691
FY 2023	N/A	N/A	8,779
Total Construction			31,894
Total Estimated Costs (TEC)			
FY 2019	10,994	10,994	1,007
FY 2020	20,900	20,900	5,508
FY 2021	0	0	8,909
FY 2022	0	0	7,691
FY 2023	0	0	8,779
Total, TEC	31,894	31,894	31,894
Other Project Cost (OPC)			
OPC Except D&D			

(Dollars in Thousands)

	Budget Authority (Appropriations)	Obligations	Costs
FY 2019	859	859	859
FY 2020	430	430	430
FY 2021	522	522	522
FY 2022	96	96	96
FY 2023	57	57	57
Total, OPC Except D&D	1,964	1,964	1,964
D&D			
FY 2019	210	210	210
FY 2021	210	210	210
Total, D&D	420	420	420
Total OPC	2,384	2,384	2,384
Total Project Cost (TPC)			
FY 2019	12,063	12,063	2,076
FY 2020	21,330	21,330	5,938
FY 2021	732	732	9,641
FY 2022	96	96	7,787
FY 2023	57	57	8,836
Grand Total	34,278	34,278	34,278

Details of Project Cost Estimate

Overhead Piping East Side (19-D-930-01)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Construction			
Construction	7,302	7,302	N/A
Contingency	3,692	3,692	N/A
Total, Construction	10,994	10,994	N/A
Other TEC			
Contingency	N/A	N/A	N/A
Total, Other TEC	N/A	N/A	N/A
Total Estimated Cost	10,994	10,994	N/A
Contingency, TEC	3,692	3,692	N/A
Other Project Cost (OPC)			
OPC except D&D			
Characterization	572	0	N/A
Commissioning	363	0	N/A
Temporary Utilities	111	0	N/A
D&D	210	210	N/A
Total, OPC	1,256	210	N/A
Contingency, OPC	0	0	N/A
Total Project Cost	12,250	11,204	N/A
Total, Contingency (TEC+OPC)	3,692	3,692	N/A

Overhead Piping West Side (19-D-930-02)

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Construction			
Construction	15,594	15,594	N/A
Contingency	5,306	5,306	N/A
Total, Construction	20,900	20,900	N/A
Other TEC			
Contingency	N/A	N/A	N/A
Total, Other TEC	N/A	N/A	N/A
Total Estimated Cost	20,900	20,900	N/A
Contingency, TEC	5,306	5,306	N/A
Other Project Cost (OPC)			
OPC Except D&D			
Characterization	235	0	N/A
Commissioning	355	0	N/A
Temporary Utilities	328	0	N/A
D&D	210	210	N/A
Total, OPC	1,128	210	N/A
Contingency, OPC	0	0	N/A
Total Project Cost	22,028	21,110	N/A
Total, Contingency (TEC+OPC)	5,306	5,306	N/A

Overall Project

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Construction			
Construction	22,896	22,896	N/A
Contingency	8,998	8,998	N/A
Total, Construction	31,894	31,894	N/A
Other TEC			
Contingency	N/A	N/A	N/A
Total, Other TEC			
Total Estimated Cost	31,894	31,894	N/A
Contingency, TEC	8,998	8,998	N/A
Other Project Cost (OPC)			
OPC Except D&D			
Characterization	807	0	N/A
Commissioning	718	0	N/A
Temporary Utilities	439	0	N/A
D&D	420	420	N/A
Total, OPC	2,384	420	N/A
Contingency, OPC	0	0	N/A

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Project Cost	34,278	32,314	N/A
Total, Contingency (TEC+OPC)	8,998	8,998	N/A

Schedule of Appropriation Requests

(Dollars in Thousands)

Request Year	Type	Prior Years	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	Outyears	Total
FY 2019	TEC	0	0	10,994	20,900	0	0	0	0	31,894
	OPC	0	0	210	0	210	0	0	0	420
	TPC	0	0	11,204	20,900	210	0	0	0	32,314
FY 2020	TEC	0	0	10,994	20,900	0	0	0	0	31,894
	OPC	0	0	1,069	430	732	96	57	0	2,384
	TPC	0	0	12,063	21,330	732	96	57	0	34,278

4. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy	1Q FY 2023
Expected Useful Life	40 years
Expected Future Start of D&D of this capital asset	1Q FY 2063

Related Funding Requirements
(Budget Authority in Millions of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	0.0353	0.0353	0.724	0.724

5. D&D Information

There is no new area being constructed in this construction project.

6. Acquisition Approach

The procurement strategy for this project is Design-Bid-Build due to the uncertainty caused by the large number of interfaces with legacy systems and facilities. Construction is planned to be a fixed price contract.

14-D-901, Spent Fuel Handling Recapitalization Project
Naval Reactors Facility, Idaho
Project is for Design and Construction

1. Summary, Significant Changes, and Schedule and Cost History

Summary
The FY 2020 Request for 14-D-901, Spent Fuel Handling Recapitalization Project is $238,000K. Critical Decision (CD)-2/3, Performance Baseline and Start of Permanent Construction, was approved on September 24, 2018 with a total project cost (TPC) of $1,686,500K and a CD-4 of 3Q FY 2025.

Significant Changes
This Construction Project Data Sheet (CPDS) is an update of the FY 2019 CPDS and does not include a new start for the budget year.

Per the Consolidated and Further Continuing Appropriations Act, 2015, the Spent Fuel Handling Recapitalization Project Major Construction Project funding includes both Total Estimated Cost and Other Project Cost.

The Spent Fuel Handling Recapitalization Project is implementing a phased approach to design the facility as first incorporated in the FY 2017 CPDS. In the FY 2019 CPDS, costs associated with the phased design in FY 2019 and FY 2020 were transferred from the construction category to the design category to better characterize the design costs.

Upon approval of the Project's Performance Baseline in September 2018, contingency funds were reduced from $197.8 million in the FY 2019 CPDS to $72.7 million in the FY 2020 CPDS to reflect current design maturity and better definition of cost uncertainties and project risks. Additionally, $40.0 million was added to the Project for FY 2021 to account for externally driven increases in commodity and labor costs. This additional funding will first be requested in the FY 2021 CPDS.

A Federal Project Director has been assigned to this project and has approved this CPDS.

Consistent with the National Environmental Policy Act Record of Decision, published on December 5, 2016, the Spent Fuel Handling Recapitalization Project will design and construct a new facility, the Naval Spent Fuel Handling Facility, with a footprint of approximately 213,000 square feet for handling naval spent nuclear fuel with the capability to receive, unload, prepare, and package naval spent nuclear fuel. The Project is currently in the final design phase, which includes finalization of safety assessments, design drawings and specifications, and project management processes to support permanent construction activities beginning in FY 2019. The Project began final design work in 1Q FY 2018.

Spent fuel handling operations in the existing Expended Core Facility will overlap with operations in the new Naval Spent Fuel Handling Facility for a period of 5 to 12 years, and examination operations in the existing Expended Core Facility will continue for the foreseeable future; therefore, the costs associated with D&D of the Expended Core Facility are not included in the range of costs cited for the Spent Fuel Handling Recapitalization Project.

Critical Milestone History

(Fiscal Quarter or Date)

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete[a]	CD-4
FY 2014	03/29/2008		1Q FY 2014	3Q FY 2015	4Q FY 2016	4Q FY 2016	N/A	4Q FY 2022
FY 2015	03/29/2008		1Q FY 2014	3Q FY 2015	4Q FY 2016	4Q FY 2016	N/A	4Q FY 2022

[a] D&D is not within the scope of this project.

(Fiscal Quarter or Date)

Fiscal Year	CD-0	Conceptual Design Complete	CD-1	CD-2	Final Design Complete	CD-3	D&D Complete[a]	CD-4
FY 2015 Rev[a]	03/29/2008		1Q FY 2015	3Q FY 2017	4Q FY 2018	1Q FY 2018	N/A	4Q FY 2024
FY 2016[b]	03/29/2008		2Q FY 2015	1Q FY 2018	4Q FY 2019	4Q FY 2018	N/A	3Q FY 2025
FY 2017	03/29/2008	03/19/2015	03/19/2015	1Q FY 2018	3Q FY 2020[c]	4Q FY 2018	N/A	3Q FY 2025
FY 2018	03/29/2008	03/19/2015	03/19/2015	4Q FY 2018[d]	3Q FY 2020	4Q FY 2018	N/A	3Q FY 2025
FY 2019	03/19/2008	03/19/2015	03/19/2015	4Q FY 2018	3Q FY 2020	4Q FY 2018	N/A	3Q FY 2025
FY 2020 PB	03/19/2008	03/19/2015	03/19/2015	09/24/2018	3Q FY 2020	09/24/2018	N/A	3Q FY 2025

CD-0 – Approve Mission Need
Conceptual Design Complete – Actual date the conceptual design was completed
CD-1 – Approve Alternate Selection and Cost Range
CD-2 – Approve Performance Baseline
Final Design Complete – Estimated date the Project design will be completed
CD-3 – Approve Start of Construction/Execution
D&D Complete – Completion of D&D work (see Section 9)
CD-4 – Approve Start of Operations or Project Completion

(Fiscal Quarter or Date)

Fiscal Year	CD-3A	CD-3B	CD-4A
FY 2017	2Q FY 2017	1Q FY2018	3Q FY 2024
FY 2018	12/7/2016	4Q FY 2017	3Q FY 2024
FY 2019	12/7/2016	6/14/2017	3Q FY 2024
FY 2020	12/7/2016	6/14/2017	3Q FY 2024

CD-3A – Start of Long Lead Material Procurement
CD-3B – Start of Early Site Preparation
CD-4A – Start of M-290 Shipping Container Unloading Operations

Project Cost History

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2014	369,400	917,100	1,286,500	165,000	N/A	165,000	1,451,500
FY 2015	369,400	917,100	1,286,500	165,000	N/A	165,000	1,451,500
FY 2015 Rev[e]	263,000	1,144,900	1,407,000	178,200	N/A	178,200	1,586,100
FY 2016[f]	268,800	1,182,100	1,450,900	195,600	N/A	195,600	1,646,500
FY 2017[g]	239,800	1,232,600	1,472,400	174,100	N/A	174,100	1,646,500
FY 2018	239,800	1,232,600	1,472,400	174,100	N/A	174,100	1,646,500

[a] The FY 2015 Revision incorporated the expected impacts of the Consolidated Appropriations Act, 2014 funding reductions.
[b] The FY 2016 CPDS incorporated the impacts from the FY 2015 delayed appropriation.
[c] The FY 2017 CPDS incorporated a phased design.
[d] The FY 2018 CPDS revised the CD-2 milestone date to be consistent with revisions to DOE Order 413.3.
[e] The FY 2015 Revision incorporated the expected impacts of the Consolidated Appropriations Act, 2014 funding reductions.
[f] The FY 2016 CPDS incorporated the impacts from the FY 2015 delayed appropriation.
[g] Divisions between cost categories were updated based on progression of the Project designs and CD-1 completion.

(Dollars in Thousands)

Fiscal Year	TEC, Design	TEC, Construction	TEC, Total	OPC, Except D&D	OPC, D&D	OPC, Total	TPC
FY 2019[a]	306,982	1,165,418	1,472,400	174,100	N/A	174,100	1,646,500
FY 2020[b] PB	302,489	1,169,911	1,472,400	174,100	N/A	174,100	1,686,500[c]

2. Project Scope and Justification

Scope

The Spent Fuel Handling Recapitalization Project will design and construct a new facility, the Naval Spent Fuel Handling Facility, to incorporate the capabilities for naval spent nuclear fuel handling that currently exist in the Expended Core Facility and its support facilities. Additionally, a major portion of this new facility is required to support additional capability, which does not exist in the Expended Core Facility, to handle full-length aircraft carrier naval spent nuclear fuel received in M-290 shipping containers. The Naval Spent Fuel Handling Facility footprint will be approximately 213,000 square feet. Of this, approximately 121,000 square feet is required for spent fuel shipping container and dry storage operations, which includes approximately 17,000 square feet for water pool spent fuel preparation and in-process storage. The remainder of the facility, approximately 92,000 square feet, is required for waste management, facility systems operations, staging, and administrative office space. The Spent Fuel Handling Recapitalization Project is currently in the final design phase, and site preparation has begun.

The following represents the general scope of the Spent Fuel Handling Recapitalization Project:

- Design and construct a facility and facility systems for naval spent nuclear fuel handling, including the capability to receive, unload, prepare, and package naval spent nuclear fuel.
- Design and construct infrastructure needed to support naval spent nuclear fuel handling operations.
- Design and procure equipment to make the facility ready for use to receive, unload, prepare, and package naval spent nuclear fuel, where appropriate.
- Provide the new capability to unload M-290 spent fuel shipping containers.
- Prepare testing, operating, and preventive maintenance procedures and drawings, where appropriate, for the naval spent nuclear fuel handling process systems, equipment, facilities, and facility systems.
- Develop training programs and conduct personnel training, where appropriate.
- Develop project management procedures and manage Project activities.
- Provide support services needed for the Project.
- Manage sub-contracts supporting the design and construction.
- Prepare an Environmental Impact Statement in accordance with National Environmental Policy Act.

Justification

The mission of Naval Reactors is to provide the nation with militarily effective nuclear propulsion plants and to ensure their safe, reliable, long-lived, and affordable operation. Naval Reactors maintains total responsibility for all aspects of the U.S. Navy's nuclear propulsion systems, including research, design, construction, testing, operation, maintenance, and disposal. At the end of reactor service life, Naval Reactors transports naval spent nuclear fuel from its origin (e.g., naval spent nuclear fuel from servicing shipyards and naval training platforms) to the Naval Reactors Facility at the Idaho National Laboratory.

The Expended Core Facility, located at the Naval Reactors Facility in Idaho, is the only facility with the capabilities to receive naval spent nuclear fuel shipping containers and process naval spent nuclear fuel. Although the existing Expended Core Facility continues to be maintained and operated in a safe and environmentally responsible manner, the infrastructure is over 60 years old, does not meet current standards (i.e., requirements that were not applicable at the time of construction) and requires recapitalization. The Expended Core Facility is also incapable of receiving full-length aircraft carrier naval

[a] Divisions between cost categories were updated to account for the phased design.

[b] Divisions between cost categories were updated based on establishment of the Performance Baseline in September 2018.

[c] The total amount of the entries in this row is $1,646,500, but the total is stated as $1,686,500 to reflect the TPC that was established with the CD-2/3 Performance Baseline. The additional $40M will first be reflected in the FY 2021 CPDS.

spent nuclear fuel, which is required to support aircraft carrier refuelings. The magnitude of required sustainment efforts and incremental infrastructure upgrades within the Expended Core Facility pose substantial risk to the continued preparation of naval spent nuclear fuel for long term storage. Specifically, sustainment efforts could require delays to naval spent nuclear fuel shipping container unloading operations, which would interrupt refueling and defueling schedules for nuclear-powered vessels and would adversely affect the operational availability of the nuclear fleet. If this interruption were to extend over long periods of time, the ability to sustain fleet operations would be impacted, resulting ultimately in a significant decrement to the Navy's responsiveness and agility to fulfill military missions worldwide.

The existing Expended Core Facility at the Naval Reactors Facility in Idaho is a single facility that is approximately 197,000 square feet. However, other facilities at the Naval Reactors Facility support operations within the Expended Core Facility and include additional areas for administrative support and warehouse storage. The Expended Core Facility has two major capabilities: (1) to receive, unload, prepare, and package naval spent nuclear fuel and, (2) to conduct naval spent nuclear fuel examinations.

Actions necessary to continue Naval Reactors' ability to support naval spent nuclear fuel handling were the subject of an Environmental Impact Statement. The Final Environmental Impact Statement for recapitalization of the infrastructure supporting naval spent nuclear fuel was published on September 30, 2016 and included an assessment of the environmental impacts associated with handling of naval spent nuclear fuel for the following alternatives:

(1) No Action Alternative – Maintain the naval spent nuclear fuel handling capabilities of the existing Expended Core Facility by continuing to use the existing infrastructure while performing corrective maintenance and repairs.
(2) Overhaul Alternative – Recapitalize the naval spent nuclear fuel handling capabilities of the Expended Core Facility by overhauling the existing facility with major refurbishment projects for the infrastructure and water pools.
(3) New Facility Alternative, including the Spent Fuel Handling Recapitalization Project – Recapitalize the naval spent nuclear fuel handling capabilities of the Expended Core Facility by constructing and operating a new facility at one of two potential locations at Naval Reactors Facility in Idaho.

The National Environmental Policy Act Record of Decision, which identified the New Facility Alternative as the preferred method to recapitalize the naval spent nuclear fuel handling capabilities of the Expended Core Facility, was published on December 5, 2016.

The Spent Fuel Handling Recapitalization Project has an equivalency to the project management requirements in DOE Order 413.3, Program and Project Management for the Acquisition of Capital Assets. The Project is being conducted in accordance with the Naval Reactors Implementation Bulletin for DOE O 413.3, and appropriate project management requirements have been met.

Prior to CD-2/3 approval, an independent cost estimate was completed by the Department of Defense Office of Cost Assessment and Program Evaluation.

<u>Key Performance Parameters (KPPs)</u>
The Threshold KPPs represent the minimum acceptable performance that the project must achieve. Achievement of the Threshold KPPs will be a prerequisite for approval of CD-4, Project Completion. The KPPs were formally established as part of the Performance Baseline and approval of CD-2/3.

Performance Measure	Threshold	Objective
Provide the facility (infrastructure) to receive, unload, prepare, and package full-length aircraft carrier and submarine naval spent nuclear fuel.	An approximate 185,000 square foot facility, which includes an approximate 15,000 square foot water pool.	An approximate 245,000 square foot facility, which includes an approximate 20,000 square foot water pool.
Provide equipment to receive and unload naval spent nuclear fuel.	Receive and unload 7 M-290 shipping containers per year.	Receive and unload 9 M-290 and 12 M-140 shipping containers per year.

Performance Measure	Threshold	Objective
Provide equipment to initially inspect and prepare naval spent nuclear fuel for ultimate disposal.	Initially inspect and prepare 62 full-length NIMITZ Class aircraft carrier spent nuclear fuel modules per year.	Initially inspect and prepare 96 full-length aircraft carrier and 64 submarine spent nuclear fuel modules per year.
Provide equipment to package naval spent nuclear fuel into canisters for dry storage.	Package 6 naval spent fuel canisters per year.	Package 10 naval spent fuel canisters per year.
Provide equipment to temporarily store naval spent nuclear fuel in the water pool.	Storage for 126 full-length NIMITZ Class aircraft carrier spent nuclear fuel modules.	Storage for 408 aircraft carrier and submarine spent nuclear fuel modules.
Provide equipment to manage remote-handled low level waste generated from receiving, unloading, preparing, and packaging spent nuclear fuel.	Package and ship 9 remote-handled low level waste canisters per year.	Package and ship 20 remote-handled low level waste canisters per year.

3. Project Cost and Schedule

Financial Schedule

(Dollars in Thousands)

	Budget Authority (Appropriations)[a]	Obligations[b]	Costs[c]
Total Estimated Cost (TEC)			
Design			
FY 2015	N/A	N/A	19,542
FY 2016	N/A	N/A	56,846
FY 2017[c]	N/A	N/A	65,964
FY 2018	N/A	N/A	78,704
FY 2019[d]	N/A	N/A	48,393
FY 2020[b]	N/A	N/A	33,040
Total, Design	N/A	N/A	302,489
Construction			
FY 2017[e]	N/A	N/A	1,867
FY 2018	N/A	N/A	11,530
FY 2019	N/A	N/A	160,456
FY 2020	N/A	N/A	189,329
FY 2021	N/A	N/A	351,633
FY 2022	N/A	N/A	294,881
FY 2023	N/A	N/A	107,340
FY 2024	N/A	N/A	27,395
FY 2025	N/A	N/A	25,480
Total Construction	N/A	N/A	1,169,911
TEC			

[a] Due to the Consolidated and Further Continuing Appropriations Act, 2015, the TEC and OPC appropriations for FY 2015 and beyond are combined into the TPC appropriations.
[b] Due to the Consolidated and Further Continuing Appropriations Act, 2015, the TEC and OPC appropriations for FY 2015 and beyond are combined into the TPC obligations.
[c] FY 2017 and FY 2018 costs are updated to reflect actual costs and FY 2019-2026 costs are updated to reflect the current spending plan.
[d] Costs associated with the phased design have been included in the TEC-Design costs.
[e] Includes long lead material and site preparation.

	Budget Authority (Appropriations)[a]	Obligations[b]	Costs[c]
FY 2015	N/A	N/A	19,542
FY 2016	N/A	N/A	56,846
FY 2017	N/A	N/A	67,831
FY 2018	N/A	N/A	90,234
FY 2019	N/A	N/A	208,849
FY 2020	N/A	N/A	222,369
FY 2021	N/A	N/A	351,633
FY 2022	N/A	N/A	294,881
FY 2023	N/A	N/A	107,340
FY 2024	N/A	N/A	27,395
FY 2025	N/A	N/A	25,480
Total, TEC	N/A	N/A	1,472,400
Other Project Cost (OPC)			
FY 2010[a]	6,600	6,600	6,372
FY 2011[a]	36,100	36,100	31,168
FY 2012[a]	25,200	25,200	29,420
FY 2013[a]	29,000	29,000	27,172
FY 2014[a]	25,400	25,400	28,017
FY 2015	N/A	N/A	8,514
FY 2016	N/A	N/A	1,567
FY 2017	N/A	N/A	1,990
FY 2018	N/A	N/A	3,448
FY 2019	N/A	N/A	2,613
FY 2020	N/A	N/A	3,453
FY 2021	N/A	N/A	4,013
FY 2022	N/A	N/A	5,605
FY 2023	N/A	N/A	6,706
FY 2024	N/A	N/A	5,492
FY 2025	N/A	N/A	4,707
FY 2026	N/A	N/A	3,843
Total, OPC	N/A	N/A	174,100
Total Project Cost (TPC)			
FY 2010	6,600	6,600	6,372
FY 2011	36,100	36,100	31,168
FY 2012	25,200	25,200	29,420
FY 2013	29,000	29,000	27,172
FY 2014	25,400	25,400	28,017
FY 2015	70,000	70,000	28,056
FY 2016	86,000	86,000	58,413
FY 2017	100,000	100,000	69,821
FY 2018[a]	197,000	197,000	93,682
FY 2019	287,000	287,000	211,462
FY 2020[e]	238,000	238,000	225,822

[a] The FY 2020 CPDS reflects that the FY 2018 enacted Appropriation was $81 million greater than the request. To maintain the TPC, the appropriations request for FY 2020 has been reduced by $81 million.

	Budget Authority (Appropriations)[a]	Obligations[b]	Costs[c]
FY 2021	239,000	239,000	355,646
FY 2022	193,000	193,000	300,486
FY 2023	47,700	47,700	114,046
FY 2024	32,900	32,900	32,887
FY 2025	29,800	29,800	30,187
FY 2026	3,800	3,800	3,843
Grand Total	1,686,500[d]	1,686,500[d]	1,686,500[d]

Details of Project Cost Estimate

(Budget Authority in Thousands of Dollars)

	Current Total Estimate	Previous Total Estimate[a]	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	300,789	291,705	N/A
Contingency	1,700	15,277	N/A
Total, Design[b]	302,489	306,982	N/A
Construction			
Long Lead Material and Site Preparation	41,148	57,143	N/A
Spent Fuel Handling Equipment	215,454	248,577	N/A
Facility Construction	845,841	700,108	N/A
Contingency	107,467	159,590	N/A
Total, Construction[c]	1,209,911	1,165,418	N/A
Total Estimated Cost	1,512,400	1,472,400	N/A
Contingency, TEC	109,167	174,867	N/A
Other Project Cost (OPC)			
Conceptual Planning	37,540	42,697	N/A
Conceptual Design	99,427	88,453	N/A
Start-up	26,273	15,153	N/A
Other (e.g., EIS, Project Reviews)	7,301	4,913	N/A
Contingency	3,559	22,884	N/A
Total, OPC	174,100	174,100	N/A
Contingency, OPC	3,559	22,884	N/A
Total Project Cost	1,686,500[c]	1,646,500	N/A
Total, Contingency (TEC+OPC)	112,726[d]	197,751	N/A

Schedule of Appropriation Requests

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[a] Previous Total Estimate is from the FY 2019 CPDS.

[b] Divisions between cost categories were updated based on establishment of the Performance Baseline in September 2018.

[c] The entries in this column reflect the additional $40 million in construction contingency funding that was established with approval of the Project's Performance Baseline.

[e] Upon approval of the Project's Performance Baseline in September 2018, contingency funds were reduced from $197.8 million in the FY 2019 CPDS to $112.7 million in the FY 2020 CPDS to reflect current design maturity and better definition of cost uncertainties and project risks.

Request Year	Type	Prior Years	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY2024	Outyears	Total
FY 2014	TEC	904,300	134,900	132,300	64,300	50,700	0	0	0	1,286,500
	OPC	132,200	5,100	7,700	10,700	9,300	0	0	0	165,000
	TPC	1,036,500	140,000	140,000	75,000	60,000	0	0	0	1,451,500
FY 2015	TEC	904,300	134,900	132,300	64,300	50,700	0	0	0	1,286,500
	OPC	132,200	5,100	7,700	10,700	9,300	0	0	0	165,000
	TPC	1,036,500	140,000	140,000	75,000	60,000	0	0	0	1,451,500
FY 2015 Rev	TEC	531,100	293,500	265,600	197,900	66,900	33,200	19,700	0	1,407,900
	OPC	134,900	4,500	4,500	6,500	6,700	7,900	9,600	3,600	178,200
	TPC	666,000	298,000	270,100	204,400	73,600	41,100	29,300	3,600	1,586,100
FY 2016	TEC	334,500	283,300	313,700	234,300	186,100	54,800	24,500	19,700	1,450,900
	OPC	145,000	3,700	5,300	4,700	6,900	7,200	8,500	14,300	195,600
	TPC	479,500	287,000	319,000	239,000	193,000	62,000	33,000	34,000	1,646,500
FY 2017	TEC	341,400	284,100	315,300	234,700	186,700	57,300	29,300	23,600	1,472,400
	OPC	138,900	2,900	3,700	4,300	6,300	4,400	3,600	10,000	174,100
	TPC	480,300	287,000	319,000	239,000	193,000	61,700	32,900	33,600	1,646,500
FY 2018	TEC	355,400	284,100	315,300	234,700	186,700	43,300	29,300	23,600	1,472,400
	OPC	138,900	2,900	3,700	4,300	6,300	4,400	3,600	10,000	174,100
	TPC	494,300	287,000	319,000	239,000	193,000	47,700	32,900	33,600	1,646,500
FY 2019[a]	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1,472,400
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	174,100
	TPC	494,300	287,000	319,000	239,000	193,000	47,700	32,900	33,600	1,646,500
FY 2020[b]	TEC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1,472,000
	OPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	174,100
	TPC	575,300	287,000	238,000	239,000	193,000	47,700	32,900	33,600	1,686,500[c]

4. Related Operations and Maintenance Funding Requirements

Start of Operation of Beneficial Occupancy	4Q FY 2024
Expected Useful Life	40 years
Expected Future Start of D&D	4Q FY 2064

Related Funding Requirements
(Budget Authority in Thousands of Dollars)

	Annual Costs		Life Cycle Costs	
	Previous Total Estimate	Current Total Estimate	Previous Total Estimate	Current Total Estimate
Operations and Maintenance	166.4	166.4	6,655.7	6,655.7

5. D&D Information

[a] Per the Consolidated and Further Continuing Appropriations Act, 2015, the Spent Fuel Handling Recapitalization Project Major Construction Project funding includes both Total Estimated Cost and Other Project Cost. For clarity, the FY2019 CPDS was updated to reflect appropriations only at the Total Project Cost level.
[b] The FY 2020 CPDS reflects that the FY 2018 enacted Appropriation was $81 million greater than the request. To maintain TPC, the appropriations request for FY 2020 has been reduced by $81 million.
[c] The total amount of the entries is $1,646,500, but the total is stated as $1,686,500 to reflect the TPC that was established with the CD-2/3 Performance Baseline. The additional $40 million will first be reflected in the FY 2021 CPDS.

The new area being constructed in this project is replacing existing facilities; however, the costs of D&D of the facilities that are being replaced are not included in the costs of this construction project.

	Square Feet
New area being constructed by this Project at the Naval Reactors Facility	213,000[a]
Area of D&D in this Project at the Naval Reactors Facility	0
Area at the Naval Reactors Facility to be transferred, sold, and/or D&D outside the project including area previously "banked"	0
Area of D&D in this Project at other sites	0
Area at other sites to be transferred, sold, and/or D&D outside the Project including area previously "banked"	0
Total area eliminated	0

Spent fuel handling operations in the existing Expended Core Facility will overlap with operations in the Spent Fuel Handling Recapitalization Project facility for a period of 5 to 12 years and examination operations in the existing Expended Core Facility will continue for the foreseeable future; therefore, no D&D is planned at this time. Separate National Environmental Policy Act action will be taken to address these future actions, if necessary.

6. Acquisition Approach

The integrated Management & Operating (M&O) prime partners will plan and execute the Spent Fuel Handling Recapitalization Project in accordance with requirements. Naval spent nuclear fuel handling equipment will be procured through the procurement M&O partners. An Engineering, Procurement, and Construction Management (EPCM) firm was selected as the subcontracting strategy for design and construction management of the facility and facility systems. The EPCM contract is cost plus fixed fee. Long-lead materials were purchased and site preparation work was performed ahead of CD-2/3.

[a] The facility area has decreased from the conceptual design and is subject to change based on final design.

Department Of Energy

FY 2020 Congressional Budget

Funding by Appropriation by Site

($K)

Naval Reactors	FY 2018 Total Enacted	FY 2019 Enacted	FY 2020 Request
Bettis Atomic Power Laboratory			
Naval Reactors Program			
Naval Reactors Program	590,974	685,949	600,547
Total, Bettis Atomic Power Laboratory	**590,974**	**685,949**	**600,547**
Idaho National Laboratory			
Naval Reactors Program			
Naval Reactors Program	149,200	195,605	205,572
Total, Idaho National Laboratory	**149,200**	**195,605**	**205,572**
Knolls Atomic Power Laboratory			
Naval Reactors Program			
Naval Reactors Program	727,075	740,237	677,574
Total, Knolls Atomic Power Laboratory	**727,075**	**740,237**	**677,574**
Naval Research Laboratory			
Naval Reactors Program			
Naval Reactors Program	20,651	21,166	21,890
Total, Naval Research Laboratory	**20,651**	**21,166**	**21,890**
Washington Headquarters			
Naval Reactors Program			
Naval Reactors Program	132,100	145,661	142,813
Total, Washington Headquarters	**132,100**	**145,661**	**142,813**
Total, Naval Reactors	**1,620,000**	**1,788,618**	**1,648,396**

General Provisions—Department of Energy
(including transfer of funds)

SEC. 301. (a) No appropriation, funds, or authority made available by this title for the Department of Energy shall be used to initiate or resume any program, project, or activity or to prepare or initiate Requests For Proposals or similar arrangements (including Requests for Quotations, Requests for Information, and Funding Opportunity Announcements) for a program, project, or activity if the program, project, or activity has not been funded by Congress.

(b)(1) Unless the Secretary of Energy notifies the Committees on Appropriations of both Houses of Congress at least 3 full business days in advance, none of the funds made available in this title may be used to—

(A) make a grant allocation or discretionary grant award totaling $1,000,000 or more;

(B) make a discretionary contract award or Other Transaction Agreement totaling $1,000,000 or more, including a contract covered by the Federal Acquisition Regulation;

(C) issue a letter of intent to make an allocation, award, or Agreement in excess of the limits in subparagraph (A) or (B); or

(D) announce publicly the intention to make an allocation, award, or Agreement in excess of the limits in subparagraph (A) or (B).

(2) The Secretary of Energy shall submit to the Committees on Appropriations of both Houses of Congress within 15 days of the conclusion of each quarter a report detailing each grant allocation or discretionary grant award totaling less than $1,000,000 provided during the previous quarter.

(3) The notification required by paragraph (1) and the report required by paragraph (2) shall include the recipient of the award, the amount of the award, the fiscal year for which the funds for the award were appropriated, the account and program, project, or activity from which the funds are being drawn, the title of the award, and a brief description of the activity for which the award is made.

(c) The Department of Energy may not, with respect to any program, project, or activity that uses budget authority made available in this title under the heading "Department of Energy—Energy Programs", enter into a multiyear contract, award a multiyear grant, or enter into a multiyear cooperative agreement unless—

(1) the contract, grant, or cooperative agreement is funded for the full period of performance as anticipated at the time of award; or

(2) the contract, grant, or cooperative agreement includes a clause conditioning the Federal Government's obligation on the availability of future year budget authority and the Secretary notifies the Committees on Appropriations of both Houses of Congress at least 3 days in advance.

(d) Except as provided in subsections (e), (f), and (g), the amounts made available by this title shall be expended as authorized by law for the programs, projects, and activities specified in the "Conference" column in the "Department of Energy" table included under the heading "Title III—Department of Energy" in the joint explanatory statement accompanying this Act.

(e) The amounts made available by this title may be reprogrammed for any program, project, or activity, and the Department shall notify, and obtain the prior approval of, the Committees on Appropriations of both Houses of Congress at least 30 days prior to the use of any proposed reprogramming that would cause any program, project, or activity funding level to increase or decrease by more than $5,000,000 or 10 percent, whichever is less, during the time period covered by this Act.

(f) None of the funds provided in this title shall be available for obligation or expenditure through a reprogramming of funds that—

(1) creates, initiates, or eliminates a program, project, or activity;

(2) increases funds or personnel for any program, project, or activity for which funds are denied or restricted by this Act; or

(3) reduces funds that are directed to be used for a specific program, project, or activity by this Act.

(g)(1) The Secretary of Energy may waive any requirement or restriction in this section that applies to the use of funds made available for the Department of Energy if compliance with such requirement or restriction would pose a substantial risk to human health, the environment, welfare, or national security.

(2) The Secretary of Energy shall notify the Committees on Appropriations of both Houses of Congress of any waiver under paragraph (1) as soon as practicable, but not later than 3 days after the date of the activity to which a requirement or restriction would otherwise have applied. Such notice shall include an explanation of the substantial risk under paragraph (1) that permitted such waiver.
(h) The unexpended balances of prior appropriations provided for activities in this Act may be available to the same appropriation accounts for such activities established pursuant to this title. Available balances may be merged with funds in the applicable established accounts and thereafter may be accounted for as one fund for the same time period as originally enacted.

SEC. 302. Funds appropriated by this or any other Act, or made available by the transfer of funds in this Act, for intelligence activities are deemed to be specifically authorized by the Congress for purposes of section 504 of the National Security Act of 1947 (50 U.S.C. 3094) during fiscal year **[**2019**]***2020* until the enactment of the Intelligence Authorization Act for fiscal year **[**2019**]***2020*.

SEC. 303. None of the funds made available in this title shall be used for the construction of facilities classified as high-hazard nuclear facilities under 10 CFR Part 830 unless independent oversight is conducted by the Office of Enterprise Assessments to ensure the project is in compliance with nuclear safety requirements.

SEC. 304. None of the funds made available in this title may be used to approve critical decision–2 or critical decision–3 under Department of Energy Order 413.3B, or any successive departmental guidance, for construction projects where the total project cost exceeds $100,000,000, until a separate independent cost estimate has been developed for the project for that critical decision.

[SEC. 305. The Secretary of Energy may not transfer more than $274,833,000 from the amounts made available under this title to the working capital fund established under section 653 of the Department of Energy Organization Act (42 U.S.C. 7263): *Provided*, That the Secretary may transfer additional amounts to the working capital fund after the Secretary provides notification in advance of any such transfer to the Committees on Appropriations of both Houses of Congress: *Provided further*, That any such notification shall identify the sources of funds by program, project, or activity: *Provided further*, That the Secretary shall notify the Committees on Appropriations of both Houses of Congress before adding or removing any activities from the fund.**]**

SEC. **[**306**]***305*. (a) None of the funds made available in this or any prior Act under the heading "Defense Nuclear Nonproliferation" may be made available to enter into new contracts with, or new agreements for Federal assistance to, the Russian Federation. (b) The Secretary of Energy may waive the prohibition in subsection (a) if the Secretary determines that such activity is in the national security interests of the United States. This waiver authority may not be delegated. (c) A waiver under subsection (b) shall not be effective until 15 days after the date on which the Secretary submits to the Committees on Appropriations of both Houses of Congress, in classified form if necessary, a report on the justification for the waiver.

[SEC. 307. (a) NEW REGIONAL RESERVES.—The Secretary of Energy may not establish any new regional petroleum product reserve unless funding for the proposed regional petroleum product reserve is explicitly requested in advance in an annual budget submission and approved by the Congress in an appropriations Act.
(b) The budget request or notification shall include—
(1) the justification for the new reserve;
(2) a cost estimate for the establishment, operation, and maintenance of the reserve, including funding sources;
(3) a detailed plan for operation of the reserve, including the conditions upon which the products may be released;
(4) the location of the reserve; and
(5) the estimate of the total inventory of the reserve.**]**

SEC. **[**308**]***306*. Notwithstanding section 161 of the Energy Policy and Conservation Act (42 U.S.C. 6241), upon a determination by the President in this fiscal year that a regional supply shortage of refined petroleum product of significant scope and duration exists, that a severe increase in the price of refined petroleum product will likely result from such shortage, and that a draw down and sale of refined petroleum product would assist directly and significantly in reducing the adverse impact of such shortage, the Secretary of Energy may draw down and sell refined petroleum product from the Strategic Petroleum Reserve. Proceeds from a sale under this section shall be deposited into the SPR Petroleum Account established in section 167 of the Energy Policy and Conservation Act (42 U.S.C. 6247), and such amounts shall be available for obligation, without fiscal year limitation, consistent with that section.

SEC. 307. Section 310 of the Omnibus Appropriations Act, 2009 (Public Law 111–8; 50 U.S.C. 2743a note) and section 306 of the Consolidated Appropriations Act, 2012 (Public Law 112–74; 50 U.S.C. 2743a) are repealed.

SEC. 308. Not to exceed 5 percent of any appropriation made available for Department of Energy activities funded in this Act may be transferred between such appropriations, but no such appropriation, except as otherwise provided, shall be increased or decreased by more than 5 percent by any such transfers, and notification of any such transfers shall be submitted promptly to the Committees on Appropriations of the House of Representatives and the Senate.

SEC. 309. (a) Allowable Costs.— (1) Section 4801(b) of the Atomic Energy Defense Act (50 U.S.C. 2781(b)) is amended— (A) by striking "(1)" and all that follows through "the Secretary" and inserting "The Secretary"; and (B) by striking paragraph (2). (2) Section 305 of the Energy and Water Development Appropriation Act, 1988, as contained in section 101(d) of Public Law 100–202 (101 Stat. 1329–125), is repealed. (b) Regulations Revised.—The Secretary of Energy shall revise existing regulations consistent with the repeal of 50 U.S.C. 2781(b)(2) and section 305 of Public Law 100–202 and shall issue regulations to implement 50 U.S.C. 2781(b), as amended by subsection (a), no later than 150 days after the date of the enactment of this Act. Such regulations shall be consistent with the Federal Acquisition Regulation 48 C.F.R. 31.205–22.

SEC. 310. Notwithstanding provisions of title 5, United States Code, the Southeastern Power Administration shall pay power system dispatchers at basic pay and premium pay rates that are based on those prevailing for similar occupations in the electric power industry. Pay may not be paid, by reason of this section, at a rate in excess of the rate of basic pay for level V of the Executive Schedule.

SEC. 311. Section 3131 of the National Defense Authorization Act for Fiscal Year 2000 (Public Law 106–65; 10 U.S.C. 2701 note) is amended by striking "or the defense activities of the Department of Energy".

(Energy and Water Development and Related Agencies Appropriations Act, 2019.)

TITLE V – GENERAL PROVISIONS

SEC. 501. None of the funds appropriated by this Act may be used in any way, directly or indirectly, to influence congressional action on any legislation or appropriation matters pending before Congress, other than to communicate to Members of Congress as described in 18 U.S.C. 1913.

SEC. 502. (a) None of the funds made available in title III of this Act may be transferred to any department, agency, or instrumentality of the United States Government, except pursuant to a transfer made by or transfer authority provided in this Act or any other appropriations Act for any fiscal year, transfer authority referenced in the joint explanatory statement accompanying this Act, or any authority whereby a department, agency, or instrumentality of the United States Government may provide goods or services to another department, agency, or instrumentality. (b) None of the funds made available for any department, agency, or instrumentality of the United States Government may be transferred to accounts funded in title III of this Act, except pursuant to a transfer made by or transfer authority provided in this Act or any other appropriations Act for any fiscal year, transfer authority referenced in the joint explanatory statement accompanying this Act, or any authority whereby a department, agency, or instrumentality of the United States Government may provide goods or services to another department, agency, or instrumentality. (c) The head of any relevant department or agency funded in this Act utilizing any transfer authority shall submit to the Committees on Appropriations of both Houses of Congress a semiannual report detailing the transfer authorities, except for any authority whereby a department, agency, or instrumentality of the United States Government may provide goods or services to another department, agency, or instrumentality, used in the previous 6 months and in the year-to-date. This report shall include the amounts transferred and the purposes for which they were transferred, and shall not replace or modify existing notification requirements for each authority.

SEC. 503. None of the funds made available by this Act may be used in contravention of Executive Order No. 12898 of February 11, 1994 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations).

SEC. 504. (a) None of the funds made available in this Act may be used to maintain or establish a computer network unless such network blocks the viewing, downloading, and exchanging of pornography. (b) Nothing in subsection (a) shall limit the use of funds necessary for any Federal, State, tribal, or local law enforcement agency or any other entity carrying out criminal investigations, prosecution, or adjudication activities.

SEC. 505. Section 611 of the Energy and Water Development Appropriations Act, 2000 (P.L. 106–60; 10 U.S.C. 2701 note) is amended as follows: (*a*) *In subsection (a), by striking "the Army, acting through the Chief of Engineers" and inserting "Energy".* (*b*) *In subsection (a)(6), by striking "by the Secretary of the Army, acting through the Chief of Engineers" and striking ", which may be transferred upon completion of remediation to the administrative jurisdiction of the Secretary of Energy".* (*c*) *In subsection (a), by adding after paragraph (6) the following undesignated matter: "Upon completion of remediation of a site acquired by the Secretary of the Army prior to fiscal year 2020, the Secretary of the Army may transfer administrative jurisdiction of such site to the Secretary of Energy.".* (*d*) *In subsection (b), by striking "the Army, acting through the Chief of Engineers," and inserting "Energy".* (*e*) *In subsection (c), by striking "amounts made available to carry out that program and shall be available until expended for costs of response actions for any eligible site" and inserting "'Other Defense Activities' appropriation account or successor appropriation account and shall be available until expended for costs of response actions for any eligible Formerly Utilized Sites Remedial Action Program Site".* (*f*) *By redesignating subsection (f) as subsection (g).* (*g*) *By inserting after subsection (e) the following new subsection: "(f) The Secretary of Energy, in carrying out subsection (a), shall enter into an agreement with the Secretary of the Army to carry out the functions and activities described in subsections (a)(1) through (a)(6).".*

[SEC. 505. For an additional amount for "Department of the Interior—Bureau of Reclamation—Water and Related Resources", $21,400,000, to remain available until expended, for transfer to Reclamation's Upper Colorado River Basin Fund to carry out environmental stewardship and endangered species recovery efforts pursuant to the Grand

Canyon Protection Act of 1992 (Public Law 102–575), Public Law 106–392, the Colorado River Basin Project Act (43 U.S.C. 1551(b)), and the Act of April 11, 1956 (commonly known as the "Colorado River Storage Project Act") (43 U.S.C. 620n). This division may be cited as the "Energy and Water Development and Related Agencies Appropriations Act, 2019".**]**

(Energy and Water Development and Related Agencies Appropriations Act, 2019.)