# Fiscal Year 2018 Annual Performance Report
# Fiscal Year 2020 Annual Performance Plan

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## Introduction

The *Fiscal Year (FY) 2018 DOE Annual Performance Report / FY 2020 Annual Performance Plan* contains details of the Department of Energy's (DOE) program performance, showing the historical targets and results from FY 2014 through FY 2018 and performance targets for FYs 2019 and 2020 for the Department's annual performance goals. It fulfills the statutory requirements in the Government Performance and Results Act (GPRA) of 1993 and the GPRA Modernization Act of 2010 related to production of an annual report on past program performance and an annual performance plan. Performance targets for FY 2018 and FY 2019 reflect enacted appropriations. FY 2020 performance targets reflect the FY 2020 Budget Request level.

## Mission

The mission of the Department of Energy is to advance U.S. national security and economic growth through transformative science and technology innovation that promotes affordable and reliable energy through market solutions and meets our nuclear security and environmental cleanup challenges.

## Overview

The DOE enterprise is comprised of approximately 14,000 federal employees and over 95,000 management and operating contractor and other contractor employees at the Department's headquarters in Washington, D.C. and 83 field locations. DOE operates a nationwide system of 17 national laboratories that provides world-class scientific, technological, and engineering capabilities, including the operation of national scientific user facilities used by thousands of researchers from academia, government, and industry. The range, scale, and excellence of science and technology (S&T) at the DOE laboratories provide strategic assets to accomplish DOE missions, support government responses to unforeseen domestic and international emergencies, and provide technical capabilities to help shape the global S&T agenda.

DOE is responsible for advancing the energy, environmental, and nuclear security of the United States; promoting scientific and technological innovation in support of that mission; sponsoring basic research in the physical sciences; and ensuring the environmental cleanup of the nation's nuclear weapons complex.

## DOE Organization

In response to changing needs and an extended energy crisis, Congress passed the Department of Energy Organization Act in 1977, creating one of the most diverse agencies in the federal Government. The legislation brought together for the first time, not only most of the Government's energy programs, but also S&T programs and defense responsibilities that included the design, construction, and testing of nuclear weapons. The Department provided the framework for a comprehensive and balanced national energy plan by coordinating and administering the energy functions of the federal Government. The Department undertook responsibility for long-term, high-risk research and development (R&D) of energy technology, federal power marketing, some energy conservation activities, the nuclear weapons programs, some energy regulatory programs, and a central energy data collection and analysis program.

The Department's organizational chart is located at http://energy.gov/about-us/organization-chart.

## Strategic Framework

The FY 2018 Annual Performance Report is a retrospective description of activities in pursuit of strategic goals. The FY 2020 Annual Performance Plan is a projection of FY 2020 activities based on the FY 2020 Budget Request.

| Strategic Goal | Contributing Programs |
|---|---|
| **Goal 1: Promote American Energy Dominance**<br>DOE will pursue energy innovation to achieve American energy dominance through the production and use of affordable and reliable energy from a variety of resources, which will drive economic growth, job creation, and energy security; ensure responsible environmental stewardship; and improve Americans' quality of life. We will accelerate technology development by investing in one of America's greatest strengths: its unlimited capacity for innovation, enabling safe and prudent development of these domestic resources to make energy more affordable, while leveraging American competitive advantages to seize market opportunities for manufacturing. An energy-dominant America will export its energy and innovation to markets around the world and expand our technology advantage, increasing our global leadership and influence. | • Fossil Energy<br>• Energy Efficiency and Renewable Energy<br>• Electricity<br>• Nuclear Energy<br>• Cybersecurity, Energy Security, and Emergency Response<br>• Indian Energy<br>• Strategic Petroleum Reserve |
| **Goal 2: Advance Science Discovery and National Laboratory Innovation**<br>DOE will advance American pre-eminence in scientific discovery through cutting-edge research, primacy in high-performance computing, and operation of world-class scientific facilities. The Department will take steps to improve access to its national laboratory portfolio of innovation and enable greater opportunities for commercialization of Lab-developed intellectual property. | • Science<br>• Technology Transitions<br>• National Nuclear Security Administration (NNSA) |
| **Goal 3: Ensure America's Nuclear Security**<br>DOE will strengthen national security by maintaining and modernizing the nuclear stockpile and nuclear security infrastructure, reducing global nuclear threats, providing for naval nuclear propulsion, improving physical and cybersecurity, and strengthening key science, technology, and engineering capabilities. | • National Nuclear Security Administration (NNSA) |
| **Goal 4: Advance National Nuclear Waste Management** | • Nuclear Energy |

| | |
|---|---|
| DOE will make progress on fulfilling the Federal Government's obligations to address commercial spent nuclear fuel and the environmental legacy of the Manhattan Project and Cold War. | • Environmental Management<br>• Legacy Management |
| **Goal 5: Enhance Cybersecurity across U.S. Energy Sector and DOE Infrastructure**<br>DOE will leverage science and technology support from the national laboratories to enhance the cybersecurity and resilience of the Nation's energy infrastructure and DOE's enterprise infrastructure. | • Cybersecurity, Energy Security, and Emergency Response<br>• Chief Information Officer<br>• NNSA-Weapons Activities |

## FY 2018 – 2019 Agency Priority Goals

The GPRA Modernization Act of 2010 requires in part that agencies focus on a limited number of near-term agency priority goals. The table below summarizes the progress on DOE's FY 2018 - 2019 Agency Priority Goals as of September 30, 2018.

| Goal Statement | FY 2018 Status |
|---|---|
| The DOE will pursue a focused research program to reduce the supply chain risks posed by the limited availability of critical minerals and materials. This program will pursue 1) improvements in domestic production, 2) reuse and recycling, and 3) research into substitutes for critical minerals.<br>• By end of Q2 FY 2019, launch a Critical Materials Recycling Prize to spur innovative solutions to solve current challenges associated with collecting, storing, and transporting discarded lithium-ion batteries for eventual recycling.<br>• By the end of Q4 FY 2019, complete Phase I: Concept Incubation and select winners from Phase I who will compete in Phase 2: Prototyping and Partnering. | **On-Track** - DOE has:<br>• Selected the leadership team at the National Renewable Energy Lab (NREL) for administering the prize.<br>• Allocated funding to NREL through FY 2019 to administer the prize<br>• Established a draft plan for timing and award levels<br>• Requested Secretarial approval for the Recycling Prize and Delegation Authority to run the competition |
| Develop and deliver the next generation of integrated high performance computing (HPC) capability by engaging in mutually supportive research and development in hardware and software to create a capable exascale computing system that integrates hardware and software capability delivering approximately 100 times the performance of current 10 petaflop systems across a range of applications representing government needs.<br>• By September 30, 2018, complete design of the first of the two exascale machines.<br>• By September 30, 2019, complete design of the second of the two exascale machines. | **On-Track** – The final design of the first of two exascale machines has been completed. A procurement contract for the machine has been signed. |
| Stand up a new public-private partnership pilot program at DOE for national laboratory innovation. DOE will:<br>• By September 30, 2018, develop an inventory of the Department's existing commercialization programs and relevant statutory authorities, and document best | **On-Track** - DOE has:<br>• Completed an inventory of relevant statutes, resources, and best practices and annotated individual authorities.<br>• Launched the Lab Partnering Service |

| Goal Statement | FY 2018 Status |
|---|---|
| practices, common challenges and resource requirements.<br>• By September 30, 2019, design a pilot commercialization program template in conjunction with the National Laboratories. | |
| Maintain and modernize the U.S. nuclear weapons stockpile and dismantle excess nuclear weapons to meet the national security requirements, as assigned by the President, through the Nuclear Posture Review. DOE will:<br>• By September 30, 2018, complete at least 90% of W76-1 production unit builds and achieve B61-12 system final design review.<br>• By September 30, 2019, achieve 100% of W76-1 production unit builds, and update the plan for future LEPs in NNSA strategic planning documents as outlined in the NPR. | **On Track**<br>• As of December 31, 2018, NNSA completed the last production unit for the W76-1 LEP, and delivered more than 95 percent of the total warheads to the Navy.<br>• The B61-12 LEP, a nuclear gravity bomb for the Air Force, completed system final design review in September 2018. System qualification of the B61-12 continues on schedule with the completion of over 45 system tests since the start of the final development phase, including qualification flight tests using F-16, F-15, and B-2A aircraft at the Tonopah Test Range. |
| Complete the legacy clean-up, deactivation, and decommissioning (D&D) of key EM facilities and other high risk excess facilities for the Department. To meet this goal, DOE will:<br>• Complete D&D of Biology Complex ancillary facilities at the Oak Ridge Y-12 National Security Complex by the end of Q4 FY 2018.<br>• Complete D&D of Pool Type Reactor (Building 280) ancillary facilities at the Lawrence Livermore National Laboratory by the end of Q1 FY 2019.<br>• Complete D&D of the Separations Process Research Unit in New York by the end of Q2 FY 2019.<br>Continue D&D progress at the East Tennessee Technology Park in Oak Ridge by completing D&D of the Central Neutralization facilities, Poplar Creek facilities, Balance of Site facilities, Toxic Substances Control Act Incinerator facilities, and the K-1037 facilities by the end of Q4 FY 2019. | **On Track**<br>• At the Y-12 Biology Complex, demolition of the ancillary facilities was completed in Q3 (ahead of the Q4 milestone).<br>• At Lawrence Livermore National Laboratory (LLNL), ancillary facility T2808 was removed from the site in Q3. Preparation for removal of the additional 3 ancillary facilities occurred, supporting the Q1 milestone.<br>• At the Separations Process Research Unit (SPRU), demolition of the H2 Building was completed in Q3 (ahead of the Q4 milestone).<br>• At the East Tennessee Technology Park (ETTP), demolition of the Central Neutralization Facility (CNF) was completed 5 weeks earlier than planned and $6.5M under budget. |

| Goal Statement | FY 2018 Status |
|---|---|
| Strengthen energy sector cybersecurity capabilities.<br>• By September 30, 2019, DOE will complete the operational technology data analysis from at least three utilities and develop a recommendation for deployment of the operational technology cybersecurity tool to utility operators nationwide. | **On Track**<br>• The Cybersecurity for the Operational Technology Environment (CYOTE) pilot is in the initial stages of acquiring OT data from key network tap points in partner utility infrastructure. Analysis has begun on data from one utility.<br>• A draft report to capture the progress made, lessons learned, and the remaining effort was developed. |
| Strengthen DOE enterprise-wide cybersecurity to protect critical IT infrastructure and ensure continuity of enterprise mission essential functions. By September 30, 2019, DOE will:<br>• Expand Departmental enterprise cybersecurity visibility to 90% by deploying sensors and integrating network security data into the iJC3.<br>• Reach 100% participation from DOE sites in the scoping, deployment and implementation of enterprise CDM tools to provide scalable, risk-based, cost-effective cybersecurity solutions.<br>• Update DOE's Cybersecurity Risk Management Framework for use across Departmental elements and establish standardized enterprise IT cybersecurity requirements.<br>• Enhance enterprise-wide cybersecurity governance of project management and architecture to standardize approaches, align with mission essential functions, and reduce technical risks | **On Track**<br>• Big Data Platform development, staging and production environments were established and Authorization to Operate was received<br>• DOE Continuous Diagnostics and Mitigation (CDM) Phase 1 Gap Fill Request for Service (RFS) Submitted to Department of Homeland Security (DHS)<br>• DOE is on track to update DOE 205.1B – Department of Energy Cyber Security Program by the end of Q4 FY 2019<br>• DOE is on track to establish a phased Enterprise Architecture strategy and initial roadmap that facilitates development and rationalization of the DOE security architecture in support of the Integrated Joint Cybersecurity Coordination Center by the end of Q4 FY 2019 |

## Cross-Agency Priority Goals

Please refer to www.Performance.gov for the agency's contributions to and progress towards FY 2018-2019 CAP Goals.

## Cross-Agency Collaborations

The Department of Energy collaborates with state, local, and tribal governments and other federal agencies to effectively position the Department to achieve its goals and objectives. DOE also participates in numerous interagency working groups.

## Management Review

The GPRA Modernization Act sets out a series of requirements for collecting, reviewing, and acting on performance measures and results. The law requires the Deputy Secretary to chair these quarterly reviews. The Department meets the GPRA Modernization Act requirement for quarterly data driven executive review of Agency Priority Goals through a meeting known within the Department as the Quarterly Performance Review (QPR). The QPR is attended by DOE senior leadership and Goal Leaders; program-office management and subject matter experts attend as needed. Senior leadership is informed of the Department's progress over the past quarter and of any impending challenges that might disrupt program success. In addition, these meetings provide an opportunity for senior leadership to ask in-depth questions of program management and for programs to request assistance from the highest levels of the Department.

## Lower-Priority Program Activities

The President's Budget identifies the lower-priority program activities, where applicable, as required under the GPRA Modernization Act, 31 U.S.C. 1115(b)(10). The public can access the volume at: http://www.whitehouse.gov/omb/budget.

## Program Performance Goals and Targets

Detailed progress reports on DOE programs' annual performance goals are presented in the pages that follow. The tables are organized by program and sub-program and provide targets FY 2014 through FY 2020 and results through FY 2018.

Performance targets for FY 2018 and FY 2019 reflect enacted appropriations. FY 2020 performance targets reflect the FY 2020 Budget Request level.

# National Nuclear Security Administration
# Federal Salaries & Expenses

## NNSA Federal Salaries & Expenses

| Program | NNSA Federal Salaries & Expenses | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Federal Administrative Costs** - Maintain the NNSA Federal Salaries and Expenses federal administrative costs as a percentage of total Weapons Activities and Defense Nuclear Nonproliferation program costs at less than 6%. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | ≤ 5.9 % | ≤ 5.9 % | ≤ 5.9 % | ≤ 5.9 % | ≤ 5.9 % | ≤ 5.9 % | ≤ 5.9 % | ≤ 5.9 % | ≤ 5.9 % | ≤ 5.9 % | ≤ 5.9 % |
| **Result** | **Exceeded** - 4.1 | **Exceeded** - 3.9 | **Exceeded** - 3.7 | **Exceeded** - 3.8 | **Exceeded** - 3.6 | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | In keeping with OMB and DOE expectations that administrative costs be minimized, maintain the NNSA Federal Salaries and Expenses federal administrative costs as a percentage of total Weapons Activities and Defense Nuclear Nonproliferation program costs at less than 6%. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Achieved the annual target of the NNSA Federal administrative costs as a percentage of total Weapons Activities and Defense Nuclear Nonproliferation program costs at 5.9 percent or less. End of year results are 3.6 percent. This result is important because it demonstrates a prudent use of valuable resources. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | The source of the costing data is the DOE STARS/IDW system. The calculation is based on the Federal Salaries and Expenses costs as a percentage of the total Weapons Activities, excluding Secure Transportation Asset, and Defense Nuclear Non proliferation program costs. | | | | | | | | | | |

# Weapons Activities

## Directed Stockpile Work

| Program | Directed Stockpile Work | | | | | | | | | | |
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| **Performance Goal (Measure)** | **Annual Warheads Assessment** - Annual percentage of warheads in the stockpile that are assessed to determine whether they are safe, secure, reliable, and effective | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 100 % of stockpile certified | 100 % of stockpile certified | 100 % of stockpile certified | 100 % of stockpile certified | 100 % of stockpile certified | 100 % of stockpile certified | 100 % of stockpile certified | 100 % of stockpile certified | 100 % of stockpile certified | 100 % of stockpile certified | 100 % of stockpile certified |
| **Result** | **Met** - 100 | **Met** - 100 | **Met** - 100 | **Met** - 100 | **Met** - 100 | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | Annually, conduct 100% of the assessment activities to determine whether warheads in the stockpile are safe, secure, reliable, effective, and available to the President for deployment | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | This Performance Measure was met for FY 2018. The Annual Assessment process ensures the overall availability of the nuclear weapons stockpile for the nation's nuclear deterrent. It is also a requirement of 50 United States Code section 2525 as amended by Fiscal Year 2016 National Defense Authorization Act.<br><br>Annual accomplishments include: 1) Laboratories issued final Annual Assessment Reports for each weapon system; 2) Laboratory Director's issued Annual Assessment Letters to the Secretaries of Defense and Energy; 3) NNSA reviewed the Annual Assessment Reports and Laboratory Director Letters and briefed senior NNSA leadership; 4) The NNSA Administrator, the Laboratory Directors, and the U.S. Strategic Command Commander briefed the Secretary of Energy and senior DOD leadership on the Annual Assessment November 27, 2018. These activities ensure the overall availability and reliability of the Nation's nuclear defense. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | This measure of NNSA's annual assessment activities and results are documented in 1) Warhead specific Annual Assessment Reports and Weapon Reliability Reports; 2) Laboratory Director's and the U.S. STRATCOM Commander's Annual Assessment Letters: and 3) Annual Assessment Execution Plan. These certifications are based on science-based stockpile stewardship tools and assessments performed at the weapon laboratories. | | | | | | | | | | |

| Program | Directed Stockpile Work | | | | | | | | | | |
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| **Performance Goal (Measure)** | **Steady State W-76-1 LEP Production** - The percentage of planned builds equal to the percentage of allocated funding as represented in the annual Selected Acquisition Report (SAR). | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 100 % of scheduled unit builds | 100 % of scheduled unit builds | 100 % of scheduled unit builds | 100 % of scheduled unit builds | 100 % of scheduled unit builds | 100 % of scheduled unit builds | N/A | N/A | N/A | N/A | N/A |
| **Result** | **Met** - 100 | **Not Met** - 85 | **Met** - 100 | **Not Met** - 95 | **Exceeded** - 127 | TBD | N/A | N/A | N/A | N/A | N/A |
| **Endpoint Target** | Complete production of the NWC-approved W76-1 LEP production schedule by FY 2019. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | NNSA exceeded the annual target by producing 127% of allocated War Reserve (WR) unit builds of the Nuclear Weapons Council-approved W76-1 Life Extension Program as represented in the annual Selected Acquisition Report (SAR). As of the end of FY 2018, W76-1 warhead production executed the baseline schedule ahead of directive schedule production requirements. At the end FY 2018, Pantex completed 127% of the FY 2018 quantity production requirement, and 99% of the cumulative stockpile (FY08-19) quantity production requirement. At the end of the FY 2018, NNSA completed all scheduled deliveries of W76-1 warheads.<br><br>This result is important because extending the life of the W76-0, a weapon system for Navy submarines, is on a highly success-oriented refurbishment schedule to meet DoD requirements and national security needs. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | 1) W76-1 Selected Acquisition Report(s);<br>2) Planning and Production Directive (P&PD) (current FY revision);<br>3) W76-01 Program Control Document (PCD) 2017-A dated 12-22-16 and subsequent PCD amendments;<br>4) Requirements and Planning Directive (RPD) (current FY revision);<br>5) NNSA memorandum from J.M. Oder, Director, Office of Nuclear Weapon Stockpile, NA-122, to Distribution, "Update to W76-1 Production and Planning Directive 2011-1 (U)," dated March 12, 2013 – provides direction to NNSA M&O contractors to implement current W76-1 LEP program of record defined in FY 2013 RPD. | | | | | | | | | | |

| Program | Directed Stockpile Work | | | | | | | | | | |
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| **Performance Goal (Measure)** | **Retired Weapons Systems Dismantlement** - Complete the dismantlement of all weapon systems in excess to stockpile requirements per approved annual schedule published in the Production and Planning Directive (P&PD). | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 100 % of annual planned dismantle-ments | 100 % of annual planned dismantle-ments | 100 % of annual planned dismantle-ments | 100 % of annual planned dismantle-ments | 100 % of annual planned dismantle-ments | 100 % of annual planned dismantle-ments | 100 % of annual planned dismantle-ments | 100 % of annual planned dismantle-ments | 100 % of annual planned dismantle-ments | N/A | N/A |
| **Result** | **Met** - 100 | **Not Met** - 66 | **Exceeded** - 102 | **Met** - 100 | **Met** - 100 | TBD | TBD | TBD | TBD | N/A | N/A |
| **Endpoint Target** | FY2018 Endpoint Target: Complete between FY 2009 and FY 2022 the dismantlement of the quantity of weapons in retired status at the end of FY 2008.<br><br>End Point Target Change: The endpoint target was revised January 11, 2019 to read "Annually, conduct 100% of plann ed dismantlement activities." Justification: Consistency and demonstration of NNSA's commitment to the Presidents hedge strategy to manage potential risk as stated in the 2018 Nuclear Posture Review (NPR) change | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | As of FY 2018 year end, NNSA met 100% of the warhead dismantlement and 100% of CSA dismantlement schedule requirements, positioning the program well for FY 2019. As a result, NNSA remains on track to dismantle the quantity of weapons that were in retired status at the end of FY 2008 by the end of FY 2022.<br><br>These results are important because they demonstrate NNSA's commitment in the 2018 Nuclear Posture Review (NPR) to meeting our Non-Proliferation Treaty (NPT) Article VI obligation to make progress toward nuclear disarmament.<br><br>Results Change: Remove statement for FY2019 for consistency with the End Point Target Change above--"As a result, NNSA remains on track to dismantle the quantity of weapons that were in retired status at the end of FY 2008 by the end of FY 2022." | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Current DSW Planning and Production Directive (P&PD) (workload planning documentation);<br>Program Control Documents (for individual weapons);<br>Dismantlements are considered complete when the NNSA Federal staff confirms that 100% of the weapons in retired status are dismantled.<br>Documentation Change: Eliminating the reference to "in retired status as of FY 2008" to reflect consistency with end point target change. | | | | | | | | | | |

| Program | Directed Stockpile Work | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Tritium Production** - Cumulative number of Tritium-Producing Burnable Absorber Rods irradiated in Tennessee Valley Authority reactors to provide the capability of producing new tritium to support national security requirements. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 2,416 TPBARs | 3,120 TPBARs | 3,120 TPBARs | 3,824 TPBARs | 4,928 TPBARs | 4,928 TPBARs | 6,512 TPBARs | 8,016 TPBARs | 8,416 TPBARs | 10,720 TPBARs | 12,224 TPBARs |
| **Result** | **Met** - 2,416 | **Met** - 3,120 | **Met** - 3,120 | **Met** - 3,824 | **Met** - 4,928 | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | Optimize tritium production for high confidence of producing sufficient tritium in each reactor cycle to meet national security inventory needs.<br><br>The Endpoint Target for this performance goal has changed to reflect the continuing tritium production mission. The previous endpoint target completed in FY 2020. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | The Tritium Sustainment Program met the cumulative target of tritium producing burnable absorber rods (TPBARs) irradiated. The tritium sustainment program completed the irradiation of 1,104 TPBARs in September 2018. These 1,104 TPBARs were irradiated in the Tennessee Valley Authority (TVA) Watts Bar Nuclear Power Plant Unit 1 reactor (WBN1). These TPBARs were inserted in the reactor in March 2017. The metric represents the cumulative total of TPBARs that have been irradiated. Once TPBARs are removed from the reactor, they are shipped to the tritium extraction facility (TEF), and the tritium is recovered. | | | | | | | | | | |
| **Comment** | Note: The Tennessee Valley Authority (TVA) Watts Bar Nuclear Power Plant Unit 1 completes irradiation of TPBARs every 18 months in approximately September or March. For FY 2013, the irradiation cycle started in October of 2012. Thus, there was no increase to the number of TPBARs irradiated in FY 2013 and, for the same reason, no increase in FY 2016 or FY 2019. With two reactors irradiating TPBARs by FY 2021, the program will expect to have increased quantities each fiscal year.<br><br>FY 2020 Annual Target Change - In early FY 2014, the program estimated that by FY 2020, 6,768 TPBARs would be irradiated. In 2015, the program reassessed tritium requirements; in addition, Congress requested that the Nuclear Weapon Council (NWC) certify the requirements. The NWC certified new requirements in 2015 and the program established an irradiation schedule, to include optimizing tritium production, to meet those requirements. Since then, the program has had to re-baseline the program slightly downward to reflect actual operating conditions, with a revised FY 2020 target of 6,512 TPBARs. The 1,104 TPBARs that recently completed irradiation will be shipped from WBN1 to TEF over the course of FY 2019. The program followed the 1,104 TPBARs with the insertion of 1,584 TPBARs in October 2018. The 1,584 quantity exceeds original projections by 80 TPBARs, and is reflected in the FY 2020 target of 6,512 TPBARs. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Milestones supporting the performance measure are documented in the Tritium Sustainment program plans. Irradiation requirements were validated in a bottom's up review mandated by Congress in FY 2015. For the future, the program anticipates changes to demonstrate a high confidence of producing tritium and to provide sufficient capability margins to meet future needs, including results associated with the Nuclear Posture Review. Site acceptance reports or other appropriate documentation (if classified, cover pages submitted including applicable document record numbers and information on how to obtain a copy of the report) Weekly site status calls with the Federal Program Manager; End of cycle reports submitted by the Tennessee Valley Authority (TVA); Quarterly Project Reviews (attended by TVA); Milestone Reporting Tool (MRT) status reports are all used to verify and validate the program is taking action to meet requirements. | | | | | | | | | | |

## Science

| Program | Science | | | | | | | | | | |
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| **Performance Goal (Measure)** | **Science-Based Capabilities** - Provide the science-based capabilities necessary to support stockpile certification on an annual basis. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | N/A | N/A | N/A | 100 % of progress | 100 % of progress | 100 % of progress | 100 % of progress | 100 % of progress | 100 % of progress | 100 % of progress | 100 % of progress |
| **Result** | N/A | N/A | N/A | **Met** - 100 | **Met** - 100 | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | Each year provide the science-based capabilities (e.g., experimental infrastructure, assessment and certification methodologies, experiments, data, and analyses) required to enable the annual assessment and certification of the stockpile including certification of LEPs and weapon modifications. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | The Science Program has achieved its FY 2018 performance measure with examples as follows: Advanced Certification: Conducted experiments and analyses to inform use of additively manufactured materials. Progress was made on additively manufactured structured high explosives. A Pit Reuse design was completed. Primary Assessment: Studies of actinide material and aging effects was completed. Completed validation of cross sections for plutonium/uranium using the Time Projection Chamber. Subcritical Experiments Executed the Lyra Series. Released the Sierra Nevada vessel certification data package supporting the Sierra Nevada plutonium experimental series which advances stockpile safety and und erstanding. Advanced Radiography: Developed a multi-cavity Linear Transformer Driver (LTD) preliminary engineering assembly model. Secondary Assessment: Developed and implemented beamline facilities at Stanford Synchrotron Radiation Lightsource. Completed systematic study of L-shell opacity on Z pulse power facility at Sandia National Laboratories. Dynamic Materials: Completed a physics analysis of the dynamic evolution of high energy explosives. Documented the first planned experiments on Pu production science. Determined the equation of state of an insensitive high explosive. Executed Joint Actinide Shock Physics Experimental Research Facility sound speed and temperature experiments with plutonium. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Predictive Capability Framework, Milestone Reporting Tool, White Paper on Quantification of Margins and Uncertainty Performance Measure; Science Implementation Plan; and Science Program Plan. | | | | | | | | | | |

## Engineering

| Program | Engineering | | | | | | | | | | |
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| **Performance Goal (Measure)** | **Engineering and Surveillance Capabilities** - Percentage progress toward providing planned/scheduled capabilities for survivability and surveillance required for annual assessment of the stockpile, Life Extension Program decisions, and early identification of aging problems that could degrade stockpile performance. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | N/A | N/A | N/A | N/A | N/A | 100% completion of specified activities/ deliverables identified in the annual update of the Engineering Program implement-tation plan | 100% completion of specified activities/ deliverables identified in the annual update of the Engineering Program implement-tation plan | 100% completion of specified activities/ deliverables identified in the annual update of the Engineering Program implement-tation plan | 100% completion of specified activities/ deliverables identified in the annual update of the Engineering Program implement-tation plan | 100% completion of specified activities/ deliverables identified in the annual update of the Engineering Program implement-tation plan | 100% completion of specified activities/ deliverables identified in the annual update of the Engineering Program implement-tation plan |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | 100% completion of specified activities/deliverables identified in the annual update of the Engineering Program implementation plan (Annual) | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | | | | | |

| Program | Engineering | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Technology Maturation Capabilities** - The annual progress towards the maturation of technologies and stockpile assessment capabilities as measured by the number of deliverables in the implementation plans completed. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 20 deliverables | 22 deliverables | 17 deliverables | 13 deliverables | 14 deliverables | N/A | N/A | N/A | N/A | N/A | N/A |
| **Result** | **Met** - 20 | **Met** - 22 | **Met** - 17 | **Met** - 13 | **Met** - 14 | N/A | N/A | N/A | N/A | N/A | N/A |
| **Endpoint Target** | Until the last nuclear weapon system in the stockpile is dismantled, NNSA will continue to mature technologies and stockpile assessment capabilities to support Directed Stockpile Work on nuclear weapons refurbishment and assessment activities. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | NNSA completed this measure for FY 2018. NNSA completed all deliverables and milestones on schedule and within budget. Significant FY 2018 accomplishments include: advancing new manufacturing technologies and processes at the Kansas City National Security Campus (KCNSC). Using these technologies, KCNSC has already provided hardware to Joint Technology Demonstrator (JTD) Work Stream 2 for ground testing. Los Alamos National Laboratory (LANL) is working with Sandia National Laboratories (SNL) and the Air Force to refine concepts for Air Force venues and is working with Use Control Steering Group Working Group 4 to develop security options for the United Kingdom (UK). Lawrence Livermore National Laboratory (LLNL) has completed development of a Technology Readiness Level (TRL) 3 demonstrator showing compatibility with a LANL component. LANL has other components that are designed for JTD that are ready for integration. This joint milestone will include integration of LLNL and LANL technology within desired form factor. SNL is fabricating on full-scale components for the first time. This hardware development is in support of future test series for the next insertion opportunity. | | | | | | | | | | |
| **Comment** | This Performance Measure is being replaced with the new Engineering and Surveillance Capabilities Performance Measure. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Milestones and a table of deliverables supporting the performance measures are documented in the Program Implementation Plan (PIP). Weekly and monthly site status calls with the Federal Program Managers are documented. Milestone Reporting Tool (MRT) status reports also document progress performance on a quarterly basis. In addition, bi-annual and annual accomplishments are provided by the sites to Federal Program Manager in formal program reviews. Federal Program Manager and staff confirm capabilities completion during site field visits and Program Reviews. | | | | | | | | | | |

## Inertial Confinement Fusion Ignition and High Yield

| Program | Inertial Confinement Fusion Ignition and High Yield | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **High Energy Density Physics Research** - Complete high energy density physics research needed to support the nuclear weapons program as embodied in the Predictive Capability Framework (PCF). | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | N/A | 10 % of progress (cumulative) | 20 % of progress (cumulative) | 30 % of progress (cumulative) | 40 % of progress (cumulative) | 47 % of progress (cumulative) | 54 % of progress (cumulative) | 61 % of progress (cumulative) | 68 % of progress (cumulative) | 75 % of progress (cumulative) | 81 % of progress (cumulative) |
| **Result** | N/A | **Met** - 10 | **Met** - 20 | **Met** - 30 | **Met** - 40 | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | By FY 2024, complete the ICF Program activities needed to complete the PCF pegposts. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | The ICF Program has achieved its FY 2018 performance measure. Ignition: Completed Lawrence Livermore National Laboratory (LLNL) evaluation of models for laser plasma interaction and hot electrons. LLNL has developed new next generation hohlraum designs for the National Ignition Facility (NIF). Los Alamos Nation Laboratory (LANL) and LLNL improved understanding of the degradation caused by a fill tube. Naval Research Laboratory (NRL) advanced science and technology (S&T) of stimulated rotational Raman scattering. Facility Operations and Target Production: LLNL improved the operational efficiency of NIF and executed a 2.1 Megajoules (MJ) shot. LLNL qualified plutonium manufacturing. Laboratory for Laser Energetics (LLE) has improved the operational efficiency of the Omega Laser Facility. Sandia National Laboratories (SNL) improved operational efficiency of the Z pulse power facility. SNL continued plutonium Equations of State (EOS) experiments. Diagnostics, Cryogenics and Experimental Support: LLNL conducted Compton radiography with Advanced Radiograph Capability (ARC). SNL and LLNL commissioned and fielded the Z line VISAR (Velocity Interferometer System for Any Reflector) diagnostic. They improved nuclear measurements on NIF. Pulsed Power SNL developed a platform that delivers 18-20MA, 15-20T and 1-2 KJ laser energy base. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | 1. Program Implementation Plans for ICF Program and Research and Development Program document annually the program of work to be accomplished in support of the PCF, including Program Milestones. 2. Milestone Reporting Tool (MRT) reports: Progress toward and completion of annual milestones as documented and reported quarterly in the Milestone Reporting Tool (MRT) System. 3. Quarterly Reports by the HED Council and the ICF Council on the execution of the planned HED program of work on the major HED facilities. The planned program of work is derived from the PCF. The Councils establish their experimental campaign plans in support of the key performance indicators above and are further supported through the milestones documented in the ICF and Science Program Implementation Plans. | | | | | | | | | | |

## Advanced Simulation and Computing

| Program | Advanced Simulation and Computing | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Reduced Reliance on Calibration** - The cumulative percentage reduction in the use of calibration "knobs" to successfully simulate nuclear weapons performance. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 44% cumulative reduction in the use of calibration "knobs" | 46% cumulative reduction in the use of calibration "knobs" | 53% cumulative reduction in the use of calibration "knobs" | 60% cumulative reduction in the use of calibration "knobs" | 63% cumulative reduction in the use of calibration "knobs" | 71% cumulative reduction in the use of calibration "knobs" | 78% cumulative reduction in the use of calibration "knobs" | 81% cumulative reduction in the use of calibration "knobs" | 89% cumulative reduction in the use of calibration "knobs" | 92% cumulative reduction in the use of calibration "knobs" | 100% cumulative reduction in the use of calibration "knobs" |
| **Result** | **Met** - 44 | **Met** - 46 | **Met** - 53 | **Met** - 60 | **Met** - 63 | TBD | TBD | N/A | N/A | N/A | N/A |
| **Endpoint Target** | By the end of FY 2024, 100% of selected calibration knobs (non-science based models) affecting weapons performance simulation have been replaced by science-based, predictive phenomenological models. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | The program achieved the annual target of 63% cumulative reduction in the use of calibration "knobs" to successfully simulate nuclear weapons performance. FY 2018 accomplishments include: Level two milestones (sourced in the Advanced Simulation and Computing FY 2018 Implementation Plan, Version 1, pages 16-18) were used to evaluate and track progress, were completed by the end of FY 2018. This work included milestone activities supporting the FY 2018 Primary Performance (Baseline Nominal) pegpost, and outyear pegposts of the Predictive Capability Framework. This result is important because the continued reduction in the use of calibration "knobs" will improve our ability to continue to certify n uclear weapons performance without underground tests. Additional accomplishments that improved predictive capability and reduced reliance on calibration include:<br>• Thermal/Mechanical Modeling for Crash and Burn Use Cases<br>• Improved Replication of In-service Mechanical Environments<br>• Capability Assessment for Simulating Weapons Performance in Limited Hostile Environments<br>• HE Models for Non-Ambient Temperatures and Corner Turning<br>• Validation of the Models for Acoustic Vibrations During Reentry Using Data Provided by Sandia's Delivery Environments Program<br>• Modeling of X-ray Driven Ablative Response Experiments | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Laboratory reports to HQ Program Manager; Defense Programs Milestone Reporting Tool (MRT) status reports. The methodology used is described in the Laboratory reports and includes systematic validation and verification assessments to support the conclusions of the reports. | | | | | | | | | | |

## Advanced Manufacturing Development

| Program | Advanced Manufacturing Development | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Component Manufacturing Development** - Complete maturation of production technologies and manufacturing capabilities to support Directed Stockpile Work, nuclear weapons refurbishment, and assessment activities. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 5 deliverables | 6 deliverables | 5 deliverables | 6 deliverables | 5 deliverables | 5 deliverables | 5 deliverables | 5 deliverables | 5 deliverables | 5 deliverables | 5 deliverables |
| **Result** | **Met** - 5 | **Met** - 6 | **Met** - 5 | **Met** - 6 | **Met** - 5 | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | Annually complete deliverables required to mature production technologies and manufacturing capabilities until last nuclear weapon system in the stockpile is dismantled. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | NNSA completed this measure for FY2018. NNSA completed all deliverables and milestones on schedule and within budget. Significant FY 2018 accomplishments include: helped to establish a Technology Realization Team on Direct Cast technology, consisting of members from Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), and Y-12 National Security Complex. This will ensure the capability is ready at Y-12 by the time the next life extension program comes online, reducing Defense Program's dependence on costly and obsolescent manufacturing processes. The Technology Realization concept came from a list of ideas generated at the 21st Century Production workshop held in August of 2017. Sandia National Laboratories (SNL) submitted a report to document operational requirements to produce optimal Magnesium Oxide (MgO) material. Kansas City National Security Campus (KCNSC) implemented Advanced Manufacturing fabrication techniques, which directly supports current and future cushion and pad production for major modernization programs. Savannah River National Laboratory (SRNL) operated their new ARCAM 3D printer and started optimizing their printing capabilities. Specifically, SRNL began making improvements on their first 3D printed tool, including improving existing designs of the conventional component. SRNL is ahead of schedule in training personnel for advanced use of the new printer. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Milestones and a table of deliverables supporting the performance measures are documented in the Program Implementation Plan (PIP). Weekly and monthly site status calls with the Federal Program Managers are documented. Milestone Reporting Tool (MRT) status reports also document progress performance on a quarterly basis. In addition, bi-annual and annual accomplishments are provided by the sites to Federal Program Manager in formal program reviews. Federal Program Manager and staff confirm capabilities completion during site field visits and Program Reviews. | | | | | | | | | | |

## Infrastructure and Operations

| Program | Infrastructure and Operations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Maintenance** - Percentage of preventive maintenance (PM) spending vs total maintenance (TM) | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | N/A | N/A | 40 % PM conducted | 35 % PM conducted | 36 % PM conducted | 36.5 % PM conducted | 37 % PM conducted | 37.5 % PM conducted | 38 % PM conducted | 38.5 % PM conducted | 39 % PM conducted |
| **Result** | N/A | N/A | **Not Met** - 34 | **Met** - 35 | **Not Met** - 27.4 | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | PM to TM target is 50% | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Did not achieve the annual target of a 36% annual ratio between preventive maintenance (PM) vs. total maintenance (TM). The cumulative ratio of PM to TM through the end of FY 2018 was 27.4%. Demand for Corrective Maintenance (CM) work was still high through the fourth quarter. The frequency of age and condition-related infrastructure failures continues to drive the need for greater spending on CM, which subsequently leads to fewer resources available to perform PM. CM to address these infrastructure failures increases the workload for craft personnel, and is also more expensive than performing PM. This is an important measure of the trend of PM; spending more on Preventive Maintenance is critical to keeping the facilities in working order.<br>**Action Plan:** The Program has received additional funding and will be communicating with the sites to focus on performing increased PMs in FY 2019. The Program will also be reviewing maintenance schedules to see where improvements can be made. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Monthly costs reported in G2 program management information system. | | | | | | | | | | |

| Program | Infrastructure and Operations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Environmental Monitoring and Remediation** - Annual percentage of environmental monitoring and remediation deliverables that are required by regulatory agreements to be conducted at NNSA sites under Long Term Stewardship (LTS) that are executed on schedule and in compliance with all acceptance criteria. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 95% of deliverables | 95% of deliverables | 95% of deliverables | 95% of deliverables | 95% of deliverables | 95% of deliverables | 95% of deliverables | 95% of deliverables | 95% of deliverables | 95% of deliverables | 95% of deliverables |
| **Result** | **Exceeded** - 100 | **Exceeded** - 100 | **Exceeded** - 100 | **Exceeded** - 100 | **Exceeded** - 100 | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | Annually, submit on schedule and receive regulatory approval of at least 95% of all environmental monitoring and remediation deliverables that are required at NNSA sites under LTS by regulatory agreements. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Exceeded the annual target of 95% required environmental monitoring and remediation deliverables. At the end of FY 2018, realized 100% of required environmental monitoring and remediation deliverables on schedule and acceptable by regulatory agreements with one milestone being moved from 3rd quarter to 4th quarter due to lack of regulatory review resources. The milestone date was renegotiated with the Environmental Protection Agency (EPA), and the program deliverable was completed and submitted prior to the renegotiated milestone date. Meeting these regulatory deliverables is important as it prevents the issuance of notices of violations (NOVs), fines, and penalties by the regulators due to deliverables being late or insufficient. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | RCRA Permits; monthly and annual reports to regulatory agencies; Compliance Monitoring Plans; Field Logs; Sampling Paperwork; LTS program plan status reports to the site offices. | | | | | | | | | | |

| Program | Infrastructure and Operations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Operations of Facilities** - Enable NNSA missions by providing operational facilities to support nuclear weapon dismantlement, life extension, surveillance, and research and development activities, as measured by percent of scheduled versus planned days mission-critical and mission-dependent facilities are available without missing key deliverables. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 95% availability | 85% availability | 85% of availability | 85% of availability | 85% of availability | 85% of availability | 85% of availability | 85% of availability | 85% of availability | 85% of availability | 85% of availability |
| **Result** | **Exceeded** - 98 | **Exceeded** - 98.6 | **Exceeded** - 98 | **Exceeded** - 97.6 | **Exceeded** - 98.3 | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | Mission critical and mission dependent facilities are available at least 85% of scheduled days annually. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Exceeded the annual target of 85% of facilities available for operations in FY 2018. Mission critical and mission dependent facilities were available 98.3% of the scheduled days through the end of FY 2018. This result is important because it demonstrates operational effectiveness and efficiency of mission critical and mission dependent facilities. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Quarterly Facility Availability Reported, by site | | | | | | | | | | |

| Program | Infrastructure and Operations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Recapitalization** - Percentage of NNSA assets rated as adequate (by Replacement Plant Value) | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | N/A | N/A | 39% of assets | 37% of assets | 35.5% of assets | 36% of assets | 36.5% of assets | 37% of assets | 37.5% of assets | 38% of assets | 38.5% of assets |
| **Result** | N/A | N/A | **Not Met** - 37 | **Not Met** - 35 | **Exceeded** - 37.9 | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | 44% of NNSA assets rated as adequate | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Exceeded the annual target of 35.5% NNSA assets rated adequate. NNSA assets rated adequate were 37.9% though the end of FY 2018. The Recapitalization measure is important for conveying the condition of facilities and the impact of focused recapitalization investments. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Facilities Information Management System query | | | | | | | | | | |

| Program | Infrastructure and Operations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Major System Construction Projects** - Execute Major System Projects within approved costs and schedules, as measured by the total percentage of sub-projects that are part of projects with a total project cost (TPC) greater than $750 million with a cost performance index (r atio of budgeted cost of work performed to actual cost of work performed) between 0.9 and 1.15. Cost performance is measured against the original approved performance baseline (approved at Critical Decision 2). | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | N/A | N/A | N/A | N/A | N/A | 90% of projects | 90% of projects | 90% of projects | 90% of projects | 90% of projects | 90% of projects |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | Annually achieve 90% of baselined construction projects with TPC greater than $750M with actual CPI of 0.9-1.15 as measured against approved baseline definitions. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | | | | | |

| Program | Infrastructure and Operations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Construction Projects (formerly Major Construction Projects)** - Execute construction projects within approved costs and schedules, as measured by the total percentage of projects with total estimated cost (TEC) greater than $20 million with a schedule performance index (ratio of budgeted cost of work performed to budgeted cost of work scheduled) and a cost performance index (ratio of budgeted cost of work performed to actual cost of work performed) between 0.9-1.15. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 90% of projects | 90% of projects | 90% of projects | 90% of projects | 90% of projects | N/A | N/A | N/A | N/A | N/A | N/A |
| **Result** | **Met** - 90 | **Met** - 90 | **Not Met** - 60 | **Not Met** - 89 | **Not Met** - 83 | N/A | N/A | N/A | N/A | N/A | N/A |
| **Endpoint Target** | Annually achieve 90% of baselined construction projects with TEC greater than $20M with actual SPI and CPI of 0.9-1.15 as measured against approved baseline definitions. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Ten of the twelve projects reported in Weapons Activities Infrastructure and Operations are within both the Cost & Schedule Performance (CPI/SPI) measured against the Total Project Cost (TPC) and Critical Decision 4 (CD-4) dates in their approved Performance Baselines (PB). All twelve projects are within the CPI range of their approved PB TPCs: (1) CMRR RLUOB Equipment Installation, Phase II, (2) CMRR PF-4 Equipment Installation, Phase I, (3) Substation Replacement at TA-3, (4) UPF Mechanical Electrical Building Subproject, (5) UPF Substation Subproject, (6) UPF Main Process Building, (7) UPF Process Support Facilities, (8) UPF Salvage and Accountability Building, (9) Exascale Class Computer Cooling Equipment project, (10) NNSA Albuquerque Complex project, (11) the Expand Electrical Distribution System project at Lawrence Livermore National Laboratory, and the (12) Radioactive Liquid Waste Treatment Facility Upgrade Project Low Level Waste (LLW) project, which was baselined at $82.7M and was operating against an approved Over-Target Baseline (OTB) of $89.8M. Two projects are outside of the SPI range: the LLW project and the TA-3 Substation. The issues with the LLW project were primarily technical, associated with startup testing before turnover to operations. The TA-3 Substation Replacement did not achieve its PB CD-4 date of September 2018 due to schedule delays associated with extensive requirements changes and the resultant design and performance of the subcontractors that are under contract with the U.S. Army Corps of Engineers (USACE). NNSA is currently developing estimates to ensure the $28M Performance Baseline will be met.<br>**Action Plan:** The LLW project achieved CD-4 in November FY 2019. The project was completed at $87.9 million, $1.9 million below the OTB in November 2018 in accordance with the OTB schedule. Regarding the TA-3 Substation, NNSA is reviewing options for completing the project and currently projects completion by December 2019. | | | | | | | | | | |
| **Comment** | This Performance Measure is being replaced with the new Major Systems Construction Projects Performance Measure. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Baselined schedules and major decision points for projects are in individual project plans; Monthly project progress reports include Earned Value Management (EVM) data and DOE Project Assessment and Reporting System (PARS) reports | | | | | | | | | | |

## Secure Transportation Asset

| Program | Secure Transportation Asset | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Safe and Secure Shipments** - Annual percentage of shipments completed safely and securely without compromise/loss of nuclear weapons/components or a release of radioactive material. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 100% of shipments | 100% of shipments | 100% of shipments | 100% of shipments | 100% of shipments | 100% of shipments | 100% of shipments | 100% of shipments | 100% of shipments | 100% of shipments | 100% of shipments |
| **Result** | **Met** - 100 | **Met** - 100 | **Met** - 100 | **Met** - 100 | **Met** - 100 | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | Annually, ensure that 100% of shipments are completed safely and securely without compromise/loss of nuclear weapons/components or a release of radioactive material. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | NNSA met the Annual Target of 100% Safe and Secure Shipments. All shipments were completed safely and securely without compromise/loss of nuclear weapons/components or a release of radioactive material. Accomplishments includes: an on-time annual delivery rate of 100%. This result is important because it indicates mission accomplishment, especially in light of the increased risks and threats to the Nuclear Security Enterprise. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Certification from the senior Program Manager for Mission Operations that there are no known internal or external reports of any compromise or loss; absence of any Department of Energy Occurrence Reporting and Processing System reports related to shipments; and documentation maintained by the program for the supporting milestones for the performance measure. Official justifications are contained internally within program secondary documents to include: Office of Mission Operations Manager Certification Memorandum, On-Time Delivery Quarterly Report, On-Board Agent Availability Report, and an Office of Secure Transportation Strategic Implementation Plan Milestone Status Report. | | | | | | | | | | |

## Defense Nuclear Security

| Program | Defense Nuclear Security | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Enterprise Risk Management (ERM)** - Implement and sustain a repeatable process for conducting site vulnerability and risk assessments and a set of consistent deliverables to help Federal oversight ensure the security program is integrated, robust, and efficient. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 90% index | 90% index | 90% index | 90% index | 95% index | N/A | N/A | N/A | N/A | N/A | N/A |
| **Result** | **Met** - 90 | **Met** - 90 | **Met** - 90 | **Met** - 90 | **Met** - 95 | N/A | N/A | N/A | N/A | N/A | N/A |
| **Endpoint Target** | By 2017, achieve an improved corporate understanding of site operations, protection strategies, and risk acceptance that enables decision-makers to make true cost/benefit and risk acceptance decisions for physical security, better risk-informed resource allocation decisions, and more balance across NNSA sites, maintaining a 95% index thereafter. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Fully achieved the annual target of 95% implementing and sustaining a repeatable process for conducting site vulnerability and security risk assessments and a set of consistent deliverables to help Federal oversight ensure the security program is integrated, robust, and efficient. The Enterprise Safeguards and Security Planning and Analysis Program (E-SSPAP), formerly Enterprise Security Risk Management Project Plan, was updated to reflect recent changes to the DOE Threat Policy and to better align with vulnerability assessments and security risk assessments. A program plan for this process has been prepared, resources have been identified, and initial assessments and program reviews have been completed at all NNSA sites. The NNSA E-SSPAP Supplemental Directive (SD) and implementation instructions were developed by DNS and subsequently approved by the Administrator on June 23, 2018. The remaining 5% will be accomplished when the E-SSPAP Supplemental Directive is placed on the contracts for all NNSA sites. | | | | | | | | | | |
| **Comment** | This Performance Measure is being replaced with the new Enterprise Safeguards and Security Planning and Analysis Program (E-SSPAP) Performance Measure. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Enterprise Safeguards and Security Planning and Analysis Program | | | | | | | | | | |

| Program | Defense Nuclear Security | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Enterprise Safeguards & Security Planning & Analysis Pgm** - Implement, mature, and expand the E-SSPAP in order to drive a standardized effective, efficient, and sustainable field nuclear security program. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | N/A | N/A | N/A | N/A | N/A | 90% index | 90% index | 95% index | 95% index | 95% index | 95% index |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | By 2021, achieve an improved corporate understanding of site operations, protection strategies, and risk acceptance that enables decision-makers to make true cost/benefit and risk acceptance decisions for physical security, better risk-informed resource allocation decisions, and more balance across NNSA sites, maintaining a 95% index thereafter. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | | | | | |

| Program | Defense Nuclear Security | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Physical Security Infrastructure Recapitalization (PSIR)** - Implement and maintain a physical security life cycle management process, including on-time and to-standard supplemental deliverables after implementation. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 85% index | 85% index | 90% index | 90% index | 95% index | N/A | N/A | N/A | N/A | N/A | N/A |
| **Result** | **Exceeded** - 100 | **Met** - 85 | **Met** - 90 | **Met** - 90 | **Met** - 95 | N/A | N/A | N/A | N/A | N/A | N/A |
| **Endpoint Target** | By 2017, achieve defensible prioritization of systems investments based on risk, more efficient bulk procurements, more common systems configurations/designs, timely redistribution of inventories based on site needs, and more accurate reporting to external stakeholders on condition of NNSA security systems, maintaining a 95% index thereafter. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | The supplemental field manuals have been field reviewed and comments are being incorporated. Initial prioritization list approved by leadership. A program plan for this process has been prepared, resources have been identified, and initial assessments and program reviews have been completed at all NNSA sites. Effort to standardize design/system configuration is in progress for the initial sites with an estimated completion date April 2019. | | | | | | | | | | |
| **Comment** | This Performance Measure is being replaced with the new Security Infrastructure Revitalization Program (SIRP) Performance Measure. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Physical Security Supplemental Project Plan, Site Visit Reports, Physical Security Supplemental quarterly and annual reports, Physical Security Technical Standards | | | | | | | | | | |

| Program | Defense Nuclear Security | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Protective Force Law Enforcement First Responder** - Tactical Casualty Care (LEFR-TCC) Program Implementation - Implement and sustain a LEFR-TCC program for protective forces at all eight NNSA sites. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | N/A | N/A | N/A | N/A | N/A | 90% index | 90% index | 95% index | 95% index | 95% index | 95% index |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | By FY 2021, implement a standardized LEFR-TCC program in which 95% of uniformed protective force personnel and instructors are trained at the user level, maintaining 95% thereafter. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | | | | | |

| Program | Defense Nuclear Security | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Protective Force Training Reform** - Implement and sustain an Enterprise Mission Essential Task List (EMETL)-based training program for protective forces at all eight NNSA sites. | | | | | | | | | | |
| Fiscal Year | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
| Target | 90% index | 90% index | 90% index | 90% index | 95% index | N/A | N/A | N/A | N/A | N/A | N/A |
| Result | **Exceeded** - 100 | **Met** - 90 | **Met** - 90 | **Met** - 90 | **Exceeded** - 100 | N/A | N/A | N/A | N/A | N/A | N/A |
| Endpoint Target | By FY 2017, produce protective forces that are high performing in mission accomplishment with a necessary/appropriate training program that minimizes unproductive training time, maintaining a 95% index thereafter. | | | | | | | | | | |
| Commentary on 2018 Results (Action Plan if Not Met) | The annual target was exceeded by achieving 100% implementation of the Enterprise Mission Essential Task List (EMETL)-based training program for protective forces at all eight NNSA sites. All sites have implemented the EMETL-based training program and have developed procedures for sustaining the program. Defense Nuclear Security released version 7.0 of the EMETL Field Manual (FM) on 9 August 2018. Quarterly performance assessment reports are submitted by each site and continue to be analyzed by the Program Office to identify enterprise-wide needs and to provide NNSA senior leadership with a current and comprehensive snapshot of protective force capabilities in all mission-essential task areas. These ongoing activities provide assurance that the implemented program is being sustained in an effective manner. | | | | | | | | | | |
| Comment | This Performance Measure is being replaced with the new Protective Force Law Enforcement First Responder – Tactical Casualty Care (LEFR-TCC) Program Implementation Performance Measure. | | | | | | | | | | |
| Documentation, Limitations, Methodology, Validation, and Verification | EMETL Project Plan, Site Assistant Visit Reports, EMETL Implementation quarterly and annual reports, Site EMETL Quarterly Assessments | | | | | | | | | | |

| Program | Defense Nuclear Security | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Security Infrastructure Revitalization Program (SIRP)** - Implement, mature, and standardized systems in order to drive an effective, efficient, and sustainable NNSA nuclear security program. This will ensure repeatable and defensible approaches to nuclear security across the broader NNSA nuclear security enterprise process for conducting site vulnerability and risk assessments and provide a set of consistent deliverables to help Federal oversight ensure the security program is integrated, robust, and efficient. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | N/A | N/A | N/A | N/A | N/A | 80% index | 83% index | 86% index | 89% index | 89% index | 89% index |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | By 2023, achieve defensible prioritization of systems investments based on risk, more common systems configurations/designs, timely redistribution of inventories based on site needs, and more accurate reporting to external stakeholders on condition of NNSA security systems, maintaining a 95% index thereafter. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | | | | | |

## NNSA IT and Cybersecurity

| Program | NNSA IT and Cybersecurity | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Cybersecurity Program Execution Guidance (PEG)** - Annual percentage of performance evaluations of NNSA sites measured against the Objectives and Key Outcomes set forth in FY PEG resulting in the rating of "satisfactory or better" as defined by FAR 16.401 c(3). | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | N/A | N/A | N/A | N/A | N/A | 100% of performance evaluations of NNSA sites resulting in at least a "Satisfactory" rating or better per FAR 16.401 c(3) | 100% of performance evaluations of NNSA sites resulting in at least a "Satisfactory" rating or better per FAR 16.401 c(3) | 100% of performance evaluations of NNSA sites resulting in at least a "Satisfactory" rating or better per FAR 16.401 c(3) | 100% of performance evaluations of NNSA sites resulting in at least a "Satisfactory" rating or better per FAR 16.401 c(3) | 100% of performance evaluations of NNSA sites resulting in at least a "Satisfactory" rating or better per FAR 16.401 c(3) | 100% of performance evaluations of NNSA sites resulting in at least a "Satisfactory" rating or better per FAR 16.401 c(3) |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | Annually, achieve at least a satisfactory rating of 100% of site performance evaluations of FY PEG implementation. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | | | | | |

| Program | NNSA IT and Cybersecurity | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Cybersecurity Assessment Reviews** - Annual Percentage of cybersecurity Site Assessment Reviews conducted by the Office of Enterprise Assessments or the NA-IM Assessment Team that resulted in an NNSA rating of "effective." | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 100 % of reviews resulting in "effective" rating | 100 % of reviews resulting in "effective" rating | 100 % of reviews resulting in "effective" rating | 100 % of reviews resulting in "effective" rating | 100 % of reviews resulting in "effective" rating | N/A | N/A | N/A | N/A | N/A | N/A |
| **Result** | **Met** - 100 | **Met** - 100 | **Not Met** - 50 | **Met** - 100 | **Met** - 100 | N/A | N/A | N/A | N/A | N/A | N/A |
| **Endpoint Target** | Annually, achieve at least an "effective" rating of 100% of NNSA OCIO Site Assistance Visit (SAV) Cybersecurity reviews. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Achieved the annual target of 100% effective ratings of Cybersecurity Site Assessment Reviews conducted by the Office of Enterprise Assessments (EA). The EA issued its official assessment report of the one NNSA Cybersecurity Site Assessment Review (Los Alamos National Laboratory) completed this FY. The EA assessment focused on identifying any gaps that could help the site with its efforts of maintaining cybersecurity effectiveness. The assessment noted many strengths about LANL's program. The assessment did not identify any findings. However, the EA assessment did note programmatic and technical deficiencies. Results of the assessment were officially issued to the Management & Operating contractor September 28, 2018, to develop and implement corrective actions plans.<br><br>This result is important because these reviews provide the NNSA Office of the Associate Administrator for Information Management and Chief Information Officer (OCIO) with evidence of the health and status of Cyber Security Programs at NNSA sites, identify issues that may require corporate actions, and aid the NNSA OCIO with identifying focus areas to improve Cybersecurity across the Nuclear Security Enterprise (NSE). | | | | | | | | | | |
| **Comment** | This Performance Measure is being replaced with the new Cybersecurity PEG Performance Measure. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Los Alamos Cybersecurity Assessment Final Report and Memo August 2018 | | | | | | | | | | |

# Defense Nuclear Nonproliferation

## Material Management and Minimization (M3)

| Program | Material Management and Minimization (M3) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **U.S. Surplus Plutonium Disposition** - Cumulative kilograms (kg) of surplus plutonium converted to oxide in preparation for final disposition. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | N/A | N/A | N/A | 767 kg | 867 kg | 967 kg | 1,067 kg | 1,167 kg | 1,267 kg | 1,367 kg | 1,467 kg |
| **Result** | N/A | N/A | N/A | **Not Met** - 688.6 | **Exceeded** - 900.9 | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | By FY 2028, convert 2 MT (2000 kg) of surplus plutonium to oxide. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Exceeded the annual target by converting 900.9 kg of plutonium metal to oxide. M3 converted over 100 kg of plutonium metal to oxide during FY 2018 and certified the 100 kg of FY 2017 produced oxide. This result is important because it demonstrates progress towards the Dep artment's goal of disposing of at least 34 metric tons of surplus U.S. weapon-grade plutonium. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Documentation and correspondence from MOX Services accepting the Certificate of Acceptance and Certificate of Conformance fro m the approved supplier (LANL) for the produced certified plutonium oxide. | | | | | | | | | | |

| Program | Material Management and Minimization (M3) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Highly Enriched Uranium (HEU) Reactors Converted or Shutdown** - Cumulative number of HEU reactors and isotope production facilities converted or verified as shutdown prior to conversion. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 92 facilities | 94 facilities | 98 facilities | 101 facilities | 103 facilities | 106 facilities | 106 facilities | 108 facilities | 109 facilities | 110 facilities | 111 facilities |
| **Result** | **Met** - 92 | **Met** - 94 | **Not Met** - 97 | **Not Met** - 100 | **Not Met** - 102 | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | By 2035, convert or verify the shutdown prior to conversion of approximately 135 HEU reactors and isotope production facilities.<br><br>Endpoint Target Change: 17 reactors and 2 isotope facilities in Russia are being removed from the endpoint target due to Congressional direction not to work with Russia and Russia's policy of not to converting its own HEU research reactors. Additionally, 2 reactors in China are being removed from the endpoint target because they have been identified as technically unfeasible to convert. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Did not achieve the annual target of converting or verifying as shutdown 3 facilities in FY 2018. Converted the Netherlands' Mo-99 production facility from HEU to LEU and confirmed shutdown of the Canadian facility. The Nigerian Miniature Neutron Source Reactor (MNSR) conversion was missed due to delays from China on signing the Project and Supply Agreement (PSA) agreement to supply needed LEU for conversion.<br><br>**Action Plan:** China conversion will take place after the HEU is removed. Pending no further delays, conversion is expected in November. Communication with China, Nigeria and the IAEA is our current verification for status updates. Nigeria will inform us once conversion is complete. Existing risk is that the conversion is still dependent on China, Nigeria and IAEA allowing M3 activities to continue as planned. This result is important to minimize the amount of weapons-usable material around the world.<br><br>NOTE: Conversion was completed in November 2018. | | | | | | | | | | |
| **Comment** | Beginning in FY 2020, annual targets have been adjusted due to political, technical and programmatic delays by foreign counterparts outside of U.S. control. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Biweekly and monthly reports providing updates from the National Laboratories on ongoing activities. | | | | | | | | | | |

| Program | Material Management and Minimization (M3) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Nuclear Material Removed** - Cumulative number of kilograms of vulnerable nuclear material (HEU and plutonium) removed or disposed. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 5,207 kg | 5,332 kilograms | 6,055 kilograms | 6,285 kilograms | 6,499 kilograms | 7,100 kilograms | 7,140 kilograms | 7,230 kilograms | 7,300 kilograms | 7,480 kilograms | 7,500 kilograms |
| **Result** | **Met** - 5,207 | **Exceeded** - 5,376.7 | **Exceeded** - 6,104.8 | **Exceeded** - 6,372.9 | **Exceeded** - 6,725.3 | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | By 2029, remove or dispose of 7,680 kilograms of vulnerable nuclear material (HEU and plutonium), enough for approximately 300 nuclear weapons.<br><br>Endpoint Target Change: The end date of the removal program has been extended by two years to 2029, taking into account that some of the remaining material inventories include technically challenging fuels that will require additional time to address. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Exceeded the annual target of 6,499 kg of material removed or disposed. To date, exceeded FY 2018 metric with 64 successful shipments totaling 352.4 kg. The cumulative total to-date is 6,725.3 kg. This result is important because this effort will minimize the amount of weapons-usable material around the world. | | | | | | | | | | |
| **Comment** | The Nuclear Material Removal Program has been successfully implementing a Memorandum of Understanding between DOE/NNSA and the Euratom Supply Agency on an HEU Exchange, whereby excess highly enriched uranium (HEU) is being removed to the United States to be down-blended to low enriched uranium (LEU). This activity has accelerated the timeline for removal campaigns and the achievement of FY 2019 annual target. Therefore, the FY 2019, FY 2020, and outyear targets have been revised upward. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Canada (NRU/NRX)<br>CNL Bill of Lading, CNL reference 10107 (B-42 BOL);<br>CNL Bill of Lading, CNL reference 10122 (B-43 BOL);<br>CNL Bill of Lading, CNL reference 10146 (B-44 BOL);<br>CNL Bill of Lading, CNL reference 10163 (B-45 BOL);<br>CNL Bill of Lading, CNL reference 10180 (B-46 BOL);<br><br>Canada (TRM)<br>CNL Bill of Lading, CNL reference 10108 (G-49 BOL);<br>CNL Bill of Lading, CNL reference 10111 (G-50 BOL);<br>CNL Bill of Lading, CNL reference 10117 (G-51 BOL);<br>CNL Bill of Lading, CNL reference 10170 (G-52 BOL);<br>CNL Bill of Lading, CNL reference 10183 (G-53 BOL);<br><br>Canada (Gap)<br>CNL Bill of Lading, CNL reference 10145;<br>CNL Bill of Lading, CNL reference 10155; | | | | | | | | | | |

| | |
|---|---|
| | CNL Bill of Lading, CNL reference10159;<br><br>Japan (AIST)<br>JAEA - Letter confirming down-blending<br><br>Estonia<br>Declaration for Dangerous Goods and Airway Bill |

| Program | Material Management and Minimization (M3) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **U.S. Highly Enriched Uranium (HEU) Downblended** - Cumulative amount of surplus U.S. highly enriched uranium (HEU) down-blended or shipped for down-blending. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 146 MT | 150 MT | 153 MT | 157 MT | 160 MT | 162 MT | N/A | N/A | N/A | N/A | N/A |
| **Result** | **Exceeded** - 146.3 | **Met** - 150 | **Exceeded** - 154.3 | **Exceeded** - 157.9 | **Exceeded** - 160.4 | TBD | N/A | N/A | N/A | N/A | N/A |
| **Endpoint Target** | By the end of FY 2019, complete down-blending of 162 MT of HEU. The overall amount of HEU available for down-blending and the rate at which it will be down-blended is dependent upon decisions regarding the U.S. nuclear weapons stockpile, the pace of warhead dismantlement and receipt of HEU from research reactors, as well as other considerations, such as decisions on processing of additional HEU through H-Canyon and disposition paths for weapons containing HEU. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Exceeded the annual target of 160 MT HEU downblended or shipped for downblending. At the end of FY 2018, a total of 160.4 MT of HEU has been downblended or shipped for downblending. This result is important because it is contributing to the Department's goal of dispositioning surplus U.S. HEU so that it is no longer weapons-usable. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Y-12 contractor monthly program status documents - September highlights report states the repurposed enriched uranium (REU) project has delivered 2,912 kilograms (kgKg) U for downblending, bringing the overall total to 160.4 MT HEU dispositioned. This exceeds the FY 2018 goal of 2,652 Kg. Material movements and quantities are also depicted in material control and accounting data forms and reports that the site is required to maintain under Special Nuclear Materials handling/shipping requirements. | | | | | | | | | | |

## Global Material Security

| Program | Global Material Security | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Mobile Detection System (MDS)** - Cumulative number of Mobile Detection Systems (MDS) deployed. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 72 MDS | 97 MDS | 117 MDS | 137 MDS | 157 MDS | 167 MDS | N/A | N/A | N/A | N/A | N/A |
| **Result** | **Exceeded** - 76 | **Not Met** - 96 | **Met** - 117 | **Exceeded** - 143 | **Exceeded** - 167 | TBD | N/A | N/A | N/A | N/A | N/A |
| **Endpoint Target** | By the end of FY 2019, deploy 167 Mobile Detection Systems. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Program exceeded the FY 2018 cumulative target of 157 Mobile Detection Systems (MDS). In FY 2018, 24 additional MDS deployments were completed. As of the end of FY 2018, the total cumulative number of MDS deployed is 167 units to 32 countries. The Nuclear Smuggling Detection and Deterrence's work in MDS is important because it provides host governments with a 'mobile' technical means to detect, deter, and interdict illicit trafficking of nuclear and other radioactive materials. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Project schedules, acceptance testing documentation, design, trip reports, and Final Inspection Testing documentation performed by NSDD representatives (Federal Country Manager or their delegate) to validate that MDS equipment meets contractual requirements | | | | | | | | | | |

| Program | Global Material Security | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Sustainability** - Cumulative number of radiation detection systems that are being indigenously sustained. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 431 sites/ports | 490 cumulative radiation detection systems | 558 cumulative radiation detection systems | 620 cumulative radiation detection systems | 684 cumulative radiation detection systems | 741 cumulative radiation detection systems | 786 cumulative radiation detection systems | N/A | N/A | N/A | N/A |
| **Result** | **Not Met** - 412 | **Not Met** - 488 | **Not Met** - 538 | **Exceeded** - 630 | **Exceeded** - 686 | TBD | TBD | N/A | N/A | N/A | N/A |
| **Endpoint Target** | By the end of FY 2020, transfer 786 radiation detection systems to indigenous sustainment. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Program exceeded the FY 2018 cumulative target of 684. Work completed in FY 2018 resulted in 56 additional sites being indigenously sustained. As of the end of FY 2018, the total cumulative number of sites in indigenous sustainment is 686. This work is important because it demonstrates that NSDD is successfully transitioning sites to host government responsibility. These host governments are now self-sustaining sites with a capacity to detect, deter, and interdict illicit trafficking of nuclear and other radioactive materials. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Project schedules, trip reports, joint transition and sustainability plans. | | | | | | | | | | |

| Program | Global Material Security | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Sites** - Cumulative number of sites with radiation detection systems deployed. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 548 sites/ports | 575 cumulative sites | 599 cumulative sites | 618 cumulative sites | 634 cumulative sites | 639 cumulative sites | N/A | N/A | N/A | N/A | N/A |
| **Result** | **Exceeded** - 550 | **Met** - 575 | **Exceeded** - 606 | **Exceeded** - 636 | **Exceeded** - 660 | TBD | N/A | N/A | N/A | N/A | N/A |
| **Endpoint Target** | By the end of FY 2019, provide radiation detection systems to approximately 639 cumulative sites. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Program exceeded the FY 2018 cumulative target of 634 sites with radiation detection systems. In FY 2018, work was completed at 24 sites. As of the end of FY 2018, the total cumulative number of sites with radiation detection systems deployed is 660. This work is important because it provides host governments with the technical means to detect, deter and interdict illicit trafficking of nuclear and other radioactive materials. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Project Schedules, trip reports, acceptance testing documentation | | | | | | | | | | |

| Program | Global Material Security | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Radiological Buildings Protected** - Cumulative number of buildings with high-priority radiological materials secured. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 1,785 buildings | 1,890 buildings | 2,027 buildings | 2,116 buildings | 2,266 buildings | 2,346 buildings | 2,426 buildings | 2,516 buildings | 2,641 buildings | 2,766 buildings | 2,866 buildings |
| **Result** | **Exceeded** - 1,816 | **Exceeded** - 1,958 | **Exceeded** - 2,100 | **Exceeded** - 2,196 | **Exceeded** - 2,283 | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | 4,394 buildings secured by 2033 | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Exceeded the cumulative target of 2,266 buildings by 17 with high priority nuclear and radiological materials secured. In FY 2018, 45 international buildings and 42 domestic buildings were secured. The total cumulative number of buildings secured is 2,283. This result is important because it reduces the risk posed by radiological materials worldwide that could be used in crude nuclear bombs and radiological dispersal devices. | | | | | | | | | | |
| **Comment** | To account for work that has proceeded more quickly than planned, the program has increased its FY 2019 target from 2,306 to 2,346 and its FY 2020 target from 2,411 to 2,426 buildings secured. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | ORS monthly performance reports, ORS Implementation Guidelines, ORS Program Management Plan. | | | | | | | | | | |

## Nonproliferation and Arms Control

| Program | Nonproliferation and Arms Control | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Export Control Review & Compliance/Interdiction Pgm (ECRC/I)** - Submit initial DOE positions on dual-use export license applications to the Department of Commerce within 25 days of receipt. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | N/A | N/A | N/A | N/A | N/A | 80% | 85% | 85% | 85% | 85% | 85% |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | Achieve an annual success rate of at least 85% or greater of all initial DOE positions on dual-use export license applications submitted to the Department of Commerce within 25 days of receipt (i.e., 5 days fewer than required). | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | | | | | |

| Program | Nonproliferation and Arms Control | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Reduce Nuclear Terrorism Threat** - Evaluate the adequacy of existing physical security measures of U.S. obligated nuclear material located at foreign facilities. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 6 assessments | 6 assessments | 6 assessments | 6 assessments | 6 assessments | 6 assessments | 6 assessments | 6 assessments | 6 assessments | 6 assessments | 6 assessments |
| **Result** | **Met** - 6 | **Met** - 6 | **Exceeded** - 7 | **Exceeded** - 8 | **Exceeded** - 8 | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | Annually review the physical security of U.S.-obligated nuclear material located at foreign facilities in order to reduce the threat of nuclear terrorism. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Exceeded the FY 2018 target of completing 6 bilateral physical protection security assessment reviews of foreign sites holding U.S.-obligated nuclear material, for a total of 8. In 1Q, one security assessment was completed. Four site visits were completed in 2Q. There were no site visits in 3Q. Three site visits were completed in 4Q. (Note that the 3 site visits previously scheduled for the end of 3Q were requested to be rescheduled to the start of 4Q by the host government.) This result is important because it documents progress of the program in ensuring the security of nuclear material to reduce the threat of nuclear terrorism. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Physical Protection Site Assessment database records and official reports; Bi-lateral Physical Protection Reports | | | | | | | | | | |

| Program | Nonproliferation and Arms Control | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Safeguards Tools** - Transfer tools to international regimes and other countries to address identified safeguards deficiencies. | | | | | | | | | | |
| Fiscal Year | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
| Target | 5 systems | 5 systems | 5 tools | 5 tools | 5 tools | 5 tools | 5 tools | 5 tools | 5 tools | 5 tools | 5 tools |
| Result | **Met** - 5 | **Met** - 5 | **Met** - 5 | **Exceeded** - 7 | **Exceeded** - 6 | TBD | TBD | TBD | TBD | TBD | TBD |
| Endpoint Target | Annually transfer tools to international regimes and other countries to address identified safeguards deficiencies. | | | | | | | | | | |
| Commentary on 2018 Results (Action Plan if Not Met) | Exceeded FY 2018 target of 5 tool transfers, for a total of 6. In 1Q, one tool transfer was completed. The Spent Fuel Neutron Counter Software was transferred to Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC). In 2Q, no tool transfers were completed. In 3Q, three tool transfers were completed. A three dimensional virtual reality model of a uranium enrichment plant was transferred to the International Atomic Energy Agency (IAEA), a testing suite for the IAEA Neutron Coincidence Counting (INCC) software with algorithm documentation was also transferred to the IAEA, and Particle Reference Materials were transferred to the IAEA. In 4Q, two tool transfers were completed. A Single Use Destructive Assay (SUDA) Sampler was tested and left with the IAEA, and a new high-purity Pu-244 reference material for use in bulk environmental sample analyses was delivered to the IAEA. This result is important because the tool transfers will allow partners to more effectively and efficiently account for and control nuclear materials, and help ensure complete and correct reporting to the IAEA. | | | | | | | | | | |
| Documentation, Limitations, Methodology, Validation, and Verification | Shipping records; technical reports; e-mails confirming receipt; photographs; and other documentation. | | | | | | | | | | |

| Program | Nonproliferation and Arms Control | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **International Nonproliferation Export Control Program** - Cumulative number of countries where International Nonproliferation Export Control Program (INECP) is engaged that have export control systems that meet critical requirements. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 34 countries | 35 countries | 36 countries | 37 countries | 38 countries | N/A | N/A | N/A | N/A | N/A | N/A |
| **Result** | **Met** - 34 | **Met** - 35 | **Met** - 36 | **Met** - 37 | **Met** - 38 | N/A | N/A | N/A | N/A | N/A | N/A |
| **Endpoint Target** | By the end of FY 2025, 45 countries where INECP is engaged will have export control systems that meet critical requirements, defined as having: (1) control lists consistent with the WMD regimes; (2) initiated outreach to producers of WMD-related commodities; (3) developed links between technical experts and license reviewers and front-line enforcement officers; and (4) begun customization of educational materials and technical guides. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Met FY 2018 target of 38 countries that meet critical export control system requirements. This number is derived from a review of yearly updates to Engagement Plans and post-event After Action Reports for countries in which International Nonproliferation Export Control Program (INECP) is engaged. This result is important because it documents the success of the program helping foreign partners build export control capacity and prevent the spread of Weapons of Mass Destruction (WMD)-related materials, equipment, and technology. | | | | | | | | | | |
| **Comment** | This Performance Measure is being replaced with the ECRC/I - Export Control Review and Compliance/Interdiction Program Performance Measure. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | International Nuclear Export Control program database records and original input documents; INECP engagement plans and After Action Reports | | | | | | | | | | |

## Nonproliferation Construction

| Program | Nonproliferation Construction | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Surplus Plutonium Disposition (SPD) Project** - Complete the design activities for the Surplus Plutonium Disposition (SPD) project. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | N/A | N/A | N/A | N/A | Complete Critical Decision (CD) – 1, Approve Alternative Selection | 30% of design | 60% design; complete 100% final design for long lead procurements, site preparation, and security modifications | Complete 80% of final design | Complete 100% of final design | N/A | N/A |
| **Result** | N/A | N/A | N/A | N/A | **Not Met** | TBD | TBD | TBD | TBD | N/A | N/A |
| **Endpoint Target** | Complete design for the Surplus Plutonium Disposition Project.<br><br>Endpoint Target Change: The endpoint target was revised due to changes to the annual targets to address the Conference Report H.R. 5895 provision which authorizes funds for design activities and prohibits the use of funds for construction and procurement activities for the Surplus Plutonium Disposition (SPD) project in FY 2019. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | NNSA did not achieve the annual target as funds were not appropriated to start the project in FY 2018. However, in FY 2018 planning and design activities were continued to support the development of the CD-1 package. Accomplishments include approval of: both the Safety Design Strategy and the Conceptual Safety Design Report via Safety Review Letters, NEPA Strategy, Environmental Permit and Compliance Plan, Preliminary Hazards Analysis Report, High Performance and Sustainable Building Plan, Risk Management Plan, Risk and Opportunity Assessment Report, Technology Readiness Assessment, and Technology Maturation Plan.<br><br>**Action Plan:** Annual targets have been revised due to the FY 2019 Conference Report H.R. 5895 provision which authorizes funds for design activities and prohibits the use of use of funds for construction and procurement activities for the Surplus Plutonium Disposition (SPD) project in FY 2019. | | | | | | | | | | |
| **Comment** | Upon approval of CD-2, this PMM will be revised to reflect the approved baseline and be measured consistent with all approved projects within NNSA. Annual targets have been revised due to the FY 2019 Conference Report H.R. 5895 provision which authorizes funds for design activities and prohibits the use of use of funds for construction and procurement activities for the Surplus Plutonium Disposition (SPD) project in FY 2019. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | | | | | |

## Nuclear Counterterrorism and Incident Response Program

| Program | Nuclear Counterterrorism and Incident Response Program | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Emergency Operations Compliance Rate (EOCR)** - Emergency Operations Compliance Rate (EOCR) measures the annual percentage of Defense Nuclear Facility (DNF) sites in full compliance with DOE Order 151.1D. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | N/A | N/A | N/A | 75% | 80% | N/A | N/A | N/A | N/A | N/A | N/A |
| **Result** | N/A | N/A | N/A | **Met** - 75 | **Met** - 80 | N/A | N/A | N/A | N/A | N/A | N/A |
| **Endpoint Target** | Maintain an annual rate of 95% of DNF sites in full compliance with DOE O 151.1D. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | NNSA met the target--the number of sites and facilities assessed in compliance is 80%. Sites and facilities continue to implement DOE Order 151.1D. In FY 2018, the Defense Nuclear Facilities Safety Board (DNFSB) closed Recommendation 2014-01, and the Department provided status update briefs on emergency activities and initiatives throughout the Department. NNSA revised Emergency Management Guides DOE G 151.1-1A, Emergency Management Fundamentals and the Operational Emergency Base Program; DOE G 151.1-2, Technical Planning Basis; DOE G 151.1-3, Programmatic Elements; DOE G 151.1-4, Response Elements; and, DOE G 151.1-5, Biosafety Facilities to align with the updated DOE Order 151.1D; however, these DOE Guides await finalization from DOE Directives Review Process. | | | | | | | | | | |
| **Comment** | The EOCR measure will be discontinued after FY 2018 and replaced with the Response Support Coordination Team Readiness measure through FY 2023. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Defense Nuclear Facilities Safety Board Recommendation (DNFSB) 2014-0 I; Approved realignment and reorganization memorandum dated November 2015 from Associate Administrator Emergency Operations and Associate Administrator Counterterrorism and Counterproliferation to the NNSA Administrator. DOE Order 151.1 D Comprehensive Emergency Management System, approved August 11, 2016; Quarterly reports on the implementation status of DOE 0 151.1 D, development of Emergency Management Guides, and applicable training; Annual HQ DOE/NN SA exercise to validate Emergency Management training proficiency and ability to respond to an all-hazard incident effecting department equities; Measure proficiency of Emergency Management Enterprise from three DNFSB site drills/exercises; Quarterly reports on training guidance and policy implementation; Quarterly reports on deficiencies and corrective actions; and Defense Nuclear Facility sites trained in Threat and Hazard Identification and Risk Assessment (THIRA). Working final coordination of Criteria and Approach Review Documents for Emergency Management following coordination and subject matter expert (SME) discussions during Emergency Management Issues - Special Interest Group (EMI-SIG) Meeting. | | | | | | | | | | |

| Program | Nuclear Counterterrorism and Incident Response Program | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Incident Response Readiness Index (IRRI)** - Annual overall organizational readiness to respond to and mitigate radiological or nuclear incidents worldwide. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| Target | N/A | N/A | N/A | 91 IRRI | 91 IRRI | 91 IRRI | 91 IRRI | 91 IRRI | 91 IRRI | 91 IRRI | 91 IRRI |
| Result | N/A | N/A | N/A | **Not Met** - 89 | **Not Met** - 89 | TBD | TBD | TBD | TBD | TBD | TBD |
| Endpoint Target | Annually, maintain a Readiness Index of 91 or higher. | | | | | | | | | | |
| Commentary on 2018 Results (Action Plan if Not Met) | The Office of Nuclear Incident Response did not reach the target .91 Readiness level for FY 2018. The office has missed the target due to a limited number of personnel available to fill required positions on various teams, training deficiencies, equipment shortages, and maintenance issues. The office has also initiated an in depth analysis of its response assets and resources to objectively determine its ability to respond to various nuclear incident scenarios. This study will also verify the accuracy of the current readiness metric system used by the office. With respect to the Emergency Response Aerial Measuring System (AMS), FY 2019 activities include issuing a solicitation for the recapitalization of fixed -wing aircraft, which is a critical step in addressing the continued increased frequency and duration of required maintenance due to the age of the aircraft.<br>**Action Plan:** NNSA continues to increase personnel, training, and equipment purchases and maintenance. A response capabilities analysis will inform NNSA leadership on staffing issues and guide program priorities. The Emergency Response AMS program is proceeding with aircraft procurement actions for aircraft replacement. Air service backup plans are in place for emergency transport and additional air transport support is continually negotiated within NNSA. | | | | | | | | | | |
| Documentation, Limitations, Methodology, Validation, and Verification | ARMS Reports; Weekly Meetings; Daily situational reports; Daily Infrastructure reports; ARMS website https://arms.orau.gov/; After action reports – evaluators; After action reports – controllers; State, local, & federal reports validating our response efforts; Task Orders/Work Authorizations | | | | | | | | | | |

| Program | Nuclear Counterterrorism and Incident Response Program | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Response Support Coordination Team Readiness** - Measures the readiness of three fully staffed and trained emergency operations response support coordination teams. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| Target | N/A | N/A | N/A | N/A | N/A | 1 teams | 2 teams | 3 teams | 3 teams | N/A | N/A |
| Result | N/A | N/A | N/A | N/A | N/A | TBD | TBD | TBD | TBD | TBD | TBD |
| Endpoint Target | Three support coordination teams that are fully resourced, fully trained, and prepared for immediate activation in support of DOE/NNSA complex wide/cascading emergencies, incidents, and events by FY 2022. | | | | | | | | | | |
| Commentary on 2018 Results (Action Plan if Not Met) | | | | | | | | | | | |
| Documentation, Limitations, Methodology, Validation, and Verification | | | | | | | | | | | |

| Program | Nuclear Counterterrorism and Incident Response Program | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Tier Threat Modeling Archive - Validation (TTMA-V)** - Percent complete toward validating national 3-D predictive modeling capability using four different experimental series designed to produce data needed to reconstruct nuclear threat device emergency disablement scenarios. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 35 % complete | N/A | 35 % | 50 % | 65 % | 75 % | 85 % | 100 % | N/A | N/A | N/A |
| **Result** | TBD | N/A | **Met** - 35 | **Met** - 50 | **Met** - 65 | TBD | TBD | TBD | N/A | N/A | N/A |
| **Endpoint Target** | By the end of FY 2021, complete the validation of the national 3-D predictive modeling capability using four different experimental series designed to produce data needed to reconstruct nuclear threat device emergency disablement scenarios.<br><br>Note: Endpoint Target was revised in FY 2019 to reflect previous, unchanged, annual targets. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Fully achieved the FY 2018 target based on completion of initial testing and associated modeling of campaign 2 experimental series. Progress is compared against the TTMA-V Endpoint Targets through FY 2021.<br><br>TTMA-V is a cornerstone joint project for the Joint Disablement Campaign that will build confidence in the models used to develop key products throughout the interagency to include assessments, tool development support, and procedure development. Follow-on projects are identified but must wait for the refinements this project will produce. This effort is coordinated with the Defense Threat Reduction Agency. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Quarterly Reports to HQ on Milestones and Reportable Activities | | | | | | | | | | |

| Program | Nuclear Counterterrorism and Incident Response Program | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **WMD Counterterrorism Expertise** - Cumulative number of officials trained in Weapons of Mass Destruction (WMD) Counterterrorism (CT) prevention and response via Office of Counterterrorism Policy and cooperation exercises. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 10,200 trained personnel | 11,000 trained personnel | 11,700 trained personnel | 12,500 trained personnel | 13,300 trained personnel | N/A | N/A | N/A | N/A | N/A | N/A |
| **Result** | **Exceeded** - 10,280 | **Met** - 11,000 | **Met** - 11,700 | **Exceeded** - 12,982 | **Met** - 13,300 | N/A | N/A | N/A | N/A | N/A | N/A |
| **Endpoint Target** | By the end of FY 2020, train 14,800 officials in Weapons of Mass Destruction (WMD) Counterterrorism (CT) prevention and response.<br><br>Note: The Office of Nuclear Incident Policy and Cooperation's Weapons of Mass Destruction (WMD) Counterterrorism Exercise Program designs, produces, and conducts tailor-made tabletop exercises for domestic public and private sector customers with nuclear or radioactive materials or associated nuclear security responsibilities. Internationally, the program works with key foreign partners to design, develop, and conduct National and regional WMD security and WMD counterterrorism tabletop exercises. Designed to build teamwork and an in-depth understanding of the roles and responsibilities of agencies charged with responding to terrorist-related radiological, nuclear, or WMD-related incidents, these exercises bring together Federal/National, State, and local decision-makers and first responders. This metric provides a quantitative (cumulative number of officials trained) measure of this program's impact. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Fully achieved the FY target of training a cumulative 13,300 first responders, security, and WMD CT officials. Executed tabletop exercises with officials from Tufts University, Yale University, Blood Center of Wisconsin, United Blood Services in Scottsdale, Special Operations Command Pacific, Serbia, Afghanistan, Sri Lanka, and Maldives to train an additional 552 officials during Q4. This result is important because it measures the Counterterrorism program's progress in strengthening WMD CT capabilities by training Federal, state, local and international officials to address WMD terrorism incidents. | | | | | | | | | | |
| **Comment** | This performance measure is being replaced by the WMD Counterterrorism Expertise performance measure. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Exercise Attendance Lists and After-Action Reports | | | | | | | | | | |

| Program | Nuclear Counterterrorism and Incident Response Program | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **WMD Counterterrorism Expertise** - Percentage of responding Silent Thunder participants who report a solid understanding of the response requirements for a radiological incident at the completion of the exercise. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| Target | N/A | N/A | N/A | N/A | N/A | 70% | 70% | 70% | 70% | 70% | 70% |
| Result | N/A | N/A | N/A | N/A | N/A | TBD | TBD | TBD | TBD | TBD | TBD |
| Endpoint Target | Annually maintain a percentage of 70% across all participants reporting a solid understanding at the strongly agree or agree level at the completion of the exercise on required survey. | | | | | | | | | | |
| Commentary on 2018 Results (Action Plan if Not Met) | | | | | | | | | | | |
| Comment | The Office of Counterterrorism Nuclear Incident Policy and Cooperation's WMD CT Exercise Program designs, produces, and conducts tailor made tabletop exercises for domestic public and private sector customers with nuclear or radioactive materials or associated nuclear security responsibilities. Designed to build teamwork and an in depth understanding of the roles and responsibilities of agencies changed with responding to terrorist radiological, nuclear, or WMD related incidents, these exercises bring together Federal/National, State and local decision makers and first responders. | | | | | | | | | | |
| Documentation, Limitations, Methodology, Validation, and Verification | | | | | | | | | | | |

## Defense Nuclear Nonproliferation Research and Development

| Program | Defense Nuclear Nonproliferation Research and Development | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Early Proliferation Detection** - Demonstrate advancements in material production and weaponization detection by achieving the baseline Technology Readiness Level (TRL) targets at project completion, as set in those projects' Life Cycle Plans. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | N/A | N/A | N/A | N/A | N/A | 80 % of completed projects | 80 % of completed projects | 80 % of completed projects | 80 % of completed projects | 80 % of completed projects | 80 % of completed projects |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | Annually, achieve baseline TRL targets on 80% of completed projects. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | | | | | |

| Program | Defense Nuclear Nonproliferation Research and Development | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Nuclear Detonation Detection** - Annual index that summarizes the status of all NNSA nuclear detonation detection R&D deliveries that improve the nation's ability to detect nuclear detonations. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 90% index | 90% index | 90% index | 90% index | 90% index | 90% index | 90% index | 90% index | 90% index | 90% index | 90% index |
| **Result** | **Met** - 90 | **Met** - 90 | **Met** - 90 | **Met** - 90 | **Met** - 90 | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | Annually achieve timely delivery of NNSA nuclear detonation detection products. (90% target reflects good on-time delivery. Index considers factors beyond NNSA's control and impact on customer schedules.) | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Achieved the FY 2018 delivery of nuclear detonation detection sensor payloads in accordance with current US Air Force published schedule for satellite production. Payload delivery for FY 2018 tracks with planned milestones; in particular, one Global Burst Detector (GBD) payload was delivered to the USAF in 1Q FY 2018. This result is important because it maintains the U.S. national capability to monitor the Earth for nuclear detonations. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Quarterly reports; Consent-to-Ship memo documenting the readiness of each delivery to user agencies; final delivery and receipt is documented in a DD 1149 Shipping and Receiving Form. | | | | | | | | | | |

| Program | Defense Nuclear Nonproliferation Research and Development | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Nuclear Security** - Demonstrate advancements in nuclear weapons and material security by achieving the baseline Technology Readiness Level (TRL) targets at project completion, as set in those projects' Life Cycle Plans. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | N/A | N/A | N/A | N/A | N/A | 80% of completed projects | 80% of completed projects | 80% of completed projects | 80% of completed projects | 80% of completed projects | 80% of completed projects |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD | TBD | TBD | TBD | TBD |
| **Endpoint Target** | Annually, achieve baseline TRL targets on 80% of completed projects. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | | | | | |

| Program | Defense Nuclear Nonproliferation Research and Development | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Nuclear Weaponization and Material Production Detection** - Cumulative percentage of progress toward demonstrating improvements in detection and characterization capabilities of nuclear weapons production activities. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 20% progress | 50% of progress | 70% of progress | 90% of progress | 100% of progress | N/A | N/A | N/A | N/A | N/A | N/A |
| **Result** | **Met** - 20 | **Met** - 50 | **Met** - 70 | **Met** - 90 | **Met** - 100 | N/A | N/A | N/A | N/A | N/A | N/A |
| **Endpoint Target** | By the end of FY 2018, achieve 100% cumulative progress toward demonstrating new capabilities detecting uranium and plutonium production and nuclear weaponization processes. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Achieved the cumulative target of 100% progress. This percentage correlates to meeting the targeted technology readiness level (TRL) goal as specified in the Nuclear Weapons and Material Security Roadmap's investment strategy for each of 18 separate requirements. This result is important because it advances U.S. technical capabilities in support of nuclear counter terrorism and incident response and to detect, characterize, and monitor the foreign development of nuclear weapons. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Program Plan/Roadmap document; Annual report (unclassified) | | | | | | | | | | |

| Program | Defense Nuclear Nonproliferation Research and Development | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Nuclear Weapons and Material Security** - The cumulative percentage of progress towards demonstrating improvements in Special Nuclear Material detection, warhead monitoring, chain-of-custody monitoring, safeguards, and characterization capabilities. | | | | | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Target** | 20% progress | 50% progress | 70% of progress | 90% of progress | 100% of progress | N/A | N/A | N/A | N/A | N/A | N/A |
| **Result** | **Met** - 20 | **Met** - 50 | **Met** - 70 | **Met** - 90 | **Met** - 100 | N/A | N/A | N/A | N/A | N/A | N/A |
| **Endpoint Target** | By the end of FY 2018, achieve 100% cumulative progress toward demonstrating new capabilities for warhead monitoring, warhead chain-of-custody, Special Nuclear Material movement detection, and nuclear safeguards. | | | | | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Achieved the cumulative target of 100% progress. This percentage correlates to meeting the targeted TRL goals as specified in the Nuclear Material Production Detection Roadmap's investment strategy for each of 12 separate requirements. This result is important because it advances U.S. technical capabilities to detect, characterize, and monitor the foreign production of special nuclear materials. | | | | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Program Plan/Roadmap document; Annual report (classified) | | | | | | | | | | |

# Naval Reactors

## Naval Reactors

| Program | Naval Reactors | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **S1B Reactor Plant Design** - Cumulative percentage of work complete on the Columbia-Class submarine reactor plant design. | | | | | | | | | | |
| Fiscal Year | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
| Target | 22% complete | 32% complete | 43% complete | 55% complete | 65% complete | 74% complete | 80% complete | 83% complete | 86% complete | 90% complete | 93% complete |
| Result | **Exceeded** - 25.7 | **Exceeded** - 34.6 | **Exceeded** - 45.3 | **Exceeded** - 57.8 | **Exceeded** - 67 | TBD | TBD | TBD | TBD | TBD | TBD |
| Endpoint Target | By the end of FY 2027, complete 100% of the Columbia-Class submarine reactor plant design (formerly known as the Ohio-Class Replacement). | | | | | | | | | | |
| Commentary on 2018 Results (Action Plan if Not Met) | As of the end of FY 2018, 67% of the COLUMBIA-class submarine reactor plant (S1B) has been completed. Milestones achieved: issued Reactor Servicing System requirements document, submitted Main Seawater and De-Ionized Water Cooling System diagrams (Rev B), submitted Reactor Plant Manual (RPM) Operating Instructions for coolant sampling, submitted RPM Operating Procedure for Reactor Plant Shutdown and Co oldown, and submitted RPM Pressurizing System Maintenance and Replacement instruction | | | | | | | | | | |
| Documentation, Limitations, Methodology, Validation, and Verification | Analysis of scheduled completion of major milestones including safety analysis and performance analysis reports, drawing deliverable performance to schedule, and cost performance to schedule. | | | | | | | | | | |

# Energy Efficiency and Renewable Energy

## Vehicle Technologies

| Program | Vehicle Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Light Duty** - Improve Light Duty vehicle fuel economy (mpg) through increased engine efficiency. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | 41.8 MPG | 42.5 MPG | 43.2 MPG |
| **Result** | N/A | - 36 | 40.3 | 41 | **Exceeded** - 42.3 | TBD | TBD |
| **Endpoint Target** | 48.6 MPG by 2030 (i.e., a 35% improvement in MPG vs. a 2015 baseline). 35% fuel economy improvement represents 25% from engine efficiency improvement assuming current fuels and an additional 10% from co-optimization with fuels. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | A fuel economy of 42.3 MPG was demonstrated using the Delphi Gasoline Direct-injected Compression Ignition (GDCI) engine. The improved engine efficiency results were used in a vehicle simulation model, Autonomie, to simulate the fuel economy. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Calculation methodologies for baseline and target costs are found in the presentation Vehicle Energy Consumption Benefits of Low Temperature Combustion (LTC) Engines<br><br>Results verified by Delphi and reported to EERE. Publication of FY18 results pending.<br><br>Fuel economy improvement is compared to a modeled 2015 baseline vehicle with an unadjusted (CAFÉ) fuel economy of 36 MPG. None of the 2020 target will come from co-optimization with fuels, since this effort is still in its early stages.<br><br>Historical trend data is shown in the results field above to provide context, even where no formal GPRA Target was published for that year. | | | | | | |

| Program | Vehicle Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Mobility** - Establish baseline energy productivity (number of cities).<br>2019: Complete initial phase of the SMART Mobility National Laboratory Consortium by publishing a results report for each of the five research pillars. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | 5 reports | 5 Cities |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD |
| **Endpoint Target** | Long term goal is to increase energy productivity and affordability. Specific, quantitative targets will be established alon g with the baselines in FY 2020. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Baseline and scenario analysis will be done for 5 different cities/regions using strategic computing capabilities and validated transportation system simulation tools, and will indicate the most promising pathways to improve mobility. Improvements will be measured using the mobility energy productivity metric developed in FY 2018, which is undergoing peer review in FY 2019. | | | | | | |

| Program | Vehicle Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Batteries** - Reduce the cost of batteries for Electric Vehicles (EVs). | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Target | $ 300 /kWh | $ 275 /kWh | $ 250 /kWh | $ 225 /kWh | $ 200 /kWh | $ 185 /kWh | $ 175 /kWh |
| Result | **Met** - 289 | **Exceeded** - 268 | **Exceeded** - 245 | **Exceeded** - 219 | **Exceeded** - 197 | TBD | TBD |
| Endpoint Target | $150/kWh by 2022<br>$100/kWh by 2028 | | | | | | |
| Commentary on 2018 Results (Action Plan if Not Met) | | | | | | | |
| Documentation, Limitations, Methodology, Validation, and Verification | Achieving the endpoint target will enable cost competitive market entry of EVs by reducing the cost of electrical vehicle batteries by approximately 70 percent (roughly $14,000) from FY 12.<br><br>Documentation of calculation methodology: https://build.export.gov/build/groups/public/@eg_main/documents/webcontent/eg_main_106910.pdf.<br><br>Publication of FY18 results pending.<br><br>Baseline: $1,000/kWh in 2008<br><br>Battery cost projections are derived by battery manufacturers using the United States Advanced Battery Consortium's (USABC) battery manufacturing cost model for specific battery cell and module designs that meet DOE/USABC system performance targets and are based on a production volume of at least 100,000 batteries per year. | | | | | | |

| Program | Vehicle Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Electric Drive Systems** - Reduce the costs of electric drive systems. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | N/A | $ 8 /kW |
| **Result** | $15/kW | $12/kW | $12/kW | $11/kW | $10/kW | N/A | TBD |
| **Endpoint Target** | $7/kW by 2022 | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | 2012 Baseline: $30/kW<br><br>Reducing the cost of electric traction drive systems that can deliver at least 55kW of peak power will enable cost competitive technologies for market entry and vehicle electrification. High volume (>100K units/year) modeled costs are based on results from advanced inverter and motor technology developments that are combined into a functional system or system model for evaluation. Includes technologies that significantly reduce or eliminate dependence on critical materials (such as cobalt and heavy rare earth magnet materials) and utilize recycled material feedstocks.<br><br>Historical trend data is shown in the results field above to provide context, even where no formal GPRA Target was published for that year. 2016 is the same as 2015 due to changes in system level assumptions. | | | | | | |

## Bioenergy Technologies

| Program | Bioenergy Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Algae** - Increase algal biomass productivity. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | 13.3 g/m$^2$/day | 15.9 g/m$^2$/day | 17.2 g/m$^2$/day |
| **Result** | N/A | 8.5 | 9.1 | 10.3 | **Not Met** - 13 | TBD | TBD |
| **Endpoint Target** | At least 25 g/m$^2$/day by 2025 | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Annual State of Technology assessment performed by the National Renewable Energy Laboratory (NREL) and the Pacific Northwest National Laboratory (PNNL) modeled a Minimum Fuel Selling Price (MFSP) of $6.83 to $11.63 (based on different conversion technology configurations), with a 3-season average algae biomass productivity of 13.0 g/m$^2$/d.<br>**Action Plan:** Continued effort to increase yield. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Results verified and reported by NREL and PNNL. These results will be published in the BETO Multi-Year Program Plan.<br><br>The FY 2018 baseline of 13.3 g/m$^2$/day is a summer productivity that is often greater than the annual average. The FY18 baseline was reset and is now derived from work in the DISCOVR consortium.<br><br>Algal biomass productivity targets and their relation to algal biofuel production cost improvements are detailed in the Bioenergy Technologies Office Multi-year Program Plan, at https://www.energy.gov/sites/prod/files/2016/07/f33/mypp_march2016.pdf (pages 2-49 to 2-56).<br><br>With the establishment of the Algae Testbed Public-Private Partnership and a standardized data collection program, a state-of-technology for algal biomass productivity was conducted for the first time in 2015 for use in establishing and assessing Bioenergy Technologies Office technical targets. The algal biomass productivity calculations and methodologies are detailed in E. Knoshaug, L. M. L. Laurens, C. Kinchin, and R. Davis, Use of Cultivation Data from the Algae Testbed Public Private Partnership as Utilized in NREL's Algae State of Technology Assessments (Golden, CO: National Renewable Energy Laboratory, October 2016), NREL/TP-5100-67289, http://www.nrel.gov/docs/fy17osti/67289.pdf.<br><br>Historical trend data is shown in the results field above to provide context, even where no formal GPRA Target was published for that year. | | | | | | |

| Program | Bioenergy Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Pathways** - Decrease minimum fuel selling price for the catalytic fast pyrolysis and upgrading pathway. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | $ 4.09 /gge | $ 3.33 /gge | $ 3.09 /gge |
| **Result** | N/A | 5.76 | 5.19 | 4.34 | **Exceeded** - 3.46 | TBD | TBD |
| **Endpoint Target** | $3/gge by 2025 | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Annual State of Technology assessment performed by NREL modeled a MFSP of $3.46/gge. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Verified and reported by NREL. These results will be published in the BETO Multi-Year Program Plan.<br><br>Updated 2017 Baseline: $4.09/gge (previously $4.34 - updated to 2016$ and reflecting new tax law). MFSP assumptions based on 2018 Ex Situ Catalytic Fast Pyrolysis and Upgrading Design Case pending publication in October 2018. MFSP is defined as the fuel selling price (leaving the biorefinery gate) that enables a 10% rate of return over the lifetime of the biorefinery including capital costs, operating costs, and financing. This price does not include fuel marketing or distribution costs, nor does it include any retail markups. Full economic assumptions (e.g. plant lifetime, interest rates, etc.) can be found here: https://www.nrel.gov/docs/fy15osti/62455.pdf<br><br>Catalytic fast pyrolysis of biomass is recognized as an efficient and feasible process to selectively convert lignocellulose into a liquid fuel—bio-oil. The main challenge of this process is the development of active and stable catalysts that can deal with a large variety of decomposition intermediates from lignocellulose. This cost reduction will be accomplished by optimizing catalyst composition and process conditions for the catalytic fast pyrolysis reactor system to improve carbon efficiency, reduce catalyst cost, and extend catalyst lifetime.<br><br>Historical trend data is shown in the results field above to provide context, even where no formal GPRA Target was published for that year. | | | | | | |

| Program | Bioenergy Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Upgradable Lignin** - Increase yield of upgradeable products from an industrially relevant lignin waste stream (% by mass). | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | N/A | 43 % |
| **Result** | N/A | N/A | N/A | N/A | 35% | N/A | TBD |
| **Endpoint Target** | Increase yield of upgradeable products from an industrially relevant lignin waste stream to 53% by mass by 2030. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Using a combination of reductive catalysis (to cleave C-O bonds) and oxidative catalysis (to cleave C-C bonds), depolymerize lignin streams into monomers that can be valorized through known upgrading routes. The latter can include feasibility of enabling biological funneling to ring-opened products (e.g., muconate) or direct use of monomers for materials applications.<br><br>Targets include contributions from Biological Lignin Valorization, Performance Advantaged Co-products, Lignin-First Biorefinery Development, and Lignin Utilization.<br><br>Selection of the lignin valorization strategy will be documented in a lab/BETO whitepaper. According to techno-economic analysis, the endpoint target of 53% upgradable products (mass basis) will enable the program's MFSP target of $3.00 per gallon gasoline equivalent.<br><br>Lignin upgrading shows catalytic processes able to generate usable monomers from lignin in biomass, either biologically convertible or separable. FY18 data is shown in the results field above to provide context, even where no formal GPRA Target was published for that year. | | | | | | |

| Program | Bioenergy Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Water Consumption** - Reduce modeled water consumption for at least one of four biofuel production pathways (% reduction from 2018 baseline). | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | N/A | 10% |
| **Result** | N/A | N/A | N/A | N/A | N/A | N/A | TBD |
| **Endpoint Target** | 15% reduction in direct water consumption by 2022 for at least one of biofuel production pathway among Catalytic Fast Pyrolysis (CFP), InDirect Liquefaction (IDL), Sludge HyDrothermal Liquefaction (HDL), Biochemical Conversion. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | FY18 Baselines:<br>1.3 gal/gge for CFP<br>3.3 gal/gge for IDL<br>1 gal/gge for Sludge HTL<br>11.3 gal/gge for Biochem<br><br>Supply chain analysis will be conducted by Argonne National Laboratory and will be verified and reported by Argonne National Laboratory with input from the National Renewable Energy Laboratory. | | | | | | |

## Hydrogen and Fuel Cell Technologies

| Program | Hydrogen and Fuel Cell Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Delivery and Dispensing cost** - Reduce the cost of hydrogen delivery and dispensing. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | $ 11.5 /kg | $ 11 /kg |
| **Result** | N/A | N/A | N/A | 13 | 12 | TBD | TBD |
| **Endpoint Target** | $5/kg by 2025 | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | $5/kg target is aligned with the near-term cost target of $7/kg for hydrogen produced, delivered and dispensed untaxed and assumes $2/kg hydrogen production from natural gas. This is consistent with record: https://www.hydrogen.energy.gov/pdfs/15012_hydrogen_early_market_cost_target_2015_update.pdf.<br><br>The ultimate (beyond 2030) target for hydrogen to be cost competitive with gasoline on a $/gge basis is $4/kg apportioned to $2/kg for production and $2/kg delivery and would enable a 27¢/mile Levelized Cost of Driving (LCD).<br><br>Historical trend data is shown in the results field above to provide context, even where no formal GPRA Target was published for that year. | | | | | | |

| Program | Hydrogen and Fuel Cell Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Materials** - Identify advanced water splitting materials and associated pathways through leveraging the HydroGEN Energy Materials Network (EMN) Consortia. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Target | N/A | N/A | N/A | N/A | N/A | 5 Materials | 7 Materials |
| Result | N/A | N/A | N/A | N/A | N/A | TBD | TBD |
| Endpoint Target | 11 materials by 2022; accelerated discovery of advanced water splitting materials to meet the hydrogen production cost target. | | | | | | |
| Commentary on 2018 Results (Action Plan if Not Met) | | | | | | | |
| Documentation, Limitations, Methodology, Validation, and Verification | Materials identified must have the potential to meet at least two technology-specific targets in efficiency, durability and/or materials cost as defined in the Hydrogen chapter of the FCTO Multi-Year Research Development and Demonstration plan, to reach the ultimate cost goal of <$2/kg. The HydroGEN EMN Consortium is focused on materials discovery and development for four diverse pathways to generate hydrogen via advanced water splitting (AWS): low temperature electrolysis, high temperature electrolysis, photoelectrochemical, and solar thermochemical. The three common parameters chosen for this metric (efficiency, durability, and materials cost) are of the greatest importance to AWS pathways. (The MYRDD is available at: https://energy.gov/sites/prod/files/2015/06/f23/fcto_myrdd_production.pdf) | | | | | | |

| Program | Hydrogen and Fuel Cell Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **PGM Free Catalysts** - Improve the catalyst activity of Platinum Group Metal (PGM) free catalysts. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | 25 mA/cm2 | 29 mA/cm2 | 33 mA/cm2 |
| **Result** | N/A | N/A | 16 | 21 | **Exceeded** - 27 | TBD | TBD |
| **Endpoint Target** | 44 mA/cm2 by 2025 | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Los Alamos National Lab (LANL) demonstrated PGM-free catalyst performance of 27 mA/cm2 based on the second polarization curve. Future efforts will need to improve catalyst durability. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Verified and reported by LANL. Publication of FY18 results pending.<br><br>Baseline: https://www.hydrogen.energy.gov/pdfs/review16/fc107_zelenay_2016_o.pdf<br><br>Catalyst activity will be measured at 0.90 ViR-free in a lab-tested H2-O2 membrane electrode assembly (fuel cell) at an oxygen partial pressure (pO2) of 1.0 bar and a cell temperature of 80 °C. Eliminating the PGM catalyst from the stack provides a pathway for the program to meet the fuel cell ultimate cost target of $30/kW to enable a 27¢/mile LCD.<br><br>Historical trend data is shown in the results field above to provide context, even where no formal GPRA Target was published for that year. | | | | | | |

## Solar Energy

| Program | Solar Energy | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Grid** - Reduce the modeled system cost of solar + storage to enable nationwide cost effective and safe integration of variable solar energy into our electric grid. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | $ 1.65 /WDC | $ 1.6 /WDC |
| **Result** | N/A | N/A | N/A | 1.96 | $ 1.86 /WDC | TBD | TBD |
| **Endpoint Target** | $1.45/WDC | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | The solar + energy storage cost target is an unsubsidized cost of energy at utility scale array with 4 hours of battery storage. Model assumptions based on NREL analysis: 2017 NREL PV Benchmark Report, the Annual Technology Baseline and PV plus storage analysis.<br><br>Historical trend data is shown in the results field above to provide context, even where no formal GPRA Target was published for that year. | | | | | | |

| Program | Solar Energy | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Photovoltaic (PV)** - Reduce the modeled Levelized Cost of Energy (LCOE) Solar PV energy. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 13 cents/kWh | 10 cents/kWh | 9 cents/kWh | 7 cents/kWh | 6 cents/kWh | 5 cents/kWh | 4.8 cents/kWh |
| **Result** | **Exceeded** - 11 | **Met** - 10 | **Exceeded** - 8.2 | **Exceeded** - 6 | **Exceeded** - 5.2 | TBD | TBD |
| **Endpoint Target** | 3 cents /kWh by 2030 (without subsidies), cost competitive with traditional electricity sources. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | 5.2 cents/kWh achieved. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Results are based on the technical report, "U.S. Solar Photovoltaic System Cost Benchmark: Q1 2018," by NREL.<br><br>Unsubsidized cost of energy at utility scale. | | | | | | |

| Program | Solar Energy | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Concentrated Solar Power (CSP)** - Reduce the modeled levelized cost of CSP energy. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 15 cents/kWh | 13 cents | N/A | N/A | N/A | 8 cents/kWh | 7.8 cents/kWh |
| **Result** | **Exceeded** - 14 | **Exceeded** - 12.9 | 12.5 | 10.3 | 9.8 | TBD | TBD |
| **Endpoint Target** | 6 cents/kWh by 2022<br>5 cents/kWh by 2030 | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Unsubsidized cost of energy at utility scale including 14 hours of thermal storage, in the U.S. southwest. Results will be published in periodic NREL technical reports. | | | | | | |

| Program | Solar Energy | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Solar Products** – Accelerate the process to develop new, innovative solar products from concept to pilot testing in less than one calendar year (number of products developed within a year) | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | N/A | 2 products |
| **Result** | N/A | N/A | N/A | N/A | N/A | N/A | TBD |
| **Endpoint Target** | 6 products by 2022 (cumulative since FY2020) | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | 2019 Baseline: 2-2 ½ years, concept to pilot<br><br>In 2007 DOE and NREL launched the first round of the PV Incubator through the Solar America Initiative to accelerate promising solar technologies to market. Through most of the history of this program, it took approximately 2.5 years to go from concept to pilot testing. The most recent round of the program (Round 12) was launched in 2016 and had the goal of bringing a hardware product concept to pilot testing in two years.<br><br>The American Made Solar Prize is testing a new prize based funding structure that could reduce this time to one year, depending on the complexity of the product and the risk tolerance of the pilot testing partner. It focuses on rapid, early stage product innovation and development and an early transition to private sector testing.<br><br>Products must be relevant to the domestic upstream manufacturing sector. | | | | | | |

## Wind Energy

| Program | Wind Energy | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Offshore** - Reduce the modeled Levelized Cost of Energy (LCOE) from offshore wind energy. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 21.5 cents/kWh | 19.9 cents per kwh | 18.1 cents/kwh | 17.2 cents/kWh | 16.2 cents/kWh | 11.5 cents/kWh | 10.9 cents/kWh |
| **Result** | **Exceeded** - 20.3 | **Not Met** - 20.8 | **Met** - 18.1 | **Met** - 17.2 | **Exceeded** - 11.9 | TBD | TBD |
| **Endpoint Target** | 10.9 cents/kWh by 2020 (Endpoint targets established in 2015)<br>9.3 cents/kWh by 2030 | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | FY18 documentation in NREL publication: https://www.nrel.gov/docs/fy18osti/72167.pdf<br><br>Offshore Wind Fixed-bottom LCOE is based off a U.S. reference wind farm with a wind speed of 8.4m/s @ 50m; 20 plant life; and a real average market discount rate derived from European installations in 2015. CapEx, OpEx, and turbine characteristics updated annually based on weighted average installations in Europe. All values are in 2015 dollars. All terms and methodologies listed above are referenced in the 2015 Cost of Energy Review: http://www.nrel.gov/docs/fy17osti/66861.pdf<br><br>In FY19, DOE is performing an analysis effort to rebaseline the assumptions for the offshore wind reference plant and associated cost reduction pathways.<br><br>The jump in FY15 costs are skewed due to several highly expensive projects built unusually far from shore and in deep water off the coast of Germany. | | | | | | |

| Program | Wind Energy | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Onshore** - Reduce the modeled Levelized Cost of Energy (LCOE) from land-based wind energy. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 7.7 cents/kWh | 6.9 cents/kwh | 5.6 cents/kWh | 5.5 cents/kWh | 5.4 cents/kWh | 4.7 cents/kWh | 4.6 cents/kWh |
| **Result** | **Met** - 7.4 | **Met** - 6.9 | **Met** - 5.6 | **Exceeded** - 5.2 | **Exceeded** - 4.8 | TBD | TBD |
| **Endpoint Target** | 4.6 cents/kWh by 2020 (Endpoint targets revised in 2018)<br>2.3 cents/kWh by 2030 | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | FY18 documentation in NREL report: https://www.nrel.gov/docs/fy18osti/72167.pdf<br><br>The onshore wind energy cost target is an unsubsidized cost of energy at utility scale. Real market Weighted Average Cost of Capital (WACC) of 5.6%; national capacity weighted average installed CapEx and OpEx values; 7.25 m/s Wind speed @ 50m hub height; and 25 year plant life. | | | | | | |

## Water Power

| Program | Water Power | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Dams** - Reduce the modeled Levelized Cost of Energy (LCOE) from hydropower from non-powered dams. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | Establish Baseline | 9.8 cents/kWh | 9.7 cents/kWh | 9.6 cents/kWh | 9.4 cents/kWh | 9.2 cents/kWh |
| **Result** | N/A | **Met** - 10 | **Met** - 9.8 | **Met** - 9.7 | **Met** - 9.6 | TBD | TBD |
| **Endpoint Target** | 9.2 cents/kWh by 2020<br>9.0 cents/kWh by 2022<br>7.5 cents/kWh by 2030 | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Scale-testing of a Composite Archimedes Screw turbine was able to be completed in Q4; and achieved efficiencies of 90%, almost ten percent greater than a traditional steel turbine. The composite design has also demonstrated potential to reduce deployment costs: the detachable blades make it possible to transport the turbine in segments, leading to reductions in transportation costs; and the optimized design reduces material mass and blade and tube length, therefore decreasing overall footprint and costs. This yielded an LCOE of 9.6.<br><br>In FY18 and FY19, WPTO has been engaging in data collection and analytical efforts to set new long-term GPRA targets for cost reduction of marine hydrokinetic (wave energy), and hydropower (non-powered dam, and new-stream-reach) technologies. These new long-term targets will be based on updated systems-level engineering models, new project-specific data from WPTO-funded R&D, and feedback from industry experts and engineers. Data and new proposed targets (and possibly re-baselined present-day cost numbers) will be available for discussion with OMB in Q2 of FY20. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Although the baseline for the hydropower LCOE estimate is derived from empirical data, the sample set of new hydropower builds, on an annual basis, is too small to establish an empirically based national average annually. The goals and trajectories are based on expert opinion as published in the Hydropower Vision Report and reflect cost reductions in Capital Expenditures. All terms and methodologies listed in the Hydropower Vision Report: https://energy.gov/eere/water/articles/hydropower-vision-new-chapter-america-s-1st-renewable-electricity-source. Publication of FY18 results pending.<br><br>Unsubsidized cost of energy at utility scale for small. low head dams. | | | | | | |

| Program | Water Power | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Streams** - Reduce the modeled Levelized Cost of Energy (LCOE) from new stream developments. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | Establish Baseline | 11.7 cents/kWh | 11.5 cents/kWh | 11.4 cents/kWh | 11.15 cents/kWh | 10.9 cents/kWh |
| **Result** | N/A | **Met** - 11.9 | **Met** - 11.7 | **Met** - 11.5 | **Met** - 11.4 | TBD | TBD |
| **Endpoint Target** | 10.9 cents/kWh by 2020<br>8.9 cents/kWh by 2030 | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Littoral Power Systems successfully completed lab testing of seals per American Water Works Association (AWWA) C563 requirements in Q4 for their standardized modules for hydropower dams, spillways & powerhouses that can be efficiently transported via trucks, train or barge. The modules are designed to be installed in weeks and minimize or eliminate the requirement of coffer dams, reducing civil works and installation costs. This yielded an LCOE of 11.4.<br><br>In FY18 and FY19, WPTO has been engaging in data collection and analytical efforts to set new long-term GPRA targets for cost reduction of marine hydrokinetic (wave energy), and hydropower (non-powered dam, and new-stream-reach) technologies. These new long-term targets will be based on updated systems-level engineering models, new project-specific data from WPTO-funded R&D, and feedback from industry experts and engineers. Data and new proposed targets (and possibly re-baselined present-day cost numbers) will be available for discussion with OMB in Q2 of FY20. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Although the baseline for the hydropower LCOE estimate is derived from empirical data, the sample set of new hydropower builds, on an annual basis, is too small to establish an empirically based national average annually. The goals and trajectories are based on expert opinion as published in the Hydropower Vision Report and reflect cost reductions in Capital Expenditures. https://energy.gov/eere/water/articles/hydropower-vision-new-chapter-america-s-1st-renewable-electricity-source. Publication of FY18 results pending.<br><br>Unsubsidized cost of energy at utility scale for small, low-head developments. | | | | | | |

| Program | Water Power | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Marine & Hydrokinetic (MHK)** - Reduce the modeled Levelized Cost of Energy (LCOE) from Marine & Hydrokinetic technologies.<br><br>2016: Double energy capture per cost (meters per million dollars)<br>2015: Increase power-to-weight ratio from a baseline of 0.25 (kW/ton)<br>2014: Reduce the cost of energy from Marine & Hydrokinetic technologies (cents/kWh) | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 6 cents/kWh | 0.375 kW/ton | 3 m/$M | 66 cents/kWh | 64 cents/kWh | 60 cents/kWh | 55 cents/kWh |
| **Result** | **Exceeded** - 53 | **Exceeded** - 0.4 | **Met** - 3 | **Met** - 66 | **Met** - 64 | TBD | TBD |
| **Endpoint Target** | 27 cents/kWh by 2030 | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Testing of advanced wave energy controls system completed by Sandia National Lab (SNL) at the Navy's Maneuvering and Sea Keeping (MASK) basin. Represents the first fully-closed loop implementation of a Wave Energy Converter (WEC) controller capable of doubling average power from a device when compared with current state-of-the-art. This yielded an LCOE of 64.<br><br>In FY18 and FY19, WPTO has been engaging in data collection and analytical efforts to set new long-term GPRA targets for cost reduction of marine hydrokinetic (wave energy), and hydropower (non-powered dam, and new-stream-reach) technologies. These new long-term targets will be based on updated systems-level engineering models, new project-specific data from WPTO-funded R&D, and feedback from industry experts and engineers. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Wave energy cost target is an unsubsidized cost of energy at utility scale, based on Humboldt Bay standardized resource conditions. The goals and trajectories are based on expert opinion as published in the Hydropower Vision and reflect cost reductions in Capital Expenditures. https://energy.gov/eere/water/articles/hydropower-vision-new-chapter-america-s-1st-renewable-electricity-source. Publication of FY18 results pending. | | | | | | |

| Program | Water Power | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Licensing** - By the end of Q2 FY2020, the Department will publish scientific data and analysis to support FERC's development of consistent best practices for licensing studies and requirements that reduce the licensing timeframe for non-Federal hydropower projects at non-powered dams and closed-loop pumped storage projects to 2 years or less. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | N/A | Publish data |
| **Result** | N/A | N/A | N/A | N/A | N/A | N/A | TBD |
| **Endpoint Target** | N/A | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Successfully meeting this goal will be measured by 1) whether or not the data and analysis is published on time and 2) if FERC acknowledges the need for DOE data in meeting the development of their best practices by citation in the best practices documentation. | | | | | | |

## Geothermal Technology

| Program | Geothermal Technology | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Systems** - Reduce the modeled Levelized Cost of Energy (LCOE) from newly developed Enhanced Geothermal Systems (EGS). | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 22.4 cents/kWh | 22.3 cents/kWh | 22.2 cents/kWh | 22 cents/kWh | 21.8 cents/kWh | 21.7 cents/kWh | 21.4 cents/kWh |
| **Result** | **Met** - 22.4 | **Met** - 22.3 | **Met** - 22.2 | **Met** - 22 | **Exceeded** - 21.75 | TBD | TBD |
| **Endpoint Target** | 16 cents/kWh by 2030; 6 cents/kWh by 2050 (revised from 2030) | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | The new LBNL Step-Rate Injection Method for Fracture In-Situ Properties (SIMFIP) tool uses stress measurements to improve stimulation for Enhanced Geothermal Systems (EGS) has been successfully tested at the EGS Collab site. GTO assesses that this tool will result in an increase in the simulation success rate from the previous baseline of 75% up to 80%. As an example, another GTO project at Raft River, Idaho continued successful stimulation in FY18; as of May of 2018, the team observed an increase in well injectivity of approximately 80 times, from approximately 20 gallons per minute (gpm) to approximately 1,590 gpm. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | The Geothermal Electricity Technology Evaluation Model (GETEM) user manual is published on the Idaho National Lab Website here: https://workingincaes.inl.gov/SiteAssets/CAES%20Files/FORGE/inl_ext-16-38751%20GETEM%20User%20Manual%20Final.pdf<br><br>Result verified and reported at the EGS Collab site. Publication of FY18 results pending.<br><br>Unsubsidized cost of energy at utility scale including both hydrothermal and Enhanced Geothermal Systems (EGS). GETEM estimates the representative costs of generating electrical power from geothermal energy. The estimated costs are dependent upon a number of factors specific to the scenario being evaluated, with most of these factors defined by inputs provided. Based on the scenario characterization, cost estimates are developed for all aspects of a project needed to provide the specified or calculated power sales. These costs and annual power sales are the basis for determining a levelized cost of electricity (LCOE). | | | | | | |

## Advanced Manufacturing

| Program | Advanced Manufacturing | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Manufacturing Energy Intensity** - Improve manufacturing energy intensity as compared to a 2015 baseline. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | % | % | 7.5 % | 10 % | 12.5 % |
| **Result** | N/A | N/A | 2.45 | 4.9 | **Met** - 7.5 | TBD | TBD |
| **Endpoint Target** | 17.5% improvement by 2022 relative to a 2015 baseline. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | 7.5% cumulative target achieved. 2.5% achieved annually in 2016, 2017 and 2018. Partnering with 15% of manufacturing energy footprint of the United States, supported and validated 2.5% energy intensity reduction. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Result aggregated and verified by EERE from Better Plants partner companies. Publication of FY18 results pending.<br><br>This data is derived from 201 Better Plants partner companies with over 2,900 facilities. These represent 15% of the total U.S. Manufacturing footprint in diverse industries. Energy intensity is calculated either through Cumulative Energy Savings (TBtu) or Cumulative Cost Savings; baseline is aggregate of partner baselines. | | | | | | |

| Program | Advanced Manufacturing | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Rare Earth Magnets** - Reduce the amount of rare earth materials used in magnets (weight % composition). | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | N/A | 10.8 % |
| **Result** | N/A | 36% | 36% | 18% | 18% | N/A | TBD |
| **Endpoint Target** | 3.6% weight composition by 2022 | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Goal is to substitute materials for rare earth permanent magnetic alloy systems while maintaining industrially-relevant magnetic strength of at least 50 MGOe (Mega Gauss Oersteds). 2015 baseline magnetic systems include 36 weight % REE composition, including ~30 weight % neodymium content (NdFeB) and ~6 weight % dysprosium or terbium. Permanent magnets are dependent on Rare Earth Element (REE) materials to enable the conversion of energy between mechanical and electrical forms – an integral property to the functionality of the lightweight, high-power generators and motors found in manufacturing equipment, information technology, defense applications, consumer electronics, and energy technologies such as battery storage, wind turbines, and electric vehicles.<br><br>Historical trend data is shown in the results field above to provide context, even where no formal GPRA Target was published for that year. | | | | | | |

| Program | Advanced Manufacturing | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Conductivity** - Increase electrical conductivity for copper, aluminum, and steel at scale up tests from 50 grams to 5 kg (% increase relative to 2015 baselines) | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Target | N/A | N/A | N/A | N/A | N/A | N/A | 15 % |
| Result | N/A | N/A | N/A | N/A | N/A | N/A | TBD |
| Endpoint Target | 50% increase by 2022 | | | | | | |
| Commentary on 2018 Results (Action Plan if Not Met) | | | | | | | |
| Documentation, Limitations, Methodology, Validation, and Verification | 2015 Baseline for Electrical Conductivity of:<br>Cu: 100% IACS<br>Al: 61% IACS – Different grades of aluminum have different electrical conductivity values. Current state-of-the-art Al1350 (purer grade aluminum) has 61% IACS & SOA of Al6201 (where alloying elements are added to improve its strength) has electrical conductivity of 52.5% IACS. Industry standard for over-head transmission line is Al6201.<br>Fe: 17% IACS<br><br>AMO is funding the development of generalized low cost processes to increase both the thermal and electrical conductivity of a wide range of metals and alloys for thousands of clean energy applications. The scope of the current R&D is targeting the electrical conductivity of copper, aluminum and steel in order to provide effective program management.<br><br>Some Historical Milestones (there are many others, non-quantitative)<br>Mar 2017: Achieved 30% improvement in electrical conductivity of copper -- Micron scale thin film.<br>Aug 2017: Achieved 8% improvement in the electrical conductivity of aluminum -- 5 kg scale.<br>Sept 2018: Achieved 7% improvement in electrical conductivity copper -- 50 gram scale. | | | | | | |

## Building Technologies

| Program | Building Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **HVAC** - Identify technology solutions capable of achieving dehumidification levels with 10% less energy than conventional system. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | 1 Technology Solution Identified | 2 Technology Solutions Identified (Cumulative) |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD |
| **Endpoint Target** | 3 technology solutions (cumulative) by 2021 | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Baseline: Laboratory prototype tested on the ability to dehumidify air at 33 degrees centigrade with 90% relative humidity to 35% relative humidity using 30 kW isothermally and adiabatically. The basis for improvement is: Residential central air conditioners and central air conditioning heat pumps manufactured and distributed in commerce, as defined by 42 U.S.C. 6291(16), must meet the energy conservation standards specified in the Code of Federal Regulations at CFR 430.32(c)(3). Further parameters documented here: https://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=1901&context=iracc.<br><br>Dehumidification accounts for about 40% of the energy consumed by residential and commercial buildings (ASHRAE 2017). Higher performing equipment with enhanced dehumidification capabilities that can operate at part load, or operate at lower cooling set points, are needed. The main challenge with standard AC systems is that the air dew point cannot be lower than the coil temperature, limiting latent cooling and dehumidification. We are trying to address this issue.<br><br>The program will document the identification of a technology solution by publishing a report and later posting a final project report in OSTI (https://www.osti.gov) at the completion of the project. OSTI collects, preserves, and disseminate both unclassified and classified scientific and technical information (STI) emanating from DOE-funded research and development (R&D) activities at DOE.<br><br>Note: For gas-fired dehumidification technologies the above numbers need to be divided by a factor of three to account for the difference between kWh electric vs. kWh thermal. Standards are set according to electric code of federal regulations (as of Dec 28 2017: https://www.ecfr.gov/cgi-bin/text-idx?rgn=div8&node=10:3.0.1.4.18.3.9.2 ). | | | | | | |

| Program | Building Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Lighting** - Increase power conversion efficiency of amber light. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | 13 % | 19 % | 21 % |
| **Result** | N/A | N/A | N/A | 10 | **Met** - 16 | TBD | TBD |
| **Endpoint Target** | 30% power conversion efficiency of amber light by 2025. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Lumileds achieved, in a laboratory prototype specimen, a measured 16% conversion of electric power into amber light. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Verified at the lab and reported to EERE. Publication of FY18 result pending.<br><br>2017 Baseline: 10% power conversion efficiency of amber light.<br><br>To achieve the endpoint target of 350 lm/W of mixed monochromatic white light we need to increase the power conversion efficiency of all four wavelengths (green, amber, red and blue). We are focusing on amber in FY 2019 because it has the most significant technical barriers with the greatest early stage R&D opportunity. Increasing the power conversion efficiency of amber light directly contributes towards lm/W, though it is impossible to calculate by exactly how much.<br><br>FY 2019 target is to achieve, in a laboratory prototype specimen, an increased percent conversion of electric power into amber light (580-595nm) with a 1 mm2 die at current density of 35A/cm2 and junction temperature of 25 C. | | | | | | |

| Program | Building Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Standards** - Issue energy efficiency standards in line with statutory requirements. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Target | N/A | N/A | N/A | N/A | N/A | 3 Standards | 2 Standards |
| Result | 8 | 7 | 12 | 9 | 2 | TBD | TBD |
| Endpoint Target | Standards will be issued in line with the statutorily defined standards review schedule. | | | | | | |
| Commentary on 2018 Results (Action Plan if Not Met) | | | | | | | |
| Documentation, Limitations, Methodology, Validation, and Verification | The energy conservation standards performance goal is based on the statutory requirements and associated deadlines. Additional results in recent years include test procedures for final rules delivered by fiscal year were 7 in FY14, 8 in FY15, 14 in FY16, 8 in FY17 and 1 in FY18. | | | | | | |

## Federal Energy Management Program

| Program | Federal Energy Management Program | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Workforce Development** - Increase total hours of workforce development training provided by FEMP. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | 40,000 hours | 42,500 hours | N/A |
| **Result** | 19,777 | 29,249 | 35,249 | 37,612 | **Exceeded** - 40,731 | TBD | N/A |
| **Endpoint Target** | Measure is discontinued as of FY 2020. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Training was provided through on-demand courses, live in-person workshops, the annual Energy Exchange training event and live/recorded webinar trainings. FEMP provided 17,119 hours of training at the 2018 Energy Exchange event alone. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | All training attendance data is reported monthly to FEMP. The metric, hours of training provided, is calculated using the attendance from each training offering, taking into consideration the type and length of that training format.<br><br>FEMP manages all course and training registration/attendance data through the learning management system developed by the National Institute of Building Science's (NIBS) Whole Building Design Guide. This metric provides FEMP with a clear and weighted measurement of how FEMP training material is being utilized and identifies which courses are most critical. This also is a more useful metric then just simple registration data, since many attendees take multiple courses throughout the year, thus it is critical to capture their attendance as well. | | | | | | |

| Program | Federal Energy Management Program | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Investments** - Total Federal Investment in Facilities Energy Conservation Measures Government-Wide ($Million) | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | $ 750 Million | $ 750 Million | $ 750 Million | $ 1,770 Million | $ 1,770 Million | $ 1,063 Million |
| **Result** | N/A | **Exceeded** - 1,980 | **Exceeded** - 1,735 | **Exceeded** - 1,337 | **Not Met** - 1,356 | TBD | TBD |
| **Endpoint Target** | $8.5 Billion in total efficiency investment over 8 years. $1,063 million annually through 2027 to be invested by Federal agencies Government-wide through direct obligations and through performance contracting (Energy Savings Performance Contracts (ESPCs) and Utility Energy Service Contracts (UESCs)). | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Preliminary data confirms DOE/FEMP Indefinite Delivery, Indefinite Quantity (IDIQ) Energy Savings Performance Contracts (ESPC) and ENABLE awards during FY 2018 totaling $960.15M. The reported investment value of $960.15M only accounts for federal performance contracts recorded as of 10/12/18 and does not account for FY18 federal investment in facilities energy conservation measure funded through direct obligations or UESCs. Funding of investment through direct obligations and UESCs will be reported to DOE in January 2019. Seventeen major agencies projected $395.6 million in direct obligations for efficiency investment for FY 2018 in their FY 2017 Annual Energy Data Reports submitted in January 2018.<br>**Action Plan:** Funding of investment through direct obligations will be reported to DOE around mid FY19. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Preliminary data confirms DOE/FEMP IDIQ ESPC and ENABLE awards during FY 2018 totaling $960.15M. Seventeen major agencies projected $395.6 million in direct obligations for efficiency investment for FY 2018 in their FY 2017 Annual Energy Data Reports submitted in January 2018. Funding of investment through direct obligations will be reported to DOE around mid FY19.<br><br>Agencies report project investment funded through direct obligations and performance contracting annually in their reports to DOE required under 42 U.S.C § 8258(a), however DOE-FEMP does not receive a comprehensive accounting of these investment amounts until the second quarter of the following fiscal year. DOE IDIQ ESPC/UESC performance contracting awards can be accurately reported on a quarterly basis by FEMP, however only direct obligations reported by agencies in the EISA 432 Compliance Tracking System (CTS) can be reported for GPRA progress on a quarterly basis during current fiscal year. Potential cost-effective investment of $8.5 billion has been identified by Federal agencies in CTS. The annual target of $1,063 million in investment is based on the total $8.5 billion in identified divided by the 4-year evaluation cycle and then by the two-year deadline to implement projects ($8.5B / 4 years = $2.125B / 2 years = $1.063B) | | | | | | |

| Program | Federal Energy Management Program | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Private Investment** - Private investment secured as a result of direct FEMP program activity (Cumulative $Million) | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | N/A | $ 400 |
| **Result** | N/A | N/A | N/A | N/A | N/A | N/A | TBD |
| **Endpoint Target** | Between FY2020 and FY2025, document $2 billion of efficiency investment leveraged from private sector to capitalize on efficiency technology cost savings. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Federal efficiency investment from performance contracting awards (ESPC, UESC, etc.) that are a result of FEMP program activity. FEMP activities to support the DOE IDIQ ESPC contracts, ENABLE, and UESC projects help to facilitate non-federal investments to improve the efficiency of federal facilities. This does not include other performance contracts including but not limited to the Army MATOC ESPC or stand-alone performance contracts. | | | | | | |

| Program | Federal Energy Management Program | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Cost Avoided** - Federal facility energy and water costs avoided through lower consumption compared to the prior year (Cumulative $Million) | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | N/A | $ 100 |
| **Result** | N/A | N/A | N/A | N/A | N/A | N/A | TBD |
| **Endpoint Target** | $600 million in cumulative avoided costs between FY2020 and FY 2025 | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | This metric is a calculation of the dollar value of the reduced energy and water use compared to the prior year based on the unit cost of energy and water in the current year. The target is derived from the average cost avoidance (from the prior year) since FY 2003. | | | | | | |

## Weatherization and Intergovernmental Programs

| Program | Weatherization and Intergovernmental Programs | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Retrofits** - Weatherize homes of low income families. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 24,600 homes weatherized | 33,100 homes weatherized | 33,600 homes weatherized | 33,000 homes weatherized | 36,000 Homes Weatherized | 38,000 Homes Weatherized | N/A |
| **Result** | **Exceeded** - 38,000 | **Exceeded** - 34,220 | **Not Met** - 31,370 | **Exceeded** - 37,512 | **Not Met** - 33,643 | TBD | N/A |
| **Endpoint Target** | Measure is discontinued past FY 2019. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Grantees fully reported in December 2018. Target unmet due to a higher cost per unit retrofitted.<br>**Action Plan:** Retrofits will continue as planned. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Grantees don't fully report until December.<br><br>Homes weatherized are reported on a quarterly basis. Reports are due 30 days after the close of the applicable reporting period through PAGE (Performance and Accountability for Grants in Energy) -- the online tool for grant performance reporting. Quarterly reports are quality-reviewed by Project Officers and approved before submission as final data. | | | | | | |

# Electricity

## Transmission Reliability and Resilience

| Program | Transmission Reliability and Resilience | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Transmission Reliability and Resilience** - Demonstrate and implement technologies and tools that improve the monitoring of transmission system health and the ability of operators to respond quickly and effectively to address issues. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 1 Develop a prototype wide-area synchrophasor-based voltage stability tool | Demonstrate an open-source, synchrophasor-based tool that can be used for demonstrating compliance with the frequency response requirements contained in NERC Std BAL-003. | Develop a prototype wide-area synchrophasor-based voltage stability tool | Develop and test methods for validating power system models using real-time data in a real-time environment to support operations and improve reliability. | Continue developing and testing methods for validating power system models using real-time synchrophasor data in a real-time environment to support operations and improve reliability and resiliency. | Develop and test the algorithmic methods for power system recovery/restoration to improve the resiliency of the electric power system. | N/A |
| **Result** | **Met** - 1 | **Met** | **Met** | **Met** | **Met** | TBD | N/A |
| **Endpoint Target** | Realization of a nationwide network of utility-owned synchrophasors with 100% sensor coverage of the transmission system by the end of FY 2020, allowing for complete, real-time monitoring of transmission system health. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Sandia National Laboratories and Bonneville Power Administration (BPA) along with personnel from Montana Tech designed and implemented a PMU-based oscillation detection and damping controller that successfully detects and eliminates oscillations by using the parallel DC line to counter-inject power, resulting in very significant savings. This PMU-based monitoring system transmits data on the health of the Western power grid back to control centers, providing continuous, uninterrupted power. | | | | | | |
| **Comment** | Endpoint target will be met by end of FY 2019 and target is not continued into FY 2020. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | https://phys.org/news/2018-01-smart-grid-technology-decades-problematic.html | | | | | | |

| Program | Transmission Reliability and Resilience | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **North American Energy Resilience Model** - Develop and implement an integrated system of dynamic modeling capabilities that will assist in identification and evaluation of approaches to strengthening the bulk electrical system that supplies critical infrastructure. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | N/A | Build a model for critical infrastructures and develop at least two use cases to study the impact of these infrastructures on electric power system and develop plans. |
| **Result** | N/A | N/A | N/A | N/A | N/A | N/A | TBD |
| **Endpoint Target** | By 2025, develop and test prototype infrastructure resilience modeling platform in real-world environment using dynamic data. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | |

## Resilient Distribution Systems

| Program | Resilient Distribution Systems | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Resilient Distribution Systems** - Develop and validate the technical feasibility of integrated distribution control architectures to effectively provide resilient grid services from all types of distribution assets. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 1 Demonstrate an operational prototype of a smart microgrid including integration of electric vehicles and renewable energy | Complete development of a prototype Microgrid Design Toolset (MDT) that is used by at least one A&E firm for microgrid design analysis. | Release the first generation of a microgrid controller (i.e., Complete System-Level Efficient and Interoperable Solution for Microgrid Integrated Controls, also known as CSEISMIC 1.0) with full documentation of the architecture, device controllers, and a use case with a distribution management system. | Complete development of a design support tool that is used by at least one remote community for designing an AC or DC microgrid for off-grid applications. | Complete development of the Advanced Distribution Management System core analytics engine for the open-source distribution system platform. | Complete real-time simulation testing of a networked microgrid system design, and assess the value associated with resilient grid services. | Demonstrate representative distribution feeder with at least 50% of its control optimizations originating at or below the substation, utilizing distributed energy resource-derived control services in simulation |
| **Result** | **Met** - 1 | **Met** | **Met** | **Met** | **Met** | TBD | TBD |
| **Endpoint Target** | Achievement of a resilient distribution system, with integration of networked microgrids and transactive control signals operating in coordination with the Advanced Distribution Management System, that allows for integration of all types of energy resources by the end of FY 2030 | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Completed release of version 1.0 of GridAPPS-D, an open-source Advanced Distribution Management System (ADMS) application development software platform. Version 1.0 exhibits the core features of an integrated software platform, such as the system architecture, distributed real-time database management, an application programming interface that is based on the Common Information Model (CIM) standard, and a containerized software approach for speedy execution. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | https://github.com/GRIDAPPSD/ | | | | | | |

## Energy Storage

| Program | Energy Storage | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Energy Storage** - Lower the cost of grid-scale (>1 MW) energy storage technologies. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 400 $/kWh for a 4 hour system | 325 $/kWh for a 4 hour system | 300 $/kWh for a 4 hour system (vanadium/vanadium electrolyte) | Transition to new aqueous soluble organic flow systems with the goal of substantial future cost reductions. $350/kWh for a 4-hour system (aqueous soluble organic electrolyte) | $275/kWh for a 4-hour system (aqueous soluble organic electrolyte) | Evaluate improvements to novel aqueous soluble organic flow battery on a prototype scale stack capable of meeting $250/kWh cost target for a projected 1MW/4MWh system operating at 100 mA/cm², a 25% increase in current density | Demonstrate a 2 kW prototype stack of novel aqueous soluble organic flow battery technology capable of achieving scaled up to 200 mA/cm² with a projected 1 MW/4 MWh system cost of less than $225/kWh |
| **Result** | **Met** - 400 | **Met** - 325 | **Met** - 300 | **Met** | **Met** | TBD | TBD |
| **Endpoint Target** | By 2030 deliver a suite of DC storage technologies at less than $50/kWh that can deliver cost-competitive electricity for consumers and utilities. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | In FY 2018, a new aqueous soluble organic (ASO) chemistry was developed for the redox flow battery technology. A pilot scale stack was designed and constructed to maximize the performance at 75 mA/cm²; a pilot scale stack was constructed to demonstrate the improvements in performance. The resulting pilot scale stack achieved target metrics when operated at 75 mA/cm²; a stack energy efficiency of about 70% was achieved and the system cost for a commercial 1MW/4MWh redox flow battery system was projected to be under $275/kWh. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | PNNL Report # PNNL-27269-4: Development of Aqueous Soluble Organic Redox Flow Batteries for Stationary Electrical Energy Storage (in review) | | | | | | |

## Transformer Resilience and Advanced Components

| Program | Transformer Resilience and Advanced Components | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Transformer Resilience and Advanced Components** - Develop tools and technologies that enable the next-generation of grid hardware to be more adaptive, more flexible, self-healing, resilient to all-hazards, reliable, and cost-effective compared to technologies available today, and maximizes the value and lifetimes of current grid components. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | Complete design of a large power transformer with variable impedance of ±5% to increase adaptability | Complete design tool for converters with 5% increase in soft magnetic model accuracy compared to benchmark | Complete evaluation of 1 new material for suitability in high power converters or advanced transformers |
| **Result** | N/A | N/A | N/A | N/A | **Met** | TBD | TBD |
| **Endpoint Target** | By the end of FY 2030, next-generation transformers and converters will be developed that can be utilized in more than 80% of substations cost-effectively while increasing the transformer and converter flexibility and resiliency by 50%. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target achieved. Design of a large power transformer with variable impedance of ±5% to increase adaptability was completed. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Final technical report of projects documents result submitted from performers to program manager and technical project officer. Review of report contents was consistent with progress observed during site visits and feedback provided during project close out meetings. Approved reports are or will be located on OSTI website (including https://www.osti.gov/biblio/1476384-modular-flexible-high-frequency-link-transformer-reduced-device-count-zero-high-side-devices; https://www.osti.gov/biblio/1435970-novel-concept-flexible-resilient-large-power-transformers). | | | | | | |

## Transmission Permitting and Technical Assistance

| Program | Transmission Permitting and Technical Assistance | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Technical Assistance** - Number of states to which the program provides, upon request, assistance in designing and implementing electricity policies, statutes and regulations. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 35 states/tribes assisted | 40 states and tribes assisted | 50 states/tribes assisted | 45 states/tribes assisted | 50 states/tribes assisted | 50 states/tribes assisted | N/A |
| **Result** | **Met** - 35 | **Met** - 40 | **Met** - 50 | **Met** - 45 | **Met** - 50 | TBD | N/A |
| **Endpoint Target** | Increased access to reliable, affordable, and sustainable energy sources. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Comment** | This performance goal is discontinued after FY 2019 and is replaced by a new goal better measuring the effectiveness of the technical assistance provided. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Transmission Permitting and Technical Assistance (TPTA) manages all aspects of the technical assistance (TA) program from inception to closure using best practices in project management. TPTA maintains an internal tracking database that includes all TA requests, project plans, and progress reports. Data is collected from the national laboratories and other entities responsible for conducting the TA on a quarterly basis. TPTA conducts annual reviews on the TA work performed by the national labs and other entities to ensure the goals of their products are being met and future plans are aligned with meeting TPTA's mission. Included in the TPTA technical assistance tracking process are the fifty (50) United States, recognized U.S. territories, U.S. federally recognized Native American tribes, and Instrumentalities of the States. Lawrence Berkeley National Laboratory (LBNL) is the lead laboratory in the technical assistance tracking and the TPTA Program Managers review the reporting and follow up with the labs with any questions in the reported data. | | | | | | |

| Program | Transmission Permitting and Technical Assistance | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Technical Assistance Rating** - Percentage of technical assistance products and services rated as relevant or highly relevant by an Energy Advisory Committee (EAC) subcommittee | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Target | N/A | N/A | N/A | N/A | N/A | N/A | ≥ 90 % |
| Result | N/A | N/A | N/A | N/A | N/A | N/A | TBD |
| Endpoint Target | Annually, at least 90% of technical assistance products and services will be rated as relevant or highly relevant by an EAC subcommittee | | | | | | |
| Commentary on 2018 Results (Action Plan if Not Met) | | | | | | | |
| Documentation, Limitations, Methodology, Validation, and Verification | | | | | | | |

# Cybersecurity, Energy Security, and Emergency Response

## Cybersecurity for Energy Delivery Systems

| Program | Cybersecurity for Energy Delivery Systems | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Cybersecurity** - Develop new protective measures to reduce risks from cyber incidents. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 1 substation control system component | Demonstrate a tool that designs-in enhanced communications security between control centers | Demonstrate a tool that establishes a tailored trustworthy space for one energy delivery field device. | Complete preliminary design of an early stage technology that establishes a tailored trustworthy space for one substation control system component. | Complete preliminary design of an early stage technology for prevention, detection, mitigation, or resilience against cyber incidents in energy delivery systems. | Complete prototype of an early-stage technology for prevention, detection, mitigation, or resilience against cyber incidents in energy delivery systems. | Test-bed demonstrate a technology for prevention, detection, mitigation, or resilience against cyber incidents in energy delivery systems. |
| **Result** | **Met** - 1 | **Met** | **Met** | **Met** | **Met** | TBD | TBD |
| **Endpoint Target** | Continuously advance the vision of reliable and resilient energy delivery systems throughout our Nation that are designed, in stalled, operated, and maintained to survive a cyber incident while sustaining critical functions. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | This FY 2018 target milestone has been met under the Schweitzer Engineering Laboratories (SEL) award #DE-OE0000834 "Chess Master." This project's goal is to provide system operators with a global view of their operational network, enabling them to set and view field network security policy and validate operational adherence to those policies. SEL focused on the design of the security application and the world's first International Electrotechnical Commission (IEC)-style industrial rated Software Defined Networking (SDN) switch, which will be named the SEL-2742S. The product requirements and technical specifications were documented and approved by the team in FY 2018. | | | | | | |
| **Comment** | This performance measure was associated with the Electricity Delivery and Energy Reliability appropriation prior to FY 2019. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | SEL award #DE-OE0000834 "Chess Master" quarterly report submitted by SEL to DOE | | | | | | |

## Infrastructure Security and Energy Reliability (ISER)

| Program | Infrastructure Security and Energy Reliability (ISER) | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **ISER - Informational Awareness** - Improve information sharing among energy sector stakeholders as measured by the number of active accounts in the EAGLE-I platform; both the total number and the diversity of participation from mission partners, e.g., state Emergency Operations Centers. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | 500 active accounts with more than 5% from state and local partners | Achieve 1,000 active accounts with more than 100 from state, local, and private sector partners. | N/A | N/A |
| **Result** | N/A | N/A | N/A | **Met** | **Met** | N/A | N/A |
| **Endpoint Target** | By the end of FY 2018, EAGLE-I will be the predominant source for energy situational awareness for mission partners during an emergency as measured by having more than 1,000 active accounts from all types of stakeholders | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | The EAGLE-I user database indicates 1,559 active EAGLE-I users with 194 of those being state affiliated accounts. | | | | | | |
| **Comment** | This performance measure is not continued into FY 2019.<br>This performance measure was associated with the Electricity Delivery and Energy Reliability appropriation prior to FY 2019. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | EAGLE-I user related information is provided by each user when requesting an EAGLE-I account. All user profile information is stored in the EAGLE-I user database. EAGLE-I administrators analyze reports from the database to determine numbers of active users the number of users associated with specific characteristics. The analysis determines total numbers of total EAGLE-I active users and how many of the active users are associated with U.S. states. State users are sponsored and confirmed by the ISER State, Local, Tribal, Territorial (SLTT) Program Manager.<br><br>The EAGLE-I function for user profile creation validates the user's submitted information before an account is created. The EAGLE-I disables user access when not used more than 90 days. EAGLE-I procedures disable a user account whenever user data becomes inaccurate. Disabled user accounts are not included in the ISER performance result calculations. | | | | | | |

| Program | Infrastructure Security and Energy Reliability (ISER) | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **ISER Situational Awareness Capability** - Improve information sharing among energy sector emergency response stakeholders and mission partners by expanding EAGLE-I situational awareness capabilities. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | Implement an information sharing capability (e.g., web services) with state emergency operations centers. | Expand information sharing capability to include access to damage assessments and predictive modeling. Sharing of actionable predictive information is used to address risk. |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD |
| **Endpoint Target** | By the end of FY 2023, all Federal, state, local, and private sector mission partners will have access to EAGLE-I capabilities for energy sector situational awareness, emergency response, and emergency preparedness. EAGLE-I will provide sharing or integration capabilities with other Federal situational awareness mission partners. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | |

# Fossil Energy Research and Development

## FERD - Natural Gas Technologies

| Program | FERD - Natural Gas Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Natural gas infrastructure research** - Increase the modeled efficiency of natural gas infrastructure as demonstrated by a modeled decrease in fugitive methane emissions by 50%. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | 5 % modeled reduction of fugitive methane emissions | 10 % modeled reduction of fugitive methane emissions |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD |
| **Endpoint Target** | By the end of FY 2022, develop technologies that will reduce modeled fugitive methane emissions from natural gas transmission and distribution infrastructure by 50% to a level of 13.4 MMT CO2 from the current level of 26.7 MMT CO2, as identified in the EPA's Greenhouse Gas Inventory. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | 0% reduction in 2018 due to working on establishing baselines and setting project targets. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | An engineering-based model of the natural gas value chain was developed based on the current state-of-knowledge for the U.S. average natural gas infrastructure fugitive methane emissions and other life cycle environmental attributes. This model assumes the industry adoption of technologies and does not account for Federal and State policy regulations. A memorandum of understanding (MOU) was established with the natural gas industries leading U.S. methane reduction group, ONE Future Coalition, in 2017 to quantify the current fugitive methane reductions achieved by the ONE Future Coalition, to validate the DOE/NETL engineering-based model of the natural gas value chain to technically represent the efficiency of methane reduction strategies, and to identify additional methane reduction opportunities based on the marginal abatement costs benchmarked to current and projected future natural gas prices. A public report documenting the findings of the MOU with the ONE Future Coalition was released on May 1, 2018. Report Title: "Industry Partnerships and their Role in Reducing Natural Gas Supply Chain Greenhouse Gas Emissions". Link to Public Report: https://www.osti.gov/servlets/purl/1457394 | | | | | | |

## FERD - Unconventional FE Technologies

| Program | FERD - Unconventional FE Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Unconventional FE technologies** - Improve modeled unconventional resource recovery efficiency to 12%. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | 10 % modeled recovery efficiency | 11 % modeled recovery efficiency | Establish three field projects focused on improving safe resource recovery from unconventional oil and gas formations |
| **Result** | N/A | N/A | N/A | N/A | –N/A | TBD | TBD |
| **Endpoint Target** | By the end of FY 2022, develop technologies and production methods for unconventional resources to improve modeled recovery efficiency to 12% from the current recovery efficiency level of 10%. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | During FY 2018, basin-specific models were developed based on project-specific data for those basins with Field Laboratories. These models give insights on hydraulic fracturing design parameters and proppant placement for increased ultimate recovery. Each model is baselined on basin recovery efficiencies in place prior to the emplacement of the Field Lab in that basin. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | The Marcellus Shale Energy and Environmental Laboratory (MSEEL) research team developed a model that incorporates detailed information of the natural occurring geological formation to simulate production from hydraulic fracturing in a specific basin. The insight gained from this model provides data and generates knowledge for increasing resource recovery factors in new wells throughout the Marcellus shale. Additionally, this approach can then be applied to other shale plays, incorporating location specific geology. | | | | | | |

## FERD - Coal

| Program | FERD - Coal | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Cost of Energy and CO2 Capture from Advanced Power Systems** - Develop cost-effective, efficient, and reliable CO2 separation technologies and energy conversion technologies that inherently capture CO2, for both new and existing coal-fired power plants. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | Identify material properties to meet transformational goals | Synthesize and develop process models for at least two technology types (e.g., metal organic frameworks and non-binding organic liquid solvents) | Conduct bench-scale testing under actual flue gas conditions of at least one technology type |
| **Result** | N/A | N/A | N/A | N/A | **Met** - 2 | TBD | TBD |
| **Endpoint Target** | By CY 2030, R&D technologies are available to support a new coal-fired power plant with CO2 capture with a cost of electricity at least 30% lower than a supercritical PC with CO2 capture, or approximately $30 per tonne of CO2 captured. By CY 2030, for retrofitting an existing coal-fired power plant with CO2 capture, capture technologies are available to reduce the cost of capture by 30% (actual cost of capture varies for each unit). (Baseline: NETL Cost and Performance Baseline Series; 2012 Capture Technology) | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Two processes were considered: a single- stage membrane process and a two-stage air-sweep. Both systems had to achieve 95% purity of CO2 with a 90% removal efficiency from flue gas in a standardized coal-fired power plant. | | | | | | |
| **Comment** | Typical laboratory and bench-scale R&D projects are conducted in 2-3 year time periods, after which point, systems analyses are conducted to validate current progress against target, and status of the technology in relation to the DOE program goals. Progress against the target will be updated accordingly during that period. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Two processes were considered: a single- stage membrane process and a two-stage air-sweep. Both systems had to achieve 95% purity of CO2 with a 90% removal efficiency from flue gas in a standardized coal-fired power plant. Cost of electricity (COE) was calculated as a function of membrane permeance and selectivity and compared against a base case consisting of a commercially available solvent carbon capture system. The required membrane area was also calculated as a function of membrane performance parameters. Additionally, each of those processes was evaluated with and without compression of the flue gas feed stream, and the influence of flue gas compression on plant efficiency was determined. | | | | | | |

| Program | FERD - Coal | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Power Plant Efficiency Improvements (Existing Plants)** - Increase the average modeled efficiency (heat rate) of existing coal based power plants. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | 31 % | Issue FOA and make 3 awards to improve the efficiency, reliability and flexibility of the existing fleet | Perform a minimum of two studies to improve efficiencies on critical components |
| **Result** | N/A | N/A | N/A | 31 | **Met** - 31 | TBD | TBD |
| **Endpoint Target** | By the end of FY 2022, improve the average modeled efficiency (heat rate) of a typical plant in the existing fleet by 5 percent from the 2017 baseline of 31 percent (i.e., to 32.5%) | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | The original FY 2018 performance goal was to complete the Efficiency Improvement Roadmap to 2030. Typical laboratory and bench-scale R&D projects are conducted in 2-3 year time periods, after which point, systems analyses are conducted to validate current progress against target, and status of the technology in relation to the DOE program goals. Progress against the target will be updated accordingly during that period. | | | | | | |
| **Comment** | The original FY 2018 performance goal was to complete the Efficiency Improvement Roadmap to 2030. Typical laboratory and bench-scale R&D projects are conducted in 2-3 year time periods, after which point, systems analyses are conducted to validate current progress against target, and status of the technology in relation to the DOE program goals. Progress against the target will be updated accordingly during that period. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | The NETL report "Cost and Performance Baseline for Fossil Energy Plants" presents an accurate, independent assessment of the cost and performance of Low-Rank Coal-Fired Power Systems, specifically integrated gasification combined cycle (IGCC), pulverized coal (PC) and circulating fluidized bed (CFB) plants plus natural gas combined cycle (NGCC) plants at different elevations, using a consistent technical and economic approach that accurately reflects current or near term market conditions. Please see report below.<br><br>https://www.netl.doe.gov/projects/files/CostandPerformanceBaselineforFossilEnergyPlantsVolume3ExecSummLowRankCoaltoElect_090111.pdf | | | | | | |

| Program | FERD - Coal | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Power Plant Efficiency Improvements (New Plants)** - Increase the average modeled efficiency (heat rate) of new coal based power plants. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | 38 % | Initiate up to 6 Pre-FEED studies for the CoalFIRST initiative | Perform a minimum of four Pre-FEED studies |
| **Result** | N/A | N/A | N/A | 38 | **Met** - 38 | TBD | TBD |
| **Endpoint Target** | By the end of FY 2023, improve the average modeled efficiency (heat rate) of an advanced or new coal plant by 5 percent from the 2017 baseline of 38 percent (i.e., to 40%). | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | The original FY 2018 target was to complete the Efficiency Improvement Roadmap to 2030. Typical laboratory and bench-scale R&D projects are conducted in 2-3 year time periods, after which point, systems analyses are conducted to validate current progress against target, and status of the technology in relation to the DOE program goals. Progress against the target will be updated accordingly during that period. | | | | | | |
| **Comment** | The original FY 2018 target was to complete the Efficiency Improvement Roadmap to 2030. Typical laboratory and bench-scale R&D projects are conducted in 2-3 year time periods, after which point, systems analyses are conducted to validate current progress against target, and status of the technology in relation to the DOE program goals. Progress against the target will be updated accordingly during that period. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | The NETL report "Cost and Performance Baseline for Fossil Energy Plants" presents an accurate, independent assessment of the cost and performance of Low-Rank Coal-Fired Power Systems, specifically integrated gasification combined cycle (IGCC), pulverized coal (PC) and circulating fluidized bed (CFB) plants plus natural gas combined cycle (NGCC) plants at different elevations, using a consistent technical and economic approach that accurately reflects current or near term market conditions. Please see report below.<br><br>https://www.netl.doe.gov/projects/files/CostandPerformanceBaselineforFossilEnergyPlantsVolume3ExecSummLowRankCoaltoElect_090111.pdf | | | | | | |

| Program | FERD - Coal | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **High-efficiency, low emission (HELE) Power** – Engineering studies of a high-efficiency, low emission (HELE) flexible power system | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | N/A | Complete techno-economic feasibility studies (Pre-FEED studies) |
| **Result** | N/A | N/A | N/A | N/A | N/A | N/A | TBD |
| **Endpoint Target** | By the end of FY 2023, advance at least two engineering studies of advanced high efficiency, low emission (HELE) coal fired systems that have flexible operating capacity to meet baseload and load following requirements needed for the evolving grid. . | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | |

## Petroleum Reserves

| Program | Petroleum Reserves | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Drawdown Readiness** - Ensure the operational readiness of the SPR through the achievement of equal to or greater than 95% of the annual average of monthly maintenance performance and reliability goals. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 95 % of monthly maintenance achieved | 95 % of monthly maintenance achieved | 95 % of monthly maintenance achieved | 95 % of monthly maintenance and accessibility goals achieved | 95 % of monthly maintenance achieved accessibility goals | 95 % of monthly maintenance achieved accessibility goals | 95 % of monthly maintenance achieved accessibility goals |
| **Result** | **Met** - 96.8 | **Met** - 97.6 | **Met** - 98.1 | **Met** - 98.36 | **Met** - 98.23 | TBD | TBD |
| **Endpoint Target** | Achieve 95% of monthly maintenance and accessibility goals in all years. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Data are downloaded and collected monthly through a SAP Plant Maintenance System. Analysis reports are generated from these data and reviewed by Federal staff on monthly basis. Maintenance Performance Appraisal Report scores and narratives are updated and published in PBViews, the official SPR performance measure repository. The data are also reviewed during quarterly Program Reviews conducted between Federal headquarters staff, M&O contractor staff, and Federal field office staff. | | | | | | |

| Program | Petroleum Reserves | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Multi-Year Oil Sales** - Ensure cost efficiency of drawdown operations while meeting mandates of all legislatively directed oil sales. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | Annual drawdown costs < 1.5% of revenue earned | Annual drawdown costs < 1.5% of revenue earned |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD |
| **Endpoint Target** | Achieve annual drawdown costs of <1.5% of revenue earned. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | |

| Program | Petroleum Reserves | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **SPR Modernization Project** - Ensure project schedule and cost efficiency through achievement of satisfactory performance index scores that assess the magnitude of variation from the established schedule and cost baselines. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | ≥ 0.85 on both the Cost and Schedule Performance Index | ≥ 0.85 on both the Cost and Schedule Performance Index |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD |
| **Endpoint Target** | Reach overall ≥ .90 Score on both the Cost and Schedule Performance Index at project closeout. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | |

| Program | Petroleum Reserves | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **SPR Operating Cost** - Ensure the cost efficiency of SPR operations through the achievement of an average overhead operating cost per barrel of crude oil storage capacity of no more than $0.30 per barrel | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | ≤ 0.25 $ operating cost per barrel | ≤ 0.25 $ operating cost per barrel | ≤ 0.3 $ operating cost per barrel | ≤ 0.3 $ operating cost per barrel | ≤ 0.3 $ operating cost per barrel | ≤ 0.3 $ operating cost per barrel | ≤ 0.3 $ operating cost per barrel |
| **Result** | **Met** - 0.239 | **Met** - 0.233 | **Met** - 0.25 | **Met** - 0.248 | **Met** - 0.247 | TBD | TBD |
| **Endpoint Target** | Achieve ≤ $ 0.30 operating cost per barrel. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Cost data are collected through DOE STARS reports and compiled by Federal field office staff. The data are reviewed during quarterly Program Reviews conducted between Federal headquarters staff, M&O contractor staff, and Federal field office staff. | | | | | | |

| Program | Petroleum Reserves | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Sustained (90 day) Drawdown Rate** - Maintain the capability to drawdown the SPR at the design drawdown rate of 4.415 million barrels per day. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 4.25 MMB/Day drawdown readiness rate | 4.25 MMB/Day drawdown readiness rate | 4.22 MMB/Day drawdown readiness rate | 4.2 MMB/Day drawdown readiness rate | 4.13 MMB/Day drawdown readiness rate | 4.13 MMB/Day drawdown readiness rate | 4.21 MMB/Day drawdown readiness rate |
| **Result** | **Met** - 4.25 | **Met** - 4.25 | **Not Met** - 4.1 | **Not Met** - 4.17 | **Not Met** - 4.11 | TBD | TBD |
| **Endpoint Target** | Maintain a 90 day drawdown rate of 4.415 million barrels per day by the end of the Life Extension 2 project. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Program failed to meet its 90-day drawdown target for the following reasons: 1) two caverns at Big Hill were out of service for 8 days in November; 2) a raw water pipeline at Bryan Mound was out of service for 3 days in January; 3) two caverns at Bryan Mound were out of service for 5 days in August; 4) a raw water intake structure suffered a leak at West Hackberry for 6 days in September; and, 5) a 42-inch pipeline that runs from the West Hackberry site to the Sun terminal suffered an outage for 12 days in September, bringing the drawdown rate for the month of September down to 3.62 MMB/day.<br>**Action Plan:** Program is in the beginning stages of implementing a modernization program designed to improve the SPR's aging infrastructure through the construction, maintenance, repair, and replacement of SPR facilities over the course of the next several years. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Data are collected and reviewed through site visits and Readiness and Capability Reports (RECAP reports) that are produced quarterly. The data are also reviewed during quarterly Program Reviews conducted between Federal headquarters staff, M&O contractor staff, and Federal field office staff. | | | | | | |

# Nuclear Energy

## New Nuclear Generation Technologies

| Program | New Nuclear Generation Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Advanced Modeling and Simulation** - Complete 90% of annual integrated program milestones to support deployment of advanced modeling and simulation (M&S) tools that will help solve important Light Water Reactor (LWR) performance and cost issues, accelerate advanced reactor concept development, and support NRC regulatory processes as requested. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | 90 % annual milestones met | 90 % annual milestones met |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD |
| **Endpoint Target** | On an ongoing basis, meet annual targets to enable industry to reduce operational costs and improve market competitiveness of existing Light Water Reactors (LWRs), and to expand commercial deployment of advanced reactors. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | N/A | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Results are documented in signed quarterly performance memos from the Nuclear Energy (NE) program Deputy Assistant Secretary to NE Chief Operating Officer. Milestone completions are tracked and documented in the Program Information Collections System - Nuclear Energy (PICS-NE) system. Completion percentage is calculated as follows: numerator = # of milestones completed. Denominator = # of milestones planned. | | | | | | |

| Program | New Nuclear Generation Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Light Water Reactor Sustainability (LWRS)** - Complete 90% of annual program milestones to improve the reliability and economic performance of existing nuclear plants and further extend their operational life. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 90 % annual program milestones met | 90 % annual program milestones met | 90 % annual program milestones met | 90 % annual program milestones met | 90 % annual milestones met | 90 % annual milestones met | 90 % annual milestones met |
| **Result** | **Met** - 100 | **Met** - 100 | **Met** - 100 | **Met** - 100 | **Met** - 100 | TBD | TBD |
| **Endpoint Target** | NE research, development, and demonstrations will enable the continuing operation of light water reactors. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Completion of the FY2018 LWRS performance milestones documents the transition of the LWRS program to address the economic challenges of the existing nuclear power fleet through modernization of technologies, recapturing design margins, and providing mitigation techniques. Completing each of these milestones lays the groundwork to implement advanced technologies such as digital equipment utilization in safety-related systems and promising mitigation technologies for primary plant components to repair damage experienced at extended operations. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Results are documented in signed quarterly performance memos from the Nuclear Energy (NE) program Deputy Assistant Secretary to NE Chief Operating Officer. Milestone completions are tracked and documented in the Program Information Collections System - Nuclear Energy (PICS-NE) system. Completion percentage is calculated as follows: numerator = # of milestones completed. Denominator = # of milestones planned. | | | | | | |

| Program | New Nuclear Generation Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Nuclear Science User Facilities (NSUF)** - Complete 90% of annual program milestones in order to provide industry, universities, and national laboratories access to unique nuclear energy research capabilities and expertise not normally accessible to the nuclear energy user community. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | 90 % annual milestones met | 90 % annual milestones met |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD |
| **Endpoint Target** | The Nuclear Science User Facilities (NSUF) represents a "prototype laboratory for the future," promoting the use of unique nuclear research facilities and encouraging active university, industry, and laboratory collaboration in relevant nuclear science research. On an ongoing basis, the NSUF, through competitive solicitations, provides a mechanism for research organizations to collaborate, conduct experiments and post-experiment analysis, and utilize high performance computing at facilities not normally accessible to these organizations. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | N/A | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Results are documented in signed quarterly performance memos from the Nuclear Energy (NE) program Deputy Assistant Secretary to NE Chief Operating Officer. Milestone completions are tracked and documented in the Program Information Collections System - Nuclear Energy (PICS-NE) system. Completion percentage is calculated as follows: numerator = # of milestones completed. Denominator = # of milestones planned. | | | | | | |

| Program | New Nuclear Generation Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **ART Activities** - Complete 90% of annual program milestones to support the development of innovative reactor technologies that may offer improved safety, functionality and affordability, and build upon existing nuclear technology and operating experience. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 90 % of annual program milestones met | 90 % of annual program milestones met | 90 % of annual program milestones met | 90 % annual milestones met | 90 % annual milestones met | 90 % annual milestones met | 90 % annual milestones met |
| **Result** | **Not Met** - 88 | **Met** - 91 | **Met** - 94 | **Met** - 100 | **Met** - 98 | TBD | TBD |
| **Endpoint Target** | Advanced Reactor Technologies (ART) performance endpoints range from the mid-term (2030s) to very long term. ART is focused on high value research for long-term concepts, R&D needs of promising mid-range concepts, and development of innovative technologies that benefit multiple concepts and stimulation of new ideas for transformational future concepts. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Completion of the ART milestones increases the readiness of several advanced reactor concepts for deployment in the 2030s timeframe and helps ensure the resilience of the energy supply for the future. Completion of milestones also enhances the readiness of technologies that will support advanced reactor concepts such as materials, energy conversion systems, and computational methods. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Results are documented in signed quarterly performance memos from the Nuclear Energy (NE) program Deputy Assistant Secretary to NE Chief Operating Officer. Milestone completions are tracked and documented in the Program Information Collections System - Nuclear Energy (PICS-NE) system. Completion percentage is calculated as follows: numerator = # of milestones completed. Denominator = # of milestones planned. | | | | | | |

| Program | New Nuclear Generation Technologies | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Fuel Cycle R&D (FCR&D)** - Complete 90% of annual program milestones that advance fuel cycle technologies in order to support the enhanced availability, economics, safety, and security of nuclear-generated electricity in the United States. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 90 % of annual milestones met | 90 % of annual milestones met | 90 % of annual milestones met | 90 % annual milestones met | 90 % annual milestones met | 90 % annual milestones met | 90 % annual milestones met |
| **Result** | **Met** - 98 | **Met** - 94 | **Met** - 96 | **Met** - 96 | **Met** - 100 | TBD | TBD |
| **Endpoint Target** | Perform long-term R&D on advanced technologies that could lead to the next generation of sustainable fuel cycle options that have the potential to improve resource utilization and energy generation, reduce waste generation, enhance safety, and limit proliferation risk. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Completion of Advanced Fuels milestones provided important support to the fuel vendors developing accident tolerant fuel. That fuel will enhance the availability, economics, and safety of the existing fleet of U.S. commercial reactors. The test train in the central water loop of the Advanced Test Reactor was installed and is now in operation. The transient test reactor (TREAT) underwent prescription testing and analysis in preparation for testing fuel samples to demonstrate safe performance in accident conditions. Completion of System Analysis and Integration milestones supports the advanced reactor pipeline with technology system readiness assessments, updated fuel cycle cost algorithms, and performance analyses of innovative nuclear energy systems. Completed milestones within Material Recovery and Waste Form Development include completing the lab scale tests of the CoDeContamination (CoDCon) process and significantly contributing to the improvement of current back end of the nuclear fuel cycle. The CoDCon Process studies provided critical information in demonstrating advanced control capabilities with improved accountability potential and advanced co-conversion technology. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Results are documented in signed quarterly performance memos from the Nuclear Energy (NE) program Deputy Assistant Secretary to NE Chief Operating Officer. In addition to the memo, a copy of the documentation supporting each milestone is located in the Idaho National Laboratory Document Management System. Completion percentage is calculated as follows:<br>Numerator = # of milestones completed. Denominator = # of milestones planned. | | | | | | |

## Nuclear Infrastructure

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Program** | Nuclear Infrastructure | | | | | | |
| **Performance Goal (Measure)** | **Facility Availability - Idaho Facilities Management Program** - Enable nuclear research and development activities by providing operational facilities and capabilities, as measured by availability percentages. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 80 % availability | 80 % availability | 80 % availability | 80 % availability | 80 % availability | 80 % availability | 80 % availability |
| **Result** | **Not Met** - 77 | **Not Met** - 77 | **Met** - 82.6 | **Not Met** - 76 | **Met** - 86 | TBD | TBD |
| **Endpoint Target** | Maintain the percentage of facilities and capabilities that are available for research and development activities at 90% or better. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Facility availability at the Advanced Test Reactor (ATR) improved this year compared to last year. Outage performance improved, resulting in operations that more closely followed the published Integrated Strategic Operation Plan for the ATR. Efforts continue to improve system reliability, such as replacement of Motor Control Centre (MCC) E-12, South Safety Rod replacement and various Nuclear Instrumentation improvements. FY 2018 was the best operational year for the ATR since FY 2002. Work at the Materials and Fuels Complex (MFC) continues to address legacy equipment and facility issues to ensure facility availability and equipment reliability are as high as feasible. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Performance Memorandum provided by the Director, Idaho Facilities Management (IFM), dated October 10, 2018, providing performance information of IFM Facility Availability and IFM Line Item Construction Projects for FY 2018. Percentage is attained by dividing the number of Effective Full Power Days (EFPD) numerator by the number of scheduled EFPDs denominator. | | | | | | |

| Program | Nuclear Infrastructure | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Plant and Construction: Cost and Schedule Baseline Variance** - Execute line item construction projects within approved cost profiles and schedules, using cost performance index and schedule performance index (using earned value management systems), with the green level maintaining indexes between 0.9 and 1.10, the yellow level between 0.8 and 1.20 and the red level less than 0.8 or greater than 1.20. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 80 % of projects with cost performance indexes and schedule performance indexes between 0.9 and 1.15 | 80 % of projects with cost performance indexes and schedule performance indexes between 0.9 and 1.15 | 90 % of projects with cost performance indexes and schedule performance indexes between 0.9 and 1.15 | 90 % of projects with cost performance indexes and schedule performance indexes between 0.9 and 1.15 | 90 % of projects with cost performance indexes and schedule performance indexes between 0.9 and 1.15 | 90 % of projects with cost performance indexes and schedule performance indexes between 0.9 and 1.15. | 90 % of projects with cost performance indexes and schedule performance indexes between 0.9 and 1.15. |
| **Result** | **Not Met** - 0.9 | **Met** - 100 | **Met** - 100 | **Met** - 100 | **Met** - 100 | TBD | TBD |
| **Endpoint Target** | Maintain the total percentage of projects with good cost and schedule indexes at 90% or better. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | One baselined project, the Remote-Handled Low-Level Waste (RHLLW) Disposal Facility Project, was tracked. This project was completed in 4th quarter FY 2018, successfully obtaining Project Management Executive approval of CD-4 six months ahead of schedule and approximately $4.5 million under budget per the approved performance baseline. The completed RHLLW Disposal Facility provides for the continued capability to dispose of RHLLW, ensuring the continuity of operations for both the office of Nuclear Energy and Naval Reactors missions at the Idaho National Laboratory. Now that this project is complete, it will no longer be tracked. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Performance Memorandum provided by the Director, Idaho Facilities Management (IFM), dated October 10, 2018, providing performance information of IFM Facility Availability and IFM Line Item Construction Projects for FY 2018. In FY2018, DOE-Idaho tracked only one baselined project, the Remote-Handled Low-Level Waste Disposal Facility Project. This project is now complete (achieved CD-4) and will no longer be tracked. | | | | | | |

# Environmental Management

## Nuclear Materials and Tank Waste

| Program | Nuclear Materials and Tank Waste | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Enriched Uranium Packaged** - Increase the cumulative number of certified containers packaged and ready for long-term storage | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 8,016 containers | 8,016 containers | 8,016 containers | 8,016 containers | 8,016 containers | 8,016 containers | 8,052 containers |
| **Result** | **Met** - 8,016 | **Met** - 8,016 | **Met** - 8,016 | **Met** - 8,016 | **Met** - 8,016 | TBD | TBD |
| **Endpoint Target** | This metric has a life cycle of 8,603 containers ready for long-term storage. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | To validate and verify program performance, the EM program conducts various internal and external reviews and audits. EM's programmatic activities are subject to continuing reviews by the Congress, the Government Accountability Office, the Department's Inspector General, the Nuclear Regulatory Commission, U.S. Environmental Protection Agency, state environmental and health agencies, the Defense Nuclear Facilities Safety Board, and the Office of Project Management. | | | | | | |

| Program | Nuclear Materials and Tank Waste | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Liquid Waste Eliminated** - Increase the cumulative volume of radioactive liquid waste (including other forms such as sludge) eliminated from inventory. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 7,343 thousand gallons | 7,592 thousand gallons | 7,426 thousand gallons | 7,684 thousand gallons | 7,867 thousand gallons | 8,047 thousand gallons | 10,909 thousand gallons |
| **Result** | **Not Met** - 6,592 | **Not Met** - 6,863 | **Not Met** - 7,342 | **Not Met** - 7,414 | **Not Met** - 7,523 | TBD | TBD |
| **Endpoint Target** | This metric has a life cycle estimate of 102,095 thousands of gallons eliminated from inventory. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target not met due to outage for Savannah River Site (SRS) Defense Waste Processing Facility (DWPF) melter replacement and Salt Waste Processing Facility (SWPF) tie-ins, and unplanned outages due to lightning strikes, H-Tank Farm feed wiring failure and pig launcher valve failure. **Action Plan:** DWPF resumed operations in June and worked to increase capacity over the rest of the fiscal year. Expectation is that future targets will be met. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | To validate and verify program performance, the EM program conducts various internal and external reviews and audits. EM's programmatic activities are subject to continuing reviews by the Congress, the Government Accountability Office, the Department's Inspector General, the Nuclear Regulatory Commission, U.S. Environmental Protection Agency, state environmental and health agencies, the Defense Nuclear Facilities Safety Board, and the Department's Office of Project Management. Also, for this specific metric, the EM Program uses Quality Assurance Inspection Records for waste packaging to validate and verify program performance. | | | | | | |

| Program | Nuclear Materials and Tank Waste | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Liquid Waste Tanks Closed** - Increase the cumulative number of liquid waste tanks closed. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 13 tanks closed | 15 tanks closed | 15 tanks closed | 15 tanks closed | 15 tanks closed | 15 Tanks Closed | 15 tanks closed |
| **Result** | **Met** - 13 | **Not Met** - 14 | **Met** - 15 | **Met** - 15 | **Met** - 15 | TBD | TBD |
| **Endpoint Target** | This metric has a life cycle estimate of 239 tanks closed. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Comment** | The target for this metric has not increased from the prior year as no tank closures are planned in FY 2019 or FY 2020. Progress toward increasing the number of liquid waste tanks closed extends beyond FY 2020. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | To validate and verify program performance, the EM program conducts various internal and external reviews and audits. EM's programmatic activities are subject to continuing reviews by the Congress, the Government Accountability Office, the Department's Inspector General, the Nuclear Regulatory Commission, U.S. Environmental Protection Agency, state environmental and health agencies, the Defense Nuclear Facilities Safety Board, and the Department's Office of Project Management. Also, for this specific metric, Verification of completion of the tank closure corporate performance metric may be demonstrated through the site's satisfactory compliance with the state's permit requirements for the tank once filled with grout. | | | | | | |

| Program | Nuclear Materials and Tank Waste | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Depleted and Other Uranium (DU&U) Packaged for Disposition** - Increase the cumulative amount of DU&U packaged in a form suitable for disposition | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 68,730 metric tons | 93,624 metric tons | 97,256 metric tons | 88,721 metric tons | 113,306 metric tons | 102,698 metric tons | 131,948 metric tons |
| **Result** | **Not Met** - 68,624 | **Not Met** - 79,232 | **Not Met** - 80,221 | **Not Met** - 88,306 | **Not Met** - 93,698 | TBD | TBD |
| **Endpoint Target** | This metric has a life cycle estimate of 838,031 metric tons of DU & U packaged for disposition. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target not met due to maintenance and operational issues at the Portsmouth and Paducah Sites. All three conversion lines at Portsmouth and all four conversion lines at Paducah were returned to service in September 2018.<br>**Action Plan:** Operation of all seven conversion lines is expected to meet the FY 19 targets. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | To validate and verify program performance, the EM program conducts various internal and external reviews and audits. EM's programmatic activities are subject to continuing reviews by the Congress, the Government Accountability Office, the Department's Inspector General, the Nuclear Regulatory Commission, U.S. Environmental Protection Agency, state environmental and health agencies, the Defense Nuclear Facilities Safety Board, and the Office of Project Management. EM also maintains a variety of sources for validation and verification. Specific results for this metric are listed in the Daily Production Report produced by the Depleted Uranium Hexafluoride Conversion operating contractor for both the Portsmouth and Paducah sites. | | | | | | |

| Program | Nuclear Materials and Tank Waste | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Spent Nuclear Fuel Packaged for Final Disposition** - Increase the cumulative amount of heavy metal mass of spent nuclear fuel packaged and ready for final disposition. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 2,128 metric tons of heavy metal | 2,130 metric tons of heavy metal | 2,130 metric tons of heavy metal | 2,131 metric tons of heavy metal | 2,132 metric tons of heavy metal | 2,132.58 metric tons of heavy metal | 2,132.58 metric tons of heavy metal |
| **Result** | **Met** - 2,130 | **Met** - 2,130 | **Met** - 2,130 | **Met** - 2,131 | **Met** - 2,131 | TBD | TBD |
| **Endpoint Target** | This metric has a life cycle estimate of 2,451 metric tons of heavy metal mass of spent nuclear fuel packaged and ready for final disposition. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | There is no real variance in terms of Metric Tons of Heavy Metal (MTHM). The apparent variance is due to the fact that an average MTMH is used to estimate annual amounts, but actual MTHM varies for every fuel element and is not known until a bundle is shipped and measured. | | | | | | |
| **Comment** | The target for this metric has not increased from FY 2019 to FY 2020 as no spent nuclear fuel packaging is planned in FY 2020. Progress toward increasing the amount of spent nuclear fuel ready for final disposition extends beyond FY 2020. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | To validate and verify program performance, the EM program conducts various internal and external reviews and audits. EM's programmatic activities are subject to continuing reviews by the Congress, the Government Accountability Office, the Department's Inspector General, the Nuclear Regulatory Commission, U.S. Environmental Protection Agency, state environmental and health agencies, the Defense Nuclear Facilities Safety Board, and the Department's Office of Project Management. | | | | | | |

| Program | Nuclear Materials and Tank Waste | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **High Level Waste Packaged for Final Disposition** - Increase the cumulative number of high level waste canisters packaged for disposition. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 4,153 canisters of high level waste | 4,405 canisters of high level waste | 4,393 canisters of high level waste | 4,426 canisters of high level waste | 4,476 canisters of high level waste | 4,482 canisters of high level waste | 4,650 canisters of high level waste |
| **Result** | **Met** - 4,154 | **Not Met** - 4,241 | **Not Met** - 4,374 | **Met** - 4,426 | **Not Met** - 4,438 | TBD | TBD |
| **Endpoint Target** | This measure has a life cycle estimate of 24,852 canisters packaged for disposition. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target not met due to outage for Savannah River Site (SRS) Defense Waste Processing Facility (DWPF) melter replacement and Salt Waste Processing Facility (SWPF) tie-ins, and unplanned outages due to lightning strikes, H-Tank Farm feed wiring failure and pig launcher valve failure. **Action Plan:** DWPF resumed operations in June and worked to increase capacity over the rest of the fiscal year. Expectation is that future targets will be met. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | To validate and verify program performance, the EM program conducts various internal and external reviews and audits. EM's programmatic activities are subject to continuing reviews by the Congress, the Government Accountability Office, the Department's Inspector General, the Nuclear Regulatory Commission, U.S. Environmental Protection Agency, state environmental and health agencies, the Defense Nuclear Facilities Safety Board, and the Department's Office of Project Management. EM also maintains shift reports from the Defense Waste Processing Facility as a source for validation and verification of specific results for this metric. | | | | | | |

## Waste Management

| Program | Waste Management | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Legacy and Newly Generated LLW and Mixed LLW Disposed** - Increase the cumulative amount of legacy and newly generated low-level and mixed low-level waste disposed. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 1,298,854 cubic meters | 1,305,096 cubic meters | 1,337,349 cubic meters | 1,340,981 cubic meters | 1,356,517 cubic meters | 1,388,723 cubic meters | 1,485,320 cubic meters |
| **Result** | **Not Met** - 1,292,571 | **Met** - 1,315,101 | **Not Met** - 1,330,550 | **Exceeded** - 1,343,369 | **Exceeded** - 1,364,142 | TBD | TBD |
| **Endpoint Target** | This metric has a life cycle estimate of 1,628,083 cubic meters disposed. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | To validate and verify program performance, the EM program conducts various internal and external reviews and audits. EM's programmatic activities are subject to continuing reviews by the Congress, the Government Accountability Office, the Department's Inspector General, the Nuclear Regulatory Commission, U.S. Environmental Protection Agency, state environmental and health agencies, the Defense Nuclear Facilities Safety Board, and the Department's Office of Project Management. For this specific metric the EM Program uses shipping manifests for the transport of waste to verify and validates this metric. | | | | | | |

| Program | Waste Management | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Transuranic Waste Dispositioned** - Increase the cumulative amount of transuranic (TRU) waste (consisting of Remote Handled TRU and Contact Handled TRU) dispositioned. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | = 102,591 cubic meters | 102,591 cubic meters | 102,026 cubic meters | 103,750 cubic meters | 107,456 cubic meters | 107,878 cubic meters | 114,504 cubic meters |
| **Result** | **Not Met** - 99,179 | **Not Met** - 102,026 | **Met** - 103,442 | **Exceeded** - 104,068 | **Not Met** - 106,753 | TBD | TBD |
| **Endpoint Target** | This metric has a life cycle estimate of 150,055 cubic meters of TRU waste dispositioned. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target not met due to operational problems at the Transuranic (TRU) waste retrieval and treatment facilities at the Idaho Site.<br>**Action Plan:** After evaluating options for increasing the performance rate, the Idaho Site has improved the rate at which it dispositions TRU waste; it is currently ahead of schedule and expects to meet its FY 2019 Performance Target. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | To validate and verify program performance, the EM program conducts various internal and external reviews and audits. EM's programmatic activities are subject to continuing reviews by the Congress, the Government Accountability Office, the Department's Inspector General, the Nuclear Regulatory Commission, U.S. Environmental Protection Agency, state environmental and health agencies, the Defense Nuclear Facilities Safety Board, and the Department's Office of Project Management. For this specific metric the EM Program uses shipping manifests for the transport of waste to verify and validates this metric | | | | | | |

## Site Restoration

| Program | Site Restoration | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Nuclear Facilities Completed** - Increase the cumulative number of nuclear facilities completed. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 138 facilities | 153 facilities | 160 facilities | 157 facilities | 157 facilities | 158 facilities | 166 facilities |
| **Result** | **Met** - 146 | **Not Met** - 151 | **Not Met** - 151 | **Not Met** - 152 | **Not Met** - 152 | TBD | TBD |
| **Endpoint Target** | This metric has a life cycle estimate of 491 facilities completed. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target not met because work at several Hanford Site facilities was shut down by a Stop Work Order due to safety concerns.<br>**Action Plan:** The PFP safety issues resulting in the December 2017 stop work were resolved and in September 2018, controlled, phased building demolition recommenced. Demolition is on schedule to complete the remaining Plutonium Finishing Plant buildings in September 2019. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | To validate and verify program performance, the EM program conducts various internal and external reviews and audits. EM's programmatic activities are subject to continuing reviews by the Congress, the Government Accountability Office, the Department's Inspector General, the Nuclear Regulatory Commission, U.S. Environmental Protection Agency, state environmental and health agencies, the Defense Nuclear Facilities Safety Board, and the Department's Office of Project Management. EM maintains a variety of sources for validation and verification of specific results for this metric: Decommissioning Project Final Report as well as state and federal regulator acceptance of completion report. | | | | | | |

| Program | Site Restoration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Industrial Facilities Completed** - Increase the cumulative number of industrial facilities completed. | | | | | | |
| Fiscal Year | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Target | 2,070 facilities | 2,107 facilities | 2,119 facilities | 2,162 facilities | 2,184 facilities | 2,301 facilities | 2,418 facilities |
| Result | **Met** - 2,095 | **Met** - 2,109 | **Met** - 2,144 | **Not Met** - 2,157 | **Exceeded** - 2,243 | TBD | TBD |
| Endpoint Target | This metric has a life cycle estimate of 4,271 facilities completed. | | | | | | |
| Commentary on 2018 Results (Action Plan if Not Met) | | | | | | | |
| Documentation, Limitations, Methodology, Validation, and Verification | To validate and verify program performance, the EM program conducts various internal and external reviews and audits. EM's programmatic activities are subject to continuing reviews by the Congress, the Government Accountability Office, the Department's Inspector General, the Nuclear Regulatory Commission, U.S. Environmental Protection Agency, state environmental and health agencies, the Defense Nuclear Facilities Safety Board, and the Department's Office of Project Management. EM maintains a variety of sources for validation and verification for this metric: Decommissioning Project Final Reports as well as State and Federal regulator acceptance of completion report. | | | | | | |

| Program | Site Restoration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Remediation Completed** - Increase the cumulative number of release sites remediated. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 8,035 release sites | 8,201 release sites | 8,340 release sites | 8,205 release sites | 8,339 release sites | 8,345 release sites | 9,072 release sites |
| **Result** | **Not Met** - 7,945 | **Not Met** - 8,047 | **Not Met** - 8,159 | **Exceeded** - 8,258 | **Not Met** - 8,272 | TBD | TBD |
| **Endpoint Target** | This metric has a life cycle estimate of 11,715 release sites remediated. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target was not met due to the change in contractor at Los Alamos National Laboratory (LANL) in April 2018 and subsequent delay to allow reassessment of the cleanup strategy.<br>**Action Plan:** The new contractor is expected to complete assessment of the strategy and develop a new baseline by the end of June 2019. FY 2019 and FY 2020 targets will be adjusted to reflect the new baseline. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | To validate and verify program performance, the EM program conducts various internal and external reviews and audits. EM's programmatic activities are subject to continuing reviews by the Congress, the Government Accountability Office, the Department's Inspector General, the Nuclear Regulatory Commission, U.S. Environmental Protection Agency, state environmental and health agencies, the Defense Nuclear Facilities Safety Board, and the Department's Office of Project Management. The EM Program also maintains a means of documenting this specific performance metric: state and federal regulator acceptance of the Remedial Action Report. | | | | | | |

| Program | Site Restoration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Radioactive Facilities Completed** - Increase the cumulative number of radioactive facilities completed. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 561 facilities | 563 facilities | 581 facilities | 577 facilities | 579 facilities | 597 facilities | 613 facilities |
| **Result** | **Met** - 561 | **Met** - 565 | **Not Met** - 567 | **Not Met** - 571 | **Exceeded** - 583 | TBD | TBD |
| **Endpoint Target** | This metric has a life cycle estimate of 956 facilities completed. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | To validate and verify program performance, the EM program conducts various internal and external reviews and audits. EM's programmatic activities are subject to continuing reviews by the Congress, the Government Accountability Office, the Department's Inspector General, the Nuclear Regulatory Commission, U.S. Environmental Protection Agency, state environmental and health agencies, the Defense Nuclear Facilities Safety Board, and the Department's Office of Project Management. EM maintains a variety of sources for validation and verification of specific results for this metric: Decommissioning Project Final Report as well as state and federal regulator acceptance of completion report. | | | | | | |

| Program | Site Restoration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Geographic Sites Completed** - Increase the cumulative number of sites completed. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 91 sites | 91 sites | 91 sites | 91 sites | 91 sites | 91 sites | 92 sites |
| **Result** | **Met** - 91 | **Met** - 91 | **Met** - 91 | **Met** - 91 | **Met** - 91 | TBD | TBD |
| **Endpoint Target** | This metric has a life cycle estimate of 107 geographic sites completed in their entirety. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Comment** | A site is completed when active remediation has concluded in accordance with the terms and conditions of the sites' cleanup agreements (e.g. Records of Decision and permits). Stewardship or non-EM activities may be ongoing after site completion.<br><br>No sites targeted for completion in FY 2018 or FY 2019. Brookhaven National Laboratory is planned for completion in FY 2020. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | To validate and verify program performance, the EM program conducts various internal and external reviews and audits. EM's programmatic activities are subject to continuing reviews by the Congress, the Government Accountability Office, the Department's Inspector General, the Nuclear Regulatory Commission, U.S. Environmental Protection Agency, state environmental and health agencies, and the Defense Nuclear Facilities Safety Board. Sources for validation and verification of specific results for this metric can be found in documents regarding the transfer of the targeted site to the appropriate Program Secretarial Office (e.g., Office of Science, Office of Nuclear Energy, Office of Legacy Management, etc.), the Government Accountability Office, the Department's Inspector General, the Nuclear Regulatory Commission, U.S. Environmental Protection Agency, state environmental and health agencies, the Defense Nuclear Facilities Safety Board, and the Department's Office of Project Management. | | | | | | |

# Legacy Management

## Legacy Management

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Program** | Legacy Management | | | | | | |
| **Performance Goal (Measure)** | **Environmental Remedies** - Conduct surveillance and maintenance activities to ensure the effectiveness of cleanup remedies in accordance with legal agreements or identify sites subject to additional remedial action in order to ensure effectiveness at all sites within Legacy Management's responsibility. The sites within Legacy Management's responsibility includes sites that were remedied under the Formerly Utilized Sites Remedial Action Program (FUSRAP), Defense Decontamination and Decommissioning Program (D&D), Comprehensive Environmental Response, Compensation, and Liability Act of 1978 (CERCLA), Resource Conservation and Recovery Act (RCRA), Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), and other sites. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | = 89 sites | = 90 sites | = 90 sites | = 93 Sites | = 97 Sites | = 98 sites | = 103 Sites |
| **Result** | **Met** - 89 | **Met** - 90 | **Met** - 91 | **Not Met** - 92 | **Not Met** - 92 | TBD | TBD |
| **Endpoint Target** | Inspections will continue indefinitely. Inspection of 100 percent of the sites will continue to be the goal. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Performance target was not accomplished because 5 sites scheduled to be transferred to DOE Office of Legacy Management (LM) did not transfer. Originally in the Spring of 2017 LM was planning to transfer 5 sites by the end of FY18 to bring the total of sites to 97 sites. However, those 5 sites did not transfer for the following reasons: 1) LM and the Nuclear Regulatory Commission (NRC) could not agree on Long-Term Care Fees, and 2) the required reviews and real property actions were not completed.<br>**Action Plan:** LM and NRC have established reoccurring meetings to overcome difficulties with the site transitions. In addition, LM will be conducting a more thorough review of scheduled work to plan more realistic transition date. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | LM Blue Book - This is the Annual LM Site Management Guide that details the sites that have been transitioned to LM and when sites are scheduled to transition to LM. The Site Management Guide is the control document for all site count information. | | | | | | |

| Program | Legacy Management | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Surveillance and Maintenance Cost** - Reduce the cost of performing long-term surveillance and monitoring (LTS&M) activities while meeting all regulatory requirements to protect human health and the environment. Reduction is measured in percent from the life-cycle baseline. Goal is a 2 percent reduction below the baseline each year. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 2 percent reduction | ≥ 2 percent reduction | ≥ 2 percent reduction | ≥ 2 percent reduction | ≥ 2 Percent Reduction | ≥ 2 percent reduction | ≥ 2 Percent reduction |
| **Result** | **Exceeded** - 7.9 | **Met** - 2 | **Met** - 14.4 | **Met** - 2 | **Met** - 2 | TBD | TBD |
| **Endpoint Target** | Achieve a 2 percent reduction below the baseline each year. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Quarterly Post-Competition Accountability Report (PCAR) submittals. This report details on a Quarterly basis LM's success in reducing the costs of LTS&M. | | | | | | |

# Office of Science

## Advanced Scientific Computing Research

| Program | Advanced Scientific Computing Research | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **ASCR Facility Operations** - Average achieved operation time of ASCR user facilities as a percentage of total scheduled annual operation time | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | ≥ 90 % | ≥ 90 % | ≥ 90 % | ≥ 90 % | ≥ 90 % | ≥ 90 % | ≥ 90 % |
| **Result** | **Met** | **Met** | **Met** | **Met** | **Met** | TBD | TBD |
| **Endpoint Target** | Many of the research projects that are undertaken at the Office of Science's scientific user facilities take a great deal of time, money, and effort to prepare and regularly have a very short window of opportunity to run. If the facility is not operating as expected the experiment could be ruined or critically setback. In addition, taxpayers have invested millions or even hundreds of millions of dollars in these facilities. The greater the period of reliable operations, the greater the return on the taxpayers' investment. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target met. Achieved operating time was 98.9% of scheduled operating time. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Quarterly and EOY:<br><br>This data comes directly from the batch queue accounting system at the National Energy Research Scientific Computing (NERSC) facility, Oak Ridge Leadership Computing Facility (OLCF), and Argonne Leadership Computing Facility (ALCF). The number of unavailable CPU hours are accounted for by system failures and other unscheduled downtime. Reports detailing this progress reside in the files of the ASCR Office (SC-21). | | | | | | |

| Program | Advanced Scientific Computing Research | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **ASCR Research** - Discovery of new applied mathematics and computer science tools and methods that enable DOE applications to deliver scientific and engineering insights with a significantly higher degree of fidelity and predictive power | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | Support at least two new teams to conduct fundamental computer science research and at least three applied mathematics research teams that address issues of fault tolerance or energy management for next-generation computing systems. | Conduct an external peer review of the three original co-design centers to document progress, impact, and lessons learned. | Fund two teams to develop exascale node designs. | Identify at least one multi-institutional team to develop new mathematics for DOE mission focused grand challenges at the nexus of multiple computational sub-domains such as data-driven discovery, multiscale modeling, uncertainty quantification, and adaptive algorithms. | Support at least two new efforts in Quantum Information Sciences. | Support at least two new efforts to advance the mathematical methods or computer science underpinnings of Artificial Intelligence techniques for scientific simulations and big data applications. | Recompete the SciDAC Institutes and identify at least one fundable team. |
| **Result** | **Met** | **Met** | **Met** | **Met** | **Met** | TBD | TBD |
| **Endpoint Target** | Develop and deploy high-performance computing hardware and software systems through exascale platforms | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target met. Two new Quantum Testbed awards and three new Quantum Pathfinder awards were made and announced September 2018. https://www.energy.gov/articles/department-energy-announces-218-million-quantum-information-science | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Quarterly and EOY: Research effort tracked through annual progress reports and quarterly program manager review of project accomplishments. Documents are stored in ASCR files. New awards will be documented through the Portfolio Analysis and Management System (PAMS). | | | | | | |

## Basic Energy Sciences

| Program | Basic Energy Sciences | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **BES Research** - Conduct discovery-focused research to increase our understanding of matter, materials and their properties | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | Expand computational materials and chemical discovery through increased data production and additional online computational resources: add electronic properties data for 7,000 compounds, elastic properties data for 3,000 compounds and reaction energies for 10,000 catalytic reactions to publicly available databases; add new or expanded functionality to on-line, high performance computer software/codes for prediction of materials properties. | Expand computational materials and chemical discovery through increased data production and open source software: (1) add 2000 adsorption energies for chemicals in nanoporous materials to publically available databases; (2) add new or expanded functionality to 10 online, high performance computer software/codes for prediction of materials and chemical properties. | Determine how defects affect the stability of four (4) classes of energy storage materials and their ability to sustain fast ion transport for multiply charged ions (e.g., Mg+2). |
| **Result** | N/A | N/A | N/A | N/A | **Met** | TBD | TBD |
| **Endpoint Target** | Understand, predict, and ultimately control matter and energy at the electronic, atomic, and molecular levels | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target met. The Materials Project has added electronic properties for over 83,000 compounds and elastic tensor properties to 7,000 compounds. At SUNCAT the repository of surface reaction energies is now online at its web site. The repository currently contains over 100,000 surface reaction energies. | | | | | | |

| | |
|---|---|
| **Documentation, Limitations, Methodology, Validation, and Verification** | The Materials Project at Lawrence Berkeley National Laboratory is responsible for the electronic structure and elastic properties data and the new software/code functionality. The SUNCAT Center at Stanford and SLAC is responsible for the catalytic reaction energy data. Performance is evaluated by standard Office of Science peer review criteria and monitored by quarterly progress reports. Documentation on the peer reviews and quarterly progress reports resides in files in the BES program office (SC-22). |

| Program | Basic Energy Sciences | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **BES Construction/MIE Cost & Schedule** - Cost-weighted mean percentage variance from established cost and schedule baselines for major construction, upgrade, or equipment procurement projects | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | < 10 % | < 10 % | < 10 % | < 10 % | < 10 % | < 10 % | < 10 % |
| **Result** | **Met** | **Met** | **Met** | **Met** | **Met** | TBD | TBD |
| **Endpoint Target** | Adhering to the cost and schedule baselines for a complex, large scale, science project is critical to meeting the scientific requirements for the project and for being good stewards of the taxpayers' investment in the project. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target met. Cost variance was -1.1%, schedule variance was -3.8%. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | BES Projects include those that have an approved performance baseline at the start of FY 2018, which include: LCLS-II<br><br>Supporting data reside in the DOE Office of Project Management Oversight and Assessment's Project Assessment and Reporting System-II (PARS-II) and with Basic Energy Science's Division of Scientific User Facilities (SC-22.3). The EOY report is based on PARS-II data through the end of August. | | | | | | |

| Program | Basic Energy Sciences | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **BES Facility Operations** - Average achieved operation time of BES user facilities as a percentage of total scheduled annual operation time | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | ≥ 90 % | ≥ 90 % | ≥ 90 % | ≥ 90 % | ≥ 90 % | ≥ 90 % | ≥ 90 % |
| **Result** | **Met** | **Met** | **Met** | **Met** | **Met** | TBD | TBD |
| **Endpoint Target** | Many of the research projects that are undertaken at the Office of Science's scientific user facilities take a great deal of time, money, and effort to prepare and regularly have a very short window of opportunity to run. If the facility is not operating as expected the experiment could be ruined or critically setback. In addition, taxpayers have invested millions or even hundreds of millions of dollars in these facilities. The greater the period of reliable operations, the greater the return on the taxpayers' investment. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target met. Achieved operating time was 99% of scheduled operating time. (31,381 actual hours versus 31,550 planned hours.) | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Supporting documents consist of the required quarterly and annual reports submitted to BES by the BES user facilities at the completion of each quarter and at the end of the fiscal year. These final reports reside in the files of the Office of Basic Energy Sciences (SC-22).<br><br>The total planned operating hours for FY18 for this goal is obtained from the planned operating hours of these individual user facilities in FY18: National Synchrotron Light Source II (NSLS-II) 4,750; Stanford Synchrotron Radiation Lightsource (SSRL) 5,200; Advanced Light Source (ALS) 5,100; Advanced Photon Source (APS) 5,000; Linac Coherent Light Source (LCLS) 4,750; High Flux Isotope Reactor (HFIR) 3,900; and the Spallation Neutron Source (SNS) 2,850 for a total of 31,550 hours (90% is 28,395 hours). | | | | | | |

## Biological and Environmental Research

| Program | Biological and Environmental Research | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **BER Predictive Understanding** - Advance an iterative systems biology approach to the understanding and manipulation of plant and microbial genomes as a basis for biofuels development and predictive knowledge of carbon and nutrient cycling in the environment. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | Develop one new computationally enabled approach to analyze complex genomic datasets. | Develop an improved metabolic engineering method for modifying microorganisms for biofuel production from cellulosic sugars. | Develop improved open access platforms for computational analysis of large genomic datasets. | Using genomics-based techniques, develop an approach to explore the functioning of plant-microbe interactions. | Develop metagenomics approaches to assess the functioning of microbial communities in the environment. | Report on genomic science-based advances and testing of new plant feedstocks for bioenergy purposes. |
| **Result** | N/A | **Met** | **Met** | **Met** | **Met** | TBD | TBD |
| **Endpoint Target** | BER will advance understanding of the operating principles and functional properties of plants, microbes, and complex biological communities relevant to DOE missions in energy and the environment. Deciphering the genomic blueprint of organisms and determining how this information is translated to integrated biological systems permits predictive modeling of bioprocesses and enables targeted redesign of plants and microbes. BER research will address fundamental knowledge gaps and provide foundational systems biology information necessary to advance development of biotechnology and predict impacts of changing environmental conditions on carbon cycling and other biogeochemical processes. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target Met. The use of high performance computing (HPC) in the analysis of genomic information is in its infancy but holds great potential for rapidly analyzing extremely large and complex datasets. Research on plant-microbe interactions produce large 'omic' datasets that can be analyzed by HPC methods to understand mutually beneficial interactions. A better understanding of plant-microbe interactions could lead to improved nutrient and/or water use efficiency in bioenergy crops. The latest computational approaches to analyze plant-microbe interactions are presented in the end-of-year report detailing progress on gaining a basic understanding of plant-microbe interactions at: https://pmiweb.ornl.gov/wp-content/uploads/2018/09/PMI-Summary-Report.pdf. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Quarterly - Emails from the designated performers reporting the research results (per documented control process).<br><br>EOY - Emails reporting the results and publication/availability of the results (per documented control process).<br><br>Reports available at: http://pmiweb.ornl.gov/. | | | | | | |

| Program | Biological and Environmental Research | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **BER Earth System Model** - Develop a coupled earth system model with fully interactive water, carbon and sulfur cycles, as well as dynamic vegetation to enable simulations of earth system responses to change. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | Use global models to estimate most sensitive elements of terrestrial carbon to climate change for tropics, mid-latitudes, and polar regions. | Develop capabilities to extend temporal resolution to sub-decadal for earth system models. | Develop and apply a fully coupled ice-sheet model to estimate near-term changes to the West Antarctic ice sheet. | Extend the capabilities of the DOE's high-resolution Earth System Model to simulate and evaluate human-natural interdependencies for the carbon and water cycles. | Demonstrate improved ocean model simulations with the new high-resolution Model for Prediction Across Scales - Ocean (MPAS-Ocean). | Demonstrate in the coupled DOE-Energy Exascale Earth System Model (E3SM) model, the importance of environmental factors in affecting ecosystem productivity and surface energy exchanges. | Demonstrate improved DOE-E3SM simulation of mesoscale convective systems over North America. |
| **Result** | **Met** | **Met** | **Met** | **Met** | **Met** | TBD | TBD |
| **Endpoint Target** | BER supports the leading U.S. high-resolution earth system model and addresses two of the most critical areas of uncertainty in contemporary earth system science—the impacts of clouds and aerosols that combine with biogeochemical and cryospheric processes. Delivery of improved scientific data and models (with quantified uncertainties) about the earth's atmospheric, oceanic, cryospheric, and terrestrial system to more accurately predict the earth system responses to change. The information is essential to plan for future national security, energy and infrastructure needs, water resources, and land use. DOE will continue to advance the science necessary to further develop predictive earth system models at the regional spatial scale and multiple time scales, involving close coordination with the U.S. and international science community. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target Met. Overall, the high resolution MPAS model has been shown to perform well in ocean-only simulations, in flow beneath ice sheets, when run in variable-resolution-mode, and as part of the coupled Energy Exascale Earth System Model (E3SM) system. More details are available at http://climatemodeling.science.energy.gov/about/fy-2018-performance-metrics. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Quarterly - Emails from the designated performers reporting the research results (per documented control process).<br><br>EOY - Emails reporting the results and publication/availability of the results (per documented control process).<br><br>Report is available at http://climatemodeling.science.energy.gov/about/metrics/. | | | | | | |

## Fusion Energy Sciences

| Program | Fusion Energy Sciences | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **FES Facility Based Experiments** - Experiments conducted on major fusion facilities [DIII-D National Fusion Facility (DIII-D) and National Spherical Torus Experiment Upgrade (NSTX)-U] leading toward predictive capability for burning plasmas and configuration optimization | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | Conduct experiments and analysis to investigate and quantify plasma response to non-axisymmetric (3D) magnetic fields in tokamaks. Effects of 3D fields can be both beneficial and detrimental, and research will aim to validate theoretical models in order to predict plasma performance with varying levels and types of externally imposed 3D fields. Dependence of response to multiple plasma parameters will be explored in order to gain confidence in predictive capability of the models. | Conduct experiments and analysis to quantify the impact of broadened current and pressure profiles on tokamak plasma confinement and stability. Broadened pressure profiles generally improve global stability but can also affect transport and confinement, while broadened current profiles can have both beneficial and adverse impacts on confinement and stability. This research will examine a variety of heating and current drive techniques in order to validate theoretical models of both the actuator performance and the transport and global stability response to varied heating and current drive deposition. | Conduct research to detect and minimize the consequences of disruptions in present and future tokamaks. Coordinated research will deploy a disruption prediction/warning algorithm on existing tokamaks, assess approaches to avoid disruptions, and quantify plasma and radiation asymmetries resulting from disruption mitigation measures, including both preexisting and resulting MHD activity, as well as the localized nature of the disruption mitigation system. The research will employ new disruption mitigation systems, control algorithms, and hardware to help avoid disruptions, along with | Conduct research to examine the effect of configuration on operating space for dissipative divertors. Handling plasma power and particle exhaust in the divertor region is a critical issue for future burning plasma devices. The very narrow edge power exhaust channel projected for tokamak devices that operate at high poloidal magnetic field is of particular concern. Increased and controlled divertor radiation, coupled with optimization of the divertor configuration, are envisioned as the leading approaches to reducing peak heat flux on the divertor targets and increasing the operating window for dissipative | Conduct research to test predictive models of fast ion transport by multiple Alfvén eigenmodes. Fusion alphas and injected energetic neutral particle beams provide an important source of heating and current drive in advanced tokamak operating scenarios and burning plasma regimes. Alfven eigenmode instabilities can cause the redistribution or loss of fast ions and driven currents, as well as potentially decreasing fusion performance and leading to localized losses. Measured fast ion fluxes in DIII-D and NSTX-U plasmas with different levels of Alfven eigenmode activity will be used to determine the | The edge pedestal is a vital component in achieving overall high confinement in a magnetic fusion device. Therefore, obtaining a physics understanding and predictive capability for the pedestal height and structure is a major goal of domestic and international fusion research. Great progress has been made in understanding the pressure limits imposed by MHD stability on pedestals in tokamaks. It is now clear, though, that the goal of predictive capability for the pedestal structure requires advances in the physics understanding of the separate structure of density and temperature profiles | Accumulation of impurities, ranging from light ions (helium ash) to high-Z (such as tungsten) can adversely impact the reactivity of the fusion core through fuel dilution and excessive radiation. To inform operation of ITER and beyond, transport of impurities from the divertor to the core will be studied, particularly as parameters that are expected to impact the relative balance of turbulent versus neoclassical impurity transport are varied. Experiments will introduce a wide range of low- to high-Z impurities, while turbulence and transport properties are documented. Integrated modeling |

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| | | | measurements to detect disruption precursors and quantify the effects of disruptions. | divertors. Data obtained from DIII-D and NSTX-U and archived from Alcator C-Mod will be used to assess the impact of edge magnetic configurations and divertor geometries on dissipative regimes, as well as their effect on the width of the power exhaust channel, thus providing essential data to test and validate leading boundary plasma models. | threshold for significant fast ion transport, assess mechanisms and models for such transport, and quantify the impact on beam power deposition and current drive. Measurements will be compared with theoretical predictions, including quantitative fluctuation data and fast ion density, in order to validate models and improve understanding of underlying mechanisms. Model predictions will guide the development of attractive operating regimes. | in the pedestal region. A key challenge is to understand the importance of particle sources in determining the density pedestal and project to burning plasma scenarios. Experiments on DIII-D and archived data from C-Mod, DIII-D, and NSTX will be used to test how fueling, reduced recycling, and transport affect the density pedestal structure. The role of divertor geometry strongly affects ionization properties and thus its effect upon the pedestal structure will be investigated. US researchers involved in collaborative activities on international experiments and at university facilities may gather, analyze and contribute data to this research effort. | tools will be used to validate theoretical models and interpret the physical mechanisms of transport in the core, divertor, and scape-off layer. |
| **Result** | **Met** | **Met** | **Met** | **Met** | **Met** | TBD | TBD |

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| **Endpoint Target** | Magnetic fields are the principal means of confining the hot ionized gas of a plasma long enough to make practical fusion energy. The detailed shape of these magnetic containers leads to many variations in how the plasma pressure is sustained within the magnetic bottle and the degree of control that experimenters can exercise over the plasma stability. These factors, in turn, influence the functional and economic credibility of the eventual realization of a fusion power reactor. The key to their success is a detailed physics understanding of the confinement characteristics of the plasmas in these magnetic configurations. The major fusion facilities can produce plasmas that provide a wide range of magnetic fields, plasma currents, and plasma shapes. By using a variety of plasma control tools, appropriate materials, and having the diagnostics needed to measure critical physics parameters, scientists will be able to develop optimum scenarios for achieving high performance plasmas in future burning plasma devices and, ultimately, in power plants. |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target met. Several predictive models of fast ion transport driven by energetic particle instabilities were tested utilizing existing and new experimental data. Theoretical predictions were explored, and the models and analyses improved. Increased insight regarding the mechanisms, thresholds, and impacts of the driven fast ion transport were obtained and used to recommend future research directions. Modeling was used in a "predict first" mode to design experimental scenarios. |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Supporting data are contained in progress reports maintained by the FES program office. |

| Program | Fusion Energy Sciences | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **FES Theory and Simulation** - Performance of simulations with high physics fidelity codes to address and resolve critical challenges in the plasma science of magnetic confinement | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | Understanding alpha particle confinement in ITER, the world's first burning plasma experiment, is a key priority for the fusion program. Linear instability trends and thresholds of energetic particle-driven shear Alfvén eigenmodes in ITER are determined for a range of parameters and profiles using a set of complementary simulation models (gyrokinetic, hybrid, and gyrofluid). Initial nonlinear simulations are carried out to assess the effects of the unstable modes on energetic particle transport. | Perform massively parallel plasma turbulence simulations to determine expected transport in ITER. Starting from best current estimates of ITER profiles, the turbulent transport of heat and particles driven by various microinstabilities (including electromagnetic dynamics) will be computed. Stabilization of turbulence by nonlinear self-generated flows is expected to improve ITER performance, and will be assessed with comprehensive electromagnetic gyrokinetic simulations. | Predicting the magnitude and scaling of the divertor heat load width in magnetically confined burning plasmas is a high priority for the fusion program. One of the key unresolved physics issues is what sets the heat flux width at the entrance to the divertor region. Perform massively parallel simulations using 3D edge kinetic and fluid codes to determine the parameter dependence of the heat load width at the divertor entrance and compute the divertor plate heat flux applicable to moderate particle recycling conditions. Comparisons will be made with data from DIIID, NSTX-U, and C-Mod. | Lower hybrid current drive (LHCD) will be indispensable for driving off-axis current during long-pulse operation of future burning plasma experiments, since it offers important leverage for controlling damaging transients caused by magnetohydrodynamic instabilities. However, the experimentally demonstrated high efficiency of LHCD is incompletely understood. In FY 2017, massively parallel, high-resolution simulations with 480 radial elements and 4095 poloidal modes will be performed using full-wave radiofrequency field solvers and particle Fokker-Planck codes to elucidate | The interaction of the boundary plasma with the material surfaces in magnetically confined plasmas is among the most critical problems in fusion energy science. In FY 2018, perform high-performance computational simulations with coupled boundary plasma physics and materials surface models to predict the fuel recycling and tritium retention of the divertor for deuterium-tritium burning plasma conditions, accounting for erosion, re-deposition and impurity transport in the plasma boundary, and an initial evaluation of the influence of material deposition on the recycling and retention. | Understanding the relevant turbulent transport mechanisms at the edge of a high-performance tokamak is essential for predicting and optimizing the H-mode pedestal structure in future burning plasma devices. Global electromagnetic gyrokinetic simulations will be performed based on representative experimental pedestal scenarios in order to clarify which instabilities are most important for each of the particle and heat transport channels. Edge transport modeling will be performed in order to estimate and bound the particle and heat sources—e.g., the ionization density source and the atomic energy | A Vertical Displacement Event (VDE) is an off-normal occurrence in a tokamak in which position control of the discharge is lost, and the tokamak plasma moves rapidly upward or downward until it makes contact with the vacuum vessel. The discharge current in ITER will be up to 15 MA. When a plasma with this current makes contact with the vessel, it will induce large currents into the metallic vessel, and these currents will cause large forces. Previous studies to calculate these forces for ITER assumed that the plasma remained axisymmetric during the VDE to simplify the calculation. However, it is |

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| | | | | the roles of toroidicity and full-wave effects. The simulation predictions will be compared with experimental data from the superconducting EAST tokamak. | | loss channels due to ionization, charge exchange, and radiation. Comparisons will be made with data from the DIII-D, JET, C-Mod and NSTX or MAST experiments. | known that the plasma column will deform and produce "sideways forces" in ITER that could potentially damage the machine. The two U.S. flagship magnetohydrodynamic codes, NIMROD and M3D-C1, now have the capability to model a fully 3D plasma interacting with a conducting structure. In FY 2020, simulations taking advantage of the capability of these codes will be performed to realistically model a full 3D VDE in ITER and to calculate the expected forces. |
| **Result** | **Met** | **Met** | **Met** | **Met** | **Met** | TBD | TBD |
| **Endpoint Target** | Advanced simulations based on high physics fidelity models offer the promise of advancing scientific discovery in the plasma science of magnetic fusion by exploiting the Office of Science high performance computing resources and associated advances in computational science. These simulations are able to address the multiphysics and multiscale challenges of the burning plasma state and contribute to the FES goal of advancing the fundamental science of magnetically confined plasmas to develop the predictive capability needed for a sustainable fusion energy source. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target met. The work led to the establishment of a new, high-fidelity Plasma Materials Interactions (PMI) modeling capability involving multiple boundary plasma and materials surface evolution codes which take advantage of today's high-performance computers and can predict the fuel recycling and tritium retention of the ITER divertor for D-T burning plasma conditions. This capability is important not only for ITER but for future demonstration fusion reactors based on the tokamak magnetic confinement configuration. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Supporting data are contained in progress reports maintained by the FES program office. | | | | | | |

| Program | Fusion Energy Sciences | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **FES Facility Operations** - Average achieved operation time of FES user facilities as a percentage of total scheduled annual operation time | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | ≥ 90 % | ≥ 90 % | ≥ 90 % | ≥ 90 % | ≥ 90 % | ≥ 90 % | ≥ 90 % |
| **Result** | **Met** | **Not Met** | **Met** | **Met** | **Met** | TBD | TBD |
| **Endpoint Target** | Many of the research projects that are undertaken at the Office of Science's scientific user facilities take a great deal of time, money, and effort to prepare and regularly have a very short window of opportunity to run. If the facility is not operating as expected the experiment could be ruined or critically setback. In addition, taxpayers have invested millions or even hundreds of millions of dollars in these facilities. The greater the period of reliable operations, the greater the return on the taxpayers' investment. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target met. Achieved 113% of scheduled operating time. (DIII-D operated 813 hours versus 720 planned hours.) | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Supporting data are contained in progress reports maintained by the FES program office.<br><br>FES's major national fusion facilities are:<br>- the DIII-D Tokamak at General Atomics in San Diego, California (720 hours of operations are planned for DIII-D);<br>- the National Spherical Torus Experiment - Upgrade at the Princeton Plasma Physics Laboratory. (There are no operations planned for NSTX-U this fiscal year due to the shutdown of the facility for repairs.)<br><br>720 hours total (baseline) are expected for FY18. | | | | | | |

## High Energy Physics

| Program | High Energy Physics | | | | | | |
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| **Performance Goal (Measure)** | **HEP Neutrino Model** - Carry out series of experiments to test the standard 3-neutrino model of mixing | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | Begin operation of full NOvA detector using neutrino beam from Fermilab for purpose of measuring mixing angle between muon neutrinos and electron neutrinos (sin2(2θ13)) using the appearance electron neutrinos. | Physics analyses results from the first year of data taking with the full detector will be presented by the NOvA and MicroBooNE experimental collaborations at the FY 2015 summer conferences. | Physics analyses results from data taking will be presented by the NOvA and MicroBooNE experimental collaborations at the FY 2016 summer conferences. | Fermilab switches operations mode over from neutrino beam to antineutrino beam delivery to the NOvA experiment. NOvA accumulates physics data in antineutrino mode. | MicroBooNE data taking will complete final year of phase-1. NOvA will publish the first muon and electron anti-neutrino oscillation results. | NOvA will present important results on whether neutrino mixing is "maximal" and the mass ordering of neutrino states. MicroBooNE will present new physics results related to the low-energy anomalies observed in neutrino interactions. The refurbished ICARUS detector will be commissioned and prepared for data-taking. | The ICARUS neutrino detector will take its first data in the Booster neutrino beam at Fermilab as part of the short baseline neutrino program. |
| **Result** | **Met** | **Not Met** | **Met** | **Met** | **Met** | TBD | TBD |
| **Endpoint Target** | Similar to quarks, the mixing between neutrinos is postulated to be described by a unitary matrix. Measuring the independent parameters of this matrix in different ways and with adequate precision will demonstrate whether this model of neutrinos is correct. Such a model is needed to correctly extract evidence for CP violation in the neutrino sector. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target met. MicroBooNE completed its final year of phase-1 data taking. NOvA produced 10 new public notes this summer (http://microboone.fnal.gov/public-notes/) and submitted a paper on the use of convolutional neural networks to identify electromagnetic activity in liquid argon time projection chamber (TPCs) that was submitted to Phys. Rev. D. in August 2018 (https://arxiv.org/abs/1808.07269). | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | QTR: progress reports<br>EOY: a letter or report from the Laboratory Director at Fermi National Accelerator Laboratory confirming that the full NOvA detector and the NuMI neutrino beam are operational.<br><br>The supporting documentation resides in the files of the HEP Office (SC-25). | | | | | | |

| Program | High Energy Physics | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **HEP Construction/MIE Cost & Schedule** - Cost-weighted mean percentage variance from established cost and schedule baselines for major construction, upgrade, or equipment procurement projects | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | < 10 % | < 10 % | < 10 % | < 10 % | < 10 % | < 10 % | < 10 % |
| **Result** | **Met** | **Met** | **Met** | **Met** | **Met** | TBD | TBD |
| **Endpoint Target** | Adhering to the cost and schedule baselines for a complex, large scale, science project is critical to meeting the scientific requirements for the project and for being good stewards of the taxpayers' investment in the project. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target met. Cost variance was -4.4% and schedule variance is -3.6%. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Derived from PARS II data for the following projects:<br>1. Large Hadron Collider (LHC) ATLAS (A Toroidal LHC Apparatus) Detector Upgrade<br>2. LHC CMS (Compact Muon Solenoid) Detector Upgrade<br>3. Large Synoptic Survey Telescope (LSST) Project<br>4. Muon to Electron Conversion Experiment (Mu2e)<br>5. Dark Energy Spectroscopic Instrument (DESI)<br>6. Large Underground Xenon (LUX)–ZonEd Proportional scintillation in LIquid Noble gases (ZEPLIN) experiment (LZ)<br><br>Cost and schedule variance calculated by Earned Value for each project is averaged, weighted by the Total Project Cost for that project. The EOY report is based on PARS II data through the end of August.<br><br>The supporting documentation resides in the files of the HEP Office (SC-25). | | | | | | |

| Program | High Energy Physics | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **HEP Facility Operations** - Average achieved operation time of HEP user facilities as a percentage of total scheduled annual operation time | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | ≥ 80 % | ≥ 80 % | ≥ 80 % | ≥ 80 % | ≥ 80 % | ≥ 80 % | ≥ 80 % |
| **Result** | **Met** | **Met** | **Met** | **Met** | **Met** | TBD | TBD |
| **Endpoint Target** | Many of the research projects that are undertaken at the Office of Science's scientific user facilities take a great deal of time, money, and effort to prepare and regularly have a very short window of opportunity to run. If the facility is not operating as expected the experiment could be ruined or critically setback. In addition, taxpayers have invested millions or even hundreds of millions of dollars in these facilities. The greater the period of reliable operations, the greater the return on the taxpayers' investment. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target met. Achieved operating time was 111% of scheduled operating time. (7,537 actual hours versus 6,800 planned hours.) | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Derived from letters from Lab Directors or designee. Fermi data are reported at http://www-bdnew.fnal.gov/operations/lum/supertable.html.<br><br>The scientific user facilities and scheduled hours:<br>- Total hours scheduled is 6,800 hours (5,440 hours is 80%).<br>- FACET (Facility for Advanced Accelerator Experimental Tests) will not be operating in FY2017.<br>- Fermilab Accelerator Complex is scheduled to run 4,440 hours in FY 2018 (3,552 is 80%).<br>- Brookhaven Accelerator Test Facility is scheduled to run 2,360 hours in FY 2018 (1,888 is 80%).<br><br>Unscheduled downtime reported by each facility is averaged, weighted by the Facility Operations cost. Facility Operations costs are defined in the Facilities Summary section of the HEP budget submission. | | | | | | |

## Nuclear Physics

| Program | Nuclear Physics | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **NP Nuclear Structure** - Conduct fundamental research to discover, explore, and understand all forms of nuclear matter. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | Perform mass measurements and nuclear reaction studies to infer weak interaction rates in nuclei in order to constrain models of supernovae and stellar evolution. | Measure bulk properties, particle spectra, correlations and fluctuations in gold + gold collisions at Relativistic Heavy Ion Collider (RHIC) to search for evidence of a critical point in the Quantum Chromodynamics (QCD) matter phase diagram. | Perform measurements for identified hadrons with heavy flavor valence quarks to constrain the mechanism for parton energy loss in the quark-gluon plasma at the RHIC. | Demonstrate the capability to extend the sensitivity of searches for neutrinoless double-beta decay by at least a factor of 5. | Perform measurements in experimental halls with CEBAF to enhance our understanding of the QCD) structure of nuclei and hadronic matter. | Initiate a search for a Critical Point in the Phase Diagram of Nuclear Matter. | Complete first phase of search for exotic mesons resulting from gluon excitations at JLAB to deepen understanding of how QCD works. |
| **Result** | **Met** | **Met** | **Met** | **Met** | **Met** | TBD | TBD |
| **Endpoint Target** | Increase the understanding of the existence and properties of nuclear matter under extreme conditions, including that which existed at the beginning of the universe | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target met. TJNAF has demonstrated, in more than one hall, the acquisition of data towards understanding the QCD structure of nuclei and hadronic matter. Hall A completed two measurements to compare the QCD structure of the mirror isotope 3H and 3He nuclei and is now accumulating data for a third experiment. Hall B accumulated over 20% of their first series of physics runs, covering seven experiments, towards 3D imaging of quarks in proton structure. Hall C completed a measurement of structure functions of protons and neutrons at large quark momentum fractions, and is continuing with experiments to validate the 3D (spatial and transverse momentum) imaging framework. Hall D continued the GlueX experiment to study the structure of known mesons and search for unknown exotic mesons. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Quarterly: Emails from TJNAF Management to NP Office with progress towards achieving goals.<br><br>EOY: Official letter from TJNAF Management to NP Office reporting and certifying progress made towards achieving goal.<br><br>Documentation resides in the Office of Nuclear Physics (SC-26) files. The DOE PMM FY18 target is met when TJNAF demonstrates, in more than one hall, the acquisition of data towards understanding the QCD structure of nuclei and hadronic matter. | | | | | | |

| Program | Nuclear Physics | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **NP Construction/MIE Cost & Schedule** - Cost-weighted mean percentage variance from established cost and schedule baselines for major construction, upgrade, or equipment procurement projects | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | < 10 % | < 10 % | < 10 % | < 10 % | N/A | N/A | N/A |
| **Result** | **Met** | **Met** | **Met** | **Met** | N/A | N/A | N/A |
| **Endpoint Target** | Adhering to the cost and schedule baselines for a complex, large scale, science project is critical to meeting the scientific requirements for the project and for being good stewards of the taxpayers' investment in the project. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | This measure is not applicable for FY18. | | | | | | |

| Program | Nuclear Physics | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **NP Facility Operations** - Average achieved operation time of NP user facilities as a percentage of total scheduled annual operation time | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | ≥ 80 % | ≥ 80 % | ≥ 80 % | ≥ 80 % | ≥ 80 % | ≥ 80 % | ≥ 80 % |
| **Result** | **Met** | **Met** | **Met** | **Met** | **Met** | TBD | TBD |
| **Endpoint Target** | Many of the research projects that are undertaken at the Office of Science's scientific user facilities take a great deal of time, money, and effort to prepare and regularly have a very short window of opportunity to run. If the facility is not operating as expected the experiment could be ruined or critically setback. In addition, taxpayers have invested millions or even hundreds of millions of dollars in these facilities. The greater the period of reliable operations, the greater the return on the taxpayers' investment. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Target met. Achieved 105% of scheduled operating time. (12,218 actual hours versus 11,630 planned hours.) | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | The total planned operating hours for ATLAS (Argonne Tandem-Linac Accelerator System), CEBAF (Continuous Electron Beam Accelerator Facility), and RHIC (Relativistic Heavy Ion Collider) is 11,630 hours (80% is 9,304 hours). The RHIC operating hours include 10 weeks of operations scheduled at 2 shifts per day with the third shift used for scheduled maintenance.<br><br>Quarterly: Emails from ANL (ATLAS), BNL (RHIC) and JLAB (CEBAF) management to NP Office with statistics regarding breakout of beam hours (per documented control process); NP program office worksheet showing calculations.<br><br>EOY: Official letters from ANL (ATLAS), JLAB (CEBAF), and BNL (RHIC) management to NP Office reporting and certifying annual achieved operation time of the user facility (per documented control process); NP program office worksheet.<br><br>Documentation resides in the Office of Nuclear Physics (SC-26) files. This target is met when the total operating time is 80% or greater. | | | | | | |

# ARPA-E

## Advanced Research Projects Agency - Energy

| Program | Advanced Research Projects Agency - Energy | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **New Company Formation** - Number of new companies formed as a direct result of ARPA-E funding. This was a new performance measure for ARPA-E in FY 2015. As of the end of FY 2013 ARPA-E funded research has led to the formation of at least 24 new companies. That is the baseline from which we would expect to add at least 3 new companies per year. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | ≥ 3 new companies founded | ≥ 3 new companies founded | ≥ 3 new companies founded | ≥ 3 new companies founded | ≥ 3 new companies founded | N/A |
| **Result** | N/A | **Met** - 6 | **Met** - 6 | **Met** - 20 | **Met** - 15 | TBD | N/A |
| **Endpoint Target** | On an ongoing basis, ARPA-E funding will support the formation of ≥ 3 new companies each year. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | As reported in a May 2018 report, ARPA-E funded research has led to the formation of at least 71 new companies. This represents an increase of 15 companies from the February 2017 press release.<br><br>ARPA-E expects the trend of company creation to continue in FY19. However, the actual formations will be dependent on project and market conditions. New company formation data as of May 2018 can be found in the below report: https://arpa-e.energy.gov/?q=site-page/arpa-e-impact | | | | | | |
| **Comment** | ARPA-E is proposed for elimination in the FY 2020 Budget. Therefore, no performance targets have been set beyond FY 2019. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Data Sources: New company formation is initially identified through various online channels (e.g., company websites, Pitchbook database) and through direct outreach to appropriate project team members (e.g., Awardee / Principal Investigator, Program Director, T2M Advisor, Tech SETA). The data is typically compiled annually in May.<br><br>Limitations: Potentially incomplete or erroneous information provided from the performers. ARPA-E mitigates this risk by cross-checking the data through multiple sources. Metrics are tabulated and reported once a year in the Impacts Report. In prior years this data was available in February. In 2018 the data was available in May. As such, the 2018 data includes companies created between February 2017 and May 2018.<br><br>Verification and Validation: Cross-check the data through multiple sources (e.g., company websites, Pitchbook database, awardee, etc.) | | | | | | |

| Program | Advanced Research Projects Agency - Energy | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Award Funding** - Cumulative percentage of award funding committed 45 days after award selections are announced | | | | | | |
| Fiscal Year | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Target | ≥ 70 % | ≥ 70 % | ≥ 70 % | ≥ 70 % | ≥ 70 % | ≥ 70 % | N/A |
| Result | **Met** - 70 | **Met** - 100 | **Met** - 100 | **Met** - 100 | **Met** - 100 | TBD | N/A |
| Endpoint Target | On an ongoing basis, annually commit ≥70% of award funding within 45 days of announcement of award selections. | | | | | | |
| Commentary on 2018 Results (Action Plan if Not Met) | In FY18, per target, 100% of awardee funding was committed within 45 days of selection. After announcement, selected funds are reserved and tracked in ARPA-E planning worksheets. These worksheets are reviewed by ARPA-E leadership on a monthly basis. | | | | | | |
| Comment | ARPA-E is proposed for elimination in the FY 2020 Budget. Therefore, no performance targets have been set beyond FY 2019. | | | | | | |
| Documentation, Limitations, Methodology, Validation, and Verification | Data Sources: ARPA-E Internal Records. Available funding and actual obligations are pulled from the DOE STARS financial system.<br><br>Limitations: No substantive limitations.<br><br>Verification and Validation: ARPA-E internal records are reconciled to STARS data on a monthly basis post-GL close. | | | | | | |

# Chief Information Officer

## Departmental Administration

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Detect - Anti-Phishing** - Performance of Anti-Phishing measurements must be greater than or equal to 90% on at least 5 of 7 capabilities. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | ≥ 5 capabilities greater than 90 % | ≥ 5 capabilities greater than 90% | ≥ 5 capabilities greater than 90% | ≥ 5 capabilities greater than 90% | N/A | N/A |
| **Result** | N/A | **Not Met** - 3 | **Not Met** - 2 | **Met** - 6 | **Data Not Available** | N/A | N/A |
| **Endpoint Target** | Obtain performance of at least 5 of 7 anti-phishing capabilities at 90% or greater in FY 2017 and maintain annually thereafter. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | DOE is no longer able to provide results for this measure due to changes made to related Cross Agency Priority (CAP) goals in FY 2018 Q2. All DOE metrics associated with the FY 2018-2019 CAP goals are reported quarterly as part of CAP goal reporting. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | |

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Detect - Malware Defense** - Performance of malware defense measurements must be greater than or equal to 90% on at least 3 of 5 capabilities. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | ≥ 3 capabilities greater than 90% | ≥ 3 capabilities greater than 90% | ≥ 3 capabilities greater than 90% | ≥ 3 capabilities greater than 90% | N/A | N/A |
| **Result** | N/A | **Not Met** - 0 | **Not Met** - 0 | **Met** - 3 | **Data Not Available** | N/A | N/A |
| **Endpoint Target** | Obtain a performance of at least 3 of 5 malware defense capabilities at 90% or greater in FY 2017 and maintain annually thereafter. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | DOE is no longer able to provide results for this measure due to changes made to related Cross Agency Priority (CAP) goals in FY 2018 Q2. All DOE metrics associated with the FY 2018-2019 CAP goals are reported quarterly as part of CAP goal reporting. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | |

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Detect - Other Defenses** - Performance of "Other Defenses" measurements to include specific Anti-Phishing and Malware capabilities must be greater than or equal to 90% on at least 2 of 4 capabilities. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | ≥ 2 capabilities greater than 90% | ≥ 2 capabilities greater than 90% | ≥ 2 capabilities greater than 90% | ≥ 2 capabilities greater than 90% | N/A | N/A |
| **Result** | N/A | **Not Met** - 0 | **Not Met** - 1 | **Met** - 2 | **Data Not Available** | N/A | N/A |
| **Endpoint Target** | Obtain a performance of at least 2 of 4 other defense capabilities at 90% or greater in FY 2017 and maintain annually thereafter. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | DOE is no longer able to provide results for this measure due to changes made to related Cross Agency Priority (CAP) goals in FY 2018 Q2. All DOE metrics associated with the FY 2018-2019 CAP goals are reported quarterly as part of CAP goal reporting. | | | | | | |
| **Comment** | The Other Defenses performance measure consists of the following Anti-Phishing and Malware capabilities: privileged user network accounts that have a technical control limiting access to only trusted sites, inbound network traffic that passes through a web content filter, which provides anti-phishing, anti-malware, and blocking of malicious websites (e.g., fake software updates, fake antivirus offers, and phishing offers), outbound communications traffic checked at the external boundaries to detect encrypted exfiltration of information (i.e. capability of Digital to Analog conversion (D/A) to decrypt/interrogate and re-encrypt), and email messages processed by systems that quarantine or otherwise block suspected malicious traffic. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | |

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Identify - Hardware Asset Management** - Achieve performance of 95% or greater for both Hardware Asset Management metrics (asset detection and asset meta data collection) | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | ≥ 95 % | ≥ 95 % | ≥ 95 % | ≥ 95 % | N/A | N/A |
| **Result** | N/A | **Not Met** - 87 | **Not Met** - 60 | **Not Met** - 85 | **Data Not Available** | N/A | N/A |
| **Endpoint Target** | Annually maintain performance of at least 95% for both Hardware Asset Management metrics by FY 2018 and maintain annually thereafter. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | DOE is no longer able to provide results for this measure due to changes made to related Cross Agency Priority (CAP) goals in FY 2018 Q2. All DOE metrics associated with the FY 2018-2019 CAP goals are reported quarterly as part of CAP goal reporting. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | |

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Identify - Software Asset Management** - Achieve performance of greater than or equal to 95% for both Software Asset Management metrics (software inventory and software white-listing) | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | ≥ 95 % | ≥ 95 % | ≥ 95 % | ≥ 95 % | N/A | N/A |
| **Result** | N/A | **Not Met** - 39 | **Not Met** - 44 | **Not Met** - 91 | **Data Not Available** | N/A | N/A |
| **Endpoint Target** | Obtain performance of at least 95% for both Software Asset Management metrics by FY 2018 and maintain annually thereafter. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | DOE is no longer able to provide results for this measure due to changes made to related Cross Agency Priority (CAP) goals in FY 2018 Q2. All DOE metrics associated with the FY 2018-2019 CAP goals are reported quarterly as part of CAP goal reporting. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | |

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Protect - Federated Identity Management Infrastructure** - Implement Federated Identity Management Infrastructure linking identity sources across DOE to OneID | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | 75 % | ≥ 95 % | = 100 % | = 100 % |
| **Result** | N/A | N/A | N/A | **Not Met** - 62 | **Exceeded** - 97 | TBD | TBD |
| **Endpoint Target** | Obtain performance of 100% of all identity sources across DOE linked to OneID by FY 2019 and maintain annually thereafter. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | The End of Year target for implementing a federated identity management infrastructure linking identity sources across DOE to OneID was exceeded by 2%. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | An earned value approach is taken to capture the present state of each entity according to four stages of integration. Progress towards completion is established by the OneID Program Office and the third party integrator that performs outside integrations following communications by the Identity, Credential, and Access Management (ICAM) Program. The criteria for completion is the successful installation of Commercial-Off-The-Shelf (COTS) products to perform synchronization of the site and the OneID Identity Management Service or a standards based equivalent solution implemented by each entity. The status of each entity is validated by a combination of individual contacts with the DOE entities and a comparison of accounts included in the Federal Information Security Management Act (FISMA) and the Multi-Factor Authentication (MFA) Sprint to the identity stored in OneID. Input for both FISMA and MFA is captured through a data call that is conducted on a monthly basis. | | | | | | |

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Protect - High-Priority Application Authentication** - Conduct a role-based risk assessment for all applications supporting high priority (FISMA) systems, identify the proper credential for each role within the application in accordance with the revised NIST 800-63 standard, and require the use of the proper credential for role-based access to the application. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | 10 % | ≥ 30 % | ≥ 50 % | ≥ 60 % |
| **Result** | N/A | N/A | N/A | **Not Met** - 0 | **Exceeded** - 34 | TBD | TBD |
| **Endpoint Target** | Require the credential identified through the role-based risk assessment for 80% of all applications supporting FISMA systems by FY 2021 and maintain annually thereafter. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | The End of Year target for integrating high priority, enablement-ready applications into the federated access management framework of 30% was exceeded by 4%. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Data is collected by using the DOE standard data call process through the Electronic Capital Planning Investment Control (eCPIC) system. This data call identities the total number of applications, the applications that have taken a risk assessment, and the number of applications that require the use of appropriate credentials per NIST 800-63-3 for the sensitivity of the applications being accessed. The calculation for this metric reflects the percentage of applications that require the use of a credential that meets or exceeds the risk assessment. The initial data call is vetted to ensure there aren't any erroneous submissions. In addition, several functional equations and data validation checks are built within the workbook to ensure there are no errors during data vetting. | | | | | | |

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Protect - MFA - Privileged Network Account performance** - Privileged Network Accounts that use a PIV credential or other NIST 800-63 r3 IAL3/AAL3/FAL3 must be equal to 100%. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | 100 % | 100 % | 100 % | 100 % | N/A | N/A |
| **Result** | N/A | **Not Met** - 7 | **Not Met** - 82 | **Not Met** - 96 | **Not Met** - 96 | N/A | N/A |
| **Endpoint Target** | Achieve a Level of Assurance 4 (LOA4) performance of 100% for Privileged Network Accounts by FY 2018 and maintain annually thereafter. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | The goal of 100% MFA for privileged network accounts was not met largely due to delays in issuing Program Level guidance to align site plans with the Departmental goals and objectives.<br>**Action Plan:** The NNSA Supplemental Directive was issued and sites have been provided with the necessary guidance to implement solutions to achieve compliance. In addition, the Department issued supplemental guidance in September 2018 for the implementation of credentials in accordance with NIST Special Publication (SP) 800-63-3. It is anticipated that this will increase compliance approaching the 100% goal. | | | | | | |
| **FY 2018 Note** | This performance measure will be tracked as part of the FY 2018-2019 Cross Agency Priority (CAP) goal reporting beginning in FY 2019. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Data is collected by using the DOE standard data call process through eCPIC. This data call identifies the total number privileged user accounts and the number of privileged user accounts requiring an Identity Assurance Level (IAL) credential, an Authentication Assurance Level (AAL) credential, and a Federation Assurance Level (FAL) credential, collectively known as an xAL 3 credential. The calculation for this metric reflects the percentage of privileged user accounts requiring the use of an xAL 3 credential out of the total number of privileged user accounts across the enterprise. There are some entities that conduct additional internal data calls prior to submitting them in eCPIC. These entities have re-evaluated their data call so that it aligns with OCIO official data to prevent any inconsistencies.<br>A completeness check is conducted during the initial data call to report any of the fields in eCPIC that are empty. A soundness check is also conducted to report any significant changes that have occurred in comparison through a comparison against the previous data call. Entities are contacted to verify their submission and to provide further explanation for any discrepancies. In addition, several functional equations and data validation checks are built within the workbook to ensure there are no errors when calculating compliance. | | | | | | |

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Protect - MFA - Unprivileged Network Account performance** - Unprivileged Network Accounts that use a PIV credential or other NIST 800-63 r3 IAL3/AAL3/FAL3 must be equal to 85%. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Target | N/A | 85 % | 85 % | 85 % | 85 % | 85 % | 85 % |
| Result | N/A | **Not Met** - 11 | **Not Met** - 52 | **Not Met** - 66 | **Not Met** - 70 | TBD | TBD |
| Endpoint Target | Achieve an LOA4 performance of 85% for Unprivileged Network Accounts by FY 2018 and maintain annually thereafter. | | | | | | |
| Commentary on 2018 Results (Action Plan if Not Met) | The goal of 85% MFA for non-privileged network accounts was not met largely due to delays in issuing Program Level guidance to align site plans with the Departmental goals and objectives.<br>**Action Plan:** An NNSA Supplemental Directive was issued and sites have been provided with the necessary guidance to implement solutions to achieve compliance. In addition, the Department issued supplemental guidance in September 2018 for the implementation of credentials in accordance with NIST Special Publication (SP) 800-63-3. It is anticipated that this will increase compliance approaching the 85% goal. | | | | | | |
| Documentation, Limitations, Methodology, Validation, and Verification | Data is collected by using the DOE standard data call process through eCPIC. This data call identifies the total number non-privileged user accounts and the number of non-privileged user accounts requiring an xAL 3 credential. The calculation for this metric reflects the percentage of non-privileged user accounts requiring the use of an xAL 3 credential out of the total number of non-privileged user accounts across the enterprise.<br>There are some entities that conduct additional internal data calls prior to submitting them in eCPIC. These entities have re-evaluated their data call so that it aligns with OCIO official data to prevent any inconsistencies. A completeness check is conducted during the initial data call to report any of the fields in eCPIC that are empty. A soundness check is also conducted to report any significant changes that have occurred through a comparison against previous data call. Entities are contacted to verify their submission and to provide further explanation for any discrepancies. In addition, several functional equations and data validation checks are built within the workbook to ensure there are no errors when calculating compliance. | | | | | | |

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Protect - Secure Configuration Management** - Achieve performance of greater than or equal to 95% for Secure Configuration Management | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | ≥ 95 % | ≥ 95 % | ≥ 95 % | ≥ 95 % | N/A | N/A |
| **Result** | N/A | **Not Met** - 91 | **Not Met** - 77 | **Met** - 99 | **Data Not Available** | N/A | N/A |
| **Endpoint Target** | Obtain performance of at least 95% for Secure Configuration Management by FY 2018 and maintain annually thereafter. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | DOE is no longer able to provide results for this measure due to changes made to related Cross Agency Priority (CAP) goals in FY 2018 Q2. All DOE metrics associated with the FY 2018-2019 CAP goals are reported quarterly as part of CAP goal reporting. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | |

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Protect - Standards Based Fed Access Mgmt Infrastructure** - Implement Standards Based Federated Access Management Infrastructure across DOE to enable single sign-on | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | 50 % | 95 % | ≥ 95 % | ≥ 95 % |
| **Result** | N/A | N/A | N/A | **Met** - 51 | **Not Met** - 90 | TBD | TBD |
| **Endpoint Target** | Implement Standards Based Federated Access Management across 95% of DOE by FY 2018 and maintain annually thereafter. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | The goal of achieving 95% for Standards Based Federated Access Management Infrastructure was not met due to a small number of sites that have chosen to implement federated identity management using their own local tools rather than the enterprise tool suite. Sites that have implemented federated identity management using the enterprise tool suite have met the goal for federated identity management infrastructure and federated access management infrastructure.<br>**Action Plan:** The plan for FY 2019 will focus on establishing a standards based federated access management service for all sites not currently using the enterprise tool suite. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | An earned value approach is taken to capture the present state of each entity according to four stages of integration. Progress towards completion is established by the OneID Program Office and the third party integrator that performs outside integrations following communications by the ICAM Program. There are a small number of sites, however, that elect to use local standards based solutions to synchronize digital identities. In these cases, achieving identity synchronization does not imply implementation of infrastructure to support federated access management. The status of each entity is validated by a combination of individual contacts within the DOE entities and a comparison of accounts included in FISMA and the MFA Sprint to the identity stored in OneID. Input for both FISMA and MFA is captured through a data call issued conducted on a monthly basis. | | | | | | |

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Protect - Vulnerability Management** - Achieve performance greater than or equal to 95% for the detection of hardware and software vulnerability and weakness management | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | ≥ 95 % | ≥ 95 % | ≥ 95 % | ≥ 95 % | N/A | N/A |
| **Result** | N/A | **Not Met** - 31 | **Not Met** - 64 | **Met** - 99 | **Data Not Available** | N/A | N/A |
| **Endpoint Target** | Obtain performance of at least 95% for Vulnerability Management by FY 2018 and maintain annually thereafter. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | DOE is no longer able to provide results for this measure due to changes made to related Cross Agency Priority (CAP) goals in FY 2018 Q2. All DOE metrics associated with the FY 2018-2019 CAP goals are reported quarterly as part of CAP goal reporting. | | | | | | |
| **Comment** | The Vulnerability Management performance measure involves the detection of hardware and software vulnerabilities and specifically addresses the organization's unclassified network(s) assessed for vulnerabilities using Security Content Automation Protocol (SCAP) validated and similar scanning products. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | |

# Office of Management

## Departmental Administration

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Achieve Cost-Savings** - Promote management and operational excellence by streamlining operations and reducing costs. Promote a corporate approach (including the National Laboratories) for moving from a transactional strategic sourcing approach to a more robust Category Management concept to achieve at least a 4% cost savings/avoidance target against actionable procurement spending on products and services through the increased utilization of Best-in-Class (BIC) vehicles | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | $ 247 M Cost Savings | $ 261 M Cost Savings | $ 269.5 M Cost Savings | $ 292.4 M Cost Savings | $ 321 M Cost Savings | $ 326 M Cost Savings | $ 389 M Cost Savings |
| **Result** | **Met** - 295.5 | **Met** - 380.8 | **Met** - 441.4 | **Exceeded** - 473.6 | **Exceeded** - 470.5 | TBD | TBD |
| **Endpoint Target** | Annually achieve 4% cost savings target against actionable procurement spend on products and services. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Data Source: The data is provided by two entities – Federal: The basic contract and the pricing for the supplies or services associated with that contract. That data is stored in the Department of Energy (DOE) Strategic Integrated Procurement Enterprise System (STRIPES). Contractors: Within the National Nuclear Security Administration (NNSA) and Environmental Management (EM), the savings are generated and reported by the Supply Chain Management Center (SCMC). Those not participating in the SCMC (NNSA/EM)), use contractor site specific software to capture their spend data.<br><br>Result: The reporting process was formalized in October 2011 by Senior Procurement Executive (SPE) memorandum establishing a standard set of definitions and report format. The reporting template and definition was updated through Policy Flash (2014-16), which provided clarification on what is considered strategic sourcing savings as well as provide some examples.<br><br>Limitations: The key limitation is the lack of a true enterprise wide data system that all activities use. The SCMC uses an automated system that has real time aggregation of spend/commitment transactions, enterprise spend/commitment trends, and actual savings reporting based upon actual invoices and report generation. Those that do not participate in SCMC use a variety of systems that are less robust and more manual. Again, primarily a manual system is used to calculate savings.<br><br>Verification/Validation: The SCMC conducts a bi-annual audit of its savings. The savings reporting program and template currently used has been vetted/reviewed by an Office of Inspector General (OIG) audit. | | | | | | |

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Maintain certified acquisition professionals** - Maintain levels of certified acquisition professionals | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | > 90 % | 85 % | 85 % | 85 % | 85 % | 85 % | 85 % |
| **Result** | **Met** - 93 | **Met** - 85 | **Met** - 99 | **Exceeded** - 96 | **Exceeded** - 97 | TBD | TBD |
| **Endpoint Target** | Achieve certification levels of at least 90% for acquisition professionals. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Data Source: The data is provided by two entities – Federal Acquisition Institute's Training Application System (FAITAS) and the Department of Energy's (DOE) Human Resource data provided by DOE's Human Capital Office. FAITAS is the online registration system for federal civilian acquisition workforce training and the system of record for all federal civilian acquisition certification programs. FAITAS is used to maintain certification information and register for courses with the Federal Acquisition Institute (FAI).<br><br>Result: The percentage is calculated by dividing the number of GS-1102s (contract specialists) holding a Federal Acquisition Certification in Contracting (FAC-C) derived from the FAITAS by the number of GS-1102s (contract specialists) count from DOE's Human Capital Office's official Human Resource's data collection.<br><br>Limitations: The key limitation is the FAITAS and DOE HR systems are not integrated requiring a "manual" reconciliation of the data.<br><br>Verification/Validation: As a result of the two data source systems not being integrated, the Office of Management (Acquisition Management) takes the time to reconcile the data manually to ensure the data is accurate. Any anomalies are reconciled before reporting. In addition to manual verification of the data, all data queries are submitted specific to job series 1102 and therefore, the data is free of systematic error or bias. | | | | | | |

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Reduce FOIA backlog** - Reduce Freedom of Information Act (FOIA) backlog | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | < 10 % | 10 % | 10 % | 10 % | 3 % | 3 % | 3 % |
| **Result** | **Met** - 22 | **Met** - 17 | **Met** - 17.86 | **Not Met** - 24 | **Not Met** - 74 | TBD | TBD |
| **Endpoint Target** | Continually reduce the FOIA backlog cases by 3% over the prior year backlog | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Backlog increased by 74% from 287 at the end of FY17 to 498 at the end of FY18. The goal was not met due to the increase in complexity of cases which require more time spent to process and also the loss of personnel.<br>**Action Plan:**<br>The FOIA Office is working towards hiring additional staff to facilitate processing of the complex cases as well as new requests received to ensure backlog reduction. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Data Source: The FOIA cases are tracked in the FOIAXpress database created by AINS Inc., Information Technology company that provides products to over 140 federal agencies.<br><br>Result: The results are based on the previous year backlog case number. The goal was to decrease the backlog by 3 percent. This includes all FOIA cases that are received in the next fiscal year.<br><br>Limitations: The Department receives cases that are complex and that could require searches for records of multiple offices and individuals. The results could be voluminous or very sensitive. Various levels of review and concurrence are also required, some of which include coordination with other agencies.<br><br>Verification/Validation: Cases are updated on a periodic basis to update status and other information related to the case. We review cases to ensure information is current and correct. | | | | | | |

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Energy and Water Sustainability Performance** - In accordance with statutory and executive order requirements DOE will perform a sufficient number of building evaluations, such that, in a four-year period, at least 90% of owned buildings and/or square footage will be assessed for energy & water efficiency opportunities and incorporation of sustainability principles as required. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | 90 % | 90 % | 90 % |
| **Result** | N/A | N/A | N/A | N/A | **Not Met** - 85 | TBD | TBD |
| **Endpoint Target** | Maintain 90% | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | The FY 2018 performance target was not met.<br>**Action Plan:** The DOE Sustainability Performance Office is working with the DOE programs and sites to improve their performance and ensure DOE is back on track for FY 2019. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Documentation: The web-based DOE Sustainability Dashboard (Dashboard) is a system owned and operated by the Department of Energy, which collects high level sustainability data on evaluations completed, level, and findings.<br><br>Limitations: Limited insight into quality of audit.<br><br>Verification and Validation: Perform data quality check, work with programs/sites on errors/missing info. Long term improvement plan includes document upload capability to track/verify audit documentation/quality. | | | | | | |

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Functional Assessments** - Maintain a level of assessment for DOE owned and "active" Buildings, Trailers and Structures (excluding FERC, LM, NR and PMAs) based on replacement plant value and an assessment having occurred within five fiscal years . | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | 90 % | N/A | N/A |
| **Result** | N/A | N/A | N/A | N/A | 99.1% | N/A | N/A |
| **Endpoint Target** | Maintain 90% | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Comment** | A real property asset is to have a functional assessment every five years. The calculation will be based on replacement plant value (RPV) due to the mixed category of real property assets. Calculation: RPV of Assessed / RPV of All. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Data Source: The Data is provided by the Department's Real Property Database – the Facilities Information Management System (FIMS) via fiscal, year-end Snapshot.<br><br>Result/Methodology: The metric was calculated based on replacement plant value due to the various types of real property – Criteria: all DOE owned and active buildings, OSFs and Trailers excluding assets owned by FERC, LM, NR, and the PMAs.<br><br>Limitations: No known significant concerns, however there will be a lag time between data gathered and data entered. Sites are allowed to update FIMS throughout the year. However, year-end data is used when officially providing information for external use. This becomes available mid-January following the end of the fiscal year. This allows for consistent, repeatable reporting and provides the most complete information for a given fiscal year.<br><br>Verification/Validation: The data for this element is qualitative not quantitative. The Program offices and their sites perform reviews of the information in FIMS annually or more frequently as needed. | | | | | | |

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Condition** - Increase the percent of DOE owned and "active" buildings, trailers and structures (excluding FERC, LM, NR and PMAs) assessed as "adequate" based on replacement plant value (RPV) and a completed assessment | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | 58 % | 58.25 % | 58.5 % |
| **Result** | N/A | N/A | N/A | N/A | **Met** - 58 | TBD | TBD |
| **Endpoint Target** | Maintain 60% | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Comment** | A 0.25% change equates to approximately $350M in Replacement Plant Value. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | |

# Office of Project Management

## Departmental Administration

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Project Management Success** - Complete 90% of the construction projects at the original scope and within 10% of cost baseline established at Critical Decision (CD)-2, approve performance baseline. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 90 % | 90 % | 90 % | 90 % | 90 % | 90 % | 90 % |
| **Result** | **Not Met** - 76 | **Not Met** - 78 | **Met** - 91 | **Not Met** - 88 | **Met** - 93 | TBD | TBD |
| **Endpoint Target** | On a three-year rolling basis, complete at least 90% of departmental construction projects within the original scope baseline and not to exceed 110% of the cost as reflected in the performance baseline established at Critical Decision 2. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | This represents a new high-water mark for the Department. For this performance cycle, 93% of the construction projects were completed at the original scope and within 10% of the original cost baseline. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Managed by the Project Controls Division within the Office of Project Management.<br>Documentation: Maintained in the Department's central repository for key departmental-level project information called the Project Assessment and Reporting System (PARS).<br>Limitations: Data is not available until 45 days after the end of each quarter throughout the FY.<br>Methodology: The analyst will query PARS for any capital asset project that achieved Critical Decision (CD)-4, Project Completion, over the past three fiscal years to determine project management success. The analyst will compare the delineated scope, cost, schedule, and key performance parameter criteria of CD-2, performance baseline, and CD-4, project completion, approval memorandums to determine success.<br>Validation: Results are shared with the project's respective Program Office to review the assessment prior to publishing to ensure data were not missed that could impact a success rating.<br>Verification: An assessed rating is verified to ensure it is underpinned by the appropriate documentation in PARS. | | | | | | |

# Human Capital Management

## Departmental Administration

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Annual reductions in the average time-to-hire** - Annual reductions in the average time-to-hire from 174 days in FY 09 to 100 days or less by end of FY 2011, and further to an annual average of 80 days. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | ≤ 80 Calendar Days | ≤ 80 calendar days | ≤ 80 calendar days | ≤ 80 calendar days | ≤ 80 Calendar Days | ≤ 80 Calendar Days | ≤ 80 Days |
| **Result** | **Met** - 80 | **Not Met** - 98.7 | **Not Met** - 106.5 | **Not Met** - 119.3 | **Not Met** - 128.7 | TBD | TBD |
| **Endpoint Target** | Maintain a DOE average annual time-to-hire of 80 days or less for all GS and GS-equivalent positions. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | For FY 2018 there were 331 completed hires as of 09/30/2018, 326 reported new hires were used to calculate the FY 2018 average Time-To-Hire (T2H). 5 are excluded due to errors on the Entrance-On-Duty (EOD) date therefore excluded from the T2H average calculation. The average T2H for the 326 reported new hires was 128.7 days. According to the segmented data, the segments of the hiring process that did not meet the goal for the individual segment included Announcement Preparation, Application Evaluation, Candidate Selection, Job Offer, Job Acceptance, and Enter on Duty. Announcement preparation and Job Offer are the most significant over goal values.<br>**Action Plan:** Quarterly and annual time to hire is increased due to the managed hiring process. In FY 2018, Secretarial/Deputy Secretarial approval was extended to the pathways program, exerting greater influence on the increased average T2H. Beginning in FY 2019, the two HR shared service centers (SSC) encompassing most of DOE headquarters and field locations were consolidated, which should increase efficiency and consolidate SSC resources. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Data Source: Hiring information in HR Workflow as depicted in the T2H dashboard in iManage. Data is collected at discrete intervals and the total time to hire for an individual is the actual number of days from Recruit Initiation to EOD. The T2H phases are as follows: Recruit Initiation, Job Classification/Recertification, Announcement Preparation, Vacancy Announcement, Application Evaluation, Candidate Selection, Job Offer, Job Acceptance, and Entrance on Duty. The DOE average T2H is a mathematical average that is calculated within the T2H dashboard.<br>Limitations: Data source in some instances may be delayed, in which case is updated before the end of the year. HC implemented updates to the hiring management system in FY 2018 and is still analyzing the T2H data to ensure the system changes are properly aligned to the automated data collection tool used to track T2H data within iPortal.<br>Verification and Validation: Data is collected via the HR Workflow system. The system is audited frequently. Personnel processing personnel actions are trained and qualified on the system. | | | | | | |

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Implement a framework for performance-based culture** - Percent of SES with compliant plans. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 100 % | ≥ 90 % | ≥ 90 % | ≥ 90 % | ≥ 90 % | N/A | N/A |
| **Result** | **Not Met** | **Met** - 95 | **Met** - 92.1 | **Met** - 92 | **Met** - 93.6 | N/A | N/A |
| **Endpoint Target** | Improve and continue to refine DOE performance management systems/processes so they clearly link work to mission goals, expected outcomes and accomplishment measures. Ensure meaningful distinctions between levels of performance are identified and rewarded. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Of the 422 personnel in SES pay plans, 409 are required to have a plan in the system. Of the 409 required, 383 are at the Employee - Provide Final Narrative or later step for a 93.6% compliance rate. For FY 2018, performance improved 1.6% from FY 2017. | | | | | | |
| **Comment** | An SES performance plan is compliant with DOE performance management policy if it is in place within 30-45 days of assignment, includes a mid-year progress review, and a final review completed within 30-days following the close of the fiscal year with a final rating issued by the end of the calendar year that the specific performance cycle closed. This measure is discontinued as of FY 2019. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | The sources of data are SES Performance Management Policy and ePerformance Reports.<br>An SES performance plan that is compliant with DOE performance management policy must: be in place within 30-45 days of assignment, include a mid-year progress review, and a final review completed within 30-days following the close of the fiscal year with a final rating issued by the end of the calendar year that the specific performance cycle closed. | | | | | | |

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Retention of a high performing workforce** - Increase the retention of a high performing workforce | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | ≤ 38 % of all attrition is made up of High Performing Employees | ≤ 36 % of all attrition is made up of High Performing Employees |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD |
| **Endpoint Target** | High performing employees (employees rated Exceeds or Significantly Exceeds) comprise 36% or less of all annual attritions by FY 2020. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Comment** | Baseline: High performing employees, employees rated Exceeds or Significantly Exceeds, (or equivalent)) account for 39.4% of all Departmental attrition, based on attrition data from FY14 – FY17. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | DOE recognizes that a world class workforce is critical to our success in meeting mission requirements and our ability to retain high performers ensures we have the talent needed to meet mission requirements both now and in the future. DOE will track retention of high performers by analyzing our attrition profile, where decreases in employee attrition equates to increases in employee retention.<br><br>Total Workforce Data: From FY15 – FY17, 51% of DOE's onboard workforce qualified as High Performers (employees rated Exceeds or Significantly Exceeds).<br>Methodology: High Performer Attrition includes all voluntary separations, including voluntary retirements occurring ahead of the Department's average retirement deferment period of 4 years, resignations and transfers. | | | | | | |

# Hearings and Appeals

## Departmental Administration

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **OHA Effectiveness Measure** - Improve the timeliness of security cases by reducing the number of cases over 120 days old. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 4 cases | 4 cases | 3 cases | 3 cases | 3 cases | 3 cases | 3 Cases |
| **Result** | **Met** - 3 | **Met** - 3 | **Met** - 0 | **Met** - 0 | **Met** - 1 | TBD | TBD |
| **Endpoint Target** | Continuously assure that there are no more than 3 security cases more than 120 days old at any time. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Analysis indicated that OHA had no more than 3 open security clearance case older than 120 days at any time during FY 2018. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | New case data and final closing of the case (by issuance of a Decision or a Dismissal) is submitted to OHA's Docket section. OHA's Docket section then enters the case date information (when a case is opened and when a case is closed) into OHA's Legal Files case management software. Legal Files allows OHA management to run reports which provide data on the age of all cases before OHA. The Legal Files software calculates the age of each case using the date when the case is opened and the date when the case is closed. Verification of entry data is performed by management accessing pdf copies of case documents stored in Legal Files. | | | | | | |

# Loan Programs

## Loan Program Office

| Program | Loan Program Office | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **ATVM Battery Production Capacity** - Battery production capacity of 100,000 lithium-ion EV batteries (2,400,000 kWh) established | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | ≥ 100,000 Batteries | ≥ 100,000 Batteries | ≥ 100,000 Batteries | ≥ 100,000 Batteries | ≥ 100,000 Batteries | N/A | N/A |
| **Result** | **Met** - 100,000 | **Met** - 100,000 | **Met** - 100,000 | **Met** - 100,000 | **Met** - 100,000 | N/A | N/A |
| **Endpoint Target** | Assist in the development of advanced battery manufacturing capacity to support electric vehicles. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Comment** | This goal is ending in FY 2018. The borrower has repaid the direct loan used to increase the production capacity of lithium-ion EV batteries. As a result, the program will no longer monitor the performance outputs for battery production capacity. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | LPO results are based on monthly and quarterly reports from borrowers on the manufacturing production capacity of lithium-ion Electric Vehicle batteries. For each project, LPO Engineers within its Technical Project Management Division and Independent Engineers test the manufacturing production capacity of lithium-ion Electric Vehicle batteries at the time of construction completion. From there LPO Engineers analyze monthly and quarterly reports from borrowers on their manufacturing production capacity of lithium-ion Electric Vehicle batteries to monitor and validate performance and reporting. Additional monitoring and validation is completed during periodic on-site visits performed by LPO Engineers. Reports and on-site visits allow LPO Engineers the ability to recognize performance and reporting deviations since the initial test performed at the time of construction completion. There is no limitation on the impact of assessing the performance results. | | | | | | |

| Program | Loan Program Office | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **ATVM Reduction in Petroleum Usage** - Reduction in petroleum usage achieved through the use of advanced technology vehicles manufactured (at least in part) with funding provided through the ATVM loan program as compared to vehicles available in the base year. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 250 Million Gallons | 290 Million Gallons | 290 Million Gallons | 290 Million Gallons | ≥ 270 Million Gallons | N/A | N/A |
| **Result** | **Met** - 306 | **Met** - 335.3 | **Not Met** - 270 | **Not Met** - 285 | **Exceeded** - 280 | N/A | N/A |
| **Endpoint Target** | Annually assist in the reduction in petroleum usage achieved through the use of advanced technology vehicles manufactured (at least in part) with funding provided through the ATVM loan program as compared to vehicles available in the base year. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Comment** | This goal is ending in FY 2018. This performance metric has been measuring the incremental addition of gasoline saved each year from vehicles manufactured by Ford using manufacturing components that were financed by ATVM direct loans. As a result, in accordance to the loan agreement, Ford will no longer be obligated to submit performance reports to the ATVM program in FY 2019 because it will no longer utilize manufacturing components that were financed from ATVM direct loans. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | LPO results are based on annual reports from borrowers on the reduction of petroleum usage. Borrowers calculate the annual reduction of petroleum usage based on the number of fuel economy vehicles produced and average petroleum usage saved as compared to business as usual during the based year. From there LPO Engineers analyze the annual reports from borrowers on the reduction of petroleum usage to monitor and validate performance and reporting. Additional monitoring and validation is completed during periodic on-site visits performed by LPO Engineers. Reports and on-site visits allow LPO Engineers the ability to recognize performance and reporting anomalies. Borrowers will not know the actual reduction in petroleum usage until one year after fuel efficient automobiles are on the road. | | | | | | |

| Program | Loan Program Office | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **ATVM Reduction in Gasoline Usage** - The annual reduction in gasoline usage achieved through the use of all vehicles on the road using advanced technologies funded through the ATVM loan program. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | 1.8 billion gallons | 1.7 billion gallons |
| **Result** | 1.2 billion gallons | 1.5 billion gallons | 1.8 billion gallons | 1.9 billion gallons | 1.9 billion gallons | TBD | TBD |
| **Endpoint Target** | An aggregate amount of 9.1 billion gallons reduced from FY 2019 to FY 2026. This goal is ending in FY 2026. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Comment** | The ATVM portfolio's annual gasoline reduction will be modeled using performance reports from the borrower. The ATVM portfolio's annual gasoline reduction will be modeled using performance reports from the borrower. The modeled data includes cars manufactured in conjunction with the ATVM loan program from 2009 to 2017, as the model year cars get older and begin coming off the road the gasoline reduction will decrease. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Historical trend data is shown in the results field above to provide context, even where no formal GPRA Target was published for that year. | | | | | | |

| Program | Loan Program Office | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Generation Capacity of Projects Receiving Loan Guarantees** - Increase annual generation capacity from projects receiving DOE loan guarantees that have achieved commercial operations. (Gigawatts, GW) | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | ≥ 3.8 GW | ≥ 4 GW | ≥ 4 GW | ≥ 4 GW | ≥ 4 GW | ≥ 4 GW | ≥ 4 GW |
| **Result** | **Not Met** - 3.2 | **Not Met** - 3.82 | **Met** - 4 | **Met** - 4 | **Met** - 4 | TBD | TBD |
| **Endpoint Target** | Continue to meet annual target until the loans are repaid. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Continue to meet annual target until the loans are repaid. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | LPO results are based on monthly reports from borrowers on the electricity generation capacity from their projects. LPO Engineers within its Technical Project Management Division and Independent Engineers contracted by LPO test the electricity generation capacity performance of each project at the time of construction completion. From there LPO Engineers analyze monthly reports from borrowers on the electricity generation capacity from their projects to monitor and validate the electricity generation capacity performance and reporting. Monthly reports allow LPO Engineers the ability to recognize performance and reporting deviations since the initial test performed at the time of construction completion. There is no limitation on the impact of assessing the performance results. | | | | | | |

| Program | Loan Program Office | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **CO2 Reductions Loans Guarantee** - Estimated annual CO2 emissions reductions of projects receiving loan guarantees that have achieved commercial operations. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | ≥ 5,000,000 mt | ≥ 16,400,000 mt | ≥ 21,200,000 mt | ≥ 21,200,000 mt | ≥ 21,200,000 mt | ≥ 21,200,000 mt | ≥ 31,000,000 mt |
| **Result** | **Met** - 8,300,000 | **Not Met** - 13,100,000 | **Not Met** - 18,300,000 | **Met** - 22,500,000 | **Exceeded** - 27,000,000 | TBD | TBD |
| **Endpoint Target** | On an ongoing basis, projects receiving loan guarantees that have achieved commercial operations will have lower estimated annual CO2 emissions reductions compared to "business as usual energy generation. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | LPO will not get actuals until November 15, 2018. On an ongoing basis, projects receiving loan guarantees that have achieved commercial operations will have lower estimated annual CO2 emissions reductions compared to "business as usual" energy generation. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | LPO results are based on quarterly reports from borrowers on the electricity generation derived from their projects. From there LPO multiplies the reported electricity generation by the CO2 avoidance conversation factor. The CO2 avoidance conversation factor is the EIA estimate of annual CO2 emissions from energy consumption at conventional power plants and combined heat and power plants divided by EIA estimate of annual US electric power industry generation. To validate the performance and performance reporting of electricity generation LPO Engineers within its Technical Project Management Division test the electricity generation derived from borrowers' projects during annual on-site visits. There is no limitation on the impact of assessing the performance results. However, it is worth noting that the reported electricity generation from borrowers are real time whereas, the data used to calculate the CO2 avoidance conversation factor are actuals from the prior year because at the time of reporting only estimates are available for the current year. | | | | | | |

# Environment, Health, Safety and Security

## Departmental Administration

| Program | Departmental Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Former Worker Satisfaction** - Obtain an average rating of no less than satisfactory on 90 percent of customer satisfaction surveys from former worker medical screening program participants who receive medical screenings. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | 90 percent satisfactory rating on customer satisfaction surveys | 90 percent satisfactory rating on customer satisfaction surveys | 90 percent satisfactory rating on customer satisfaction surveys | 90 percent satisfactory rating on customer satisfaction surveys | 90 percent satisfactory rating on customer satisfaction surveys | 90 percent satisfactory rating on customer satisfaction surveys | 90 percent satisfactory rating on customer satisfaction surveys |
| **Result** | **Met** - 97 | **Met** - 97 | **Met** - 98 | **Met** - 98.3 | **Met** - 99.1 | TBD | TBD |
| **Endpoint Target** | Achieve 90% satisfactory rating on customer satisfaction surveys annually. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | The survey satisfaction results demonstrate EHSS's and the Department's commitment to its employees and former employees regarding the implementation of the medical screening program. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | The Former Worker Program cooperative agreement holders maintain a file of all completed surveys. The aggregated results of the customer surveys are forwarded to EHSS and are maintained in a results table. The rate of satisfaction is based on a satisfactory or higher rating on at least 90% of the completed surveys. | | | | | | |

# Energy Information Administration

## Energy Information Administration

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Program** | Energy Information Administration | | | | | | |
| **Performance Goal (Measure)** | **Timeliness of EIA Information Products** - Percentage of selected EIA recurring products meet their release date targets (all product types). | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | = 95 % of products released on schedule | ≥ 95 % of products released on schedule | ≥ 95 % of products released on schedule | ≥ 95 % of products released on schedule | ≥ 95 % of products released on schedule | ≥ 95 % of products released on schedule | ≥ 95 % of products released on schedule |
| **Result** | **Met** - 96 | **Met** - 95 | **Met** - 97 | **Met** - 96 | **Met** - 97 | TBD | TBD |
| **Endpoint Target** | This is an ongoing annual performance measure, as timely delivery of energy information is central to EIA's mission. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | As the nation's premier source of energy information, customers rely on EIA for timely delivery of independent, impartial statistics and analyses. This reliability promotes efficient energy markets while also contributing to sound policymaking and public understanding of energy and its interactions with the economy and the environment. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Internal tracking: for a core set of recurring data and analytical products, EIA develops a release schedule and tracks the actual release dates. The Quality Assurance Team within EIA's Office of Energy Statistics verifies the calculations and stores the file. | | | | | | |

| Program | Energy Information Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Quality of EIA Information Products** - Percentage of customers who are satisfied or very satisfied with the quality of EIA information. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | = 90 % customer satisfaction rating | ≥ 90 % of customers satisfaction rating | ≥ 90 % of customer satisfaction rating | ≥ 90 % of customer satisfaction rating | ≥ 90 % of customer satisfaction rating | ≥ 90 % of customer satisfaction rating | ≥ 90 % of customer satisfaction rating |
| **Result** | **Met** - 95 | **Met** - 90 | **Met** - 93 | **Met** - 91 | **Met** - 91 | TBD | TBD |
| **Endpoint Target** | This is an ongoing annual performance measure, as information quality is central to EIA's mission. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | EIA actively solicits external feedback to gain a better understanding of who uses the agency's information products, how they are used, and most importantly, whether they meet customers' diverse and evolving needs. This feedback spurs product innovation, which in turn supports the Department's role in leading the National conversation on energy. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | EIA received OMB approval to conduct the survey. A summary of the survey results is published on EIA's Intranet website, Inside EIA, and the file is stored in EIA's Office of Communications and Outreach Division. | | | | | | |

# Southeastern Power Administration

## Southeastern Power Administration

| Program | Southeastern Power Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **SEPA Repayment of Federal Power Investment** - Repayment of Investment Performance - Ensure unpaid investment (UI) is equal to or less than the allowable unpaid investment (AUI) in accordance with DOE Order RA 6120.2 and Reclamation Law. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | ≥ 100 percent | ≤ 2.148 AUI | ≤ 2,143 million dollars AUI | ≤ 2,212 million dollars AUI | ≤ 2,138 million dollars AUI | ≤ 2,135 million dollars AUI | ≤ 2,097 million dollars AUI |
| **Result** | **Met** - 100 | **Met** - 1.686 | **Met** - 1,626 | **Met** - 1,586 | **Met** - 1,647 | TBD | TBD |
| **Endpoint Target** | Continue to meet legislated cost recovery requirements for timely repayment of Federal investment in maintaining financial integrity of projects/program. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Documentation: Rates and Repayment Statement of Project Revenues, Expenses, and Repayment of Investment. Repayment statistics are compiled annually by project from the most recent final power repayment study (PRS) developed by Rates/Power Marketing Offices using audited financial data. These studies identify project investment category totals for unpaid Federal investment (UI) and the amount of allowable unpaid Federal investment (AUI). AUI is the amount of investment for which repayment is not yet required based on the duration of the repayment period. Annual planned repayment estimates are developed in the PRS, and are based on average hydrology that can vary greatly, impacting both revenue and expenses. Moreover, annual repayment of Federal investment in infrastructure/facilities isn't required, but assumes repayment within the average service life up to a maximum of 50 years. | | | | | | |

| Program | Southeastern Power Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **SEPA System Reliability Performance - NERC** - Attain average North American Electric Reliability Corporation (NERC) compliance ratings for NERC Control Performance Standard 1 (CPS1) of greater than or equal to 100 percent. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | > 100 CPS1 rating with CPS2>90 | > 100 CPS1 rating with CPS2>90 | > 100 CPS1 rating with CPS2>90 | ≥ 100 CPS1 Rating | ≥ 100 CPS1 Rating | ≥ 100 CPS1 rating | ≥ 100 CPS1 rating |
| **Result** | **Met** - 193.2 | **Met** - 187.7 | **Met** - 200.51 | **Met** - 266.3 | **Met** - 225.83 | TBD | TBD |
| **Endpoint Target** | Ensure the reliability of the electrical grid by attaining a NERC CPS 1 rating of equal to or greater than 100 percent each year. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Comment** | CPS1 measures generation/load balance on one-minute intervals. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Documentation: NERC Control Performance Standards Summary (Operations Center). The North American Electric Reliability Corporation's (NERC) Control Performance Standard (CPS) establishes the statistical boundaries for ACE (area control error) values, ensuring the system frequency is always within its scheduled value. CPS1 defines the permissible distribution of all ACE values in an interconnection, based on the expected frequency performance, and must be met 100 percent of the time. | | | | | | |

| Program | Southeastern Power Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **SEPA Operating Cost** - Annual Operating Cost Performance: Provide power at the lowest possible cost by keeping total operation and maintenance cost per kilowatt-hour generated at or below the National median for public power for 100+ customers. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Target | N/A | N/A | N/A | N/A | N/A | ≤ 0.068 /$ KWh | ≤ 0.056 /$KWh |
| Result | N/A | N/A | N/A | N/A | N/A | TBD | TBD |
| Endpoint Target | Control annual Operations and Maintenance costs, thereby providing power at the lowest possible cost. | | | | | | |
| Commentary on 2018 Results (Action Plan if Not Met) | | | | | | | |
| Comment | Due to the seasonal nature of hydropower generation throughout the fiscal year, a rolling 1-year total will be calculated for both Operating & Maintenance (O&M) expense information as well as Net Generation. O&M data is obtained through the financial management system, while generation data is compiled from the power operations reports of each contributing generating agency. The annual target for each performance reporting cycle is determined by referencing the latest annual report on financial and operating ratios as published by the American Public Power Association (APPA). Specifically, SEPA will refer to the "Median Values by Customer Size Class" table. The APPA compiles benchmark information from both a survey instrument and data residing with the Energy Information Administration. | | | | | | |
| Documentation, Limitations, Methodology, Validation, and Verification | | | | | | | |

# Southwestern Power Administration

## Southwestern Power Administration

| Program | Southwestern Power Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **SWPA Repayment of Investment Performance** - Ensure unpaid investment (UI) is equal to or less than the allowable unpaid investment (AUI) in accordance with DOE Order RA 6120.2 and Reclamation Law. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | ≤ 1,477 million in AUI | ≤ 1,387 million in AUI | ≤ 1,460 million in AUI | ≤ 1,536 million in AUI | ≤ 1,590 million in AUI | ≤ 1,789 million in AUI | ≤ 1,708 million in AUI |
| **Result** | **Met** - 442 | **Met** - 466 | **Met** - 504 | **Met** - 551 | **Met** – 314.1 | TBD | TBD |
| **Endpoint Target** | Continue to meet legislated cost recovery requirements for timely repayment of Federal investment in maintaining financial integrity of projects/program. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Final results will not be known until the FY 2018 financial statements are finalized. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Values for Target (allowable unpaid investment) and Result (estimated/actual unpaid investment) provided annually by the Division of Resources and Rates from the most recent Power Repayment Studies (PRSs) for each of our 3 rate systems.<br>• Target - AUI is the sum of the Allowable Balance in each rate system PRS for the indicated FY. The PRS Allowable Balance is the sum total of all annual investments allowed to remain unpaid as of the end of the FY; each investment's allowable unpaid period is based on when it is placed in operation and the applicable repayment period (up to 50 years).<br>• Result - UI is the sum of the Balance to Be Repaid for each rate system PRS for the indicated FY. The PRS Balance to Be Repaid is the sum total of all remaining investment to be repaid as of the end of the FY.<br>• Actual investment data is obtained from Southwestern's financial statements and the U.S. Army Corps of Engineers' (Corps) financial statements, through the Southwestern Federal Power System (SWFPS) combined financial statement audit process.<br>• The estimated future investment data for Southwestern investments is obtained from Southwestern's budget and capital replacements plans; The estimated future investment data for the Corps is obtained from the Corps' 5-year capital projects plans and master list of major equipment replacements. These estimates are provided to Southwestern's Division of Resources and Rates as part of the annual PRS process.<br>• Finalized actual investment data is available only after the SWFPS combined financial statement audit process is complete.<br>• Estimated future investment data is dependent upon the accuracy of estimates provided by the various Southwestern and Corps sources.<br>• Verification and validation occurs throughout the FY financial audit of the SWFPS combined financial statements, as the financial data provided by the various Southwestern and Corps sources during the annual PRS process is cross-checked with financial statements. | | | | | | |

| Program | Southwestern Power Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **SWPA System Reliability Performance - NERC** - Attain average North American Electric Reliability Corporation (NERC) compliance ratings for NERC Control Performance Standard 1 (CPS1) of greater than or equal to 100 percent. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | > 100 CPS1 rating and CPS2>90 | CPS1>100 and CPS2>90 | CPS1>100 and CPS2>90 | ≥ 100 CPS1 Rating | ≥ 100 CPS1 Rating | ≥ 100 CPS1 Rating | ≥ 100 CPS1 Rating |
| **Result** | **Met** - 187.97 | **Met** - 214.3 | **Met** - 220.25 | **Met** - 195.44 | **Met** - 207.3 | TBD | TBD |
| **Endpoint Target** | Ensure the reliability of the electrical grid by attaining a NERC CPS1 rating of equal to or greater than 100 percent each year. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Comment** | CPS1 measures generation/load balance on one-minute intervals. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Data provided by the Division of Scheduling and Operations for quarterly updates. CPS1 measures generation/load balances at one minute intervals. This information is tracked through Southwestern's Supervisory Control and Data Acquisition System (SCADA). It is a 10 minute clock on a rolling 12 month average. A balancing authority's (BA) ability to balance supply and demand is measured by its area control error (ACE), a real-time value that is continuously tracked in each BA's supervisory control and data acquisition (SCADA) system. The North American Electric Reliability Corporation's (NERC) Control Performance Standard (CPS) establishes the statistical boundaries for ACE values, ensuring the system frequency is always within its scheduled value. CPS1 defines the permissible distribution of all ACE values in an interconnection, based on the expected frequency performance. Documentation: NERC Control Performance Report submitted by each SWPA Balancing Authority. | | | | | | |

| Program | Southwestern Power Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **SWPA System Reliability Performance - Outages** - Effectively operate the transmission system to limit the number of accountable outages to no more than 3 annually. | | | | | | |
| Fiscal Year | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Target | ≤ 3 accountable outages | ≤ 3 accountable outages | ≤ 3 accountable outages | ≤ 3 accountable outages | ≤ 3 accountable outages | N/A | N/A |
| Result | **Met** - 0 | **Met** - 3 | **Met** - 2 | **Met** - 3 | **Met** - 2 | N/A | N/A |
| Endpoint Target | Southwestern provides reliable service to customers each year, thereby maintaining power system reliability. | | | | | | |
| Commentary on 2018 Results (Action Plan if Not Met) | | | | | | | |
| Comment | SWPA will be measuring this number of outages internally starting in FY 2019. As such, no targets have been established beyond FY 2018. | | | | | | |
| Documentation, Limitations, Methodology, Validation, and Verification | Data has been provided by Southwestern's Deputy Administrator Office of Power Delivery. The outages are tracked manually via an elog recorded and provided by Southwestern's dispatchers. All outages are reviewed by the Senior Management to determine cause analysis to correct future issues. The unavoidable outages analysis may lead to additional training requirements and it is passed along to pertinent parities. | | | | | | |

| Program | Southwestern Power Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **SWPA Operating Cost** - Annual Operating Cost Performance: Provide power at the lowest possible cost by keeping total operation and maintenance cost per kilowatt-hour generated at or below the National median for public power for 100+ customers. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Target | N/A | N/A | N/A | N/A | N/A | ≤ 0.068 /$ KWh | ≤ 0.056 /$ kWh |
| Result | N/A | N/A | N/A | N/A | N/A | TBD | TBD |
| Endpoint Target | Control annual Operations and Maintenance costs, thereby providing power at the lowest possible cost. | | | | | | |
| Commentary on 2018 Results (Action Plan if Not Met) | | | | | | | |
| Comment | Due to the seasonal nature of hydropower generation throughout the fiscal year, a rolling 1-year total will be calculated for both Operating & Maintenance (O&M) expense information as well as Net Generation. O&M data is obtained through the financial management system, while generation data is compiled from the power operations reports of each contributing generating agency. The annual target for each performance reporting cycle is determined by referencing the latest annual report on financial and operating ratios as published by the American Public Power Association (APPA). Specifically, SWPA will refer to the "Median Values by Customer Size Class" table. The APPA compiles benchmark information from both a survey instrument and data residing with the Energy Information Administration. | | | | | | |
| Documentation, Limitations, Methodology, Validation, and Verification | | | | | | | |

# Western Area Power Administration

## Western Area Power Administration

| Program | Western Area Power Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **WAPA - Repayment of Investment Performance** - Ensure unpaid investment (UI) is equal to or less than the allowable unpaid investment (AUI) in accordance with DOE Order RA 6120.2 and Reclamation Law. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | ≤ 8.667 billion dollars UI | ≤ 8.632 billion dollars AUI | ≤ 8.025 billion dollars AUI | ≤ 7.996 billion dollars AUI | ≤ 7.85 billion dollars AUI | ≤ 8.078 billion dollars AUI | ≤ 8.534 billion dollars AUI |
| **Result** | **Met** - 5.476 | **Met** - 5.214 | **Met** - 5.318 | **Met** - 5.263 | **Met** - 5.145 | TBD | TBD |
| **Endpoint Target** | Continue to meet legislated cost recovery requirements for timely repayment of Federal investment in maintaining financial integrity of projects/program. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Met (Green): Collective repayment for Western projects through the 4th quarter of FY 2018 indicate UI is on target to be equal or less than AUI. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Repayment statistics are compiled annually by project from the most recent final power repayment study (PRS) developed by Rates/Power Marketing Offices using audited financial data. There is typically a lag in the final statistics becoming available for performance reporting and as such, these results are considered preliminary until then. The studies identify project investment category totals for unpaid Federal investment (UI) and the amount of allowable unpaid Federal investment (AUI). AUI is the amount of investment for which repayment is not yet required based on the duration of the repayment period. If at any point, the unpaid levels exceed those allowed in accordance with the principles established in R A6120.2, repayment is behind schedule. As to the application of principal in the PRS, generally repayment is applied to the highest interest rate first. However, e.g. if in year 20 of a 20-year investment, AUI is zero, a "required payment" must be made regardless of the interest rate. Note: Annual planned repayment estimates are developed in the PRS, and are based on average hydrology that can vary greatly, impacting both revenue and expenses. Moreover, annual repayment of Federal investment in infrastructure/facilities isn't required, but assumes repayment within the average service life up to a maximum of 50 years. Documentation: Final Power Repayment Studies. | | | | | | |

| Program | Western Area Power Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **WAPA - System Reliability Performance - NERC Rating** - Attain average North American Electric Reliability Corporation (NERC) compliance ratings for NERC Control Performance Standard 1 (CPS1) of greater than or equal to 100 percent. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | > 100 CPS1 rating with CPS2>90 | CPS1>100; CPS2>90 | > 100 CPS1 rating with CPS2>90 | ≥ 100 CPS1 Rating | ≥ 100 CPS1 Rating | ≥ 100 CPS1 Rating | ≥ 100 CPS1 Rating |
| **Result** | **Met** - 171.78 | **Met** - 162.18 | **Met** - 142.52 | **Met** - 154.44 | **Met** - 156.68 | TBD | TBD |
| **Endpoint Target** | Ensure the reliability of the electrical grid by attaining a NERC CPS1 rating of equal to or greater than 100 percent each year. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Met (green): WAPA's control area achieved a "Pass" rating for CPS1 FY 2018 with an annual average CPS1 of 156.68. | | | | | | |
| **Comment** | CPS1 measures generation/load balance on one-minute intervals. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | A balancing authority's (BA) ability to balance supply and demand is measured by its area control error (ACE), a real-time value that is continuously tracked in each BA's supervisory control and data acquisition (SCADA) system. The North American Electric Reliability Corporation's (NERC) Control Performance Standard (CPS) establishes the statistical boundaries for ACE values, ensuring the system frequency is always within its scheduled value. CPS1 defines the permissible distribution of all ACE values in an interconnection, based on the expected frequency performance. Documentation: NERC Control Performance Report submitted by each WAPA Balancing Authority. | | | | | | |

| Program | Western Area Power Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **WAPA Operating Cost** - Annual Operating Cost Performance: Provide power at the lowest possible cost by keeping total operation and maintenance cost per kilowatt-hour generated at or below the National median for public power for 100+ customers. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | ≤ 0.068 $/KWh | ≤ 0.056 $/kWh |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD |
| **Endpoint Target** | Control annual Operations and Maintenance costs, thereby providing power at the lowest possible cost. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Comment** | Due to the seasonal nature of hydropower generation throughout the fiscal year, a rolling 1-year total will be calculated for both Operating & Maintenance (O&M) expense information as well as Net Generation. O&M data is obtained through the financial management system, while generation data is compiled from the power operations reports of each contributing generating agency. The annual target for each performance reporting cycle is determined by referencing the latest annual report on financial and operating ratios as published by the American Public Power Association (APPA). Specifically, WAPA will refer to the "Median Values by Customer Size Class" table. The APPA compiles benchmark information from both a survey instrument and data residing with the Energy Information Administration. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | |

# Bonneville Power Administration

## Bonneville Power Administration

| Program | Bonneville Power Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **BPA Repayment of Federal Power Investment to Keep Costs Low** - Meet planned annual repayment of principal on Federal power investments to help keep costs low consistent with sound business principles. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | ≥ 100 percent | ≥ 100 percent | ≥ 100 percent | ≥ 100 percent | ≥ 100 percent | ≥ 100 percent | ≥ 100 percent |
| **Result** | **Met** - 100 | **Met** - 100 | **Met** - 100 | **Met** - 100 | **Met** - 100 | TBD | TBD |
| **Endpoint Target** | Continue to meet planned annual repayment of principal | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | BPA made a total annual payment of $862 million of which $569 million was principal amortization. BPA met this performance target for the 35th straight year, demonstrating Bonneville's ongoing commitment to meeting its obligations to U.S. taxpayers. | | | | | | |
| **Comment** | As a capital-intensive business, with constant requirements to maintain extensive generation and transmission system assets across the region, meeting BPA's planned federal annual repayment is vital to maintaining a high credit rating which enables access to lower cost non-federal capital to make needed system investments. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Documented in the Quarterly Findings Memo (from BPA Chief Operating Officer to BPA Administrator). This memo is used to describe, document, and validate the quarterly results before they are declared final through a process of checks and review, first by subject matter experts, then by managers and vice presidents, and then by senior executives. | | | | | | |

| Program | Bonneville Power Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **BPA System Reliability Performance - NERC Rating** - Attain average North American Electric Reliability Corporation (NERC) compliance ratings for NERC Control Performance Standard 1 (CPS1) of greater than or equal to 100 percent. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Target | ≥ 100 CPS1 rating | ≥ 100 percent | ≥ 100 percent | ≥ 100 percent | ≥ 100 percent | ≥ 100 percent | ≥ 100 percent |
| Result | **Met** - 130.39 | **Met** - 139.91 | **Met** - 143.8 | **Met** - 151.3 | **Met** - 163.1 | TBD | TBD |
| Endpoint Target | Continually ensure the reliability of the electrical grid by attaining a NERC CPS1 rating of equal to or greater than 100 percent each year. | | | | | | |
| Commentary on 2018 Results (Action Plan if Not Met) | BPA achieved the CPS1 standard with a result of 163.1% against a target of no less than 100%. Meeting this target demonstrates BPA's ongoing commitment and ability to provide reliable transmission for the region. | | | | | | |
| Comment | CPS1 measures generation/load balance on one-minute intervals. | | | | | | |
| Documentation, Limitations, Methodology, Validation, and Verification | Documented in the Quarterly Findings Memo (from BPA Chief Operating Officer to BPA Administrator). This memo is used to describe, document, and validate the quarterly results before they are declared final through a process of checks and review, first by subject matter experts, then by managers and vice presidents, and then by senior executives. | | | | | | |

| Program | Bonneville Power Administration | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **BPA Hydropower Generation Efficiency Performance** - Achieve 97.5% Heavy-Load-Hour Availability (HLHA) through efficient performance of Federal hydro-system processes and assets, including joint efforts of BPA, Army Corps of Engineers, and Bureau of Reclamation. HLHA is actual machine capacity available during heavy-load hours (0700-2200 Monday-Saturday), divided by planned available capacity during heavy-load hours. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | ≥ 97.5 percent | ≥ 97.5 percent | ≥ 97.5 percent | ≥ 97.5 percent | ≥ 97.5 percent | ≥ 97.5 percent | ≥ 97.5 percent |
| **Result** | **Met** - 100.7 | **Met** - 100.6 | **Met** - 102.1 | **Met** - 99.9 | **Met** - 100.5 | TBD | TBD |
| **Endpoint Target** | Maintain at least 97.5% Heavy-Load-Hour Availability | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | Bonneville and its Federal Columbia River Power System (FCRPS) partners, the U.S. Army Corps of Engineers and the Bureau of Reclamation with a combined 31 hydro-electric dams, met this operational goal for the hydropower system with a result of 100.5%. | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | Documented in the Quarterly Findings Memo (from BPA Chief Operating Officer to BPA Administrator). This memo is used to describe, document, and validate the quarterly results before they are declared final through a process of checks and review, first by subject matter experts, then by managers and vice presidents, and then by senior executives. | | | | | | |

# Indian Energy Policy and Programs

## Indian Energy

| Program | Indian Energy | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Generation Capacity** - Increase total installed generation capacity from projects receiving Indian energy deployment grants (cumulative beginning in FY 2019, Megawatts, MW) | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | 4.4 MW | 11 MW |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD |
| **Endpoint Target** | Installation of 100 MW cumulative of new generation capacity in Indian Country by 2030. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | |

| Program | Indian Energy | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Savings** - Increase energy cost savings to tribal communities co-funded by the Office of Indian Energy over the life of the installed generation system or efficiency measures (cumulative beginning in FY 2019, $M) | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | N/A | N/A | $ 100 million | $ 250 million |
| **Result** | N/A | N/A | N/A | N/A | N/A | TBD | TBD |
| **Endpoint Target** | Cumulative energy cost savings to funded tribal communities over the life of the installed generation systems of more than $2 billion dollars by 2030. | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | | | | | | | |

# Office of Small and Disadvantaged Business Utilization

## Office of Small and Disadvantaged Business Utilization

| Program | Office of Small and Disadvantaged Business Utilization | | | | | | |
|---|---|---|---|---|---|---|---|
| **Performance Goal (Measure)** | **Prime contracting awards** - Advocate for small business set-asides and track the agency prime contracting awards to small businesses with the goal of ensuring DOE meets or exceeds the Small Business Administration's (SBA) determined percentage of DOE projected Federal Spend for primes. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | 10.2 % | 10.2 % | 11.65 % | TBD |
| **Result** | N/A | N/A | N/A | **Met** - 12.02 % | **Met -** 13.76 % | TBD | TBD |
| **Endpoint Target** | Meet or exceed SBA's determined percentage of DOE projected Federal spend for prime SB contracts (inclusive of first-tier M&O subcontracts). | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | OSDBU depends on the Small Business Administration (SBA) for the final goal achievement numbers (for the previous FY, i.e. FY18). Historically and to date, there is significant lag time in getting this data due to end of year contracting closeout and reporting system lag. We traditionally get this information from SBA sometime in spring and there is no set date, therefore the FY18 results may not be final. | | | | | | |
| **Comment** | DOE OSDBU does not unilaterally set the agency's goals. Goals are determined by the DOE OSDBU internally collaborating with program elements and externally with the SBA. Small business utilization goals for a given fiscal year are typically available by the end of November (of that fiscal year). | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | The data systems are the Federal Procurement Data System (FPDS) and Management and Operating Subcontracting Reporting Capability (MOSRC). | | | | | | |

| Program | Office of Small and Disadvantaged Business Utilization | | | | | | |
|---|---|---|---|---|---|---|---|
| Performance Goal (Measure) | **Subcontracting awards** - Advocate for small business subcontracting and track the subcontracting awards with the goal of ensuring DOE meets or exceeds the Small Business Administration's (SBA) determined percentage of DOE projected Federal Spend for subcontracting. | | | | | | |
| **Fiscal Year** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| **Target** | N/A | N/A | N/A | 40 % | 42 % | 45 % | N/A |
| **Result** | N/A | N/A | N/A | **Met** - 43.3% | **Not Met -** 24.57 % | TBD | N/A |
| **Endpoint Target** | Meet or exceed SBA's determined percentage of DOE projected Federal spend for prime SB subcontracts (not including first-tier M&O subcontracts). | | | | | | |
| **Commentary on 2018 Results (Action Plan if Not Met)** | OSDBU depends on the Small Business Administration (SBA) for the final goal achievement numbers (for the previous FY, i.e. FY18). Historically and to date, there is significant lag time in getting this data due to end of year contracting closeout and reporting system lag. We traditionally get this information from SBA sometime in spring and there is no set date, therefore the FY18 results may not be final. | | | | | | |
| **Comment** | DOE OSDBU does not unilaterally set the agency's goals. Goals are determined by the DOE OSDBU internally collaborating with program elements and externally with the SBA. Small business utilization goals for a given fiscal year are typically available by the end of November (of that fiscal year). | | | | | | |
| **Documentation, Limitations, Methodology, Validation, and Verification** | The data systems is called the Electronic Subcontracting Reporting System (ESRS). ESRS is a national system used by all Federal agencies. | | | | | | |

# APPENDIX 1: ADDITIONAL INFORMATION

## Strategic Review Summary of Progress

The following table provides a summary of DOE's progress, as of the end of FY 2018, toward meeting its Strategic Objectives and indicates the objectives that were designated as areas of Noteworthy Progress or in need of focused improvement.

| |
|---|
| **Strategic Goal 1: Promote American Energy Dominance** - Pursue energy innovation to achieve American energy dominance through the production and use of affordable and reliable energy from a variety of resources, which will drive economic growth, job creation, and energy security; ensure responsible environmental stewardship; and improve Americans' quality of life. |
| **Strategic Objective 1:** Develop Energy Technologies that Increase the Affordability of Domestic Energy Resources |
| **Key Accomplishments:**<br><u>Energy Efficiency and Renewable Energy</u><br>• Vehicles: Reduced modeled electric vehicle battery pack cost to $197/kWh.<br>• Vehicles: Developed and validated lithium ion battery technology that requires only 200g/kWh of cobalt (40% reduction since 2012).<br>• Fuel Cells: Reduced modeled hydrogen fueling station capital cost by up to 40% through the development of innovative pressure consolidation approaches to fueling station operation that reduce the cost of hydrogen dispensing.<br>• Bioenergy: Decreased the modeled fuel selling price ($/gge) for the catalytic fast pyrolysis pathway from 4.34 in FY 2017 to 3.46.<br>• Manufacturing: 2.5% reduction in energy intensity among Better Plants partners. These partners represent 15% of the total U.S. Manufacturing footprint in diverse industries.<br>• Buildings: Increased the power conversion efficiency (as measured in a laboratory prototype) to 16% for amber light, a key step towards achieving 350 lm/W for mixed monochromatic white light.<br>• Federal Energy Management Program (FEMP): $960 million federal investment in facilities energy conservation measures government-wide and over 40,000 hours of workforce development training facilitated by FEMP.<br>• Solar: Reduced the modeled cost of utility-scale photovoltaic energy (cents/kWh) to 5.2 (from 6 in FY 2017), reaching the Solar Office's 2020 goal three years early.<br>• Wind: Reduced the modeled levelized cost of energy from offshore wind (cents/kWh) to 11.9 (from 17.2 in FY 2017) and onshore wind to 4.8 (from 5.2 in FY 2017).<br>• Water: Reduced the modeled levelized cost of energy (cents/kWh) from Dams to 9.6 (from 9.7 in FY 2017), from Marine and Hydrokinetic (MHK) energy to 64 (from 66 in FY 2017), and from Streams to 11.4 (from 11.5 in FY 2017).<br>• Geothermal: Reduced the modeled levelized cost of energy (cents/kWh) for Enhanced Geothermal Systems to 21.75 (from 22 in FY 2017) using a new Lawrence Berkeley National Laboratory Step-Rate Injection Method for Fracture In-Situ Properties (SIMFIP) tool, which uses stress measurements to improve stimulation. |

Fossil Energy Research and Development

- The Petra Nova project, which received financial and project management support from DOE, is showing how carbon capture technologies, when coupled with enhanced oil recovery, can support the long-term viability of coal-fueled power plants. As of September 2018, Petra Nova has captured and sent for storage 2,020,610 short (US) tons of carbon dioxide, and West Ranch Oil Field has produced 2,156,442 barrels of oil through enhanced oil recovery (cumulative amounts since the beginning of operations in January 2017). Multiple projects were selected for award to develop sensors and controls technologies that will enable existing coal-fueled power plants to achieve higher efficiency, improved availability, increased reliability, lower electricity costs, and more responsive load cycling.

**Strategic Objective 2: Reduce Regulatory Burdens on Domestic Energy Resources (Noteworthy Progress)**

**Key Accomplishments:**

Energy Efficiency and Renewable Energy

- Released a Funding Opportunity for MHK technologies research that included a $1.6M topic area specifically targeted at reducing regulatory barriers by increasing access to newly developed scientific information on potential environmental impacts for state and federal regulators.
- Published a Request for Information (RFI) seeking public input on potential modifications to the Process Rule and sought further input through a public meeting. DOE received significant feedback on its RFI and in the public meeting, which informed the Notice of Proposed Rule Making published in the Federal Register on 12/18/2018. At present, this NPRM is currently out for comment.
- Released the second U.S. Hydropower Market report (first released in 2015), which contained new high-level information on the time, costs, and uncertainty associated with hydropower and pumped-storage licensing processes.

Fossil Energy Research and Development

- Initiated NETL research on material properties to determine the performance limits of alloys for natural gas pipelines and fuel transport.
- Announced a final rule, which took effect August 24, 2018, to enable DOE to give faster approvals to applications requesting small-scale exports to non-Free Trade Agreement countries.

Office of Electricity

- Provided state utility regulators technical assistance and training needed to oversee modernization of the grid and approve utility cost recovery for prudent grid modernization investments.
- Provided state energy offices technical assistance and training to carry out state policies and programs related to grid infrastructure and improving engagement in Public Utility Commission regulatory proceedings in furtherance of state energy goals.
- DOE is on-track to update the Presidential permit process to require early pre-application coordination procedures by January 1, 2019.

**Strategic Objective 3: Revitalize U.S. Nuclear Energy Sector**

**Key Accomplishments:**

Nuclear Energy

- Inserted the first samples of accident tolerant fuel cladding in a commercial U.S. reactor in February 2018. Global Nuclear Fuels' iron-chrome-aluminum cladding was inserted in Southern Nuclear's Plant Hatch. The cladding was developed in a private-public partnership with the Department.
- The Advanced Test Reactor at Idaho National Laboratory began its latest irradiation cycle in June 2018 with a new test train that holds 26 accident tolerant fuel samples. The start of this long-term experiment is the culmination of three years of planning, design, engineering, and fabrication between the lab and the three industry teams that are developing accident tolerant fuel concepts.

- The Versatile Test Reactor (VATR) Research and Development Plan was completed in December 2017 and the Requirements document was completed in March 2018.

**Strategic Objective 4: Improve Electric Grid Reliability and Resilience**

**Key Accomplishments:**

Energy Efficiency and Renewable Energy

- Working closely with the Office of Electricity and the Grid Modernization Laboratory Consortium (GMLC), EERE has developed over 90 projects since 2016 that cover grid modernization and address the reliability and resilience of the power system. These projects were presented and reviewed by subject matter experts at our Grid Modernization Peer Review in September 2018. Some of the results of that work are below.
- Developed an energy and infrastructure resiliency plan for New Orleans including local distributed generation, renewable energy sources, and cost-effective grid resilience enhancements which could serve as a model for similar U.S. coastal communities.
- In February 2018, Hawaiian Electric became the first U.S. utility to require distributed energy resources (DER) to provide services to support the bulk power system, following the recommendations of a GMLC Technical Report published by the project team, and the staff of the California Public Utilities Commission has recommended that California take a similar step.
- Hierarchical Engine for Large-scale Infrastructure Co-Simulation (HELICS) developed, enabling large-scale interdependency studies across transmission, distribution, and communication infrastructures.

Fossil Energy Research and Development

- STEP 10 MW sCO2 Pilot Plant facility: Completed cycle definition and environmental assessment, which found "No Significant Impact".
- Successfully completed the factory test of the first fully integrated 200 kWe Solid Oxide Fuel Cell prototype system. Upon completion of the test, the system was installed on site at the NRG facility in Pittsburgh, Pennsylvania and is awaiting the completion of several municipal inspections prior to being placed in operation. The satisfactory operation of this system is necessary to validate the technology at large scale prior to embarking on a MWe-class pilot-scale demonstration.
- Awarded a project to create a model of a regional generating and transmission system to evaluate the potential benefits that an engine-based power plant fueled with coal-derived syngas could offer to the local electrical grid in central Alaska.

Office of Electricity

- Released the *Energy Resilience Solutions for the Puerto Rico Grid* report, which outlines recommendations for resilience improvements to energy infrastructures that should be considered by the Government of Puerto Rico in their recovery plans.
- Completed the development of an open-source Advanced Distribution Management System (ADMS) application development software platform.
- Lowered the cost of grid-scale (over 1 MW) energy storage technologies to demonstrate $250/kWh for a 4-hour system (aqueous soluble organic electrolyte).

Cybersecurity, Energy Security, and Emergency Response

- Developed a hands-on workshop, called "Cyber Strike," for energy sector owners and operators to walk through a simulated cyber-attack on energy control systems. This workshop leveraged lessons learned from the 2015 and 2016 attacks on Ukraine's electric system.
- Infrastructure Security and Energy Restoration (ISER) staff, with the assistance of Carnegie Mellon University's Software Engineering Institute, held a Cybersecurity Capability Maturity Model (C2M2)

Update Stakeholders Forum at DOE Headquarters. The C2M2 program is a public-private partnership effort that was established to improve electricity subsector cybersecurity capabilities and to understand the cybersecurity posture of the grid.

- ISER conducted Clear Path VI, the Department's flagship exercise series designed to help energy sector stakeholders prepare for the 2018 hurricane season. The exercise brought together industry and interagency partners to test and validate pre-landfall, response, and mutual assistance plans in response to a significant hurricane impacting the Mid-Atlantic region.
- On August 20–23, Idaho National Laboratory (INL) and CESER/ISER hosted Resilience Week 2018 in Denver, Colorado. The goal of Resilience Week is to discuss mechanisms that will foster a cohesive multidisciplinary community that advances risk analysis research to aid resilient decision-making processes.

**Strategic Objective 5: Increase Domestic and International Accessibility to American Energy Resources**

**Key Accomplishments:**

Fossil Energy Research and Development

- Recovered rare earth element (REE) concentrates exceeding 80wt% from coal-based resources.
- Completed construction of bench-scale facility to recover REEs from acid mine drainage sludge.
- Initiated conceptual designs for pilot plants that can recover ten pounds per day of rare earth oxides from coal-based resources.
- Identified a site within the Prudhoe Bay Unit for a methane hydrate stratigraphic well test on the Arctic North Slope that meets both the program's and the operator's criteria as high-value site.

Indian Energy Policy and Programs

- Issued a fuel and technology neutral Funding Opportunity Announcement (FOA) estimated to result in 6 to 15 tribal energy projects valued at up to $22 million. DOE's investment of between $5.5 million and $11.5 million is estimated to result in 4 MW of new installed generation and potential savings of up to $100 million over the life of the energy generating systems.
- Held workshops in Unalaska, Kodiak, and Cordova completing a 4-year plan to conduct energy workshops across each of the regions in Alaska. Conducted 12 monthly webinars to educate Tribes on energy development; each was attended by an average of over 100 attendees. Office also completed 20 technical assistance requests with another 20 in process.

**Strategic Objective 6: Protect the U.S. Economy from Severe Petroleum Supply Disruptions**

**Key Accomplishments:**

Petroleum Reserves

- Completed the FY 2018 Congressionally-mandated oil sale to fund the Strategic Petroleum Reserve (SPR) Modernization Program, which will address the aging SPR infrastructure through systems upgrades and equipment replacement.
- Made progress on the Life Extension Phase II Critical Decisions (CD), including submittal of CD-3A Long Lead Time Equipment Procurement Items.

**Strategic Goal 2: Advance Science Discovery and National Laboratory Innovation** - DOE will advance American pre-eminence in scientific discovery through cutting-edge research, primacy in high-performance computing, and operation of world-class scientific facilities. The Department will take steps to improve access to its national laboratory portfolio of innovation and enable greater opportunities for commercialization of Lab-developed intellectual property.

**Strategic Objective 7 - Conduct Discovery-Focused Research to Increase our Understanding of Matter, Materials, and their Properties**

**Key Accomplishments:**

Science

- Improved handling of vast amounts of simulation data: Researchers at LBNL have developed and deployed in situ techniques for cosmology simulations. By saving only the analysis results rather than the full simulation data, the application saw a one thousand fold decrease in data volume exported from the simulation without loss of scientifically valuable information. (ASCR)
- New capabilities to probe ultrafast phenomena, such as light activated processes occurring on timescales of attoseconds to nanoseconds: The new experimental technique promises to lead to insights on the ultrafast response of other organic molecules to light, including processes relevant to photosynthesis and human vision. (BES)
- Insights into the functioning of biological systems: Researchers at MIT have designed a yeast strain that accumulates 25% more lipids than control strains, useful for renewable biodiesel fuel production, using an innovative combination of computational hypothesis generation and experimental testing to guide metabolic engineering techniques, an important approach for systematizing biosystems design techniques. (BER)
- Heating the core of fusion reactors leads to sheared rotation that can improve plasma performance: New measurements and simulations of plasma rotation at the DIII-D tokamak facility at General Atomics (GA) show that self-organized "intrinsic rotation" in tokamaks is generated by turbulence. Such self-organized flow can be beneficial for fusion reactor performance because it suppresses turbulent energy loss and magnetohydrodynamic instabilities. The experimental measurements show that simply heating the plasma core can cause it to generate a sheared flow. The computer modeling provides a quantitative understanding of the amount of sheared flow that can be generated with the use of this self-generated intrinsic torque. (FES)
- COHERENT experiment uses the world's smallest neutrino detector to make the first observation of coherent scattering of low energy neutrinos off nuclei (Intensity Frontier): Understanding coherent scattering will improve the scientific reach of future neutrino and dark matter experiments. (HEP)
- New Measurement of the Neutron Lifetime with Unprecedented Precision: Astrophysicists need to know the precise value of the free neutron lifetime to calculate the rate of nucleosynthesis during the "Big Bang", and nuclear and particle physicists need a precise value of the neutron lifetime to constrain fundamental parameters of the Standard Model. Researchers at Los Alamos National Laboratory determined the lifetime to within an uncertainty of 1 second, significantly improving the previous uncertainty of approximately 8 seconds in the neutron lifetime. (NP)

**Strategic Objective 8: Provide the Nation's researchers with World-Class Scientific User Facilities that Enable Research and Advance Scientific Discovery**
**(Noteworthy Progress)**

**Key Accomplishments:**

Science

- Upgraded the Oak Ridge Leadership Computing Facility to a 200 petaflop IBM/NVIDIA system (Summit), ranked as the fastest supercomputer in the world, according to the TOP500 List, a semiannual ranking of the world's fastest computing systems.
- Completed the 12 GeV Continuous Electron Beam Accelerator Facility (CEBAF) Upgrade Project within approved cost, schedule, and scope baseline, and began formal start of operations.

- Refurbishment and upgrades to the Jupiter Laser Facility (JLF) at the Lawrence Livermore National Laboratory (LLNL) are underway. They will enable new scientific discovery in laser-driven ion acceleration, X-ray and Gamma ray sources, and relativistic laser-plasma interactions (LPI).
- The Molecular Foundry scientists developed a new electron microscopy imaging technique that greatly improves images of light elements while using fewer electrons. The MIDI-STEM method may solve the challenge of seeing structures with a mixture of heavy and light elements in close proximity, thereby allowing scientists to use high resolution electron microscopy on a broader set of hard and soft material combinations. The high resolution, speed, and non-invasiveness could transform the way key biomolecular interactions are studied for sensors, biology, and biomedicine.
- The Large Hadron Collider (LHC) is the highest energy particle collider in the world and continues to break performance records and exceed its goals for producing particle collisions. The CMS experiment produced the first direct observation of the Higgs boson decaying to tau leptons, the heaviest known cousin of an electron. The ATLAS experiment measured the mass of the W boson, a carrier particle of the weak nuclear force, to a precision of 2.4%, matching the precision of the best previous measurement. This new measurement enables important tests of the self-consistency of the Standard Model.

**Strategic Objective 9: Advance High-Performance and Future Computing Technologies and the Potential of Artificial Intelligence Technologies to Ensure American Primacy in Computing and to Meet National Research, Security, and Economic Objectives**

**Key Accomplishments:**

Science

- The Exascale Computing Project (ECP) Interoperable Design of Extreme-scale Application Software project released the first version of its Extreme-scale Scientific Software Development Kit (xSDK) to improve ECP developer productivity and software sustainability while ensuring continued scientific success. The xSDK toolkit provides a superior solution for application developers using libraries by enabling turnkey installation, compatible builds, and interoperability, which is especially important for multi-scale and multi-physics projects that rely upon this functionality. The current xSDK packages include four numerical libraries, two domain components, and nine others being staged as part of future releases. The explicit ECP investment in developing, adapting, and adopting new and better software practices will improve developer productivity and software sustainability at a time when such improvements are essential for transforming capabilities for new platforms, coupling multiscale and multi-physics, and improving the effectiveness of DOE's highly skilled computational scientists.

**Strategic Objective 10: Enable Commercialization of National Laboratory Innovation**

**Key Accomplishments:**

Technology Transitions

- On October 31, 2017, DOE removed barriers for business to engage the National Labs through a flexible mechanism, known as Agreements for Commercializing Technology, and extended it to projects that receive federal funding.
- Launched the Lab Partnering Service (LPS) in July 2018. The LPS is a web tool for providing streamlined access to the expertise and intellectual property developed at the National Labs. It was developed in consultation with the investor and business communities.
- The Technology Commercialization Fund supported 54 projects across 12 National Laboratories involving more than 30 private-sector partners.
- An inventory of the Department's existing commercialization programs, initiatives, and activities led by the DOE Programs and Laboratories was assembled. The inventory, together with a recently

completed survey of relevant statutory authorities as well as best practices, will inform future activities and policies.

**Strategic Goal 3: Ensure America's Nuclear Security** - DOE will strengthen national security by maintaining and modernizing the nuclear stockpile and nuclear security infrastructure, reducing global nuclear threats, providing for naval nuclear propulsion, improving physical and cybersecurity, and strengthening key science, technology, and engineering capabilities.

**Strategic Objective 11: Maintain the Safety, Security and Effectiveness of the Nation's Nuclear Deterrent**

**Key Accomplishments:**

National Nuclear Security Administration

- As of September 2018, NNSA completed over 95 percent of the total production units of the W76-1 LEP, and delivered more than 90 percent of the total warheads to the Navy.
- The B61-12 Life Extension Program (LEP), a nuclear gravity bomb for the Air Force, is currently in production engineering. System qualification of the B61-12 continues with the completion of over 45 system tests since the start of the final development phase, including qualification flight tests using F-16, F-15, and B-2A aircraft at the Tonopah Test Range.

**Strategic Objective 12: Strengthen Key Science, Technology, and Engineering Capabilities and Modernize the National Security Infrastructure**

**Key Accomplishments:**

National Nuclear Security Administration

- Conducted two plutonium strength experiments at the National Ignition Facility (NIF) to compare with weapons performance assessment models and generated highest fusion yield-to-date at NIF (54 kilojoule [kJ] total fusion yield) by advancing hohlraum drive symmetry control and reducing fill-tube degradation effects.
- Achieved a record yield for cryogenic deuterium-tritium laser-direct-drive implosions on the Omega Laser Facility.
- Set new Z facility records for less than 20 kilo-electron volt (keV) x-ray output (increase of greater than 50 percent) and peak current to a radiation source for vulnerability and hardening studies.
- Initiated construction of the NNSA Albuquerque Complex on May 18, 2018. Took tenancy at the John C. Drummond Complex (formerly the Pantex Administrative Complex) at the Pantex Plant.
- In April 2018, NNSA published the 2018 Master Asset Plan, an enterprise-wide infrastructure plan that lays out NNSA's infrastructure vision and highlights strategic investments being made to achieve it.
- Through FY 2018, completed 80 disposition and recapitalization projects, and an additional 226 projects are underway. In addition, ~$373.6M of maintenance and repair activities have been completed, which exceeds the $279.4 million completed in all of FY 2017 by 34%. NNSA also completed 15 Roof Asset Management Program (RAMP) projects in FY 2018.

**Strategic Objective 13: Reduce Global Nuclear and Radiological Security Threats and Strengthen the Nuclear Enterprise**

**Key Accomplishments:**

National Nuclear Security Administration

- Converted 2 facilities from the use of highly enriched uranium (HEU) fuel to low enriched uranium (LEU) fuel for a cumulative total of 102; removed or confirmed the disposition of HEU or plutonium for a cumulative total of 6,725.3 kilograms; dispositioned the cumulative total of 160 MT of surplus weapon-grade uranium; and converted 100 kg of plutonium to an oxide in preparation for final disposition.
- Engaged with over 100 countries to build capacity in nuclear and radiological security; secured 84 buildings containing radiological material for a cumulative total of 2,283; equipped 24 sites/ports with detection systems; deployed 24 mobile detection systems (MDS); and transitioned 56 sites/ports/MDS to indigenous partner country responsibility.
- Transferred 6 safeguards tools to international partners to address identified safeguards deficiencies.
- Conducted 6,000 technical reviews of U.S. Export Control Licenses for Nuclear and Dual Use Commodities and provided 3,000 Technical Analyses for interdiction cases.
- Executed the PHOENIX proliferation detection campaign with 100 interagency participants, validating sensors and methods, and providing a realistic training environment; delivered a Global Burst Detector to the USAF in support of the U.S. Nuclear Detonation Detection System; completed high fidelity, archival, radiation signature measurements of the B61 and B83 under the Warhead Measurement Campaign; and improved U.S. capabilities in low-yield nuclear test monitoring by executing the Source Physics Experiment, DAG-1, at the Nevada Nuclear Security Site.
- Provided policy makers unprecedented options for the final, fully verified denuclearization (FFVD) of North Korea, leading preparations for a key aspect of denuclearization and engaging other departments and agencies to form comprehensive plans addressing the technical, logistical, and policy aspects of FFVD. Staff engaged state and territorial governments at highest risk from North Korean missile threats to better prepare for radiological or nuclear incidents in their region. Experts used atmospheric modeling and state-of-the-art tools, techniques, and practices to enhance the readiness in this critical region
- Conducted four exercises, four workshops, and two training events to continue modernizing nuclear forensics capabilities to adapt to current threats and identify needed organizational and policy changes across the U.S. Government to enhance future capabilities.

**Strategic Objective 14: Provide Safe and Effective Integrated Nuclear Propulsion Systems for the U.S. Navy**

**Key Accomplishments:**

National Nuclear Security Administration

- Achieved target of 65% design complete for the Columbia-Class reactor plant.
- Maintained Department of Defense and DOE funding alignment necessary to meet the COLUMBIA-Class project schedule and lead-ship delivery. DOE funded reactor plant component design/development continued on cost and schedule. Navy funded ship design continued on schedule.
- Commenced overhaul efforts and progressed refueling preparations for the S8G Prototype.
- Completed manufacturing of four COLUMBIA like advanced material fuel modules to be inserted in the S8G Prototype reactor plant as part of upcoming refueling. Currently, manufacturing runs for Columbia-Class specific design parameters are being completed to further refine the production-scale processes.

- Established performance baseline for the Spent Fuel Handling Recapitalization Project.

**Strategic Goal 4: Advance National Nuclear Waste Management** - DOE will make progress on fulfilling the Federal Government's obligations to address commercial spent nuclear fuel and the environmental legacy of the Manhattan Project and Cold War.

**Strategic Objective 15: Continue Environmental Remediation of DOE Legacy and Active Nuclear Waste Sites**

**Key Accomplishments:**

Environmental Management

- Waste Isolation Pilot Plant received its 12,270th shipment and ramped up the number of shipments to 8-10 per week. Mining of Panel 8 began in January 2018. When combined with the completion of the new ventilation system, this will lead to increased shipments and emplacements by the end of FY 2021.
- Savannah River Site tank waste program replaced a 3rd melter in the Defense Waste Processing Facility (DWPF) and accepted a 30 million gallon Salt Disposal Unit for processing.
- Hanford Waste Treatment and Immobilization Plant (WTP) is making progress in completing facilities required for the Direct Feed Low Activity Waste (DFLAW) approach. More than 50% of all WTP systems and components needed for DFLAW completed construction, startup, and testing phases and have been transitioned into commissioning, the final step before operation. Modifications in the tank farms are being made to support DFLAW. Significant progress has been made in advancing toward commissioning of the LAW facility, including approval of the facility's Documented Safety Analysis ahead of schedule.
- Early site preparation for the Outfall 200 Mercury Treatment Facility at Y-12 construction activities were initiated in December 2017 and are on track for completion by end of calendar year 2018.
- EM completed treatment of 2.2 billion gallons of contaminated groundwater at Hanford, is on track to produce 40 canisters of High-Level Waste at DWPF, complete Deactivation and Decommissioning activities at the Separations Process Research Unit, and dispose of 1.2 million cubic feet of (Mixed) Low-Level Waste at Nevada by the end of FY 2018.

**Strategic Goal 5: Enhance Cybersecurity across U.S. Energy Sector and DOE Infrastructure** - DOE will leverage science and technology support from the national laboratories to enhance the cybersecurity and resilience of the Nation's energy infrastructure and DOE's enterprise infrastructure.

**Strategic Objective 16: Enhance Energy Infrastructure Situational Awareness, Strengthen Cyber Incident Response Capabilities, and Leverage the National Laboratories to Drive Cybersecurity Innovation**

**Key Accomplishments:**

Cybersecurity, Energy Security, and Emergency Response

- The Cybersecurity for Energy Delivery Systems (CEDS)-supported Pacific Northwest National Laboratory (PNNL) "Enabling Situational Awareness" project developed a cybersecurity situation awareness visualization dashboard to bridge the communication gap between transmission control room operators and cybersecurity professionals during cyber events.
- Through a partnership with the CEDS program, Los Alamos National Laboratory (LANL) is leveraging the capabilities of quantum communications to transmit secret keys for use in traditional cryptographic algorithms and reveal any attempted interception of the secret key as it is exchanged between trusted parties operating critical energy delivery control systems at the moment the adversarial intrusion is attempted. LANL's breakthrough will substantially reduce unit costs of

quantum key exchange systems and will thereby lower the barrier to widespread deployment of this technology.
- Strengthened DOE's cyber incident response capabilities - ISER developed a pre-cooked checklist to streamline government-industry information exchange and sector technical assistance during cyber incident response. ISER also facilitated the industry-led effort with the Department of Homeland Security and the Federal Bureau of Investigation to update the Request for Technical Assistance (RTA) agreement that organizations have to sign if they request government engagement during cyber incidents. This included adding a provision to allow for a standing request model for technical assistance.

**Strategic Objective 17: Modernize DOE IT Infrastructure to Deliver Effective Services Supporting Smart, Efficient Cybersecurity and Enhance DOE's Cybersecurity Risk Management Structure to Create Transparency across the Enterprise**

**Key Accomplishments**

Office of the Chief Information Officer

*Enhance DOE Cybersecurity*

- DOE directed that the entire Department will participate in the Department of Homeland Security (DHS) Continuous Diagnostics and Mitigation (CDM) program as opposed to the previous direction which included only the DOE federal sites. As CDM tools are implemented across the remainder of DOE, we will realize dramatic improvements in our Information Security Continuous Monitoring (ISCM) capabilities.
- Made significant progress toward CDM Phases 1 and 2 capability deployment for DOE and Office of Science headquarters.
- Secured Department of Homeland Security funding and released the DOE implementation plan supporting CDM Phase 1 capability deployment to include DOE sites not previously covered.
- Developed Concept of Operations for Enterprise Risk Management (ERM) Cybersecurity Work Streams for Governance and Situational Awareness.
- Released a Cybersecurity Strategy and Implementation Plan for 2018-2020, established an Integrated Project Team (IPT) to re-write the DOE Cybersecurity Order, and drafted a DOE Incident Response Plan.
- Completed testing and accreditation for the DOE big data platform (BDP) which, when fully matured, will significantly improve cybersecurity incident response and hunting for stakeholders across the DOE enterprise.
- Made significant investments in the Cooperative Protection Program (CPP). CPP enables cyber defenders through the deployment and management of sensor platforms; provides analytics and reports to the DOE enterprise, and enables secure methods for data sharing and collaboration.

*Modernize DOE IT Infrastructure*

- Completed Phases 1 and 2 of the DOE HQ Network Refresh initiative, and made progress on phase 3 (50%). The effort is 82% complete overall.
- Eliminated the dependency on the legacy Nortel Phone switch for Voice-over-IP (VoIP) traffic at HQ Germantown. Completed migration of analog phone customers to VoIP at 950 L'Enfant Plaza and Corporate 270 buildings. Disconnected legacy telecomm circuits at 950 L'Enfant Plaza and decommissioned the Nortel phone switch supporting that location. Established a solution for a single virtual view of the multiple HQ user directories for VoIP. The migration of HQ analog phone customers to VoIP and decommissioning of the HQ legacy analog phone switch is 70% complete.
- Completed all fiber cable plant work in the HQ Forrestal and Germantown buildings. Transition to the new fiber is scheduled for completion over 4 weekends in October and November 2018.

- Two new 10 Gb telecommunications circuits have been installed between the HQ Germantown and Forrestal buildings to provide carrier-diversity and in preparation for retiring the legacy SONET Ring when the VoIP migration has been completed.

National Nuclear Security Administration

*Enhance DOE Cybersecurity*

- Designed and deployed a new sensor platform that will capture data feeds to improve situational awareness across the DOE/NNSA Enterprise as part of NNSA's Information Assurance Response Center (IARC). To date, the new sensor platforms have been deployed to the four federal unclassified networks.
- Completed phase 1 of the Integrated Joint Cybersecurity Coordination Center (iJC3) implementation for federal networks. NNSA has complete coverage of the NNSA environment, to include unclassified, classified, and mission space. NNSA has developed the approach and standards to provide situational awareness of the nuclear security enterprise (NSE) to the DOE CIO.
- Worked in collaboration with the DOE CIO to establish the Department's Data Taxonomy Framework. This effort was used to expand DOE HQ visibility across the DOE enterprise in relation to the response to cybersecurity incidents.
- In partnership with Sandia National Laboratories, created a Center of Excellence (CoE) to improve and enhance the situational awareness, incident response, and incident management throughout the NSE.

## Fiscal Year 2017 Unmet Performance Targets

The following table displays performance measures where the FY 2017 target was not met, the FY 2018 status, and whether the measure was discontinued.

| Program | FY 2017 Performance Goal | FY 2018 Performance Status |
|---|---|---|
| **NNSA**<br><br>Weapons Activities/ Directed Stockpile Work | **Steady State W-76-1 LEP Production** - The percentage of planned builds equal to the percentage of allocated funding as represented in the annual Selected Acquisition Report (SAR).<br><br>FY 2017 Target: 100% of scheduled unit builds, Result: 95% | **Exceeded**<br>FY 2018 Target: 100%<br>Result: 127% |
| **NNSA**<br><br>Weapons Activities/ Infrastructure and Operations | **Construction Projects (formerly Major Construction Projects)** - Execute construction projects within approved costs and schedules, as measured by the total percentage of projects with total estimated cost (TEC) greater than $20 million with a schedule performance index (ratio of budgeted cost of work performed to budgeted cost of work scheduled) and a cost performance index (ratio of budgeted cost of work performed to actual cost of work performed) between 0.9-1.15.<br><br>FY 2017 Target: 90% of projects, Result: 89% | **Not Met**<br>FY 2018 Target: 90%<br>Result: 83% |
| | **Recapitalization** - Percentage of NNSA assets rated as adequate (by Replacement Plant Value<br><br>FY 2017 Target: 37% of assets, Result: 35% | **Exceeded**<br>FY 2018 Target: 35.5%<br>Result: 37.9% |
| **NNSA**<br><br>Defense Nuclear Nonproliferation / Material Management and Minimization | **Highly Enriched Uranium (HEU) Reactors Converted or Shutdown** - Cumulative number of HEU reactors and isotope production facilities converted or verified as shutdown prior to conversion.<br><br>FY 2017 Target: 101 facilities, Result: 100 | **Not Met**<br>FY 2018 Target: 103<br>Result: 102 |
| | **U.S. Surplus Plutonium Disposition** - Cumulative kilograms (kg) of plutonium metal converted to oxide in preparation for final disposition. | **Exceeded**<br>FY 2018 Target: 867 |

| Program | FY 2017 Performance Goal | FY 2018 Performance Status |
|---|---|---|
| | FY 2017 Target: 767 kg, Result: 688.6 | Result: 900.9 |
| **NNSA**<br><br>Defense Nuclear Nonproliferation/ Nuclear Counterterrorism and Incident Response | **Incident Response Readiness Index (IRRI)** - Annual overall organizational readiness to respond to and mitigate radiological or nuclear incidents worldwide.<br><br>FY 2017 Target: 91 IRRI, Result: 89 | **Not Met**<br>FY 2018 Target: 91<br>Result: 89 |
| **Fossil Energy Research and Development**<br><br>Coal | **CCS Demonstrations** - Initiate operation of CCS demonstration projects - Initiating operation of CCS demonstration projects will help to establish that carbon capture, compression of CO2 and injection, combined with long term monitoring, verification, accounting, and assessment (MVAA), can be performed at commercial scale at both power plants and industrial sites while continuing to maintain reliable plant operations.<br><br>FY 2017 Target: 4 CCS projects initiated operation, Result: 3 | **Not Applicable**<br>FY 2018 Target: N/A<br>Measure ended |
| **Fossil Energy Research and Development**<br><br>Petroleum Reserves | **Sustained (90 day) Drawdown Rate** - Maintain the capability to drawdown the SPR at the design drawdown rate of 4.415 million barrels per day.<br><br>FY 2017 Target: 4.2 MMB/Day drawdown readiness rate, Result: 4.17 | **Not Met**<br>FY 2018 Target: 4.13<br>Result: 4.11 |
| **Nuclear Energy**<br><br>Nuclear Infrastructure | **Facility Availability** - Idaho Facilities Management Program - Enable nuclear research and development activities by providing operational facilities and capabilities, as measured by availability percentages.<br><br>FY 2017 Target: 80% availability, Result: 76% | **Exceeded**<br>FY 2018 Target: 80%<br>Result: 86% |

| Program | FY 2017 Performance Goal | FY 2018 Performance Status |
|---|---|---|
| **Environmental Management**<br><br>Nuclear Materials and Tank Waste | **Depleted and Other Uranium (DU&U) Packaged for Disposition** - Increase the cumulative amount of DU&U packaged in a form suitable for disposition<br><br>FY 2017 Target: 88,721 metric tons, Result: 88,306 | **Not Met**<br>FY 2018 Target: 113,306<br>Result: 93,698 |
| | **Liquid Waste Eliminated** - Increase the cumulative volume of radioactive liquid waste (including other forms such as sludge) eliminated from inventory.<br><br>FY 2017 Target: 7,684 thousand gallons, Result: 7,414 | **Not Met**<br>FY 2018 Target: 7,867<br>Result: 7,523 |
| **Environmental Management**<br><br>Site Restoration | **Industrial Facilities Completed** - Increase the cumulative number of industrial facilities completed.<br><br>FY 2017 Target: 2,162 facilities, Result: 2,157 | **Exceeded**<br>FY 2018 Target: 2,184<br>Result: 2,241 |
| | **Nuclear Facilities Completed** - Increase the cumulative number of nuclear facilities completed.<br><br>FY 2017 Target: 157 facilities, Result: 152 | **Not Met**<br>FY 2018 Target: 157<br>Result: 152 |
| | **Radioactive Facilities Completed** - Increase the cumulative number of radioactive facilities completed.<br><br>FY 2017 Target: 577 facilities, Result: 571 | **Exceeded**<br>FY 2018 Target: 579<br>Result: 584 |
| **Legacy Management** | **Environmental Remedies** - Conduct surveillance and maintenance activities to ensure the effectiveness of cleanup remedies in accordance with legal agreements or identify sites subject to additional remedial action in order to ensure effectiveness at all sites within Legacy Management's responsibility.<br><br>FY 2017 Target: 93 sites, Result: 92 | **Not Met**<br>FY 2018 Target: 97<br>Result: 92 |

| Program | FY 2017 Performance Goal | FY 2018 Performance Status |
|---|---|---|
| **Chief Information Office** | **Identify - Hardware Asset Management** - Achieve performance of 95% or greater for both Hardware Asset Management metrics (asset detection and asset meta data collection)<br><br>FY 2017 Target: ≥ 95%, Result: 85 | FY 2018 Target: N/A<br>Measure discontinued |
| | **Identify - Software Asset Management** - Achieve performance of greater than or equal to 95% for both Software Asset Management metrics (software inventory and software white-listing)<br><br>FY 2017 Target: ≥ 95%, Result: 91 | FY 2018 Target: N/A<br>Measure discontinued |
| | **Protect - Federated Identity Management Infrastructure** - Implement Federated Identity Management Infrastructure linking identity sources across DOE to OneID<br><br>FY 2017 Target: 75%, Result: 62 | **Exceeded**<br>FY 2018 Target: ≥ 95%<br>Result: 97% |
| | **Protect - High-Priority Application Authentication** - Conduct a role-based risk assessment for all applications supporting high priority (FISMA) systems, identify the proper credential for each role within the application in accordance with the revised NIST 800-63 standard, and require the use of the proper credential for role-based access to the application.<br><br>FY 2017 Target: 10%, Result: 0 | **Exceeded**<br>FY 2018 Target: ≥ 30%<br>Result: 34% |
| | **Protect - MFA - Privileged Network Account performance** - Privileged Network Accounts that use a PIV credential or other NIST 800-63 r3 IAL3/AAL3/FAL3 must be equal to 100%.<br><br>FY 2017 Target: 100%, Result: 96% | **Not Met**<br>FY 2018 Target: 100%<br>Result: 96% |

| Program | FY 2017 Performance Goal | FY 2018 Performance Status |
|---|---|---|
| | **Protect - MFA - Unprivileged Network Account performance** - Unprivileged Network Accounts that use a PIV credential or other NIST 800-63 r3 IAL3/AAL3/FAL3 must be equal to 85%.<br><br>FY 2017 Target: 85%, Result: 66% | **Not Met**<br>FY 2018 Target: 85%<br>Result: 70% |
| **Office of Management** | **Reduce FOIA backlog** - Reduce Freedom of Information Act (FOIA) backlog<br><br>FY 2017 Target: 10%, Result: 24% increase | **Not Met**<br>FY 2018 Target: 3%<br>Result: 74% increase |
| **Office of Project Management** | **Project Management Success** - Complete 90% of the construction projects at the original scope and within 10% of cost baseline established at Critical Decision (CD)-2, approve performance baseline.<br><br>FY 2017 Target: 90%, Result: 88% | **Met**<br>FY 2018 Target: 90%<br>Result: 93% |
| **Human Capital Management** | **Annual reductions in the average time-to-hire** - Annual reductions in the average time-to-hire from 174 days in FY 09 to 100 days or less by end of FY 2011, and further to an annual average of 80 days.<br><br>FY 2017 Target: ≤ 80 calendar days, Result: 119.3 | **Not Met**<br>FY 2018 Target: ≤ 80<br>Result: 128.7 |
| **Loan Programs Office** | **ATVM Reduction in Petroleum Usage** - Reduction in petroleum usage achieved through the use of advanced technology vehicles manufactured (at least in part) with funding provided through the ATVM loan program as compared to vehicles available in the base year.<br><br>FY 2017 Target: 290 million gallons, Result: 285 | **Exceeded**<br>FY 2018 Target: ≥ 270<br>Result: 280 |

## Performance Goals Discontinued as of Fiscal Year 2018

The following table displays the performance measures which were discontinued following the close of FY 2017 and the reason for their discontinuation.

| Program | Performance Goal Discontinued as of FY 2018 | Rationale |
|---|---|---|
| Energy Efficiency and Renewable Energy / Bioenergy Technologies | Thermochemical - Reduce modeled thermochemical conversion cost of a combined gasoline and diesel production ($/gge)<br><br>FY 2017 Target: $2.47/gge, Result: $2.47/gge | Measure is being discontinued in FY 2018 as overarching verification goal was met by the end of FY 2017. |
| Energy Efficiency and Renewable Energy / Hydrogen and Fuel Cell Technologies | Fuel Cell Power - Improve the catalyst specific power of fuel cells (kW/gram of platinum group metal).<br><br>FY 2017 Target: 7.1 kW/g, Result: 8 kW/g | Measure discontinued in FY 2018 due to the strategic decision to shift towards earlier stage research on non-PGM catalysts |
| Energy Efficiency and Renewable Energy / Advanced Manufacturing | R&D Consortia - Number of Manufacturing Research and Development Consortia selected for negotiation to demonstrate advanced material and process technologies, leading to commercialization<br><br>FY 2017 Target: 2 Consortia, Result: 2 | Measure discontinued in FY 2018 due to a shift in focus towards early-stage R&D. |
| Energy Efficiency and Renewable Energy / Building Technologies | Lighting - Decrease the manufacturing cost of a warm white LED package. (Lumens/$)<br><br>FY 2017 Target: 210 lm/$ , Result: 210 lm/$ | Measure discontinued in FY 2018 due to shift in focus towards early-stage R&D. |
| Electricity Delivery / Transmission Reliability and Resilience | Advanced Modeling Grid Research - Development of capabilities in understanding, modeling, and predicting grid behavior in real-time.<br><br>FY 2017 Target: Develop and test advanced computational capabilities for simulating power system behavior in a real-world environment, Result: Met | The Advanced Modeling and Grid Research and Transmission Reliability activities were consolidated under Transmission Reliability as of FY 2018. |
| | Energy Systems Risk and Predictive Capability - Provide Federal agencies, states, and sector stakeholders with independent and | Measure discontinued because DOE discontinued support for |

| Program | Performance Goal Discontinued as of FY 2018 | Rationale |
|---|---|---|
| | transparent analyses of risks to energy infrastructure systems and supply chain impacts.<br><br>FY 2017 Target: Deploy initial analytical products assessing risk and improving decisions for energy infrastructure systems, Result: Met | this activity beginning in FY 2018. |
| Cybersecurity, Energy Security, and Emergency Response / Infrastructure Security and Energy Reliability (ISER) | ISER - Situational Awareness - Improve awareness of near real-time monitoring situational awareness tool, across the Federal Government ensuring that this tool is available to interagency partners for use in their operations centers and other appropriate situations.<br><br>FY 2017 Target: 80% situational awareness capability availability, Result: Met | This measure has been replaced by the ISER – Situational Awareness Capability measure beginning in FY 2019, which is a more appropriate measure of the program's activities. |
| Fossil Energy Research and Development / Coal | CCS Demonstrations - Initiate operation of CCS demonstration projects - Initiating operation of CCS demonstration projects will help to establish that carbon capture, compression of CO2 and injection, combined with long term monitoring, verification, accounting, and assessment (MVAA), can be performed at commercial scale at both power plants and industrial sites while continuing to maintain reliable plant operations.<br><br>FY 2017 Target: 4 CCS projects initiated operation, Result: 3 | This goal will be completed in FY 2017 and will no longer will be tracked in FY 2018 and beyond since this no longer aligns with the program's efforts focused on early stage R&D. |
| | Carbon Capture and Advanced Energy Systems - Achieving the target signifies that the Carbon Capture & Advanced Energy Systems programs are continuing to make progress in meeting the goal of developing cost-effective, reliable carbon capture technologies for pre-combustion, post-combustion, natural gas carbon capture and advanced combustion capture applications.<br><br>FY 2017 Target: 47 $ per tonne CO2 captured Result: 46.6 | The goal was not continued due to a refocusing of program efforts away from 2nd generation technology to early stage R&D. |

| Program | Performance Goal Discontinued as of FY 2018 | Rationale |
|---|---|---|
| | Carbon Storage - Inject CO2 in large-volume field test sites to demonstrate the formations' capacity to permanently and safely store carbon dioxide.<br><br>FY 2017 Target: 8 MMTs injected (since 2009), Result: 14 | This program goal is no longer relevant as the program has shifted to early-stage R&D and the RCSP will be terminated starting in 2018. |
| Nuclear Energy | NEET- Mod & Sim Hub - Complete 90% of annual research and development milestones to support the wider applicability and deployment of virtual reactor modeling and simulation tools set for predictive simulation of Light Water Reactors by 2020.<br><br>FY 2017 Target: 90% annual milestones met, Result: 100% | Performance milestones associated with this goal were integrated into one overall modeling and simulation program. This goal has been replaced by the Advanced Modeling and Simulation goal. |
| | SMR - Licensing Technical Support Program - Enable the submission of license application documentation to the Nuclear Regulatory Commission (NRC) by SMR vendors and utility partners by supporting design, engineering, certification, and licensing efforts for selected SMR projects.<br><br>FY 2017 Target: Complete program milestones, Result: Met | The SMR Licensing Technical Support Program concluded at the end of FY 2017. |

| Program | Performance Goal Discontinued as of FY 2018 | Rationale |
|---|---|---|
| Office of Science / Basic Energy Sciences | BES Energy Storage - Deliver two high-performance research energy storage prototypes for transportation and the grid that project at the battery pack level to be five times the energy density at 1/5 the cost of the 2011 commercial baseline.<br><br>FY 2017 Target: Demonstrate energy storage research prototypes that are scalable for transportation and grid applications using concepts beyond lithium ion (multivalent ions, chemical transformation, and non-aqueous redox flow), as identified through materials discovery and techno-economic modeling, Result: Met | The performance goal was accomplished at the end of FY 2017.<br><br>Beginning in FY 2018 the BES research performance goal is: Conduct discovery-focused research to increase our understanding of matter, materials, and their properties. |
| Office of Management | Un-assessed DOE Buildings - Decrease percentage of un-assessed DOE Buildings, OSFs and Trailers with "active" status (excluding FERC, LM, NR and PMAs).<br><br>FY 2017 Target: 5 % reduction of un-assessed buildings, Result: 11% | This measure has been replaced by the Functional Assessments measure, which is a more appropriate measure of the program's activities. |
| Loan Program Office | ATVM Battery Production Capacity - Battery production capacity of 100,000 lithium-ion EV batteries (2,400,000 kWh) established<br><br>FY 2017 Target: ≥ 100,000 Batteries, Result: 100,000 | The borrower has repaid the direct loan used to increase the production capacity of lithium-ion EV batteries. As a result, the program will no longer monitor the performance outputs for battery production capacity. |

| Program | Performance Goal Discontinued as of FY 2018 | Rationale |
|---|---|---|
| Southwestern Power Administration | SWPA Annual Operating Cost Performance - Provide power at the lowest possible cost by keeping total operation and maintenance expense per kilowatt-hour generated below the national median for public power. ($/kilowatt hour, kWh)<br><br>FY 2017 Target: < 0.065 $/kWh, Result: 0.017 | Prior information that was available is no longer supplied by utilities. As a result, this measure has been replaced by a new operating cost measure. |

## Evaluations Completed in Fiscal Year 2018

The following table displays the independent program evaluations that were completed in FY 2018 and their location (where available).

**National Nuclear Security Administration (NNSA): Defense Nuclear Nonproliferation (DNN)**

| Program, Topic or Area Evaluated and Name of Study | Brief Description of Study | Evaluators and Hyperlink to Completed Evaluation |
|---|---|---|
| Annual Assessment of the NNSA Material Management and Minimization Molybdenum-99 Program | The assessment concluded that while the active NNSA Cooperative Agreement projects have incurred delays, it is probable that one or more of the NNSA supported projects will enter the Mo-99 market, perhaps as early as the first half of 2018. NNSA is progressing towards meeting the goals of the Mo-99 program. It included one recommendation for future implementation of the Uranium Lease and Take-Back (ULTB) program. | Nuclear Science Advisory Committee<br>https://science.energy.gov/~/media/np/nsac/pdf/docs/2018/Mo-99_2018_postNSAC_final.pdf |
| DNN Research and Development (R&D), technical and programmatic enterprise assessment | Provided a technical and programmatic enterprise assessment of DNN R&D. The assessment focused on alignment with and contribution to Department and Administration strategic goals, adequacy of management approach, adequacy of technical approach, adequacy of the budgetary estimates and funding strategy, adequacy and availability of resources other than budget, adequacy of self-assessment approach, and adequacy of the risk management approach. | Aerospace Corporation<br>Hyperlink not available |
| Mo-99 Program: National Academies of Sciences and the Russian Academy of Sciences Symposium | The final proceedings documented the presentations discussed at an international symposium on "Opportunities and Approaches for Supplying Molybdenum-99 and Associated Isotopes to Global Markets", which was hosted by the National Academies of Sciences and the Russian Academy of Sciences at the International Atomic Energy Agency (IAEA) in July 2017. | National Academies of Sciences<br>https://www.nap.edu/catalog/24909/opportunities-and-approaches-for-supplying-molybdenum-99-and-associated-medical-isotopes-to-global-markets |

**National Nuclear Security Administration: Office of Counterterrorism and Counterproliferation**

| Program, Topic or Area Evaluated and Name of Study | Brief Description of Study | Evaluators and Hyperlink to Completed Evaluation |
|---|---|---|
| U.S. Nuclear and Radiological Terrorism Prevention Strategy: Assessment of Nuclear Counterterrorism and Counterproliferation Capabilities | This JASON study examined critical parameters for nuclear device assessments, and whether available information and diagnostic data is being used effectively. Based on these needs JASON will make recommendations for investment in new technologies, modifications to current processes, and deployment of existing technologies by interagency and international partners to improve both the quality and speed of NNSA assessments. | JASON Program Office<br>Hyperlink not available<br>Classified Report |

## Energy Efficiency and Renewable Energy (EERE)

| Program, Topic or Area Evaluated and Name of Study | Brief Description of Study | Evaluators and Hyperlink to Completed Evaluation |
|---|---|---|
| EERE Advanced Manufacturing Office: Reducing Embodied-energy And Decreasing Emissions in Materials Manufacturing Institute Peer Review, August 28-29, 2018 | Review of the R&D and technical partnerships supported by the office. | Panels of independent external subject matter expert reviewers from industry, academia, and federal agencies |
| | | Report available upon request |
| EERE Advanced Manufacturing Office: Institute for Advanced Composite Manufacturing Innovation Peer Review, August 15-16, 2018 | Review of the R&D and technical partnerships supported by the office. | Panels of independent external subject matter expert reviewers from industry, academia, and federal agencies |
| | | Report available upon request |
| EERE Advanced Manufacturing Office: 2018 Advanced Manufacturing Office Program Peer Review, July 17-19, 2018 | Review of the R&D and technical partnerships supported by the office. | Panels of independent external subject matter expert reviewers from industry, academia, and federal agencies |
| | | https://www.energy.gov/eere/amo/events/2018-advanced-manufacturing-office-program-peer-review |
| EERE Advanced Manufacturing Office: Rapid Advancement in Process Intensification Deployment Institute Peer Review, July 11-12, 2018 | Review of the R&D and technical partnerships supported by the office. | Panels of independent external subject matter expert reviewers from industry, academia, and federal agencies |
| | | Report available upon request |
| EERE Advanced Manufacturing Office: Power America Institute Peer Review, June 12-13, 2018 | Review of the R&D and technical partnerships supported by the office. | Panels of independent external subject matter expert reviewers from industry, academia, and federal agencies |
| | | Report available upon request |
| EERE Advanced Manufacturing Office: Critical Materials Institute Peer Review, May 15-16, 2018 | Review of the R&D and technical partnerships supported by the office. | Panels of independent external subject matter expert reviewers from industry, academia, and federal agencies |
| | | Report available upon request |

| Program, Topic or Area Evaluated and Name of Study | Brief Description of Study | Evaluators and Hyperlink to Completed Evaluation |
|---|---|---|
| EERE Advanced Manufacturing Office: Manufacturing Demonstration Facility Peer Review, April 5-6, 2018 | Review of the R&D and technical partnerships supported by the office. | Panels of independent external subject matter expert reviewers from industry, academia, and federal agencies |
| | | Report available upon request |
| EERE Building Technologies Office: Evaluation of Home Energy Score Deployment: New Jersey Natural Gas & Wisconsin Focus on Energy Final Report, September 2018 | Impact evaluation of Home Energy Score's deployment in New Jersey Natural Gas & Wisconsin Focus on Energy's efficiency incentive programs. | Third party evaluators from The Energy to energy (E2e) Project. |
| | | Report available upon request |
| EERE Building Technologies Office: 2018 Building Technologies Office (BTO) Peer Review, April 30-May 3, 2018 | Review of the R&D and technical partnerships supported by the office. | Panels of independent external subject matter expert reviewers from industry, academia, and federal agencies |
| | | https://www.energy.gov/eere/buildings/building-technologies-office-2018-peer-review |
| EERE Building Technologies Office: Evaluation of Building America and Selected Building Energy Codes Program Activities, February 2018 | Impact evaluation of Building America and Selected Building Energy Codes Program Activities. | Industrial Economics, Incorporated |
| | | https://www.energy.gov/eere/buildings/downloads/evaluation-building-america-and-selected-building-energy-codes-program |
| EERE Solar Energy Technologies Office: 2018 Solar Energy Technologies Office Peer Review, February 12-14, 2018 | Review of the R&D and technical partnerships supported by the office. | Panels of independent external subject matter expert reviewers from industry, academia, and federal agencies |
| | | https://www.energy.gov/eere/solar/downloads/2018-seto-portfolio-review |
| EERE Vehicle Technologies Office (VTO): Vehicle Technologies Office Annual Merit Review and Peer Evaluation, June 18-21, 2018 | Review of the technical progress and merit of VTO-funded projects | Panels of independent external subject matter expert reviewers from industry, academia, and federal agencies |
| | | https://www.energy.gov/eere/vehicles/annual-merit-review |
| EERE Hydrogen and Fuel Cells Program: | Review of the technical progress and merit of Fuel Cell Technologies Office-funded projects | Panels of independent external subject matter expert reviewers from industry, academia, and federal agencies |

| Program, Topic or Area Evaluated and Name of Study | Brief Description of Study | Evaluators and Hyperlink to Completed Evaluation |
|---|---|---|
| 2018 Hydrogen and Fuel Cells Program Annual Merit Review and Peer Evaluation, June 13–15, 2018 | | https://www.hydrogen.energy.gov/annual_review18_proceedings.html |
| EERE Office of Strategic Programs Tech-to-Market: Second-Year Impact Evaluation of the U.S. DOE Energy I-Corps Program, Final Report, March 2018 | Determine preliminary early stage impacts | Research Into Action Inc., NMR Group Inc., Gretchen Jordan, Al Link, and East Mountain IP<br>Report available upon request |
| EERE Office of Strategic Programs Tech-to-Market: Small Business Vouchers Evaluation Round 2 Awardees Preliminary Results, February 28, 2018 | Determine preliminary early stage impacts for Round 2 | Research Into Action Inc., NMR Group Inc., Gretchen Jordan, Al Link, and East Mountain IP<br>Report available upon request |
| EERE Office of Strategic Programs Tech-to-Market: Energy I-Corps Program: 2017 Case Studies, February 2018 | Case studies of Energy I-Corps successes | Research Into Action Inc., NMR Group Inc., and Gretchen Jordan<br>https://www.energy.gov/sites/prod/files/2018/02/f49/energy_i-corps_program_2017_case_studies_0.pdf |

## Office of Electricity (OE)

| Program, Topic or Area Evaluated and Name of Study | Brief Description of Study | Evaluators and Hyperlink to Completed Evaluation |
|---|---|---|
| Grid Modernization Initiative (GMI): Foundational Projects and Technical Area Portfolio Peer Review of the Grid Modernization Laboratory Consortium | The Grid Modernization Initiative includes a portfolio of work to help better integrate all sources of electricity, improve the security of our Nation's grid, solve challenges of energy storage and distributed generation, and provide a critical platform for U.S. competitiveness and innovation in a global energy economy. Results of the peer review will be used to enhance the effectiveness of existing efforts and to better design future projects. | Subject matter experts from utilities, industry, academia, , nonprofit organizations, and government<br>https://www.energy.gov/grid-modernization-initiative-0/2018-grid-modernization-initiative-peer-review |
| 2018 Transmission Reliability Program Peer Review | Peer reviewers assessed whether a project is a good use of DOE funds, how the project could be improved, and whether a project should be continued or terminated. Results inform programmatic decisions. | Representatives from the electric power industry<br>https://energy.gov/oe/downloads/2017-transmission-reliability-program-peer-review-june-13-presentations |
| 2018 Microgrid Research & Development Program Peer Review | Peer review results were used to inform programmatic decision making, including modifying/continuing/ discontinuing ongoing projects, and guiding areas for future development and support. | DOE Microgrid Program Steering Committee members<br>https://drive.google.com/open?id=1KmJPYgQao9QzTQYMCAQfiGBKSWIJXxnC |

| Program, Topic or Area Evaluated and Name of Study | Brief Description of Study | Evaluators and Hyperlink to Completed Evaluation |
|---|---|---|
| Energy Storage Program: 2018 Energy Storage Program Peer Review, September 25–27, 2018 | Peer reviewers assessed whether a project is a good use of DOE funds, how the project could be improved, and whether a project should be continued or terminated. Results are used to inform programmatic decisions. | International panel of 20 experts drawn from academia, industry, utilities, and the regulatory community. |
| | | Presentations included in the Peer Review are available to the public at: https://www.sandia.gov/ess-ssl/lab_pubs/conference-archives/2018-program-peer-review-and-update-meeting-2/. The reviews of individual projects are confidential. A summary of the reviewer comments will be made available to the public. |

**Office of Cybersecurity, Energy Security, and Emergency Response (CESER)**

| Program, Topic or Area Evaluated and Name of Study | Brief Description of Study | Evaluators and Hyperlink to Completed Evaluation |
|---|---|---|
| Cybersecurity for Energy Delivery Systems (CEDS): CEDS From Innovation to Practice | CEDS Research & Development (R&D) investments in tools and technologies designed to prevent, detect, mitigate, and survive cyber incidents. This document highlights CEDS R&D tools and technologies that have successfully transitioned to the energy sector. The report includes a description of CEDS-funded technology, how it works, and how it advanced the state-of-the-art. Reviewers determined that CEDS technologies were worthy of adopting to reduce cyber-risk, resulting in the transition of these technologies to practice in the energy sector. | Various end-users of CEDS technologies<br>https://www.energy.gov/sites/prod/files/2018/09/f55/CEDS%20From%20Innovation%20to%20Practice%20FINAL_0.pdf |

**Fossil Energy**

| Program, Topic or Area Evaluated and Name of Study | Brief Description | Evaluators and Hyperlink to Completed Evaluation |
|---|---|---|
| Oil and Gas Peer Review | Peer Review of select projects in the Oil & Gas program area. Specifically, project objectives, work progress, and planned activities. | Independent panel of experts convened by KeyLogic Systems https://www.netl.doe.gov/coal/peerreviews |
| Solid Oxide Fuel Cell (SOFC) Program Peer Review | Peer Review of the Solid Oxide Fuel Cell (SOFC) program. | Independent panel of experts convened by KeyLogic Systems https://www.netl.doe.gov/coal/peerreviews |
| Rare Earth Elements Peer Review | Peer Review of select projects in the Rare Earth Elements program area. Specifically, project objectives, work progress, and planned activities. | Independent panel of experts convened by KeyLogic Systems https://www.netl.doe.gov/coal/peerreviews |
| Crosscutting (Sensors and Controls) Peer Review | Peer Review of select projects in the Sensors and Controls program area. Specifically, project objectives, work progress, and planned activities. | Independent panel of experts convened by KeyLogic Systems https://www.netl.doe.gov/coal/peerreviews |

**Office of Science**

| Program, Topic or Area Evaluated and Name of Study | Brief Description of Study | Evaluators and Hyperlink to Completed Evaluation |
|---|---|---|
| Advanced Scientific Computing Research: Committee of Visitors (COV) review of Advanced Scientific Computing Research FY 2013-FY 2015 | Committee of Visitors (COV) review of the management processes for the research programs in Applied Mathematics, Computer Science, and Computational Partnerships called Scientific Discovery through Advanced Computing (SciDAC) within in the Advanced Scientific Computing Research (ASCR) Program during the fiscal years 2013-2015. | Advanced Scientific Computing Advisory Committee (ASCAC)<br>https://science.energy.gov/~/media/sc-2/pdf/cov-ascr/2017/ASCA_COV_Report_on_ASCR_Research_FY13-FY15.pdf |
| Biological and Environmental Research: Committee of Visitors (COV) review of the current Biological Systems Science Division (BSSD) | The Committee of Visitors (COV) reviewed several components of the current Biological Systems Science Division (BSSD) science portfolio that were active during the 2014–2017 period. | Biological and Environmental Research Advisory Committee (BERAC)<br>*Hyperlink* – https://science.energy.gov/~/media/sc-2/pdf/cov-ber/2017/BER_COV_2017_BSSD_Report.pdf |

**Legacy Management (LM)**

| Program, Topic or Area Evaluated and Name of Study | Brief Description of Study | Evaluators and Hyperlink to Completed Evaluation |
|---|---|---|
| Evaluation to help LM reduce budget expenditures and improve our stakeholder confidence | DOE Office of Science, Office of Environmental Management, and Office of Legacy Management are integrating resources to evaluate technical needs and develop innovative approaches or solutions to advance environmental remediation protectiveness, cost effectiveness, and compliance. In 2018 the Office of Science performed the following targeted evaluations on behalf of Legacy Management.<br>• Rocky Flats Site, Colorado<br>• Fernald Preserve Site, Ohio<br>• Tuba City Site, Arizona | Savannah River National Lab: Luke Reid, Carol Eddy-Dilek, and Brian Looney.<br>Hyperlink not available |

**Office of Indian Energy Policy and Programs**

| Program, Topic or Area Evaluated and Name of Study | Brief Description of Study | Evaluators and Hyperlink to Completed Evaluation |
|---|---|---|
| Techno-Economic Renewable Energy Potential on Tribal Lands | This study was developed to support American Indian tribes and Alaska Natives in decision-making as they evaluate technologies, potential scales of development, and economic viability. | Panels of independent external subject matter expert reviewers from industry, academia, and federal agencies<br>https://www.nrel.gov/docs/fy18osti/70807.pdf |

## Goals to Address Management Priorities

DOE's Agency Financial Report, available at https://energy.gov/cfo/listings/agency-financial-reports, provides a complete description of DOE's Management Priorities as well as a discussion of progress to date and planned actions to address these priorities. The table below provides a summary of each challenge along with the related performance goals and milestones, and the responsible DOE official.

| Management Priority | FY 2018 Related Performance Goals / Indicators / Milestones | FY 2019 / 2020 Related Performance Goals / Indicators / Milestones |
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| **Contract and Major Project Management:**<br><br>*Responsible Officials:*<br>*Under Secretary of Energy*<br>*Director, Office of Project Management*<br><br>The Department is the largest civilian contracting agency in the Federal Government and spends approximately 90% of its annual budget on contracts to operate its scientific laboratories, engineering and production facilities, and environmental restoration sites and to acquire capital assets. Contractors at DOE sites and laboratories perform critical missions that include maintaining the nuclear weapons stockpile, cleaning up radioactive and hazardous waste resulting from the legacy of the Manhattan Project, and conducting some of the world's most sophisticated basic and applied energy and scientific research activities. To conduct these missions, the Department must manage some of the largest, most complex capital asset projects in either the public or private sector.<br><br>The Department's portfolio of construction projects includes over 90 projects at a value of $103 billion. Within the portfolio, there are 32 construction projects in execution, or post-CD-2, totaling $32 billion. These projects are tracked to CD-4, or project completion, and performance is measured and reported against this particular agency goal. The remaining projects in the portfolio are in planning and design. | **Project Management Success:** Complete 90% of the construction projects at the original scope and within 10% of cost baseline established at Critical Decision (CD)-2, approve performance baseline.<br><br>Result: Exceeded. 93% | **Project Management Success:** Complete 90% of the construction projects at the original scope and within 10% of cost baseline established at Critical Decision (CD)-2, approve performance baseline. |

| Management Priority | FY 2018 Related Performance Goals / Indicators / Milestones | FY 2019 / 2020 Related Performance Goals / Indicators / Milestones |
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| **Security:**<br><br>*Responsible Official: Associate Under Secretary for Environment, Health, Safety and Security*<br><br>Safeguarding and protecting national assets entrusted to DOE in an effective and efficient manner that supports DOE mission success. The safeguarding and protection of national assets entrusted to DOE are vital to preserving the highest ideals of America's way of life. | **Implement an insider threat program to detect, deter, and mitigate insider threat actions by federal and contractor employees.**<br><br>• Development of Departmental Insider Threat Program Training/Communication/Awareness/Education material for DOE general population and other groups such as practitioners and supervisors.<br><br>Result: Met. In 2018 the Insider Threat Program developed an annual briefing and a briefing for new supervisors and employees.<br><br>• Conduct of quarterly Site Assistance Visits to assist Local Insider Threat Working Groups in the establishment and administration of their programs.<br><br>Result: Met. The Insider Threat Program has conducted Site Assistance Visits at 16 of 31 sites.<br><br>**Improve electrical grid resiliency and security through partnerships with the Power Marketing Administrations, the North American Electric Reliability Corporation, and the Department of Defense's Counter-terrorism Technology.**<br><br>• Completion and validation of the Power SURGE (Security Upgrades for Reliable Grid Enhancements) Asset Protection matrix and publication of Power SURGE Technology Transfer Manual.<br>Result: Met. The Asset Protection Matrix, along with instructions for its use and applicable training materials, | **Implement an insider threat program to detect, deter, and mitigate insider threat actions by federal and contractor employees.**<br><br>**FY 2019 Performance Measures**:<br>• Fulfill 90% of Local Insider Threat Working Group (LITWIG) training and technical support requests.<br><br>• Train 60% of all DOE Senior Executives on workforce stressors and indicators.<br><br>**FY 2020 Performance Measures**:<br>• Conduct four or more Site Assistance Visits, as requested by the sites, to assist Local Insider Threat Working Groups in the establishment and administration of their programs.<br><br>• Train additional 20% of all DOE Senior Executives on workforce stressors and indicators, when compared with previous year training.<br><br>**Support cost effective implementation of the Department's Design Basis Threat Order to address credible and emerging threats to personnel, assets, facilities, and missions.**<br><br>**FY 2019 Performance Measure:**<br>• Complete 80% of DBT Implementation Milestones on time and within current cost projections, and Site Master Security Plans<br>**FY 2020 Performance Measures:** |

| Management Priority | FY 2018 Related Performance Goals / Indicators / Milestones | FY 2019 / 2020 Related Performance Goals / Indicators / Milestones |
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| | were completed and provided to the DOE Power Marketing Administrations.<br><br>• Adoption and use of new electric grid risk assessment methodology by Power Marketing Administrations.<br><br>Result: Met. All of the Power Marketing Administrations have been trained in the use of the Power SURGE risk assessment tool and they are adopting it for use in physical security risk assessments.<br><br>• Recognition by the North American Electric Reliability Corporation that the new DOE risk assessment is acceptable to use to meet their standards.<br><br>Result: Met. EHSS staff briefed NERC, Federal Energy Regulatory Commission and other electric utility regulators on the Power SURGE risk assessment tool. While the regulators, by internal policy, cannot officially endorse a specific risk assessment tool or methodology, they unanimously affirmed that the EHSS risk assessment tool would meet the intent of their risk assessment requirements.<br><br>• Completion and implementation of TINCAP (Transmission Incident Notification system for Critical Asset Protection) as a means to provide real-time situational awareness of coordinated attacks on the grid. Result: Not Met - TINCAP received zero funding in FY 2018 and all work on this project was curtailed. | • Complete 90% of site assistance visits provided within 60 days of initial field request<br><br>• Complete 90% of security waivers and exemptions received within 60 days of Program Office initial request.<br><br>**Update information classification policy and guidance to stay abreast of emerging programs, technologies, and threats in order to protect national security interests.**<br><br>**FY 2019 Performance Measures:**<br>• Reduce Incidents of Security Concerns by 30% from previous year reporting across the DOE Enterprise as reported in the Safeguards and Security Information Management System (SIMMS)<br><br>• Train 90% of all Officially Designated Federal Security Authority (ODFSAs), Classification Officers, and Security Specialists on compliance objectives listed in DOE Order 473.3A, Chg. 1, Protection Programs Operations<br><br>• Manage information declassification actions within 90 days of initial notification from site on all Technical Evaluation Panel reports.<br><br>**FY 2020 Performance Measures:**<br>• Manage information declassification actions within 90 days of initial notification from site on all Technical Evaluation Panel reports. |

| Management Priority | FY 2018 Related Performance Goals / Indicators / Milestones | FY 2019 / 2020 Related Performance Goals / Indicators / Milestones |
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| | **Support cost effective implementation of the Department's Design Basis Threat Order to address credible and emerging threats to personnel, assets, facilities, and missions.**<br><br>• Site assistance visits provided within 30 days of field request<br><br>Result: Met. EHSS conducted all site requests for DBT implementation assistance within 30 days. Support included: Scenario Development Review Team (SDRT) visits to Savannah River Site (SRS) and Idaho National Laboratory (INL) and Y-12; Facility Characterization site assistance reviews at Y-12 and Pantex; and technical consultations at Oak Ridge National Laboratory (ORNL) and SRS for characterization, processing, disposition and protection strategies for excess accountable special nuclear materials. Additionally, EHSS conducted two broad scale DBT implementation assistance activities including 1) a workshop with key stakeholders to provide requested detailed guidance for implementation of the Material Risk Review Committee (MRRC) requirements under the 2016 DBT policy, and 2) a Vulnerability Assessment Technical Working Group (VATWG) workshop for Departmental program offices and sites to assist with and answer key questions toward implementation of 2016 DBT policy.<br>• Waivers and exemptions processed within 60 days of program office request<br><br>Result: Met. EHSS processed all DBT waiver and exemption requests within 60 days of notification. Support included Material Risk Review Committee | |

| Management Priority | FY 2018 Related Performance Goals / Indicators / Milestones | FY 2019 / 2020 Related Performance Goals / Indicators / Milestones |
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| | (MRRC) requests from INL and SRS for security material risk assessments related to multi-year special nuclear material disposition campaigns.<br><br>**Update information classification policy and guidance to stay abreast of emerging programs, technologies, and threats in order to protect national security interests.**<br>• Develop a policy guidance bulletin for procurement activities.<br><br>Result: Met. Developed final draft of classification policy bulletin for procurement activities for coordination with program offices. EHSS will finalize the document of the coordination effort is completed.<br><br>• Manage information declassification actions to ensure coordination within 90 days of Technical Evaluation Panel recommendations.<br><br>Result: Met. All actions coordinated within 90 days of receipt of TEP recommendations.<br><br>• Examine Unclassified Controlled Nuclear Information scope for expanded use in weapons information.<br>Result: Met. Ongoing effort – Solicited Field input for changes to UCNI regulation to decrease cost of use.<br><br>• Update at least ten guides and bulletins.<br><br>Result: Met. EHSS completed 16 HQ classification guides and issued 13 bulletins. | |

| Management Priority | FY 2018 Related Performance Goals / Indicators / Milestones | FY 2019 / 2020 Related Performance Goals / Indicators / Milestones |
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| **Environmental Cleanup:**<br><br>*Responsible Official: Environmental Management*<br><br>For over 25 years, EM has worked to clean up the environmental legacy of six decades of nuclear weapons production and government-sponsored energy research. While significant progress has been made, some of the highest risk and most technically complex work still remains. | **Safely clean up the environmental legacy brought about by six decades of nuclear weapons development and government-sponsored nuclear energy research.**<br><br>**FY 2018 milestones:**<br>• Resume mining operations at the Waste Isolation Pilot Plant (WIPP)<br>Result: Met. WIPP mining resumed in January 2018.<br><br>• Complete treatment of legacy Remote-Handled Transuranic waste at the Idaho Site<br>Result: Met. Treatment of the legacy Remote-Handled Transuranic waste identified in the Idaho Settlement Agreement is complete. The waste now requires certification to the Waste Acceptance Criteria Revision 8 for disposal at the Waste Isolation Pilot Plant, but there are no criteria in Revision 8 for Remote Handled Waste to be certified to.<br><br>• Declare first process building (X-326) demolition ready at Portsmouth<br>Result: Not Met. The milestone for the X-326 process building to be demolition ready was not met in FY 2018. However, the site has initiated limited pre-demolition activities, including asbestos abatement, which are being done concurrently with final deactivation activities. The milestone is expected to be completed in Q4 FY 2019.<br><br>• West Valley Demonstration Project Vitrification Facility - Demolished to Grade and removed. | **Safely clean up the environmental legacy brought about by six decades of nuclear weapons development and government-sponsored nuclear energy research.**<br><br>**FY 2019 milestones:**<br>• Continue efforts to commission the Savannah River Site (SRS) Salt Waste Processing Facility (SWPF) to support startup in FY 2020.<br>• Submit the fifth WIPP Compliance Recertification Application to the Environmental Protection Agency<br>• Complete demolition of the C-400 Cleaning Building at the Paducah Site<br><br>**FY 2020 milestones:**<br>• Start up the SRS SWPF with planned processing rates of 3,800,000 gallons per year.<br>• Issue draft Supplemental Environmental Impact Statement (SEIS) for Phase 2 Decommissioning at West Valley.<br><br>In addition to the above milestones, cleanup progress is measured by the EM corporate performance measures reported in the annual performance plan/report. |

| Management Priority | FY 2018 Related Performance Goals / Indicators / Milestones | FY 2019 / 2020 Related Performance Goals / Indicators / Milestones |
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| | Result: Met. Demolished to grade and removed in September 2018. | |

| Management Priority | FY 2018 Related Performance Goals/Indicators/Milestones | FY 2019 / 2020 Related Performance Goals / Indicators / Milestones |
|---|---|---|
| **Cybersecurity:**<br><br>*Responsible Official: Chief Information Officer*<br><br>Today's rapidly evolving cybersecurity landscape presents unprecedented opportunities and challenges. Achieving a safe, secure, and resilient cyber environment requires DOE to continually pursue cost effective investments and activities to reduce cyber risk. Cyber is an enterprise-wide responsibility that demands an expanded view to encompass the broad scope of information sharing and information safeguarding. | <u>Protect - MFA - Unprivileged Network Account performance</u><br>• Unprivileged Network Accounts that use a PIV credential or other NIST 800-63 r3 IAL3/AAL3/FAL3 must be equal to 85%.<br>Result: Not Met – 70%<br><br><u>Protect – Federated Identity Management Infrastructure</u><br>• Implement Federated Identity Management infrastructure linking identity sources across DOE to OneID.<br>Target: ≥ 95%, Result: Exceeded – 97%<br><br><u>Protect - Standards Based Fed Access Mgmt Infrastructure</u><br>• Implement Standards Based Federated Access Management Infrastructure across DOE to enable single sign-on<br>Target: 95%, Result: Not Met – 90%<br><br><u>Protect - High-Priority Application Authentication</u><br>• Conduct a role-based risk assessment for all applications supporting high priority (FISMA) systems, identify the proper credential for each role within the application in accordance with the revised NIST 800-63 standard, and require the use of the proper credential for role-based access to the application.<br>Target: ≥ 30%, Result: Exceeded – 34% | <u>Protect - MFA - Unprivileged Network Account performance</u><br>• Unprivileged Network Accounts that use a PIV credential or other NIST 800-63 r3 IAL3/AAL3/FAL3 must be equal to 85%.<br>FY 2019 Target: 85%, FY 2020 Target: 85%<br><br><u>Protect – Federated Identity Management Infrastructure</u><br>• Implement Federated Identity Management infrastructure linking identity sources across DOE to OneID.<br>FY 2019 Target: 100%, FY 2020 Target: 100%<br><br><u>Protect - Standards Based Fed Access Mgmt Infrastructure</u><br>• Implement Standards Based Federated Access Management Infrastructure across DOE to enable single sign-on<br>FY 2019 Target: ≥ 95%, FY 2020 Target: ≥ 95%<br><br><u>Protect - High-Priority Application Authentication</u><br>• Conduct a role-based risk assessment for all applications supporting high priority (FISMA) systems, identify the proper credential for each role within the application in accordance with the revised NIST 800-63 standard, and require the use of the proper credential for role-based access to the application.<br>FY 2019 Target: ≥ 50%, FY 2020 Target: ≥ 60% |

| Management Priority | FY 2018 Related Performance Goals/Indicators/Milestones | FY 2019 / 2020 Related Performance Goals / Indicators / Milestones |
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| **Human Capital Management:**<br>*Responsible Official: Chief Human Capital Officer*<br><br>DOE requires an engaged and high-performing federal workforce to accomplish its mission. Key human capital challenges include:<br><br>• Competition for highly skilled talent;<br>• Risk to institutional knowledge due to retirement eligibility of the workforce;<br>• Vulnerability to unplanned attrition;<br>• Workforce and leadership development gaps; and<br>• Employee Engagement. | • Annual Reductions in Average time to hire.<br>Target: ≤ 80 calendar days.<br>Result: Not Met: 128.7 days<br><br>• Implement a framework for performance-based culture - Percent of SES with compliant plans.<br>Target: ≥ 90%<br>Result: Exceeded – 93.6% | • Annual Reductions in Average time to hire.<br>FY 2019 Target: ≤ 80 calendar days.<br>FY 2020 Target: ≤ 80 calendar days.<br><br>• Retention of a high performing workforce - Increase the retention of a high performing workforce<br>FY 2019 Target: ≤ 38 % of all attrition is made up of High Performing Employees<br>FY 2020 Target: ≤ 36 % of all attrition is made up of High Performing Employees |

| Management Priority | FY 2018 Related Performance Goals/Indicators/Milestones | FY 2019 / 2020 Related Performance Goals / Indicators / Milestones |
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| **Safety:**<br><br>*Responsible Official: Associate Under Secretary for Environment, Health, Safety and Security*<br><br>Maintain the safety and health of the DOE workforce and ensure the safety of the public and the environment from Departmental operations while striving to enhance the Department's productivity to achieve mission objectives. | **Assist program offices in continuing DOE's excellent safety performance at levels exceeding industry performance.**<br><br>• DOE occupational illness and injury incidence rates and days away from work due to illness and injury cases less than industry.<br><br>Result: Met. DOE occupational illness and injury incidence rates and days away from work due to illness and injury cases were less than industry.<br><br>**Improve DOE's safety culture by establishing a safety culture community of interest to share best practices, performing safety culture self-assessments, and implementing methods to monitor safety culture performance.**<br><br>• The number of lessons learned/best practices shared<br><br>Result: Met. DOE's contractors developed and shared lessons learned, best practices, and benchmarking results throughout FY 2018. The subjects included key elements of safety culture such as | **Assist program offices in continuing DOE's excellent safety performance at levels exceeding industry performance.**<br><br>**FY 2019 and FY 2020 Performance Measures:**<br>• DOE occupational illness and injury incidence rates and days away from work due to illness and injury cases less than industry.<br><br>**Improve DOE's safety culture by establishing a safety culture community of interest to share best practices, performing safety culture self-assessments, and implementing methods to monitor safety culture performance.**<br><br>**FY 2019 and FY 2020 Performance Measures:**<br>• Conduct 10 or more Safety Culture Improvement Panel Webex meetings and one training workshop to share best practices and lessons learned for building a robust safety culture.<br><br>• Provide training on safety culture at 90% of the new SES Orientation training sessions.<br><br>**Defense Nuclear Facilities Safety Board (DNFSB)**<br>**Provide effective cross organizational leadership in prioritizing, managing, and resolving DNFSB technical and management issues to ensure adequate protection of public health and safety at the Department's defense nuclear facilities.**<br>**FY 2019 and FY 2020 Performance Measures:** |

| Management Priority | FY 2018 Related Performance Goals/Indicators/Milestones | FY 2019 / 2020 Related Performance Goals / Indicators / Milestones |
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| | organizational culture, contractor assurance, employee engagement, electrical safety, occupational medicine, and work planning and control. This was an on-going activity that varied greatly from informal discussions in meetings and conferences to formal documents that were posted on web sites.<br><br>• The number of lessons/practices adopted by sites.<br><br>Result: Met. Lessons learned, best practices, and benchmarking results shared throughout FY 2018 have been adopted by contractors and Federal offices at DOE sites. Adoption was an on-going activity that varied greatly from employee workgroup initiatives to organization-wide surveys and resultant senior management initiatives.<br><br>• The number of self-assessments conducted<br>Result: Met. All Federal offices used relevant elements of the OPM's Federal Employee Viewpoint survey for safety culture self-assessments and most contractors perform self-assessments consistent with DOE's | • Complete 80% of Departmental actions on time, including DNFSB Recommendations, Implementation Plans, Correspondence, and Reporting Requirements.<br><br>**Environmental Protection**<br>**Provide training and technical consultation on key environmental protection and natural resource management topics to address DOE site and program needs.**<br><br>**FY 2019 and FY 2020 Performance Measures:**<br>• Issue updated Technical Standards on Derived Concentration Standards and Evaluating Radiation Doses to Biota, to improve process efficiencies and environmental protection outcomes.<br><br>**Health and Safety**<br>**FY 2019 and FY 2020 Performance Measures:**<br>• Perform 6 Voluntary Protection Program assessments assisting the site in maintaining excellence in protecting worker safety and health execution through evaluation and recommendations on opportunities to improve formal site Worker Safety and Health Programs.<br><br>**Nuclear Safety**<br>**FY 2019 Performance Measure:**<br>• Complete development of a new Standard for Hazard Category 3 facilities that will clarify an |

| Management Priority | FY 2018 Related Performance Goals/Indicators/Milestones | FY 2019 / 2020 Related Performance Goals / Indicators / Milestones |
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| | Energy Facility Contractors Group's Best Practices.<br><br>• The number of sites actively measuring safety culture performance.<br><br>Result: Met. All Federal offices are actively measuring safety culture performance since it is an element of the annual OPM Federal Employee Viewpoint survey. Most contractors, especially the large prime contractors, are actively measuring safety culture performance. Some of these large prime contractors include their subcontractors.<br><br>**Develop, pilot and deliver safety culture courses for DOE for each of the following three audiences: senior managers, front line managers, and employees.**<br><br>• The number of individuals in each category trained per year.<br><br>Result: Met. Supported DOE (including EHSS) with employee engagement and workplace culture improvement initiatives | acceptable graded-approach to meet safety requirements in FY 2019.<br><br>**FY 2020 Performance Measure:**<br>• Complete rulemaking to revise 10 CFR Part 830, Nuclear Safety Management, to reduce unnecessary regulatory burden and help ensure an effective and efficient nuclear safety framework no later than the end of FY 2020. |

| Management Priority | FY 2018 Related Performance Goals/Indicators/Milestones | FY 2019 / 2020 Related Performance Goals / Indicators / Milestones |
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| **Infrastructure:**<br><br>*Responsible Official: Director, Office of Management*<br><br>DOE is responsible for a vast portfolio of world-leading scientific and production assets as well as the general purpose infrastructure that supports the Department to operate and use those assets. While the Department has made significant investments in its world-class mission facilities, much of the supporting infrastructure, including office space, general laboratory spaces, maintenance shops, and utilities that enables the mission and forms the backbone of the laboratory and production plant sites, is beyond its design life, and is in need of greater attention. Based on Department-wide facility assessments and data analyses, the Department is facing a systemic challenge of degrading infrastructure and high levels of deferred maintenance.<br><br>In addition to a degrading infrastructure, excess contaminated facilities can pose a risk to safety, security, and programmatic objectives. The Department faces a significant challenge with the number of aging excess facilities throughout the complex and need to deactivate, decontaminate, decommission, and demolish those facilities in the near term. | Condition – Increase the percent of DOE owned and "active" buildings, trailers, and structures (excluding FERC, LM, NR and PMAs) assessed as "adequate" based on replacement plant value (RPV) and a completed assessment.<br>FY 2018 Target: 58%<br>Result: Met – 58%<br><br>Energy and Water Sustainability Performance - In accordance with statutory and executive order requirements DOE will perform a sufficient number of building evaluations, such that, in a four-year period, at least 90% of owned buildings and/or square footage will be assessed for energy & water efficiency opportunities and incorporation of sustainability principles as required.<br><br>FY 2018 Target: 90%<br>Result: Not Met – 85% | Condition – Increase the percent of DOE owned and "active" buildings, trailers, and structures (excluding FERC, LM, NR, and PMAs) assessed as "adequate" based on replacement plan value (RPV) and a completed assessment.<br><br>FY 2019 Performance Target: 58.25%<br>FY 2020 Performance Target: 58.50%<br><br>Energy and Water Sustainability Performance - In accordance with statutory and executive order requirements DOE will perform a sufficient number of building evaluations, such that, in a four-year period, at least 90% of owned buildings and/or square footage will be assessed for energy & water efficiency opportunities and incorporation of sustainability principles as required.<br><br>FY 2019 Performance Target: 90%<br>FY 2020 Performance Target: 90% |