



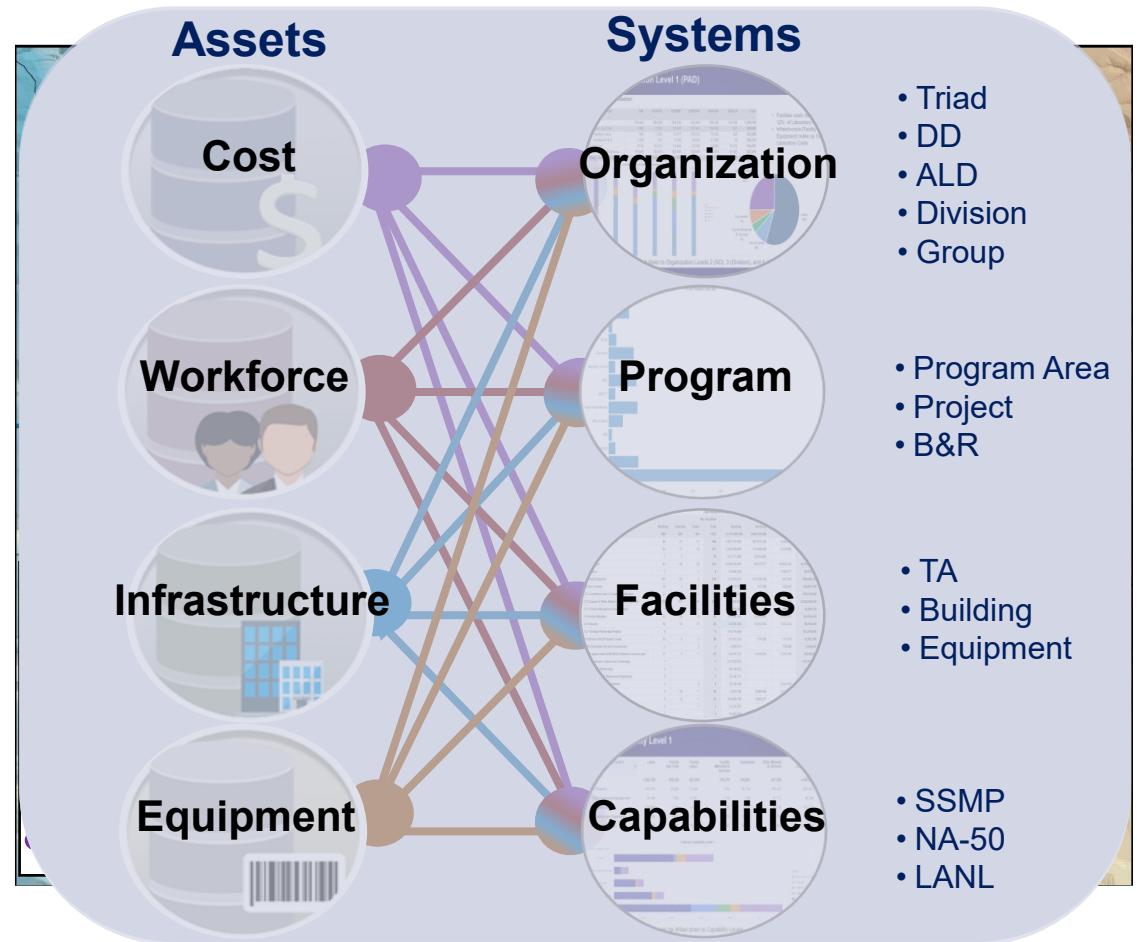
B61-12 Life Extension Program Impact Analysis – Data integration, Analytical Framework, and Outputs

David Parobek, Tanya Moore, Tri Tran

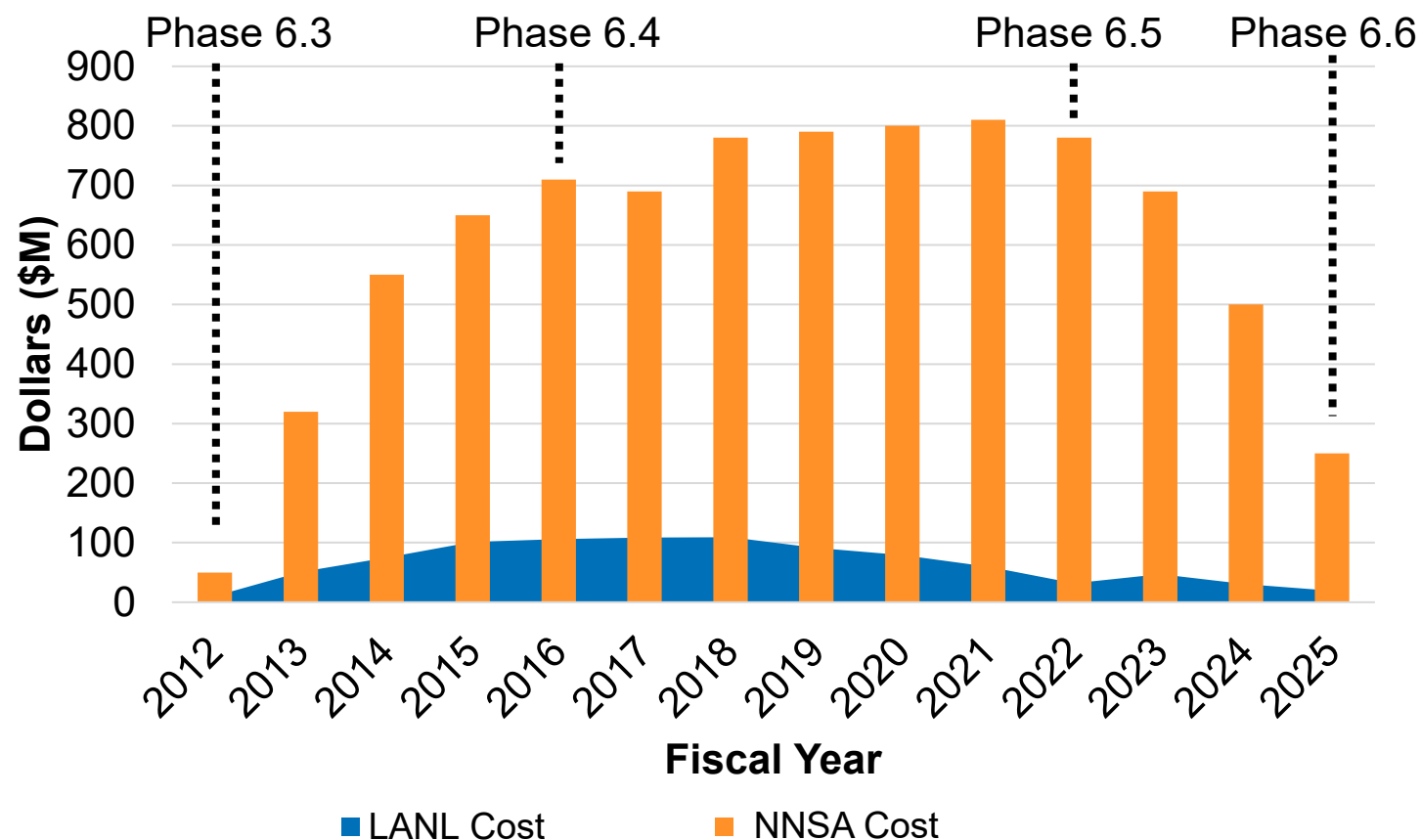
Stockpile and Enterprise Analytics Office
Deputy Directorate for Weapons
Los Alamos National Laboratory

B61-12 Life Extension Program (LEP) Analysis and Quantification of Program Impact

- The scope of this work involves developing a tool that assesses the full extent of a programs impact on the lab by linking multiple data sources (finance, HR, facilities, procurement) to visualize the historical impact of cost, workforce, equipment, infrastructure, materials and services on LANL systems
- The B61-12 LEP case study provides a proof-of-concept scenario for the Los Alamos Enterprise Analysis Data System (LEADS), cross walking multiple organizational databases to visualize LANL as an integrated “system of systems”.

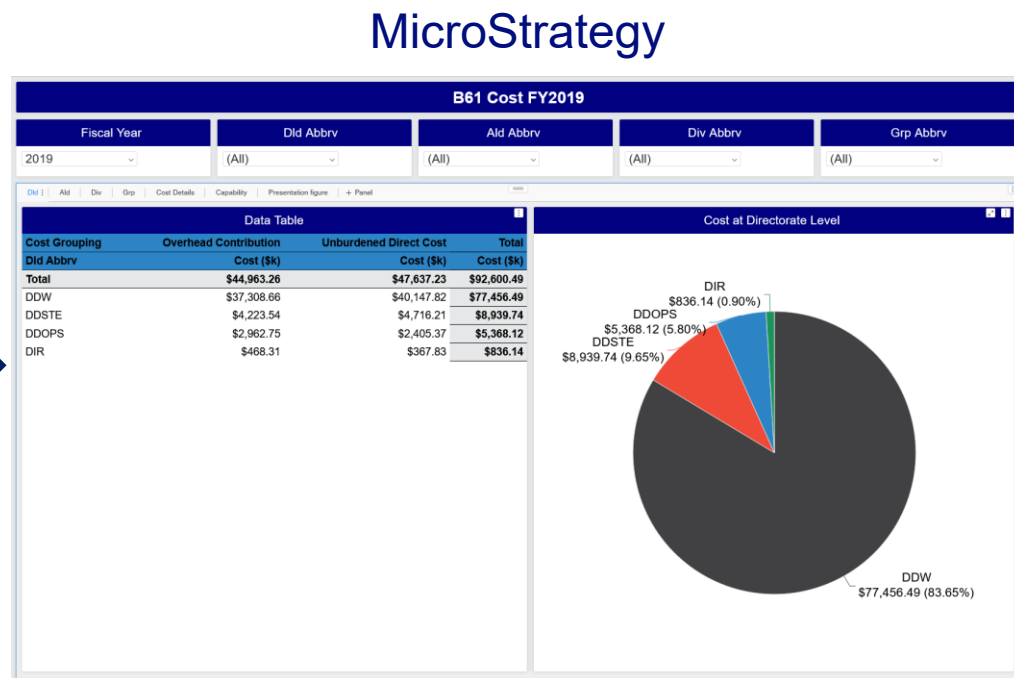
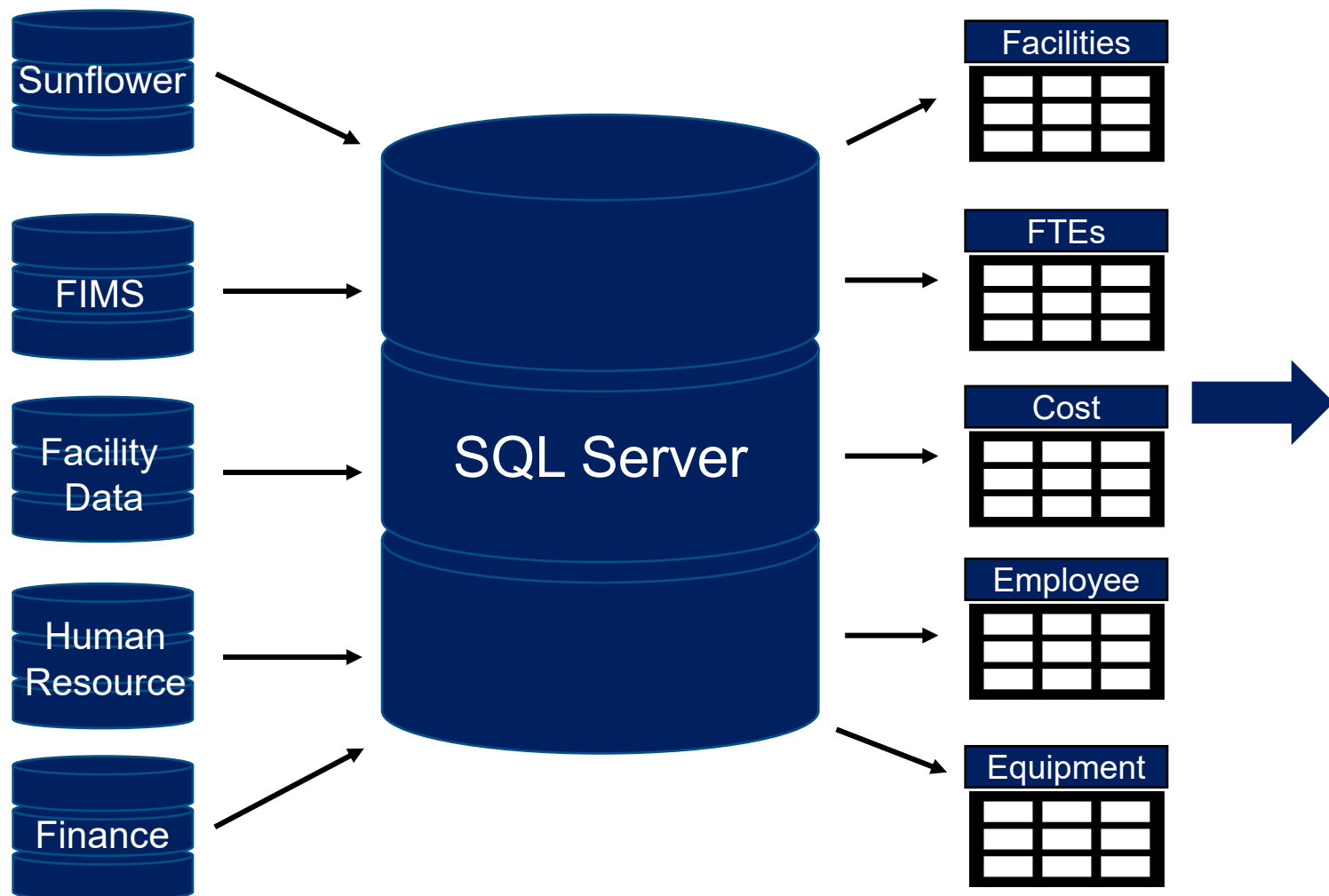


DOE/NNSA B61-12 LEP Cost from FY2012 to FY2025



FY	LANL Cost (\$M)	NNSA Cost (\$M)
2012	11	50
2013	51	320
2014	75	550
2015	101	650
2016	106	710
2017	109	690
2018	109	780
2019	91	790
2020	79	800
2021	60	810
2022	32	780
2023	47	690
2024	30	500
2025	19	250
Total	921	8370¹

The Analysis uses Los Alamos Data Integration Framework



Analytical Process to Assess the B61-12 LEP Impact

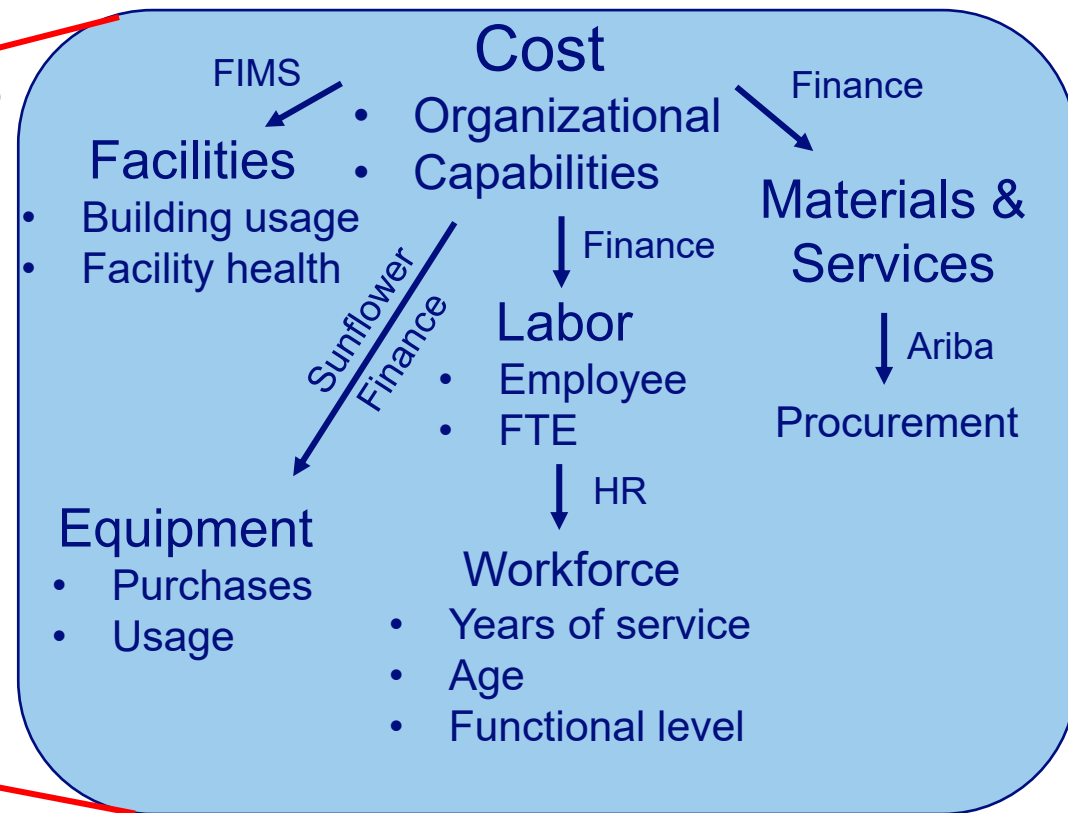
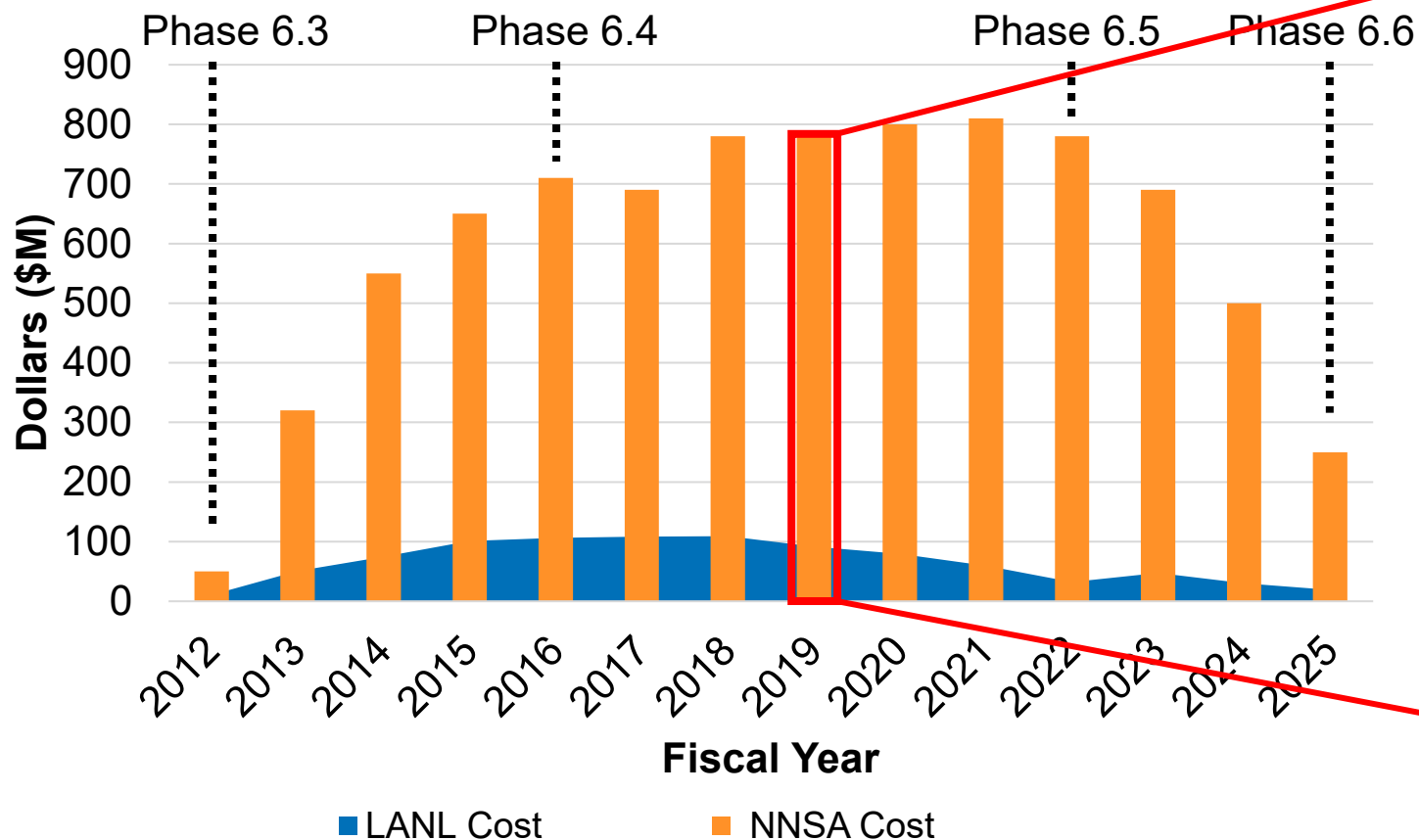
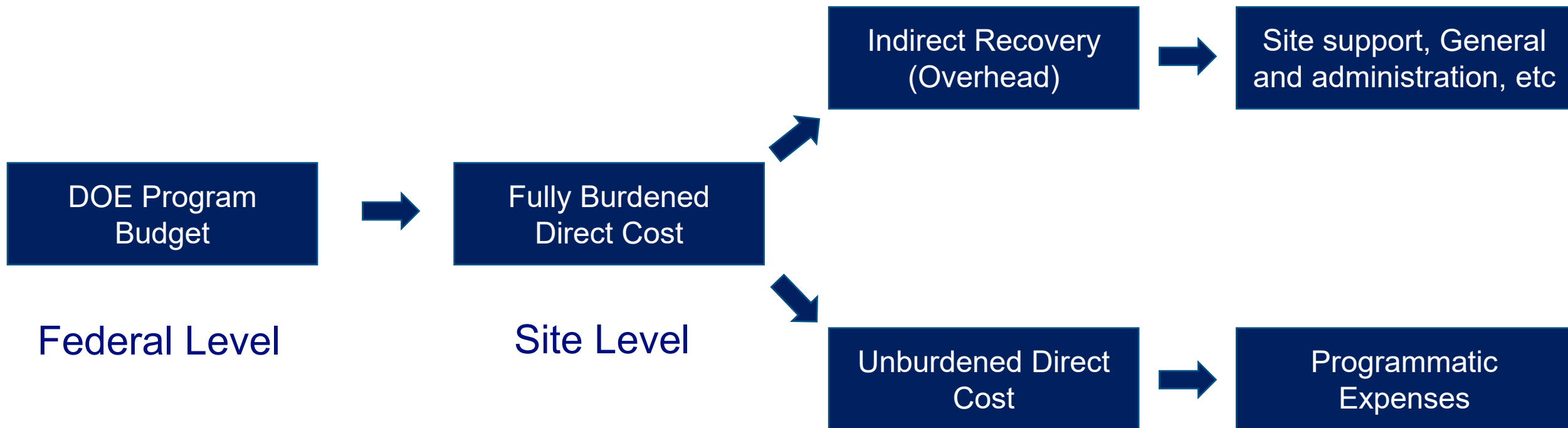
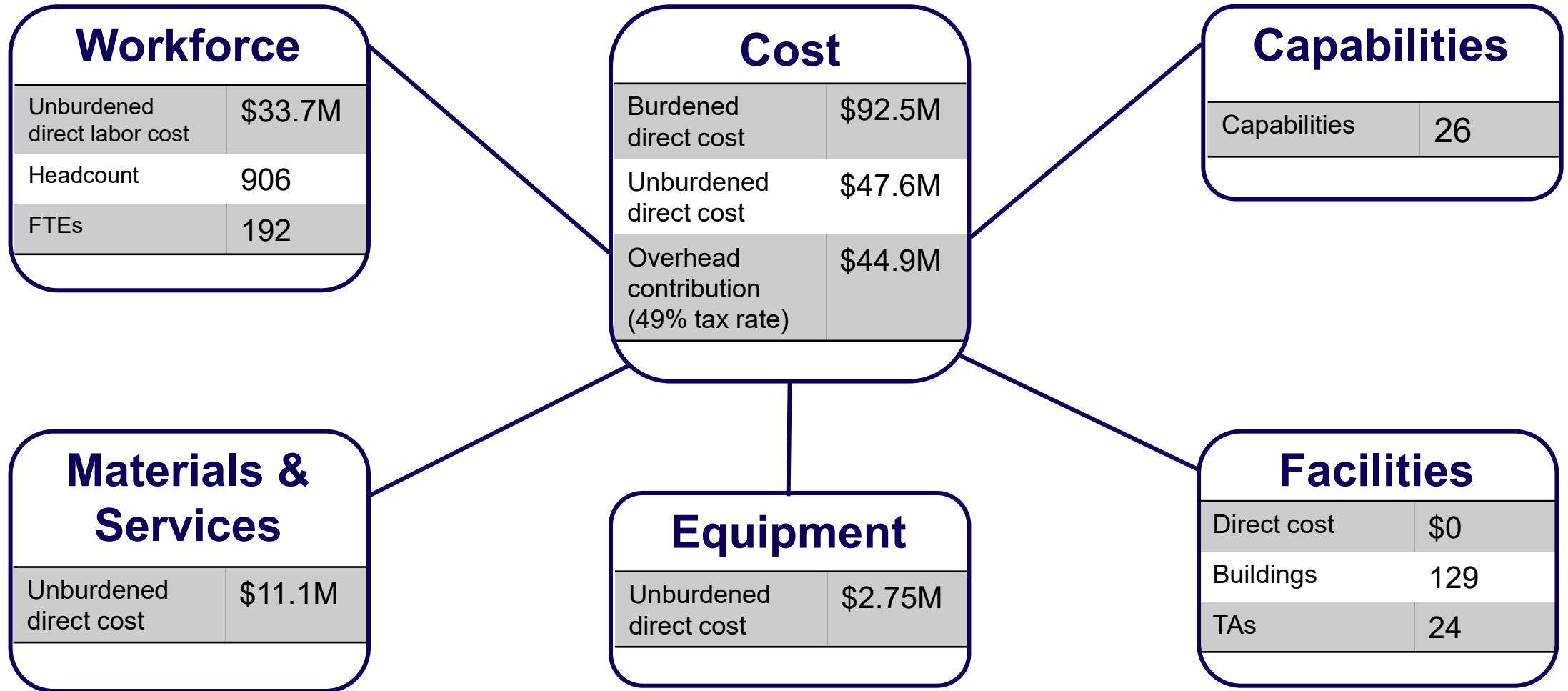


Illustration of Direct vs Indirect Cost

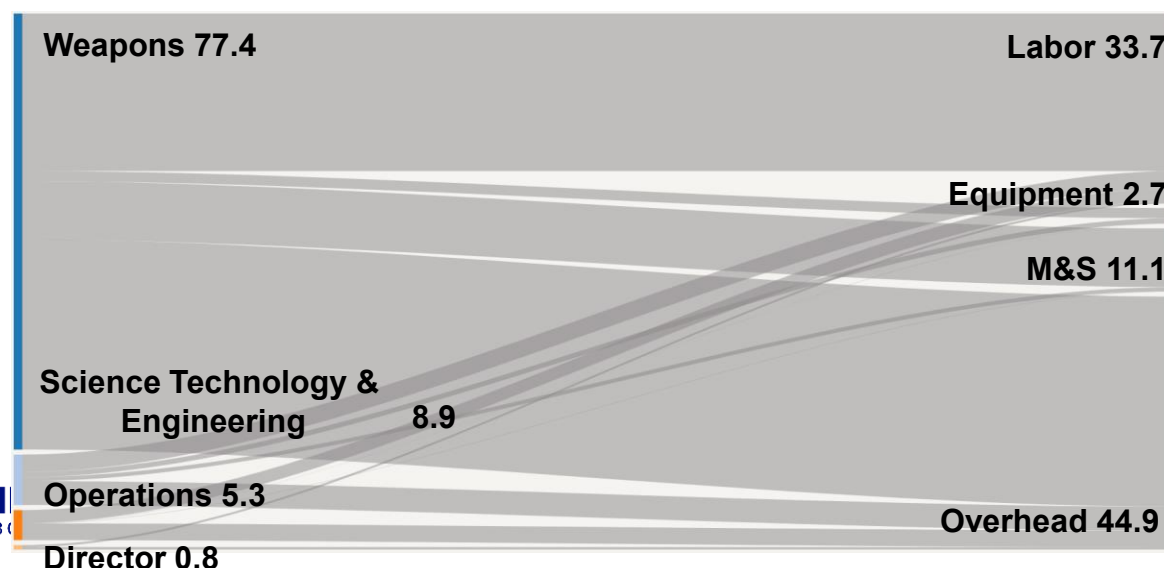
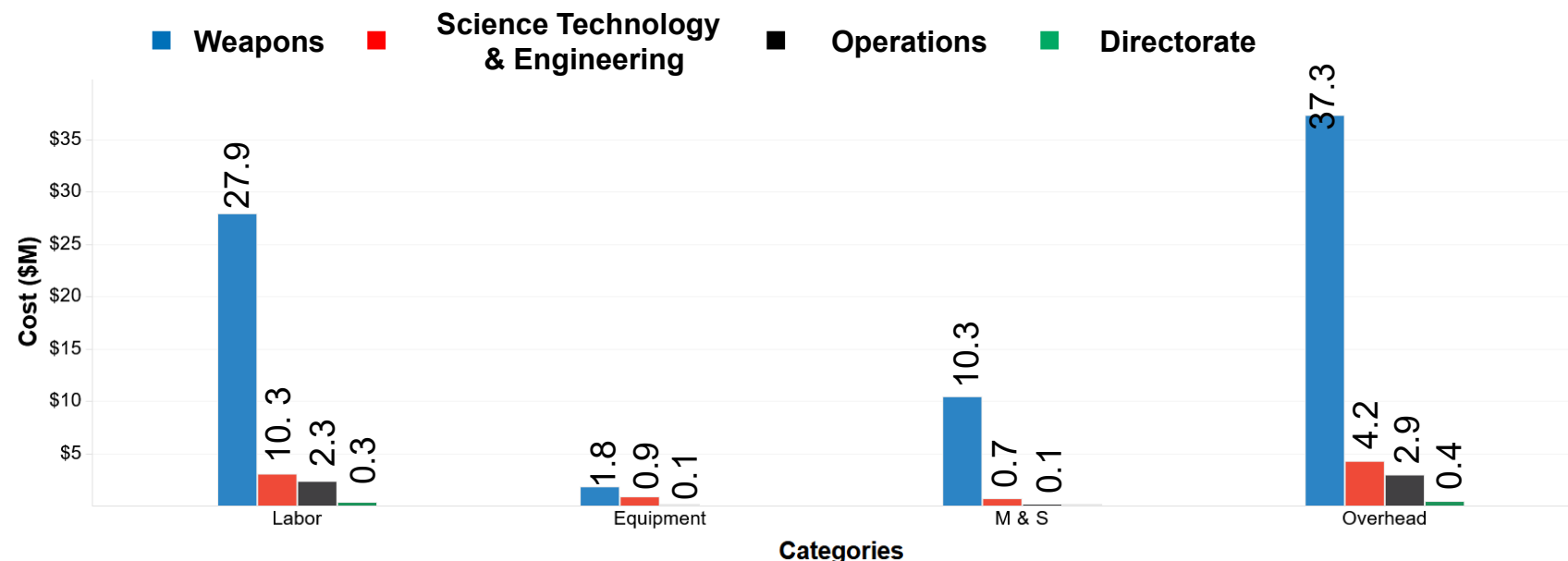


B61-12 LEP FY2019 at a Glance



B61 LEP Cost Distribution Across Directorate Level

Directorate	Categories	Cost (\$M)
Total		92.5
Weapons	Total	77.4
	Labor	27.9
	M & S	10.3
	Equipment	1.8
	Overhead	37.4
Science Technology & Engineering	Total	8.9
	Labor	3.1
	Equipment	0.9
	M & S	0.7
	Overhead	4.2
Operations	Total	5.4
	Labor	2.3
	M & S	0.1
	Equipment	0.1
	Overhead	2.9
Director	Total	0.8
	Labor	0.3
	M & S	0.1
	Equipment	0.1
	Overhead	0.4

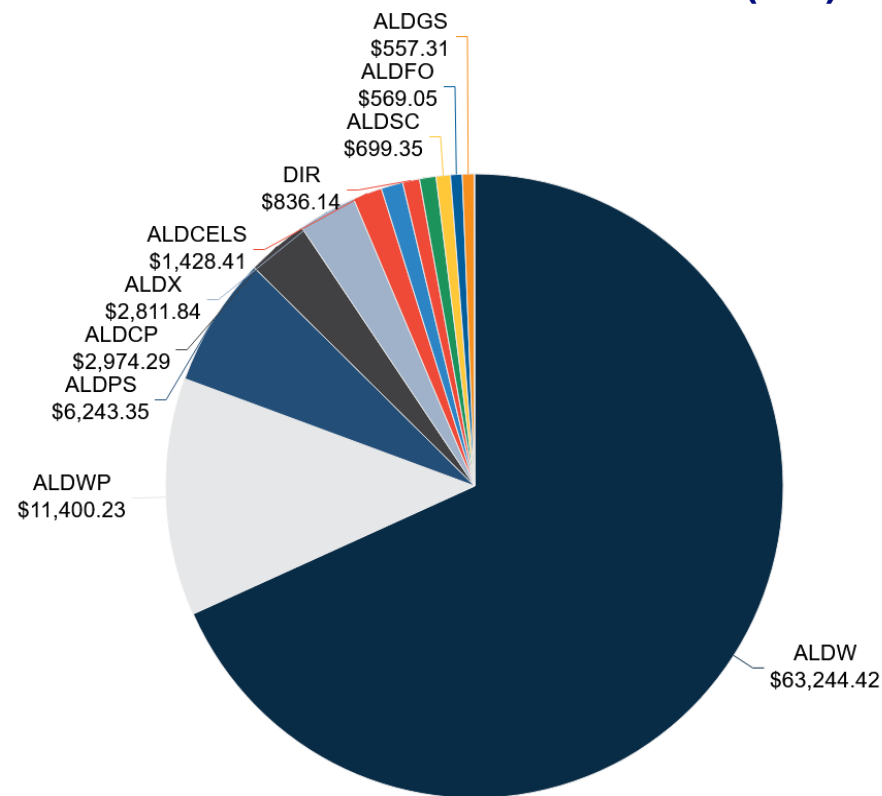


MicroStrategy provides platform to visualize and slice data through a variety of graphs and filters

Program Impact by Cost at Smaller Organizational Units

Directorate	Associate Directorate	Direct Cost (\$M)	Overhead(\$M)	Total Cost (\$M)
Total		47.6	44.9	92.5
Weapons	Total	40.1	37.2	77.4
	Weapons Engineering	32.1	31.0	63.2
	Weapons Production	6.7	4.7	11.4
	Weapons Physics	1.3	1.5	2.8
Science Technology & Engineering	Total	4.7	4.2	8.9
	Physical Science	3.5	2.9	6.4
	Chemical, Earth, and Life Sciences	0.7	0.7	1.4
	Simulation and Computation	0.3	0.3	0.6
	Global Security	0.2	0.3	0.5
Operations	Total	2.4	2.9	5.4
	Capital Projects	1.3	1.7	3.0
	Business	0.5	0.6	1.1
	Environmental Health and Safety	0.3	0.4	0.7
	Facilities and Operations	0.3	0.3	0.6
Director	Director	0.4	0.4	0.8

Associate Directorate Cost (\$M)

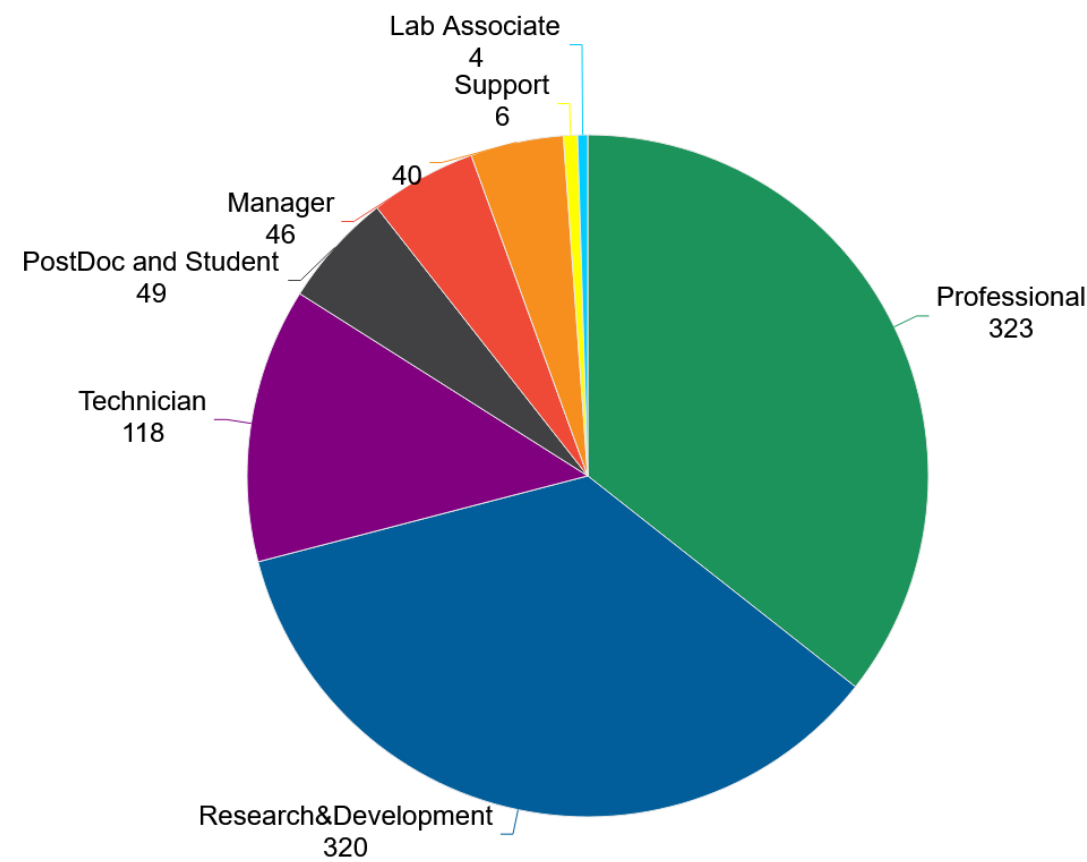


The program leverages 13 associate directorates across 58 divisions and 145 groups

Linking Cost to HR information Offers Insight into Skills being Exercised by the Program

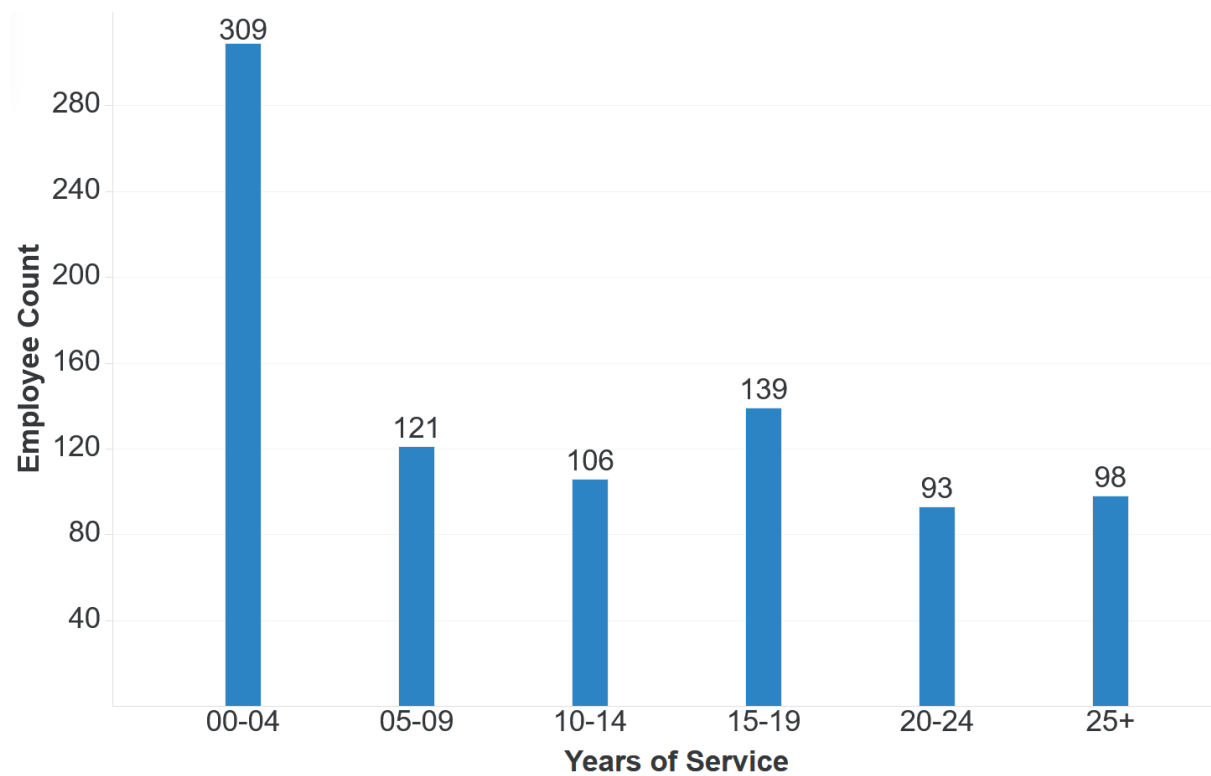
Directorate	Associate Directorate	Direct Cost (\$M)	Number of Employees	FTEs
Total		33.7	906	193.3
Weapons	Total	27.9	614	159.3
	Weapons Engineering	23.6	458	128.6
	Weapons Production	3.2	128	23.5
	Weapons Physics	1.1	28	7.2
Science	Total	3.1	159	18.3
Technology	Physical Science	2.0	113	12.0
&	Chemical, Earth, and	0.6	24	3.7
Engineering	Life Sciences	0.3	8	1.3
	Simulation and Computation	0.2	14	1.3
	Global Security	0.2	14	1.3
Operations	Total	2.4	133	12.7
	Capital Projects	1.3	30	7.0
	Business	0.5	26	2.7
	Environmental Health and Safety	0.4	26	2.0
	Facilities and Operations	0.2	51	1.0
Director	Director	0.3	10	3.0

Employees by Job Class Description

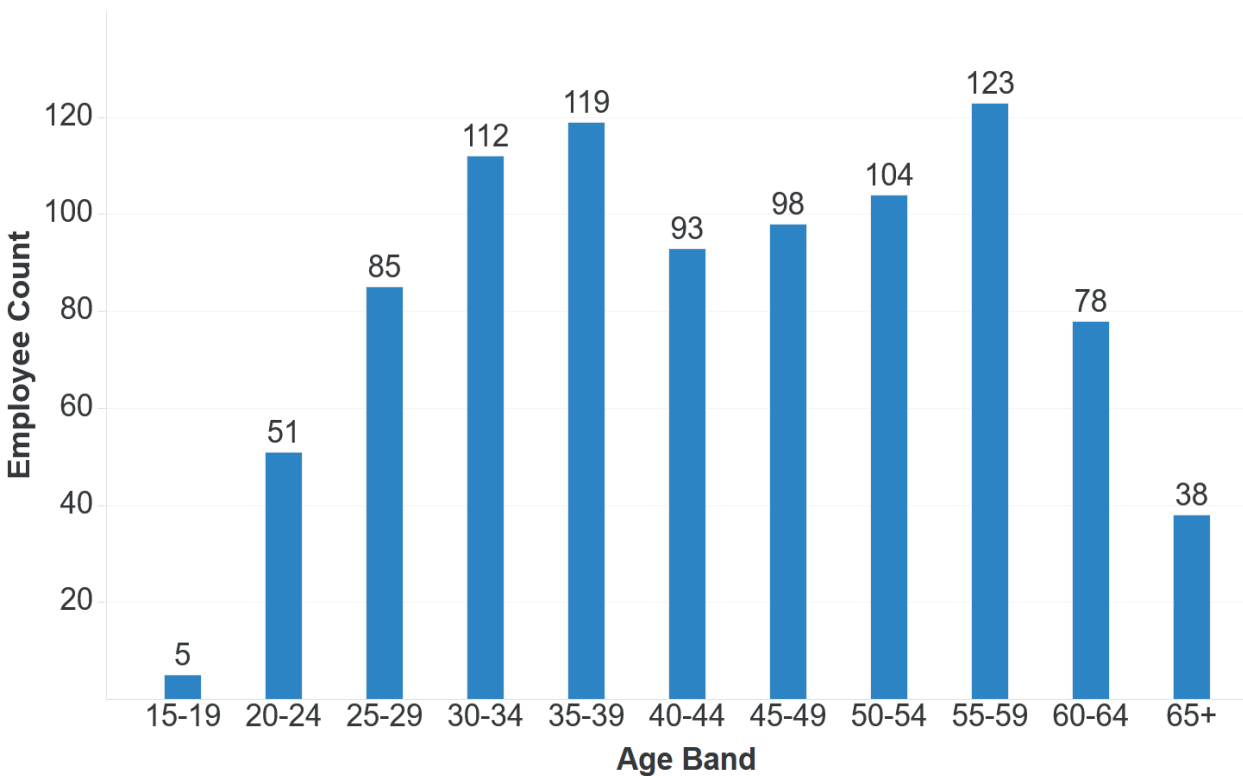


Demographics of B61 Workforce can be Further Quantified and Evaluated

Employee Years of Service FY2019



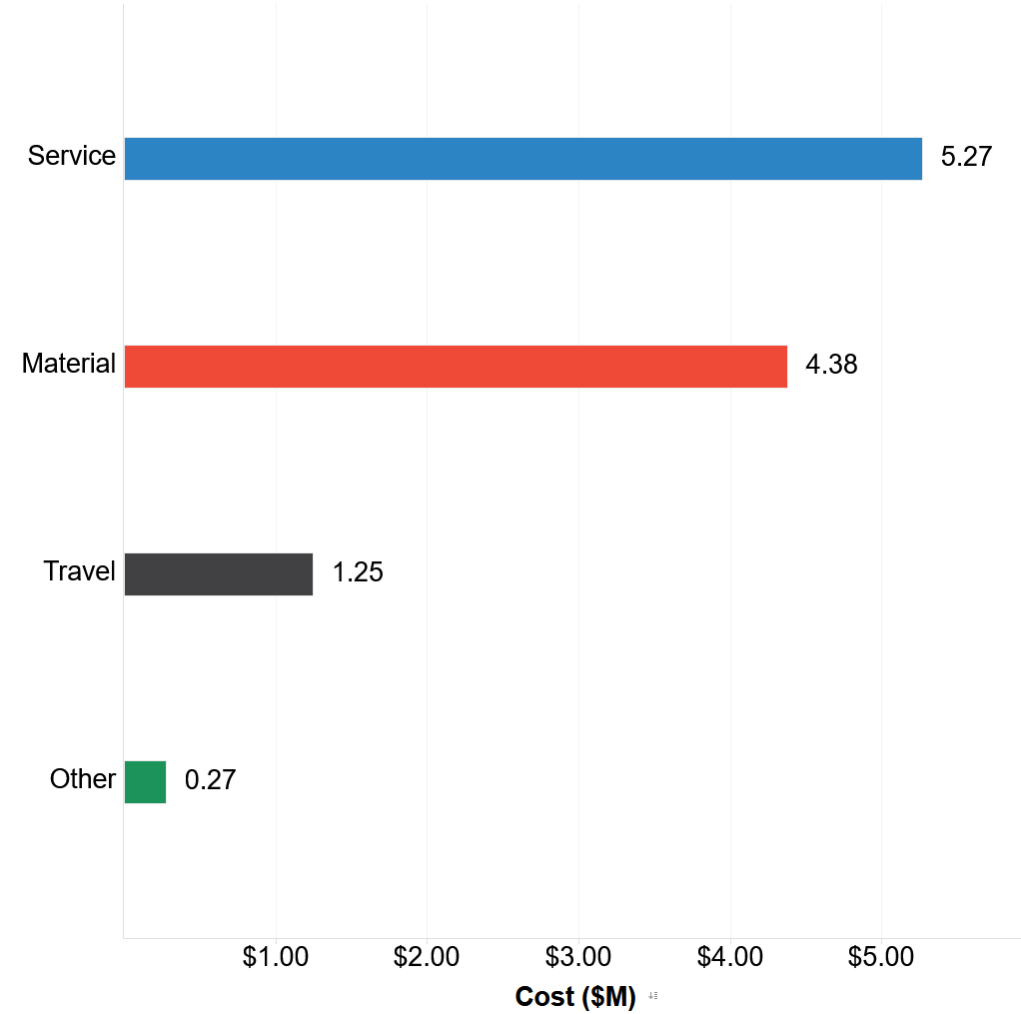
Employee Age FY2019



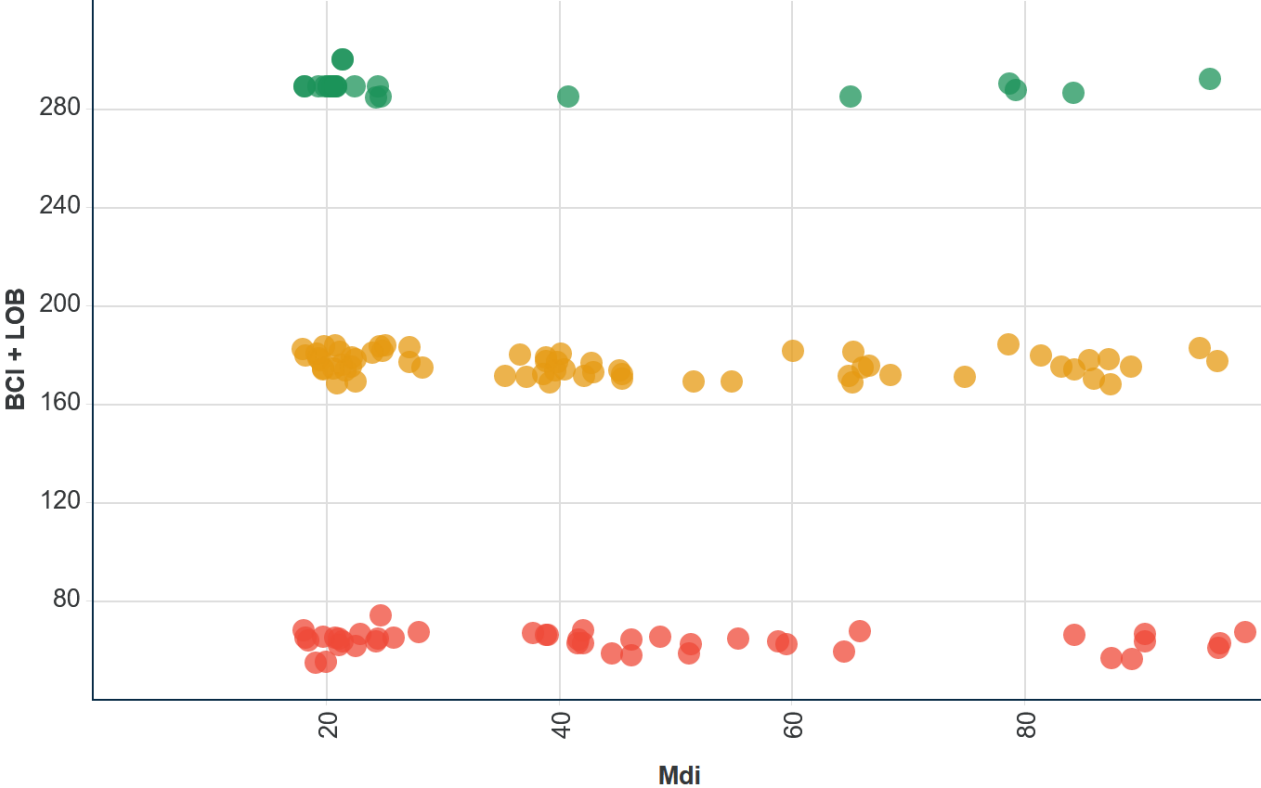
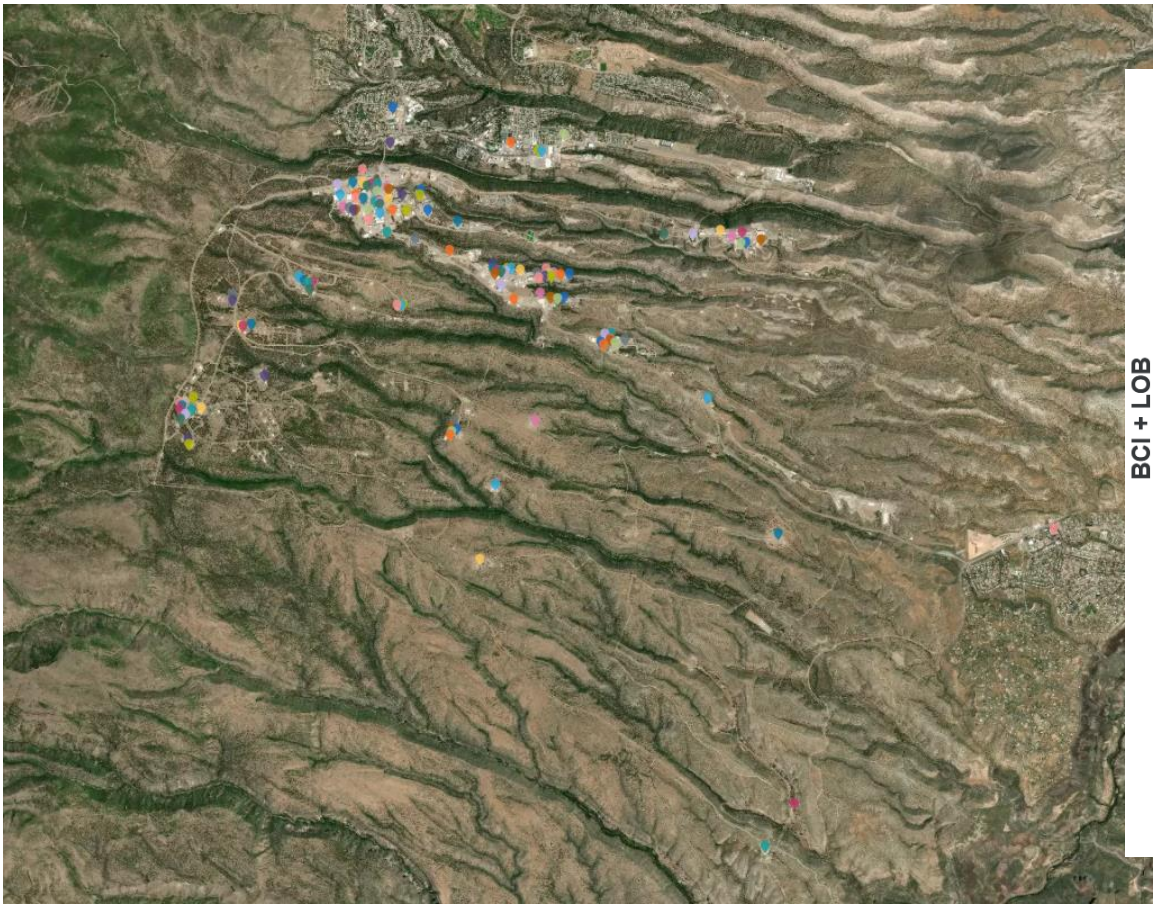
Materials, Services and Equipment Account for 15% of Program Cost

D Directorate	M&S Subcategories	Direct Cost (\$M)
Total		11.1
Weapons	Total	10.3
	Equipment	1.34.9
	Capital	0.44.0
	Equipment	0.11.1
Science	Total	0.90.3
Technology	Total	0.7
Technology	Capital	0.20.3
Engineering	Equipment	0.10.3
Engineering	Travel	0.1
Operations	Total	0.05
	Travel	0.02
	Service	0.03

M&S Subcategory Unburdened Cost (\$M)

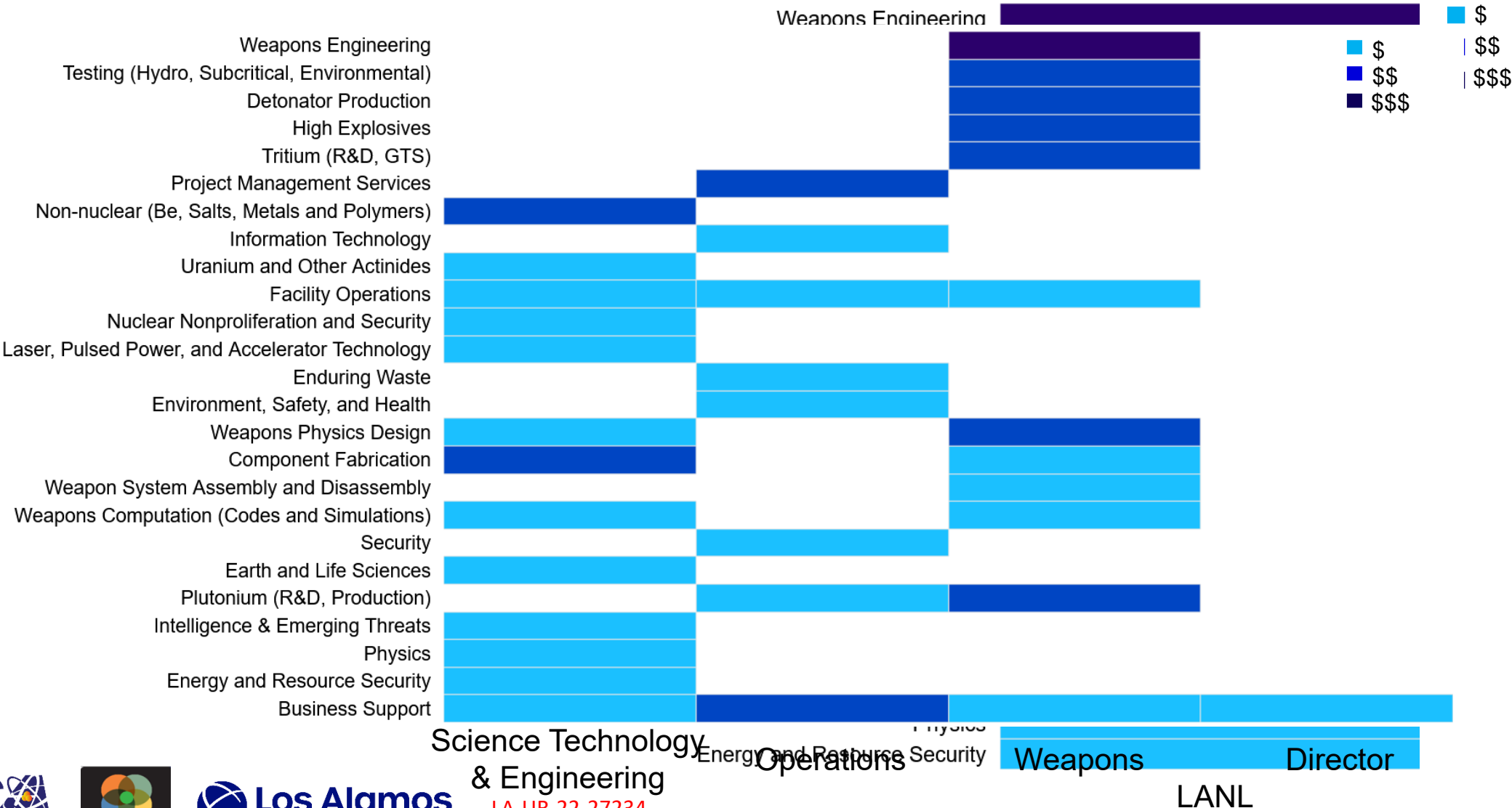


Linking Finance with Facility Information shows B61 LEP Work at 129 Buildings Across 24 Technical Areas



B61 LEP Work Touches most LANL Capabilities

LANL's
program
function
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Summary of B61-12 LEP Impact Analysis and Future Work

- Where we are today
 - Showed direct/indirect cost for major expense categories (labor, facilities, equipment, M&S) across line organizations and capabilities for FY2019
 - Analysis completed for FY2015 – FY2021
 - Data integrated into MicroStrategy
- Next steps
 - Develop assumptions for building occupancy to examine facility and equipment health
 - Develop metrics and evaluation framework for program impact analysis
 - Expand analyses to other programs, organizations, and capabilities
 - Incorporate new software to create applications with more functionality to support planning and what-if scenario studies

Back up materials

Weapons Systems

Table 1–1. Current U.S. nuclear weapons and associated delivery systems

Warheads—Strategic Ballistic Missile Platforms					
<i>Type^a</i>	<i>Description</i>	<i>Delivery System</i>	<i>Laboratories</i>	<i>Mission</i>	<i>Military</i>
W78	Reentry vehicle warhead	Minuteman III intercontinental ballistic missile	LANL/SNL	Surface to surface	Air Force
W87	Reentry vehicle warhead	Minuteman III intercontinental ballistic missile	LLNL/SNL	Surface to surface	Air Force
W76-0/1/2	Reentry body warhead	Trident II D5 submarine-launched ballistic missile	LANL/SNL	Underwater to surface	Navy
W88	Reentry body warhead	Trident II D5 submarine-launched ballistic missile	LANL/SNL	Underwater to surface	Navy
Bombs—Aircraft Platforms					
B61-3/4	Non-strategic bomb	F-15, F-16, certified NATO aircraft	LANL/SNL	Air to surface	Air Force/Select NATO forces
B61-7	Strategic bomb	B-52 and B-2 bombers	LANL/SNL	Air to surface	Air Force
B61-11	Strategic bomb	B-2 bomber	LANL/SNL	Air to surface	Air Force
B83-1	Strategic bomb	B-52 and B-2 bombers	LLNL/SNL	Air to surface	Air Force
Warheads—Cruise Missile Platforms					
W80-1	Air-launched cruise missile strategic weapons	B-52 bomber	LLNL/SNL	Air to surface	Air Force

LANL = Los Alamos National Laboratory

NATO = North Atlantic Treaty Organization

LLNL = Lawrence Livermore National Laboratory

SNL = Sandia National Laboratories

^a The suffix associated with each warhead or bomb type (e.g., “-0/1” for the W76) represents the modification associated with the respective weapon.

Future Modernization

Table 5-4. Cost estimates for life extension programs and major alterations within the 25-year program of record²³

Life Extension Program, Major Alteration, or Modification Program	Type of Cost Estimate	Total Estimated Cost (FY 2020 dollars in billions)	Total Estimated Cost (then-year dollars in billions)
W76 LEP	BCR/SAR	4.2	3.5
W76-2 Modification Program	BCR/SAR	0.075	0.075
B61-12 LEP	BCR/SAR ²⁴	8.4	8.3
W88 Alt 370	BCR/SAR ²⁵	2.9	2.8
W80-4 LEP	WDCR/SAR ²⁶	9.7	11.0
W87-1 Modification Program	MB Cost Estimate	11.1	13.8
W93	MB Cost Estimate	14.2	18.2
Future Strategic Land-Based Warhead	MB Cost Estimate	14.2	19.2
Future Strategic Sea-Based Warhead	MB Cost Estimate	14.2	20.5
B61 Follow-On	MB Cost Estimate	14.2	26.3

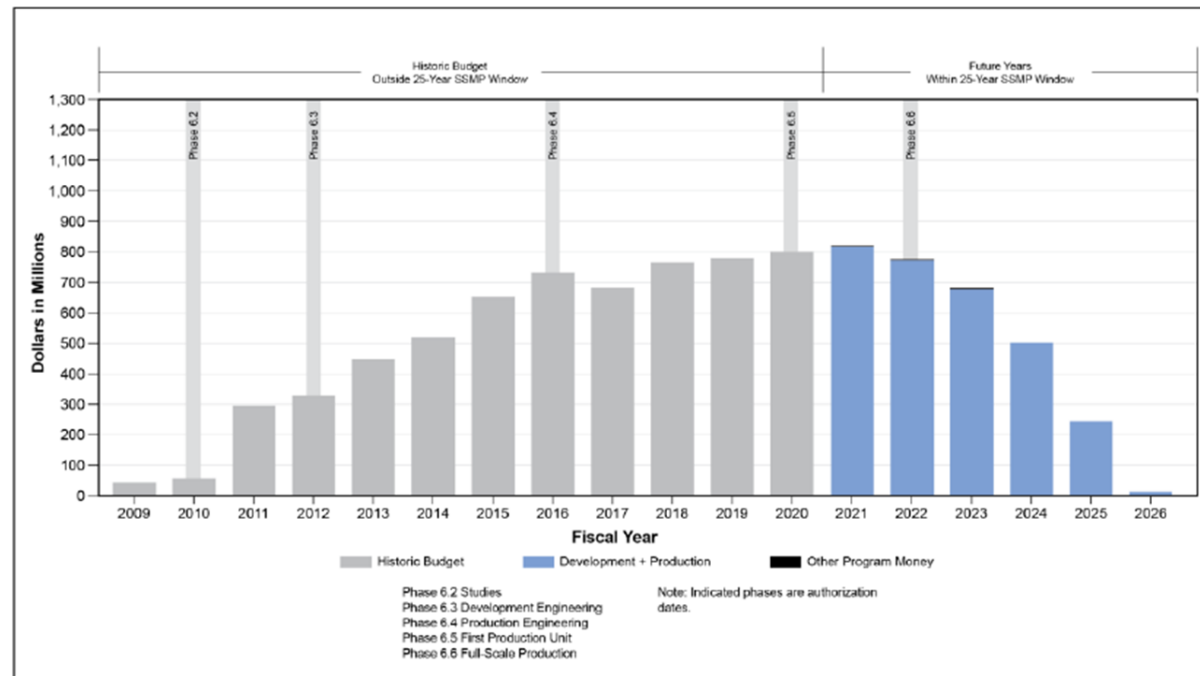


Figure 8-16. B61-12 Life Extension Program cost from FY 2009 to completion¹⁷

Phase 6.X Process

- Developed for non-routine nuclear weapon alteration, modifications, and life extension programs of an existing weapons system

Phase 6.1	Phase 6.2	Phase 6.2A ¹	Phase 6.3 ¹	Phase 6.4 ¹	Phase 6.5 ¹	Phase 6.6
Concept Assessment	Feasibility Study & Design Options	Design Definition & Cost Study	Development Engineering	Production Engineering	First Production	Full-Scale Production
Management and Budget Cost Estimate		Weapons Design and Cost Report	Baseline Cost Report reported as part of the Selected Acquisition Report			

¹The Office of Cost Estimating and Program Evaluation conducts the DOE/NNSA independent cost review prior to Phase 6.2A and independent cost estimates prior to entry in Phases 6.3, 6.4 and 6.5.

Figure 5–13. Cost estimates across the *Phase 6.x Process*