

Extended Life Programs

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Bottom-line Up-front

- The objective of the Extended Life Program is to reduce and mitigate the nuclear safety risk associated with long-term operation of aging nuclear facilities at the Y-12 National Security Complex.
- Significant steps have been taken and continue to be taken to reduce the Material-at-Risk in these facilities.
- A Safety Strategy and associated Implementation Plan have been issued to define the scope of the Extended Life Program and help ensure resources are available to execute the Extended Life Program.
- During the past several years, the National Nuclear Security Administration has prioritized funding complex-wide infrastructure upgrade projects

Overview

- Background
- Purpose of the Extended Life Program
- Scope of this Revision
- Risk Reduction
- Risk Mitigation
- Safety Basis Documentation
- Funding/Implementation

Background

- The 9215 Complex (enriched uranium machining) and Building 9204-2E (component assembly/disassembly) were constructed in mid-1950's and mid-1960's, respectively.
- Around 2012, Building 9204-2E and the 9215 Complex were removed from the scope of operations to be transitioned to the Uranium Processing Facility during the 2025 time frame.
- NNSA's mission will rely on extended operations in Building 9204-2E and the 9215 Complex.
- Y-12 management established an Extended Life Program (ELP) in 2016 that involved reviewing both regulatory issues and the physical condition of facilities and equipment, and made recommendations for practical infrastructure investments.

Purpose of the Extended Life Program

In the spirit of DOE Standard 1189, *Integration of Safety into the Design Process*, the ELP Safety Strategy is intended to:

- Identify a strategy for **reducing**, **mitigating**, and **accepting** the nuclear safety risk associated with long-term operation of Building 9204-2E and the 9215 Complex
- Outline the key safety decisions, including the safety analysis approach, for continuing to operate these facilities until the 2050 time frame
- Allow key stakeholders a forum to review and agree on the overarching strategy and key safety decisions

Note: the Safety Strategy is considered a living document that is updated as additional relevant information becomes available

Risk Reduction

CNS is actively working to reduce the Material-at-Risk (MAR; i.e., the total quantity of hazardous radiological and toxicological materials) in Building 9204-2E and the 9215 Complex, with the goal of eventually transitioning to a true working inventory rather than mass storage of legacy materials.

Risk Mitigation

CNS is reevaluating and, as practical, addressing the gaps between (a) the existing configuration of facilities and (b) modern nuclear safety and facility design requirements. Areas to be re-evaluated as part of this effort include the following:

- Facility response to natural phenomena hazards (e.g., earthquake, flood)
- Confinement
- Fire protection
- Electrical systems
- Criticality safety
- Containers
- Safety basis documentation

Natural Phenomena Hazards

- CNS completed a *Seismic Expert Panel Review of Buildings 9204-2E and 9215* in September 2016.
- Consistent with recommendations of the expert panel, CNS intends to:
 - Complete new facility walk-downs (FY2019)
 - Re-characterize the Y-12 site earthquake and flood/precipitation hazards (FY2020)
 - Use the results of the walk-downs and updates to the seismic and flood hazard characterization to update the engineering studies in FY2021
- Any gaps between the NPH capabilities of the facilities and modern NDC-2 requirements will be identified.
- If necessary, modifications will be prioritized to bring the facilities in compliance with NDC-2 requirements (e.g., exterior reinforcement using reinforcing steel and shotcrete and/or reinforcement of interior columns and beams with epoxy dowels).

Note: It is important to complete the new NPH analysis prior to initiating other ELP activities, such as safety basis upgrades, evaluating confinement, etc.

Confinement

- DOE Order 420.1C states that nuclear facilities must have the means to confine radioactive materials following evaluation basis accidents; however, this Chapter of the Order is only applicable to new nuclear facilities or major modifications to existing facilities.
- In 2008, CNS developed Confinement Ventilation System Evaluations that identified gaps in the ventilation systems for Building 9204-2E and the 9215 Complex when compared to the criteria for safety-significant active confinement systems (although neither system warrants categorization as safety-significant).
- Execution of the ELP will include reassessing and updating these Confinement Ventilation System Evaluations.
- The results of these of this efforts will include (a) if feasible, identifying practical actions that could be taken to address identified gaps or (b) incorporating a discussion of any significant confinement deficiencies in updates to the safety basis documents for Building 9204-2E and the 9215 Complex.
- It is unlikely that practical modifications to significantly improve the confinement capability of these systems exist; nevertheless, the potential for these types of upgrades will be reevaluated as part of executing the ELP.

Fire Protection

- Existing equivalencies and exemptions to fire protection codes and standards will be re-evaluated (including equivalencies and exemptions to requirements of both DOE and NFPA codes and standards).
- For any equivalencies and exemptions that were based on the limited life of these facilities, a determination will be made on whether (a) if feasible, practical actions can be taken to address identified gaps or (b) the basis for the equivalency or exemption needs to be revised to reflect that operations may continue in these facilities until at least 2050.
- In addition, the following specific activities will be executed to identify and correct any potential deficiencies or weaknesses in the fire protection systems of Building 9204-2E and the 9215 Complex:
 - Continue to prioritize replacement of aged sprinkler heads in Building 9204-2E and the 9215 Complex
 - Complete hydraulic calculations for systems that do not have calculations to identify weaknesses
 - Perform fire barrier penetration evaluation
 - Perform quantitative “lights out” test of emergency lighting

Electrical Systems

- In FY2016, DOE began to fund and Y-12 began to execute a Nuclear Facilities Electrical Modernization (NFEM) project to remove, replace, upgrade and test the electrical distribution systems within these facilities. For example, the project includes replacing 68 electrical panels and 20 motor controls centers (MCCs) in the 9215 Complex, and 10 electrical panels and 7 MCCs in Building 9204-2E. This project is scheduled to be completed in FY2020, and will result in significantly reducing the electrical fire risk within these facilities.
- In addition to executing the NFEM project, CNS intends to make the following improvements to the electrical systems in the 9215 Complex and Building 9204-2E during execution of the ELP:
 - Installing ground fault detectors on switchgear
 - Obtaining and maintaining the ability to calculate arc-flash energies for equipment labeling
 - Installing new labels on all electrical equipment in Building 9204-2E and the 9215 Complex
 - Replacing renewable fuses and current-limiting fuses

Criticality Safety

- A 2015 review of the Criticality Accident Alarm Systems (CAAS) highlighted that many components of the existing CAAS have been in service since the system was installed in 1957. The CAAS in Building 9204-2E and the 9215 Complex are scheduled to be replaced by 2022.
- CNS will also review and update, as necessary, Criticality Safety Evaluations (CSEs) for fissile material activities in Building 9204-2E and the 9215 Complex; a key focus of this update will be ensuring assumptions (including those made in supporting calculations) are properly identified and protected.

Containers

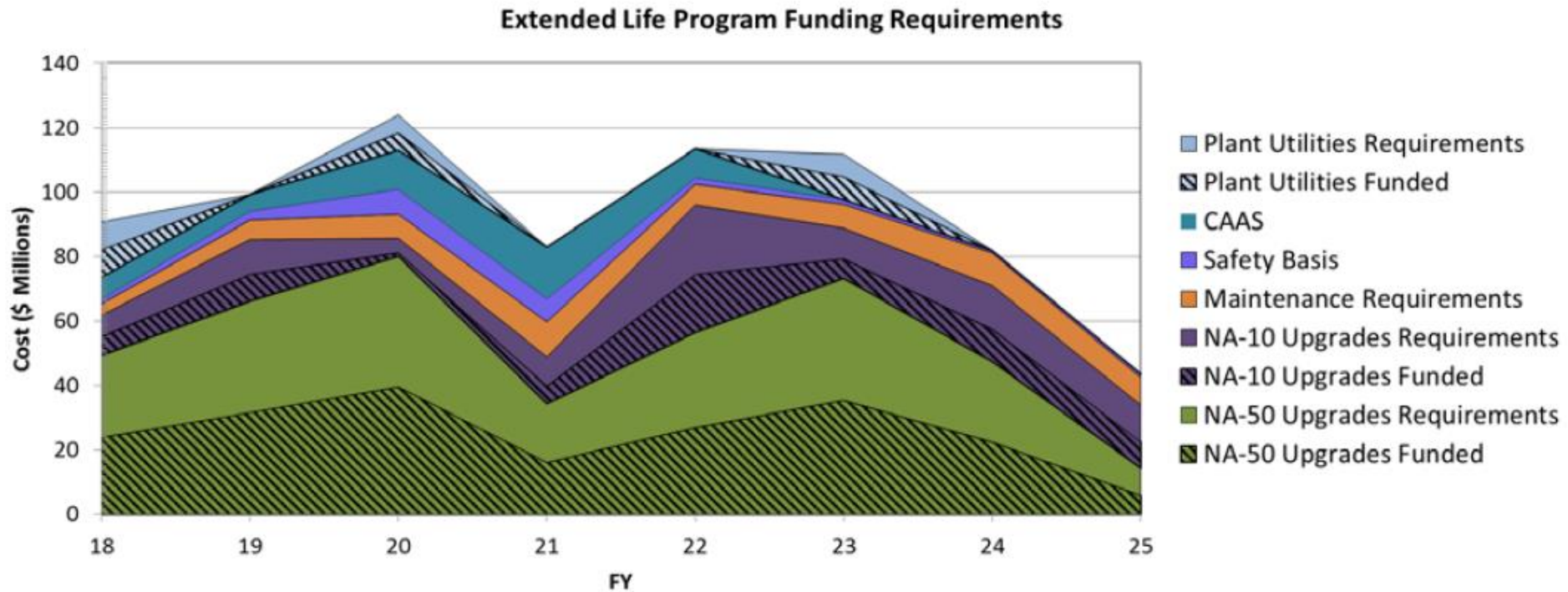
- In response to DNFSB Recommendation 2005-1, DOE issued DOE M 441.1-1, *Nuclear Materials Packaging Manual*, to codify expectations, requirements, and guidance associated with containers used to store nuclear material.
- CNS is developing new containers that are compliant with the requirements of this Manual for use in conjunction with startup of UPF.
- Execution of the ELP will include requiring that, by 2025, newly generated nuclear materials (e.g., product from Electrowinning in the 9215 Complex) will be stored in containers that are compliant with DOE M 441.1-1.

Safety Basis Documentation

- The safety basis for Building 9204-2E will be updated to comply with the requirements and guidance of DOE-STD-3009-2014 during execution of the ELP; the safety basis documentation for the 9215 Complex will be evaluated for potential updates to DOE-STD-3009-2014 expectations.
- Achieving compliance with DOE Standard 3009-2014 (e.g., receptor-based consequences; mitigated analysis; improved definition of safety functions, functional requirements, and performance criteria) will facilitate improvements in the procurement, implementation, configuration management, and maintenance of safety-related equipment.
- As areas are identified where compliance with DOE-STD-3009-2014 is determined to be impractical, those 'gaps' will be identified in this safety strategy as requiring formal approval via established DOE processes (i.e., equivalencies, exemptions, or approval of the safety basis).
- While some progress toward implementing DOE Standard 3009-2014 will be made prior to FY2021, the bulk of the effort will be accomplished during the FY2021 – FY2025 time frame.

Funding

The ELP Implementation Plan identifies the notional schedule and resources required for executing the suite of ELP-related tasks.



ELP Implementation Plan Example

Type	ELP Deliverable ¹	Program	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	Deliverable Total
Safety Basis and Supporting	Training for use of earthquake experience data	Engineering Development Training	\$0.09M									\$0.09M
	Y-12 Probabilistic Flood Hazard Assessment ²	Operation of Facilities	\$1.3M	\$1.2M								\$2.5M
	Criticality Accident Alarm System Analysis Safety DAC Revs 0 and 1 for 9204-2E	Recapitalization	\$0.1M									\$0.1M
	Criticality Accident Alarm System Analysis Safety DAC Revs 0 and 1 for 9215	Recapitalization		\$0.1M								\$0.1M
	Y-12 Probabilistic Seismic Hazard Analysis	Operation of Facilities		\$0.5M								\$0.5M
	9204-2E seismic analysis (building, equipment, and II/I) and walkdowns ³	Operation of Facilities		\$0.5M	\$0.1M							\$0.6M
	9215 Complex seismic analysis (building, equipment, and II/I) and walkdowns	Operation of Facilities		\$0.5M	\$0.1M							\$0.6M
	Criticality Accident Alarm System Fire Hazard Analysis, Safety Basis Docs, TSR/DSA DCNs for 9204-2E	Recapitalization			\$0.7M							\$0.7M

Questions?