

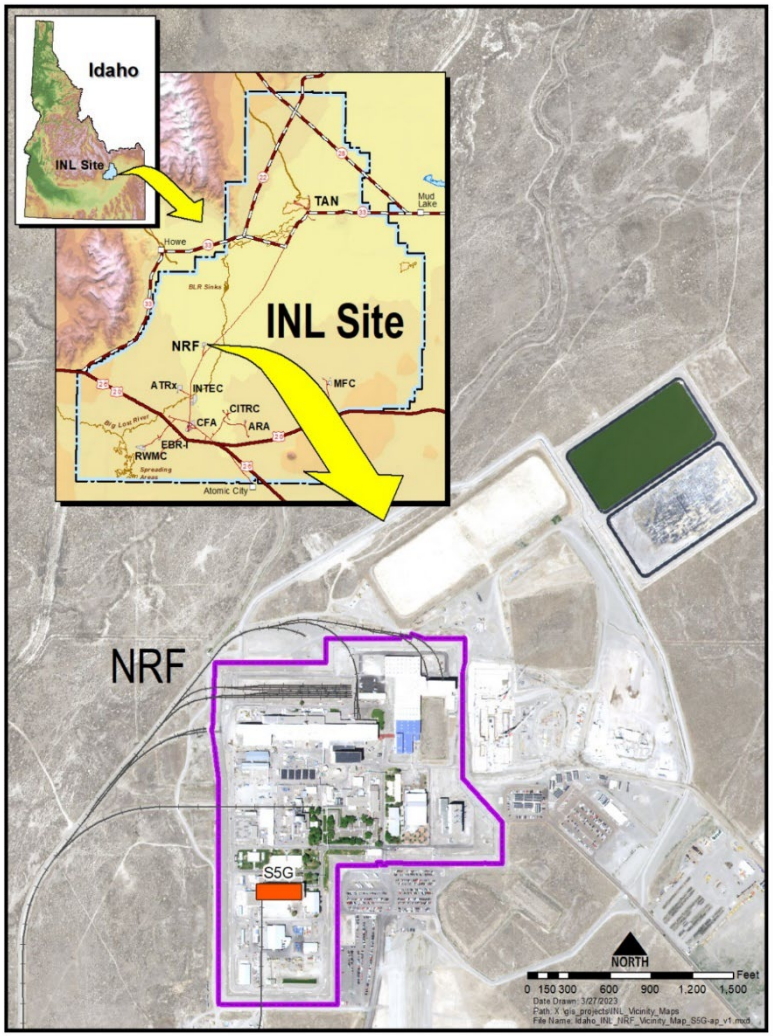

Engineering Evaluation/Cost Analysis for Naval Reactors Facility S5G Prototype Facility End State Including Disposition of Reactor Vessel

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INL Site and Prototypes at Naval Reactors Facility



Location of S5G Prototype relative to other prototypes at Naval Reactors Facility (NRF).



NRF and S5G within the Idaho National Laboratory Site.

Key Messages

- The U.S. Department of Energy Idaho Operations Office (DOE-ID) recommends complete removal of the S5G Prototype Facility (Alternative 4), leaving the building in useable condition
- Idaho Department of Environmental Quality (DEQ) and U.S. Environmental Protection Agency (EPA) concur
- Alternative 4 is consistent with removal action objectives (RAOs) in existing Idaho National Laboratory (INL) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) decision documents

Background

- General decommissioning approach at INL under CERCLA:
  - *Action Memorandum for General Decommissioning Activities under the Idaho Cleanup Project* (DOE/ID-11293), signed by DOE, DEQ, and EPA in 2006
  - Establishes process for decommissioning and demolition (D&D) as CERCLA non-time-critical removal actions (NTCRAs)
  - Allows addition of facilities upon Agency concurrence
  - Documents selection of Idaho CERCLA Disposal Facility (ICDF) for disposition of D&D wastes that meet waste acceptance criteria (WAC)
  - Requires preparation of an engineering evaluation/cost analysis (EE/CA) and action memorandum for major facilities

Background

- Memorandum of Agreement between DOE Offices of Environmental Management (EM) and Naval Reactors (NR)
  - Signed May 2019
  - Provides for D&D of Naval Nuclear Laboratory Sites (such as Naval Reactors Facility [NRF]) by DOE-EM
  - Includes NRF reactor prototypes and ancillary structures for D&D by the DOE contractor for the Idaho Cleanup Project (ICP)

General D&D Approach under CERCLA at INL

1995 → **Joint DOE and EPA Policy on Decommissioning DOE Facilities Under CERCLA (Administrative Record Document ID 5137955)**
Endorses the use of removal action authority to conduct decommissioning of surplus DOE facilities as CERCLA NTCRAs

1996 → **Executive Order 12580**
States DOE is the lead CERCLA agency for removal actions at DOE sites

2006 → ***Action Memorandum for General Decommissioning Activities under the Idaho Cleanup Project*** **(DOE/ID-11293)**

- Establishes process for D&D as CERCLA NTCRAs at INL
- Allows addition of facilities upon Agency concurrence
- Documents selection of ICDF for disposition of D&D wastes
- Requires preparation of an EE/CA and action memorandum for identified major facilities

2008, **2010**, **2011**, **2016** → **D&D of reactors completed as CERCLA NTCRAs at INL**

- Engineering Test Reactor (ETR)
- Power Burst Facility (PBF)
- Materials Test Reactor (MTR)
- Experimental Breeder Reactor II (EBR-II)

Timeline for D&D of NRF Prototypes

2020

NRF S1W, A1W, and S5G Prototypes added to Action Memorandum for General Decommissioning (DOE/ID-11293, LST-1213)

- Categorized as major facilities
- Requires preparation of an EE/CA and action memorandum

2022
2023
2024

S1W and A1W combined into one EE/CA because of similarities

- EE/CA completed (DOE/ID-12046)
- Action Memorandum (DOE/ID-12051) signed and D&D began
- D&D is ongoing

2024

S5G warranted a separate evaluation

- Unlike S1W and A1W, S5G is below grade
- DOE conferred with DEQ and EPA and consulted the Tribes on the recommended option
- EE/CA was finalized for S5G (DOE/ID-12081) and issued for public comment
- Comments will be collected during the public comment period

2025

Action memorandum for S5G will be prepared and signed

S5G History and Operations

1961-1963 S5G Test Plant Building (NRF-633A), attached support building (NRF-633B), and adjacent warehouse (NRF-634) were constructed.



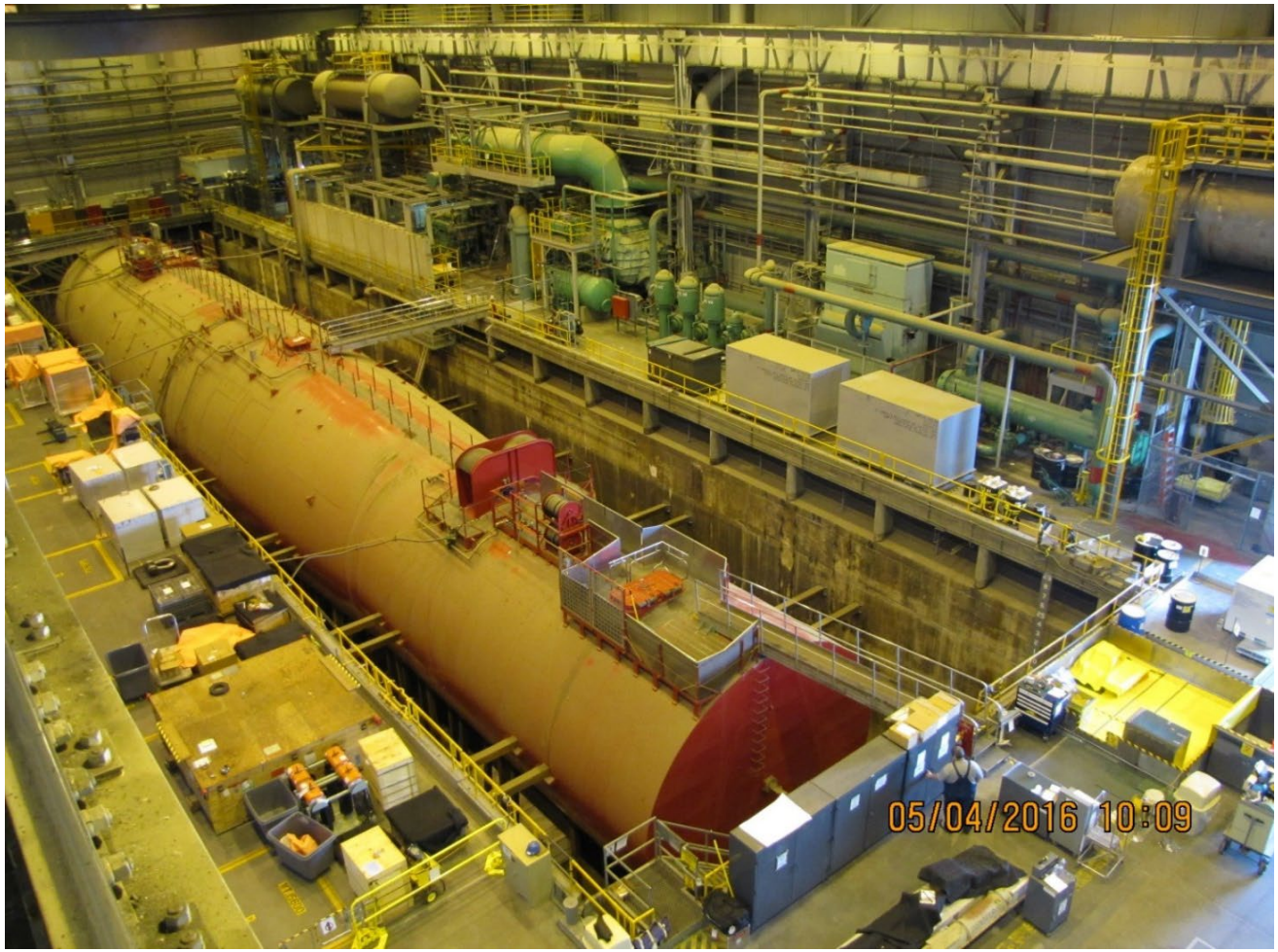
S5G History and Operations

1965-1995 The prototype was operated for almost 30 years.



S5G History and Operations

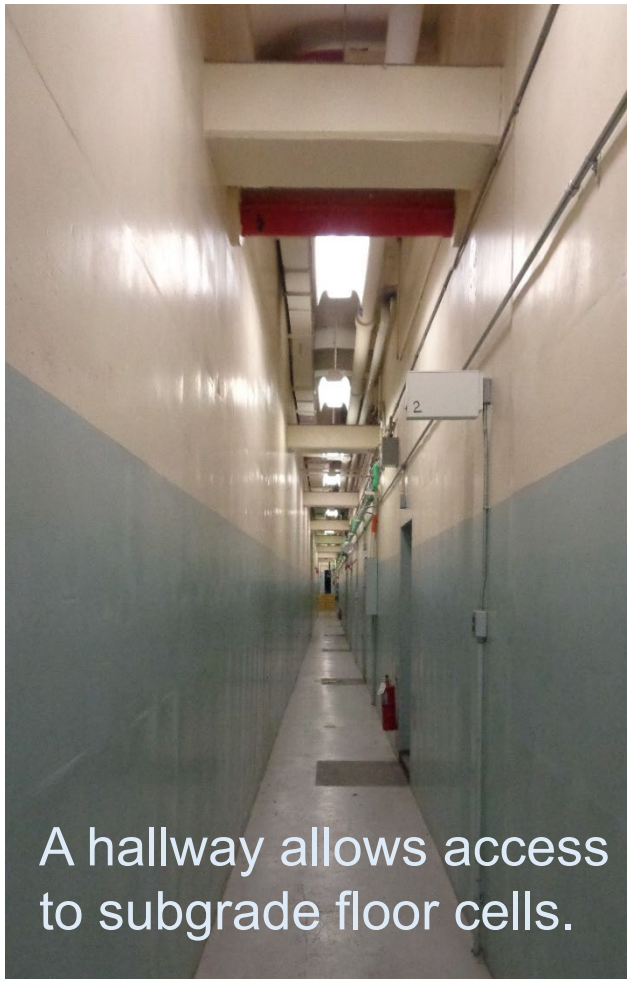
1995-1999 S5G Prototype was shut down in May 1995. Defueling and layup were completed in 1999.



S5G History and Operations



The hull basin is constructed of poured concrete.

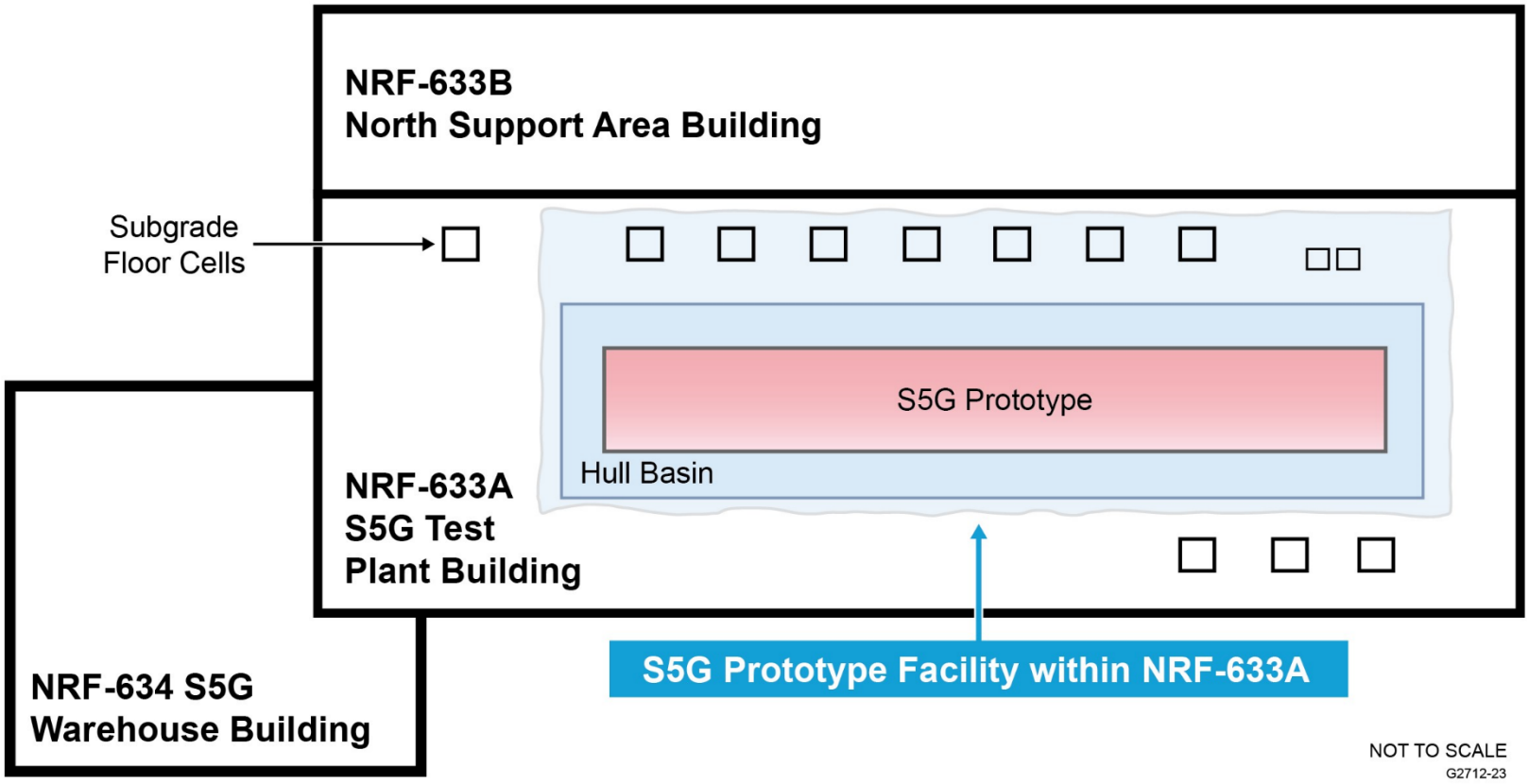


A hallway allows access to subgrade floor cells.

S5G EE/CA Scope

- The S5G Prototype Facility consists of:
  - S5G Prototype and its defueled reactor vessel
  - Subgrade hull basin housing the prototype
  - Nine subgrade cells on the north side of the hull basin
- S5G Test Plant Building (NRF-633A), attached support building (NRF-633B), and adjacent warehouse (NRF-634) will be left in place following D&D of the S5G Prototype Facility
- The buildings are identified for future D&D as minor facilities under the *Action Memorandum for General Decommissioning*

S5G EE/CA Scope



EE/CA Removal Action Objectives

- RAOs are derived from Records of Decision for Operable Unit (OU) 8-08 and OU 10-08
  - Limit total human health excess cancer risk to 1 in 10,000 (1E-04) for future residents
  - Limit noncancer effects to a hazard index of 1 for future residents
  - Inhibit unacceptable exposure to populations of flora and fauna
- In addition to meeting RAOs, the selected alternative should incorporate DOE's goal to reduce the "CERCLA footprint" to the extent practicable within project constraints

EE/CA Evaluates Four Alternatives

Alternative 1 – No Action

Alternative 2 – Continued Surveillance and Maintenance

Alternative 3 – In Situ Decommissioning

Alternative 4 – Complete Prototype Removal

Alternative 1 – No Action

- Simulates abandonment in place
- Allows building to naturally degrade and contamination to spread
- Used as a baseline for comparison to evaluate worst case spread of contamination
- Not a viable alternative because not protective
- Eliminated from comparative analysis in the EE/CA

Alternative 2 – Continued Surveillance and Maintenance

- Maintains the facility in the near-term to prevent release of contaminants
- Postpones a permanent solution until some future date
- Increases overall cost
- Not a viable stand-alone alternative because not protective
- Eliminated from comparative analysis in the EE/CA

Alternative 3 – In Situ Decommissioning

- Reduces size, repositions, and works around obstacles within the confines of the prototype and basin to surgically remove targeted wastes
- Removes regulated materials (e.g., hazardous waste) for treatment and disposal off the INL Site
- Removes CERCLA hazardous substances to a depth of 10 ft below ground surface and stabilizes remaining contaminants in place
- Expected to require long-term controls
- Estimated cost is $73,500,000

Alternative 4 – Complete Prototype Removal

- Removes the entire prototype and peripheral components using a simple top-down approach
- Removes regulated materials (e.g., hazardous waste) for treatment and disposal off the INL Site
- Expected to eliminate long-term control requirements
- Estimated cost is $70,100,000

Comparative Analysis

Comparison Topic	Alternative 3 In Situ Decommissioning	Alternative 4 Complete Prototype Removal
Time to implement	**A few months less**	A few months more
Implementation and worker risk	Complex approach, increased worker risks	**Simple approach, reduced worker risks**
Material transport	**14 loads offsite** **360 loads onsite** **Total ~1,100 tons**	26 loads offsite 1,800 loads onsite Total ~6,100 tons
Recycling potential	~65% less	**~ 65% more**
Cost	$73,500,000	**$70,100,000**
Warehouse floor	Complicated and more expensive	**Straightforward and less expensive**
Reduced CERCLA footprint?	No	**Yes**

Bold text indicates favorable comparison

Recommended Alternative

Alternative 4 – Complete Prototype Removal

- Meets RAOs protecting human health and the environment
- Reduces risks to workers
- Has a similar cost to Alternative 3 (~5% decrease)
- Reduces DOE's CERCLA footprint
- Offers greater potential for recycling
- Features straightforward engineering and construction of a new warehouse floor
- Not expected to require long-term controls

Before and After Concept





Artist's rendering

Summary

- DOE evaluated the S5G Prototype Facility at NRF as a NTCRA under CERCLA
- DOE recommends Alternative 4 – Complete Prototype Removal; DEQ and EPA concur
- Alternative 4:
  - Meets RAOs to protect human health and the environment
  - Reduces DOE's CERCLA footprint
  - Is cost effective in today's dollars
  - Extends the use of the building for several decades, avoiding the need for constructing a new warehouse
  - Expected to eliminate the need for long-term controls

Public Involvement

- Questions? Submit in the “Questions” box to the right of the screen
- Send comments electronically by November 14, 2024, to:
  eeca_comments@icp.doe.gov
- Mail comments by November 14, 2024, to:
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