



Proposed Consolidation of Nuclear Operations Related to the Production of Radioisotope Power Systems



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The Department of Energy Proposes to:

- **Consolidate the nuclear activities related to the production of radioisotope power systems (RPSs) required for U.S. Government national security and space exploration missions at a single, highly secure Department of Energy site**



DOE's Ongoing RPSs Production Nuclear Operations

- **Located at DOE sites:**
 - Idaho National Laboratory (INL) in Idaho
 - Los Alamos National Laboratory (LANL) in New Mexico
 - Savannah River Site (SRS) in South Carolina
- **Previously decided and planned to locate additional nuclear operations at the Oak Ridge National Laboratory (ORNL) in Tennessee**
 - No action has been taken to do so
- **Requires nuclear material to be transported between the states**
- **Requires separate highly secure sites**



Proposed Consolidation

- **Consolidated operations would include:**
 - Storage of neptunium-237 (Np-237) used in the production of Pu-238
 - Production of Pu-238 used for the RPSs
 - Purification and encapsulation of Pu-238
 - Assembly and testing of RPSs



Key Drivers for the Consolidation of Nuclear Operations

- **Ensuring a continuing supply of Pu-238 for national security mission requirements will be available after the end of this decade**
- **Decreasing reliance on Russian Pu-238 for space missions**
- **Reducing costs associated with RPS production**
- **Consolidating nuclear materials related to RPS production**



Key Drivers for Consolidation of Nuclear Operations

- Increasing the security of nuclear material in the post 9/11 environment
- Reducing risks associated with transporting nuclear materials
- Continuing to enhance the protection of the public and environment



Public Scoping Meetings

- **Engage the public, Tribes, Federal, States, and local agencies early in the process**
- **Provide a forum for DOE to communicate information about the proposed action**
- **Solicit comments regarding the scope of the EIS**
 - Alternatives to be considered
 - Identify issues that should be addressed in the EIS
- **Accept written or oral comments regarding the scope of the EIS**
 - Additional information is contained in the provided packets
- **Address relevant comments in the EIS**

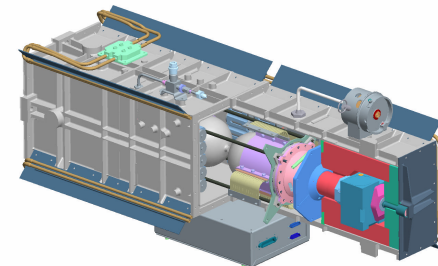
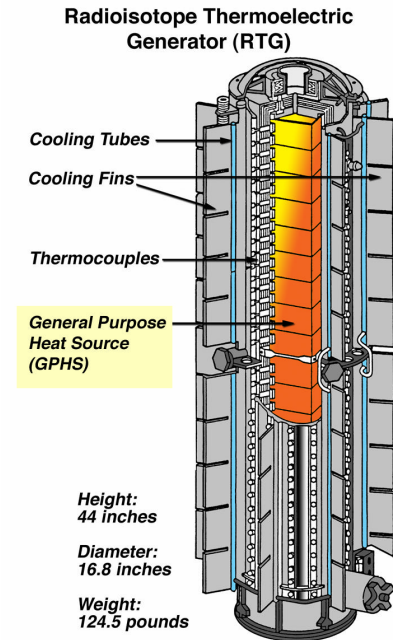
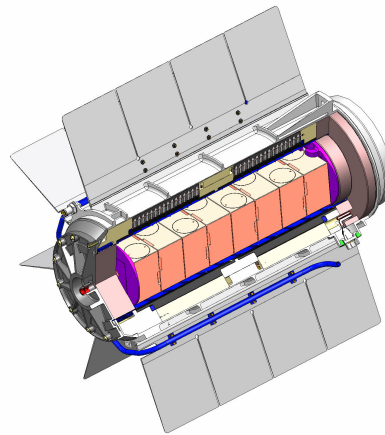


Radioisotope Power Systems (RPSs)

- **Pu-238 is the radioisotope used in the RPSs**
- **The only proven and available technology for national security and space missions**
 - Provides source of electrical power or heat for long periods of time without maintenance
 - Operates in harsh and remote environments
- **RPSs have been used for U.S. national security and space exploration for decades**
- **Proven record of safety and performance**

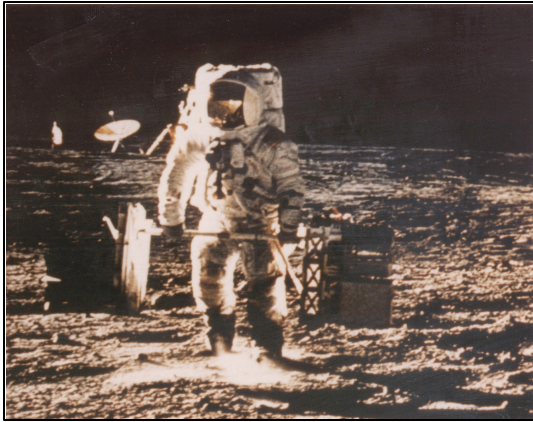
RPS

- Radioisotope Thermoelectric Generator (RTG)
- Multi-mission RTG
- Stirling Radioisotope Generator (SRG)

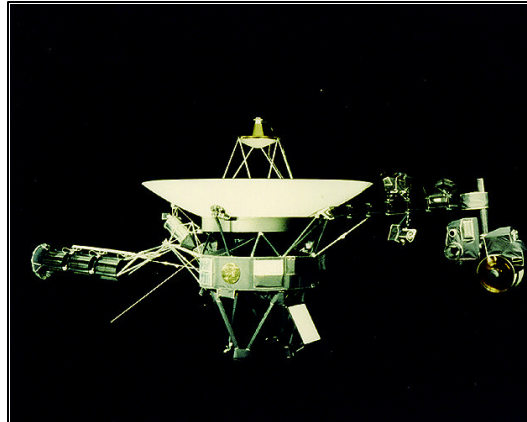




Missions



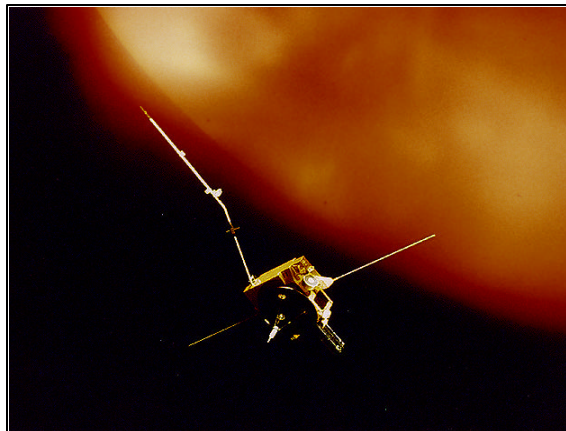
Apollo



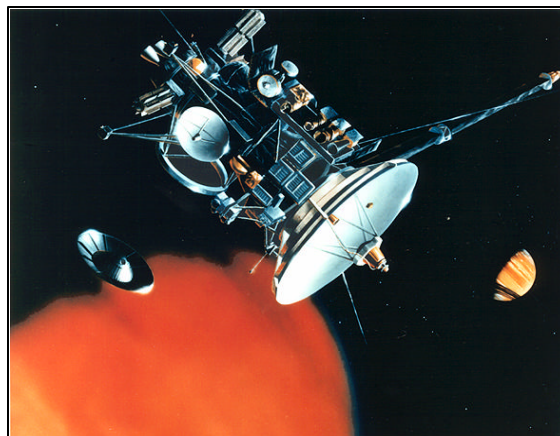
Voyager



Galileo



Ulysses

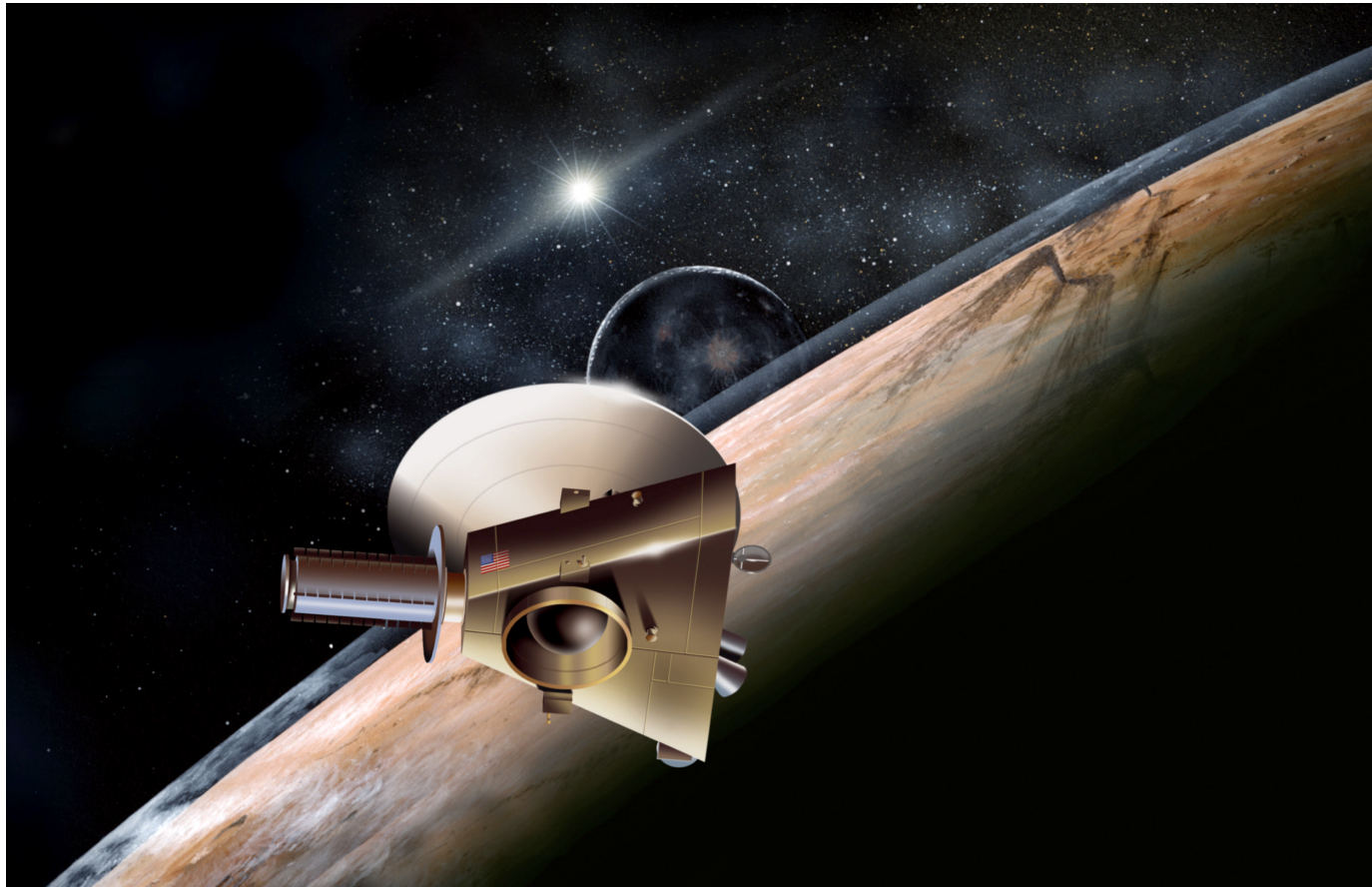


Cassini

Examples of space missions that have used RPSs



New Horizons Mission to Pluto



Launch: January 2006

Arrival: July 2015



Nuclear Infrastructure Required for RPS Production

- **Domestic production of Pu-238**
- **Purification and encapsulation of Pu-238**
- **Assembly and testing**



Domestic Production of Pu-238

- **No current domestic capability to produce Pu-238 exists**
- **Was produced at Savannah River Site**
- **National security requirements for Pu-238 being met from existing domestic inventory**
- **Domestic inventory being augmented by purchases from Russia for space missions**



Domestic Production of Pu-238 – Current Status

- **Nuclear Infrastructure Programmatic EIS Record of Decision (January 2001) decided and planned to establish production at the Oak Ridge National Laboratory (ORNL)**
 - Not yet established
 - Still viable under No Action Alternative
- **Would involve the:**
 - Fabrication of Np-237 targets at ORNL
 - Irradiation of targets at Idaho National Laboratory
 - Extraction of Pu-238 from the targets at ORNL
- **Np-237 stored at Idaho National Laboratory until needed for production of Pu-238**



Purification and Encapsulation of Pu-238

- **Previously conducted at various DOE sites**
 - Mound Site in Miamisburg, Ohio
 - Savannah River Site
- **Current Status**
 - Ongoing at Los Alamos National Laboratory
 - Involves the:
 - Purification of Pu-238
 - Pelletization of purified Pu-238
 - Encapsulation of Pu-238 pellet



Assembly and Testing of RPS

- **Previously located at the Mound Site**
- **Nuclear operations at the Mound Site evaluated post 9/11**
- **Implementation of the increased security requirements at the Mound Site were cost prohibitive**
- **Transferred to Idaho National Laboratory into an existing highly secure area**



Assembly and Testing of RPS – Current Status

- **Ongoing at the Idaho National Laboratory in the recently commissioned Space and Security Power Systems Facility**
- **Preparations continue for the assembly and test of a RPS for the New Horizons mission to Pluto**
- **Involves the:**
 - Assembly of the heat sources
 - Assembly of RPSs
 - Testing of the RPSs

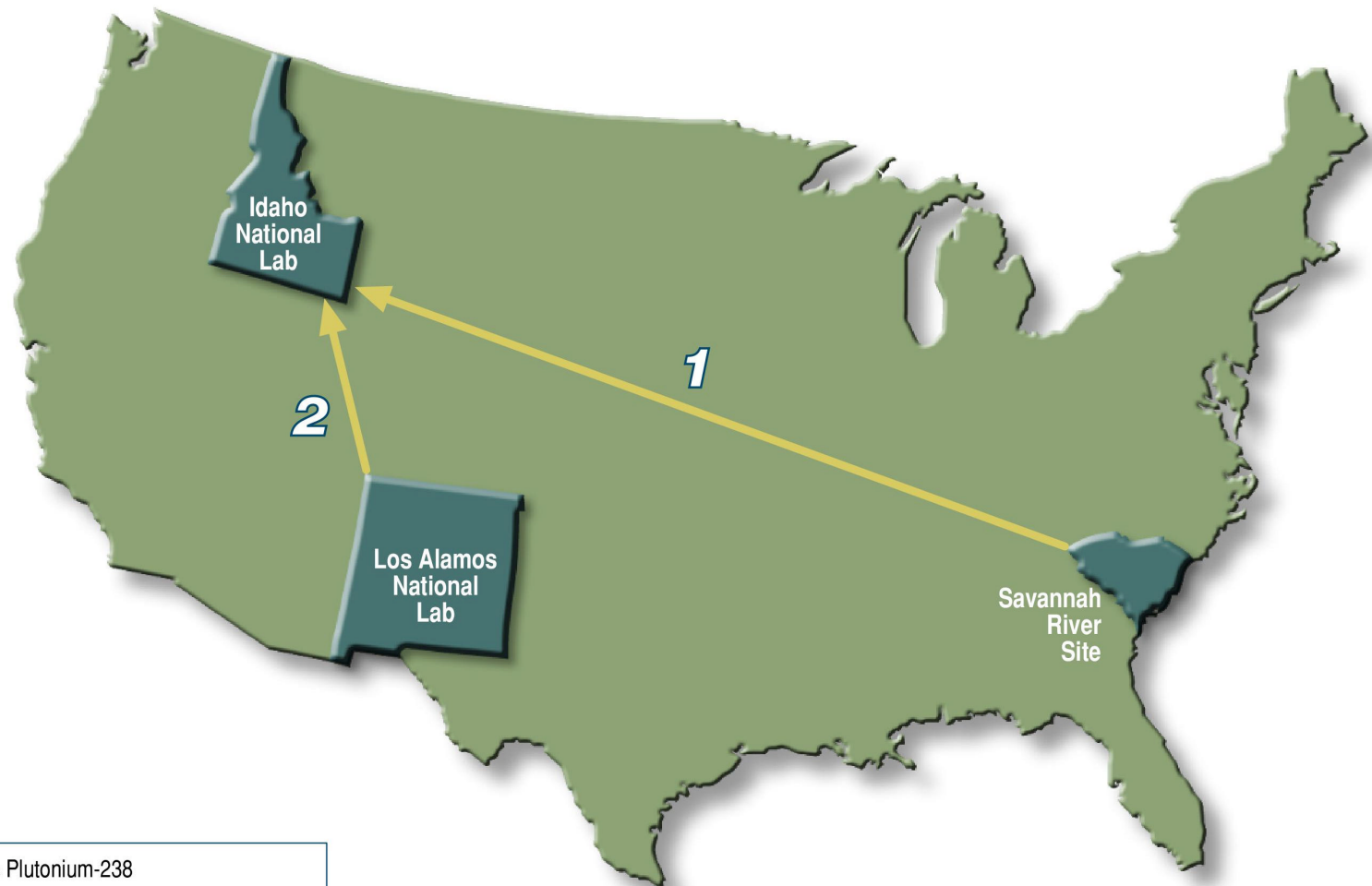


Alternatives Identified

- **No Action**
- **Consolidation at Idaho National Laboratory**
- **Other reasonable alternatives identified through scoping**



Current Operations



Pu-238 = Plutonium-238

Np-237 = Neptunium-237

Inter-site Transportation Route



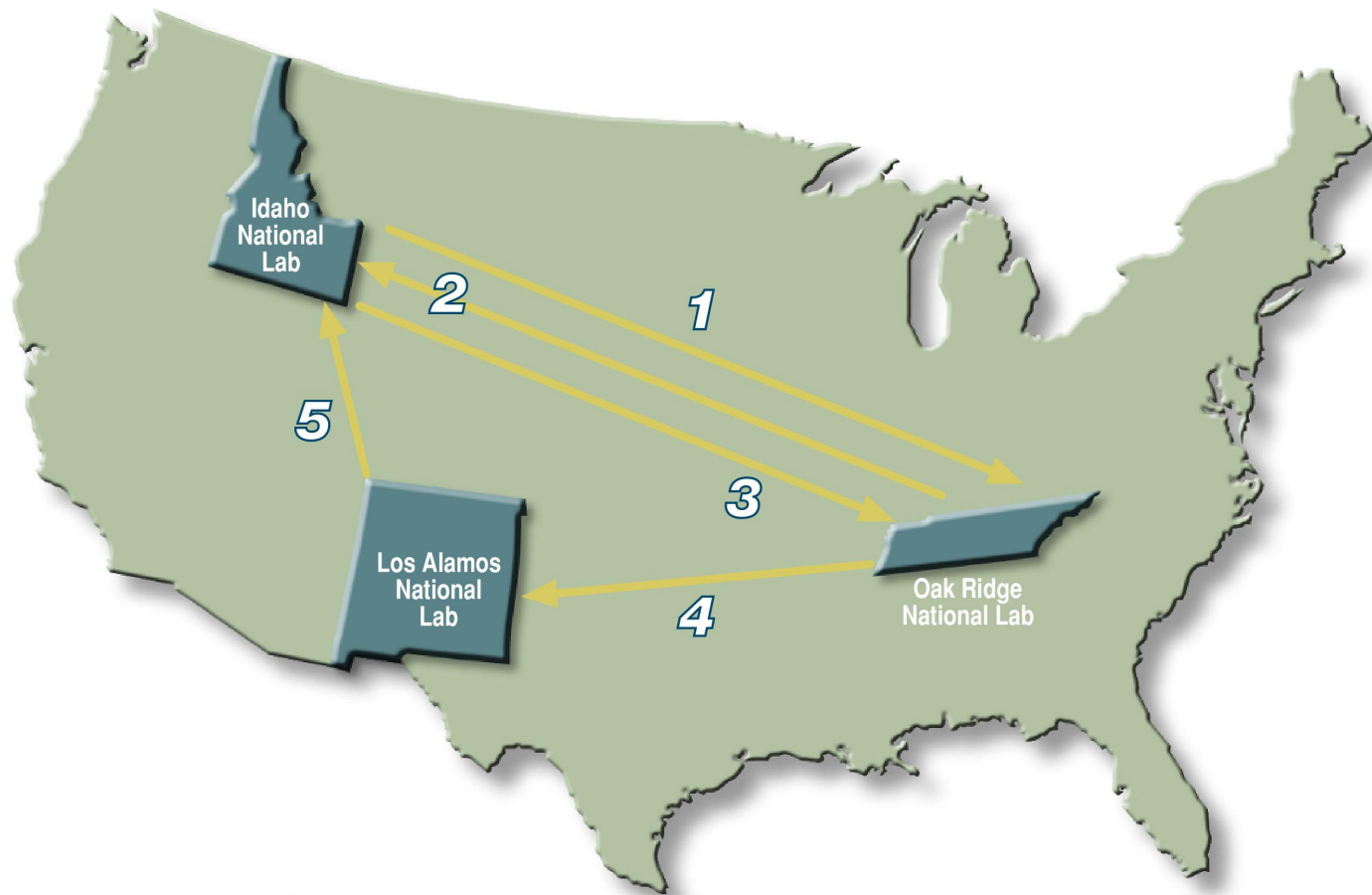


Current Operations

- **SRS converting Np-237 solution to Np-237 oxide**
- **SRS ships Np-237 oxide to INL for storage**
- **LANL purifying existing stockpile of Pu-238**
- **LANL produces Pu-238 oxide pellets**
- **LANL encapsulates Pu-238 pellets**
- **LANL ships encapsulated Pu-238 to INL**
- **INL assembles and tests Radioisotope Power Systems (RPS) at the Space and Security Power Systems Facility**



No Action Alternative



Pu-238 = Plutonium-238

Np-237 = Neptunium-237

Inter-site Transportation Route →

**Total shipping distance
is more than 8,000 miles.**

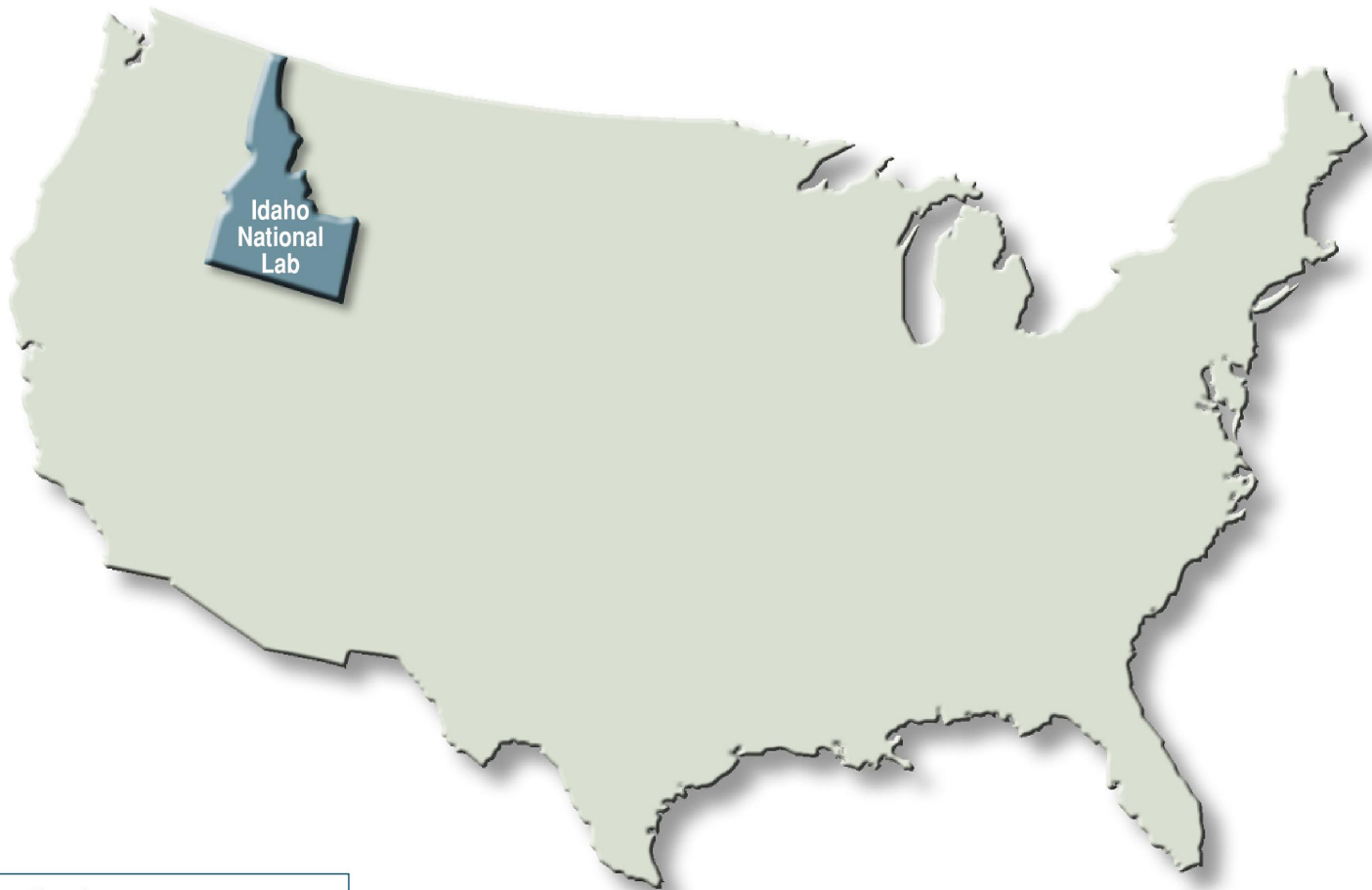


No Action Alternative

- **INL stores and ships Np-237 oxide to ORNL**
- **ORNL purifies Np-237 oxide**
- **ORNL fabricates Np-237 targets and ships targets back to INL**
- **INL irradiates Np-237 targets and ships targets back to ORNL**
- **ORNL extracts the Pu-238 from the targets**
- **ORNL ships Pu-238 oxide to LANL**
- **LANL purifies, produces, and encapsulates Pu-238 oxide pellets**
- **LANL ships encapsulated Pu-238 to INL**
- **INL assembles and tests RPS at the Space and Security Power Systems Facility**



Proposed Consolidation Alternative



Pu-238 = Plutonium-238

Np-237 = Neptunium-237

Inter-site Transportation Route →



Proposed Consolidation Alternative

- **INL stores the Np-237 oxide**
- **INL purifies the Np-237 oxide**
- **INL fabricates Np-237 targets**
- **INL irradiates Np-237 targets**
- **INL extracts the Pu-238 from the NP-237 targets**
- **INL purifies and encapsulates Pu-238 oxide pellets**
- **INL assembles and tests RPS at the Space and Security Power Systems Facility**



Alternatives Considered but Dismissed

- **Consolidation at LANL**

- No operating reactor at the site
- Shipment of targets to INL for irradiation still required
- DOE's goal of consolidation not met

- **Consolidation at ORNL**

- Operating reactor on site, but not capable of meeting programmatic production requirements
- Shipment of targets to INL for irradiation still required
- DOE's goal of consolidation not met



Public Comments Received to Date

- **Address waste generation, minimization, and disposal**
- **Address the transportation of nuclear materials**
- **Does the proposed action include reprocessing (proliferation and high level waste)?**
- **Is calcination equivalent to incineration?**
- **Does the proposed action support nuclear weapons?**
- **Adequacy of the High Efficiency Particulate Air (HEPA) filters**