Consolidation EIS Overview

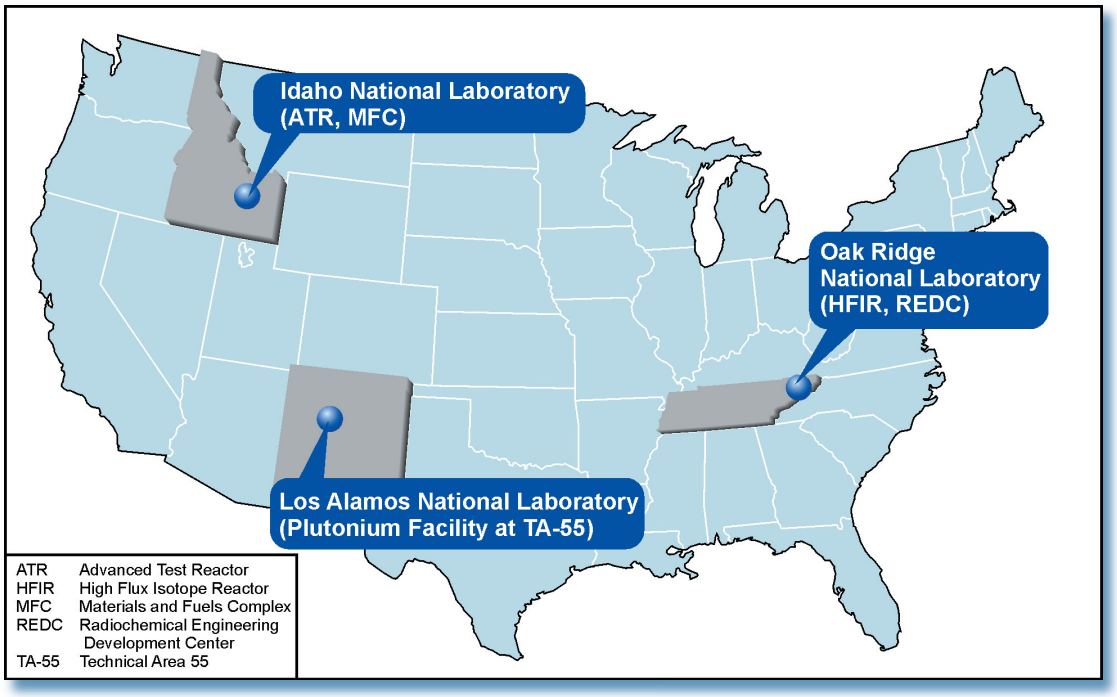
The U.S. Department of Energy (DOE) is responsible for producing radioisotope power systems (RPS) in support of U.S. Government national security and space exploration missions. The RPS is a unique technology that can be used for missions requiring a long-term, unattended source of heat and/or electrical power for use in harsh and remote environments such as deep-space. These reliable, maintenance-free systems are capable of operating for decades. The RPS uses the heat generated by the radioactive decay of plutonium-238 (Pu-238), a non-weapons grade of plutonium, as the source for generating electricity and providing heat.

The nuclear infrastructure required to produce RPSs consists of three major components:

- Production of Pu-238, which would include target fabrication, irradiation, and extraction;
- Purification, pelletization, and encapsulation of Pu-238 into a usable fuel form; and
- Assembly, testing, and delivery of RPSs to Federal users.

There currently is no domestic capability to produce Pu-238. This capability must be reestablished to meet future mission needs although there is an inventory of Pu-238 available to meet short-term needs. The inventory includes Pu-238 milliwatt radioisotope thermoelectric generator heat sources removed from nuclear weapons as part of the ongoing weapons dismantlement program. A milliwatt generator is a very small RPS designed to produce a fraction of a watt of electricity. As weapons are dismantled, at the Pantex Plant in Texas, approximately 3,200 of these heat sources are projected to become available between fiscal years 2009 and 2022. Some milliwatt heat sources are also located at the Los Alamos National Laboratory (LANL) in New Mexico. Once removed from weapons under this program, the Pu-238 would not be returned to the weapons stockpile.

The other two infrastructure components are operating to meet current mission needs. Currently DOE RPS production operations exist or are planned to exist at three geographically separate DOE



locations, Idaho National Laboratory (INL), in Idaho; Oak Ridge National Laboratory (ORNL), in Tennessee; and LANL:

- As announced in the January 2001 Record of Decision (ROD) for the *Final Programmatic Environmental Impact Statement for Accomplishing Expanded Civilian Nuclear Energy Research and Development and Isotope Production Missions in the United States, Including the Role of the Fast Flux Test Facility (NI PEIS)*, **Pu-238 production capability** would be reestablished using facilities at ORNL and INL. **Neptunium-237 (Np-237) targets would be fabricated** in the Radiochemical Engineering Development Center (REDC) at ORNL and transported to the Advanced Test Reactor (ATR) at INL for **irradiation**. If necessary, targets would also be irradiated in the High Flux Isotope Reactor (HFIR) at ORNL.

- Irradiated targets would be returned to REDC for **Pu-238 extraction**. The extracted Pu-238 would be transported to the Plutonium Facility at TA-55 at LANL for **purification, pelletization, and encapsulation**. Existing Pu-238 at LANL is currently being purified and encapsulated in support of space and national security missions.

- The encapsulated Pu-238 would be transported to INL where the RPSs would be **assembled and tested**. RPSs are currently being assembled and tested at the Assembly and Testing Facility (ATF) at the Material and Fuels Complex (MFC) at INL in accordance with the Finding of No Significant Impact for the *Final Environmental Assessment for the Future Location of the Heat Source/Radioisotope Power System Assembly and Test Operations Currently Located at the Mound Site* (DOE/EA-1438, August 2002).

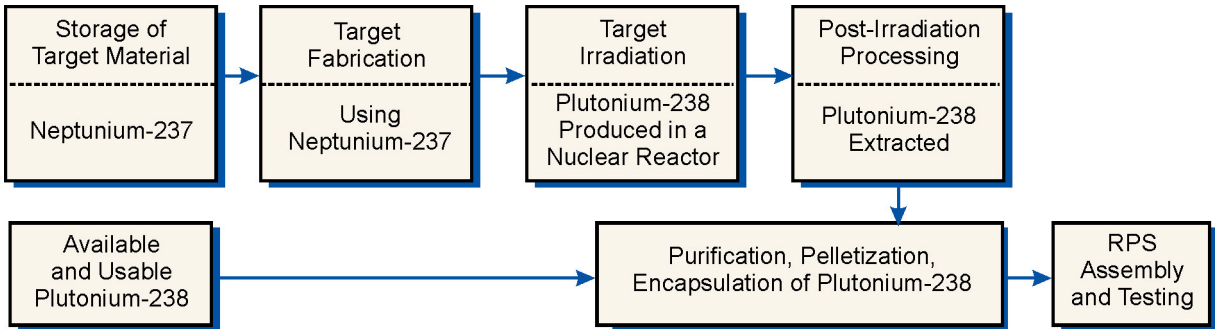
- Np-237 is currently being transferred to INL for storage in accordance with the August 2004 amendment to the *NI PEIS* ROD. This change has occurred because DOE determined that Np-237 should be managed with the same level of security as special nuclear materials.

Alternatives Being Evaluated

DOE is proposing to consolidate all nuclear operations related to RPS production at a single, highly secure site within its Complex. This proposed action is intended to address security requirements in a cost-effective manner, to reduce interstate transportation of special nuclear and radioactive materials, and increase program efficiency and flexibility. The *Consolidation EIS* evaluates a No Action Alternative and two alternatives for implementing this action, the Consolidation Alternative and the Consolidation with Bridge Alternative.

No Action Alternative

Under this alternative, Pu-238 would be produced in accordance with the *NI PEIS* ROD, as amended, using existing facilities at two separate DOE sites: ORNL and INL. No new facilities would be constructed. However, as described in the *NI PEIS*, some internal modifications would be made to REDC at ORNL. The operational period for this alternative would be 35 years, from 2007 through 2042.



The nuclear infrastructure components required to produce RPSs would be implemented as follows:

Target Material Storage. Np-237 would be stored at the Fuel Manufacturing Facility (FMF) at INL, and transported to ORNL for target fabrication.

Target Fabrication and Post-irradiation Pu-238 Extraction. REDC would be used for target fabrication and post-irradiation processing. Following fabrication, the Np-237 targets would be transported to ATR at INL (or, if needed, to HFIR at ORNL) for irradiation, then returned to REDC to extract the Pu-238. Some modifications and additional equipment installation would be required for REDC to support post-irradiation extraction of the Pu-238. After extraction, the Pu-238 would be transported to LANL for purification, pelletization, and encapsulation.

Target Irradiation. Targets would be irradiated at ATR at INL, supplemented as necessary by HFIR at ORNL. It is expected that the production would result in approximately 5 kilograms (11 pounds) of Pu-238 per year, which would satisfy anticipated program needs.

Purification, Pelletization, and Encapsulation. These activities would continue at the Plutonium Facility at LANL. Encapsulated Pu-238 would then be transported to INL for RPS assembly and testing.

RPS Assembly and Testing. The existing ATF would be used for assembly and testing operations.

Storage of Available Pu-238 Inventory. The available inventory stored at various DOE Complex sites would remain at current locations until needed.

Consolidation Alternative (Preferred Alternative)

Under this alternative, all RPS nuclear production operations would be consolidated within the secure area at MFC at INL. New construction to house Pu-238 production, purification, pelletization, and encapsulation operations would be required. A new Plutonium-238 Facility, a Support Building, a Radiological Welding Laboratory, and a new road would be constructed. A new road between ATR and MFC is proposed to provide appropriate security measures for the transfer of unirradiated and irradiated targets and to preclude shipment on public roads. It is expected that new construction would be completed by 2009, and operations would start in 2011. The operational period for this alternative would be 35 years. The nuclear infrastructure components required to produce RPSs would be implemented as follows:

Storage of Target Material. Np-237 would be stored at FMF at INL.

Target Fabrication and Post-irradiation Processing. Target fabrication and post-irradiation processing would occur in the production wing of the proposed new Plutonium-238 Facility, that would be constructed within the secure area at MFC.

Target Irradiation. Target irradiation would occur in ATR. It is expected that ATR alone would be sufficient to produce up to approximately 5 kilograms (11 pounds) of Pu-238 per year to satisfy program needs.

Purification, Pelletization, and Encapsulation. These activities would occur in the proposed new Plutonium-238 Facility.

RPS Assembly and Testing. The existing ATF would be used for assembly and testing operations.

Storage of Available Plutonium-238 Inventory. The available inventory of Pu-238 stored at various locations in the DOE Complex would be transported to the MFC for storage until needed.

Consolidation with Bridge Alternative

This alternative was developed in response to comments made during the scoping period. It was pointed out that should national security needs exceed the available inventory of Pu-238 prior to completion of new facilities at INL under the proposed Consolidation Alternative, up to 2 kilograms (4.4 pounds) of Pu-238 per year could be produced using REDC and HFIR. REDC operations would be scaled down from those analyzed in the *NI PEIS* due to the reduced production rate. Under the Consolidation and Consolidation with Bridge Alternative, DOE would implement all aspects of the Consolidation Alternative. In addition, DOE would use existing facilities for Pu-238 production until

the new facilities at INL become operational. This period, from 2007 through 2011, is referred to as the "bridge" period. HFIR would be the only reactor used for target irradiation during the bridge period, so production would be limited to 2 kilograms (4.4 pounds) of Pu-238 per year. RPS nuclear production operations at INL would start in 2011 when the new facilities would become operational. The operational period for this alternative includes the bridge period of 5 years (2007 through 2011) plus the consolidation period of 35 years (2012 to 2047).

Discussion of Impacts

The *Consolidation EIS* evaluates the potential environmental impacts of implementing alternatives for consolidating RPS nuclear production capabilities, which includes both construction and operations activities.

Construction Impacts. Because there is no new construction proposed under the No Action Alternative, no impacts would result from construction beyond those described in the *NI PEIS* for modification of REDC at ORNL. Both the Consolidation and Consolidation with Bridge Alternatives would require the construction of several new buildings at the MFC and a new roadway between MFC and ATR at INL. Since the new construction would be the same for both alternatives, potential impacts would also be the same.

Operations Impacts. RPS production capabilities would use similar facilities, procedures, resources, and numbers of workers during operations regardless of the location of the facilities. For each alternative, the environmental conditions would be different (e.g., population, site boundaries, meteorology). These site differences would lead to some differences in potential environmental impacts based on the same operations. For most environmental areas of concern, however, these differences would be minimal. In addition, each of the alternatives has adequate existing waste management facilities to treat, store, dispose, and ship of waste that would be generated by these operations.

Key Findings. The following key environmental findings have been identified from the analyses in the *Consolidation EIS*:

- Transportation impacts would be higher under the No Action Alternative than under the Consolidation or Consolidation with Bridge Alternatives, primarily because no interstate transportation would be required after the consolidation of RPS nuclear operations at INL.
- Consolidated RPS nuclear operations at INL would result in the lowest radiological risk to the public during normal operations and from accidents and to workers from accidents; nuclear operations at ORNL under the No Action Alternative would have the highest radiological risk to the public during normal operations and from accidents.
- Construction of new facilities and a new road at INL would have an impact on air quality, and on land, water, ecological, and cultural resources under the Consolidation and Consolidation with Bridge Alternatives. Depending on the chosen routing, impacts to the Big Lost River Floodplain could also occur.
- Operations impacts would be very small under each alternative, including radiological impacts to workers during normal operations, as well as air quality and noise impacts, socioeconomic impacts, public health and safety impacts from radiological and chemical accidents, environmental justice impacts, and cumulative impacts.
- The contribution of RPS consolidation activities to cumulative impacts would be minimal.

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