Question: *What is an RTG and why does it use plutonium?*

An RTG is a type of radioisotope power system that has been used for decades by the United States to provide electricity and heat to power instruments when other energy technologies such as solar cells will not work. This includes the remote and harsh environment of deep space and for certain national security applications.

RTGs operate without moving parts and can operate reliably and predictably for long periods of time, thus requiring no maintenance or other human intervention.

The Department of Energy (DOE) is working on a new generation of RPSs called Stirling Radioisotope Generator, which use moving parts to generate electricity and are about four times more efficient than RTGs. RPSs consist of two elements: a heat source that contains plutonium-238 and a set of converters that turn the plutonium's heat energy into electricity.

The RTG to be delivered to NASA for the *New Horizons* mission to Pluto will carry about 7-8 kilograms (15-18 pounds) of plutonium-238 (Pu-238). Power available at the beginning of the mission would be about 241 watts; power at the end of the mission for the Pluto-Charon flyby in 2015 would be about 192 watts.

Question: *What is plutonium-238?*

Plutonium-238 is a man-made radioactive element that generates significant heat as it becomes less radioactive. This makes it a reliable and predictable source of heat. During this process, it emits radiation mainly in the form of alpha particles, which have a low penetrating power. For example, alpha particles could not penetrate a sheet of paper.

Just as there are different types of carbon – coal, graphite, diamonds, and the naturally-occurring carbon-14 used to find the age of formerly living things – so, too, are there different types of plutonium. Plutonium-238 is not a weapons grade material. Plutonium-238 has a half-life of about 88 years, and is more radioactive than the weapons grade Plutonium-239, which has a half life of about 24,000 years. Pu-238 can produce small quantities of electricity predictably for several decades.

Question: What *is the role of the Idaho National Laboratory in producing radioisotope power systems?*

The Department of Energy moved the final assembly and testing operations from the Mound Site in Ohio to the Materials and Fuels Complex (MFC) at the Idaho National Laboratory in 2002-2003 for security and economic reasons. Today, scientists, engineers and other employees of the MFC are working to assemble and test the next RTG, which will be delivered to NASA later this year for the *New Horizons* mission to Pluto. Additionally, INL operates the Advanced Test Reactor, which is the only DOE reactor capable of meeting anticipated demand for plutonium-238. In the future, it may be used to meet our nation's needs for this material.

The Department of Energy is examining whether to consolidate nuclear activities related to production of radioisotope power systems to the Idaho National Laboratory (INL) located near Idaho Falls, Idaho. Originally, the Department's nuclear operations related to these systems existed at or were planned for three geographically distant DOE sites: the Idaho National Laboratory in Idaho, the Los Alamos National Laboratory in New Mexico, and the Oak Ridge National Laboratory in Tennessee. Although some purification activities continued at the Savannah River Site (SRS) in South Carolina until the early 1990's, production ended at SRS in the late 1980's.

The proposed consolidation, which includes production, purification and encapsulation of plutonium-238, is consistent with the department's approach to reducing the number of special nuclear material storage and operational sites across the country, decreasing the secure transportation workload, further reducing the small risks of transporting materials across the country, and increasing program efficiency and flexibility.

Question: *Why did the Department of Energy select the Idaho National Laboratory as its preferred alternative for consolidation of the Pu-238 operations?*

The Department selected Idaho as its preferred location for consolidating Pu-238 operations because of the existing safe and secure infrastructure at the Idaho National Laboratory and because many of the operations related to producing radioisotope power systems are already performed at the Lab.

The Advanced Test Reactor (ATR), a 250 MW water-cooled reactor, is the only reactor in the DOE complex that has the capacity to produce the quantity of Pu-238 that would be required to support production of future radioisotope power systems. ATR is a multipurpose reactor, operating today in support of fuels and materials research, civilian nuclear energy R&D, and medical isotope production.

Consolidating these operations at INL is consistent with the long term mission profile of the laboratory and offers a flexible and efficient means of producing radioisotope power systems in the future while enhancing safety and security and reducing risks. INL currently performs final assembly and acceptance testing of radioisotope power systems.

Question: *When will the Department make a decision on where to produce these systems?*

The Department of Energy completed and issued a *Draft Environmental Impact Statement for the Proposed Consolidation of Nuclear Operations Related to Production of Radioisotope Power Systems* in June 2005. A 60-day comment period on the draft EIS is planned, during which public meetings will be held. The public meetings are being held during July 2005. The final EIS and Record of Decision are anticipated to be issued in late fall or early winter 2005. No decision has been or will be made by the Department of Energy regarding the proposed consolidation until the EIS is finalized and the Record of Decision is issued. Information regarding the Department's EIS may be found on the Consolidation EIS web site, (www.consolidationeis.doe.gov)

Question: *What is the projection for how many of these batteries will be needed in the future?*

Over the next several years, it is projected that between 10 and 20 radioisotope power systems will be required to support both NASA and national security missions.

Question: *What is the U.S. current inventory of Pu-238?*

Current inventories are contained in the table below.

Current Locations and Quantities of Plutonium-238 and Neptunium-237 Available and Usable Inventory and Program Requirements

DOE Site	*Plutonium-238 Inventory* [a] *(kilograms)*	*Neptunium-237 Inventory (kilograms)*
Idaho National Laboratory	11.2	6 [b]
Los Alamos National Laboratory	28.3	0
Sandia National Laboratories	0	0
Oak Ridge National Laboratory	0.01	0
Savannah River Site	0	294 [b]
Hanford Site	0	0
Lawrence Livermore National Laboratory	0	0
Brookhaven National Laboratory	0	0
Kansas City Plant	0	0
Total current DOE inventory	39.51	300
National security requirements to 2010	< 25	Not applicable [c]
NASA minimum requirements to 2010 [d]	8	Not applicable [c]
Total plutonium-238 requirements to 2010	< 33	Not applicable [c]
Remaining plutonium-238 inventory in 2010	≥ 6.51 [e]	Not applicable [c]
Pantex	≤ 20 [f]	0

NASA = National Aeronautics and Space Administration.

[a] Since 1993, 16.5 kilograms of plutonium-238 have been purchased from Russia and is at LANL. An additional 5 kilograms of plutonium-238 has been ordered from Russia. Russian plutonium-238 is precluded from use in national security missions.

[b] The SRS neptunium-237 is being transported to INL based on the amended *NI PEIS* ROD (69 FR 5018).

[c] Not applicable, as neptunium-237 is the material used to produce plutonium-238, but not directly usable in RPSs.

[d] Assumes RPS use only for the New Horizons Pluto mission. If NASA schedules the Mars Science Laboratory mission during this time period, an additional 11 kilograms will be required for RPSs based on the number of RPSs and their electric power requirements for this mission.

[e] Of this remaining inventory, only 0.2 kilograms is domestically produced and is available for national security missions beyond 2010 because 0.81 kilograms is used in calibration instruments and 5.5 kilograms was obtained from Russia.

[f] This inventory is in old heat sources from dismantled nuclear weapons' RTGs. Its purity level is too low for direct reuse, but suitable for blending with higher purity plutonium-238. Some of these heat sources are located at LANL. The 20 kilograms is the total inventory for all the heat sources, both at LANL and Pantex. Transportation of this inventory from LANL and Pantex to INL is analyzed in this EIS. This inventory will be available and usable by 2011.

Note: To convert from kilograms to pounds, multiply by 2.2046.

Sources: AEC 1969, INL 2005c, and Monsanto 1978.

Question: *Why does the Government want to proceed with this project now as opposed to delaying it several years when more is known about supply and demand?*

A secure and reliable domestic supply of plutonium-238 must be established or the Department risks not being able to support important national security missions and future NASA missions.

It is important to remember that these national security missions will help safeguard every man, woman, and child in America.

It is estimated that it will take at least 5 years to establish purification and encapsulation capabilities at the INL. Current supplies of plutonium-238 will be exhausted around the end of the decade with current mission commitments. Current supplies of plutonium-238 will be exhausted around the end of the decade with current mission commitments. The Department also believes that the production can be accomplished more efficiently, safely and securely by consolidating operations at a single site. As such, the Department believes it necessary to begin this project now to assure a plutonium-238 supply is available for future missions.

In June 2003, DOE's Inspector General conducted an independent review of the need for plutonium-238, concluding that "unless the Department accelerates its program to reestablish a plutonium-238 capability, it risks being unable to meet future national security and NASA missions." (DOE/IG 0607)

Question: *Why can't the United States purchase plutonium-238 from another country?*

To meet near term needs, DOE is purchasing plutonium-238 from Russia's inventories, but in the longer term, the U.S. will need to resume plutonium-238 production to assure a long-term reliable supply of the material for both NASA and national security applications. It is important to remember that these national security missions will help safeguard each man, woman and child in America.

No countries other than Russia have routinely produced plutonium-238, and Russia is not producing new plutonium-238 inventory. A government-to-government agreement between the U.S. and Russia allows for the purchase of up to 5 kg per year over the period of the agreement for use in space exploration.

Question: *How much will it cost to establish this capability at the Idaho site and over what schedule?*

Establishing the production, purification and encapsulation capabilities in Idaho was estimated in 2004 to cost in excess of $200 million and take at least 5 years to complete.

Question: *Will there need to be any other reactors built at INL for this?*

No other reactors would be built to support the proposed consolidation at INL. INL's Advanced Test Reactor is capable of meeting anticipated needs for Pu-238 supply of 5 kg per year.

Question: *Will there need to be upgrades to the existing Advanced Test Reactor? And what are the costs of this?*

Upgrades to ATR are not needed to support plutonium-238 production in the reactor.

Question: *If operations were consolidated at INL, how much waste would be generated and what would be its disposition?*

All radioactive and hazardous waste generated from consolidated operations would be shipped out of Idaho, just as waste from current operations at LANL are shipped offsite. Quantities of waste are provided in the EIS and are summarized below.

About 100 55-gallon drums of transuranic waste would be generated annually. About 815 drums of liquid low level waste would be generated that would subsequently be volume reduced and solidified for offsite disposal. About 260 drums of solid low level waste would be generated annually and about 27 drums of mixed low level waste would be generated annually. No high level waste would be generated. These waste estimates do not include the reduction in waste that would occur through volume reduction of waste.

Question: *Does the consolidation of Pu-238 operations in Idaho present an increased security risk?*

The Idaho National Laboratory is very safe and secure, and is well-equipped to protect both its current operations and the potential consolidation of Pu-238 operations at the Lab. The Lab operates with hardened facilities and infrastructure that are highly protected, including the use of state-of-the-art physical security systems and a highly trained, proficient security force. In addition, the physical security infrastructure at the Materials and Fuels Complex (formerly known as the Argonne National Laboratory-West site) was recently further upgraded to incorporate new advances in physical protection technology. Should they be required, we have access to the full resources of the U.S. government to protect the site.

In addition, INL has a proven track record of maintaining the security and integrity of the site. No nuclear material has been diverted or stolen from the site nor have there been any breaches in security.

Question: *Would the plutonium-238 present an attractive target to terrorist attack or diversion during transportation or production at the Idaho National Laboratory?*

Answer: Plutonium 238 is not used in nuclear weapons. It is a material that produces a lot of heat for a relatively long period of time, which makes it suitable for producing small quantities of electricity reliably and predictably, but it is not useful for a nuclear weapon. While Pu-238 could theoretically sustain a fission chain reaction, from an engineering viewpoint it is virtually impossible to design or build a fissile weapon system using Pu-238 as the fissile material.

Question: Would plutonium-238 present an attractive target to terrorist attack or diversion during transportation or production at the INL?

Answer: Because of the precautions we have taken, limited quantities of Pu-238 that would be present at any given time, and inherent characteristics of the site, the INL is an unattractive target. In addition to hardened facilities, we have a well trained, well-armed security force, a sophisticated information network, and state-of-the-art physical protection systems to rely upon.

Extensive precautions are taken for the transportation of plutonium-238 and for its storage, handling, and processing. Plutonium-238 coming to or leaving Idaho would be shipped by secure transport in containers that have been tested and demonstrated to meet stringent Department of Transportation requirements and Nuclear Regulatory Commission requirements for safety and security. These containers are tested to assure that the packaging can protect against a release of material even in the most severe accidents, including impact, crush, fire, vibration, a free drop, compression, penetration, puncture, and water immersion.

Consolidating all of the plutonium-238 production capability in Idaho would greatly reduce the amount of transportation necessary for special nuclear materials like neptunium-237 and plutonium-238. As a result, it also would reduce potential security, environmental and financial concerns. The potential impacts of transportation incidents and accidents are evaluated in the draft EIS.

Question: *What controls are in place for protecting workers, the general public and the environment?*

Answer: Protecting the citizens of our region, our workers and the environment is an absolute priority. The Department of Energy and the Idaho National Laboratory take worker safety and health and protection of the environment very seriously. Safe conduct of operations and protection of the environment is the responsibility of every individual at the INL. INL employees live here and work here. Our loved ones – friends and families – are here. We have more incentive than anyone to operate safely and securely to protect the environment all day, every day.

Safety, security, and environmental protection will be designed into a new state-of-the-art facility built specifically for this mission. Control of Pu-238 will be achieved by incorporating engineered features such as shielding, ventilation, and containment systems into the design of this facility; through administrative controls (postings, access control, training, radiation work permits, etc.) and personnel protective measures and monitoring. Experience from more nearly 50 years of handling Pu-238 will be applied to the design and operation of the facility. The facility also will be designed and operated in accordance with all applicable Idaho and federal regulations to protect on-site workers, the general public and the environment.

Question: *What are the economic considerations of consolidating the operations at the Idaho National Laboratory?*

DOE estimates that federal agencies that require these systems will fund between $10 million and $20 million annually for mission-specific development. Additionally, DOE provides about $25 million annually to maintain the readiness of this infrastructure and capabilities. Construction of a new facility would require an initial investment of more than $200 million and could employ up to 250 workers at its peak, largely from Idaho firms.

Consolidating the radioisotope power system work at INL would create a unique nuclear capability at the laboratory, providing an exciting, challenging and enduring mission for the site that would help retain and attract nuclear engineers and scientists to the laboratory. A more detailed assessment of the economic impacts from the proposed consolidation is contained in the Draft Environmental Impact Statement.