CHAPTER 2: DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 DESCRIPTION OF THE EXISTING OPERATIONS

DOE has been assembling HSs for space and other missions at Mound for more than 35 years. HSs are assemblies of various designs that contain the radioisotope Plutonium 238 (Pu-238) which produces heat through radioactive decay. All the HSs assembled and tested at Mound are fueled with encapsulated Pu-238 dioxide. The current HS design is the General Purpose Heat Source (GPHS) module, although HSs of prior designs may also be processed at Mound and other HS designs are presently being developed for future missions. For the GPHS design, the Pu-238 dioxide is pressed into pellets and encapsulated into iridium at DOE's Los Alamos National Laboratory (LANL) Site in Los Alamos, New Mexico. These fueled clad assemblies are shipped from LANL to Mound for assembly with the graphite components. In the past, Pu-238 was made at the Savannah River Site in South Carolina. The current supply of Pu-238 is from Russia and the existing U.S. inventory. The information discussed in this section was derived from the Mound Consolidation EA (DOE 1999a).

For the past 15 years, Mound has also been involved in the assembly and testing of RTGs. The RTGs use thermoelectric components to convert the heat from the HSs to electricity. Other methods of conversion are being developed and could be used in the future. The term radioisotope power system (RPS) is now used to encompass the RTG and potential future conversion processes. Together, the HS and the RPS form an HS/RPS assembly. It should be noted that HS/RPS operations at Mound discussed in this EA include those operations previously identified as HS/RTG operations.

The HS/RPSs are safely assembled in glove boxes, which are large enclosures that protect the workers from the nuclear materials as well as protecting the final assemblies from unintended environments. Thermoelectric converters are shipped to Mound from Lockheed Martin Astronautics, King of Prussia, or other industry partners. In assembling an HS/RPS, the electrical heater that simulates the HS is removed and the assembled HSs are inserted into the converter using specially designed tools and fixtures. The RPSs are assembled in a large inert atmosphere chamber. Each RPS is put through a series of acceptance and characterization tests. Table 2.1-1 summarizes the process for HS/RPS operations using a GPHS module.

TABLE 2.1-1. – ***GPHS/RPS Process***

Activity/ Process	Responsible Site
Process Pu-238 Dioxide	LANL
Press into Pellets	LANL
Manufacture Cladding Components	Oak Ridge National Laboratory (ORNL)
Procure Graphitic Components	Mound
Encapsulate Fuel Pellets	LANL
Assemble HSs	Mound
Manufacture and Test Electrical Converter	Lockheed Martin Astronautics
Fuel Converter	Mound
Perform Acceptance Tests on RPS	Mound
Package and Ship RPS	Mound

Post–assembly environmental testing of flight units includes dynamic (vibration and shock) tests in both the lateral and longitudinal attitudes and thermal vacuum testing, all at the expected mission launch and operating conditions. Other acceptance tests performed on these units include radiation survey, magnetic mapping and mass properties determination. Qualification and surveillance units undergo similar testing, but often at more extreme conditions. In addition, qualification and surveillance units may be subjected to a vacuum life endurance test.

The tests require sophisticated instrumentation and unique fixturing. Acceptance and characterization testing is complicated by the high thermal output and radiation fields generated by an RPS. The test cells in which these tests are performed at Mound are shielded; most of the tests are remotely controlled, although the RPSs are required to be manually transferred between the test stations. There are many unique design features incorporated into the facilities, instrumentation, and tooling to assure that risk to the RPS is minimized during these test and transfer activities. The completed RPSs are shipped to locations designated by the user agencies.

Beginning in 1999, DOE began consolidating the HS/RPS operations into a small area of existing and new buildings at Mound. Table 2.1-2 shows the operations associated with each building. This consolidation is not complete. Should the HS/RPS operations continue at Mound under the No Action Alternative, a new Storage Building might be built as described in the Mound Consolidation EA and the domestic water and sewer utilities would be connected to utility services provided by the city of Miamisburg to complete the consolidation.

TABLE 2.1-2.— *HS/RPS Buildings and Associated Functions at Mound*

Building	Operations/Functions
Building 36	• Cleaning Facility • Material Control • Furnace Operations • Metallographic Equipment • Machining Operations
Building 37	• Primary Machining Operations • Inspection Functions
Building 46	• Welding Functions (Electron Beam [EB] Welder and Inert Gas Weld Boxes) and Weld Development
Building 50	• Production and Assembly Operations (HS Assembly, HS Processing, RPS Assembly, RPS Acceptance Testing, Short- and Long-Term Storage and RPS Packaging) • Shipping Container Decanning • Calorimetry
Administrative Building	• Records Storage • Personnel/Project Management
Boiler Building	• Two Natural Gas Fired Boilers

2.2 ALTERNATIVES FOR FUTURE LOCATION OF HS/RPS OPERATIONS

2.2.1 No Action Alternative

Under the "No Action" alternative, the HS/RPS operations would continue at Mound in the current facilities as described above. The costs for the additional security measures required to protect the special nuclear materials have and would continue to increase. With no other program on the site that requires a higher level of security, the costs would not be shared. These security costs could cause continuation of the program, as currently configured at Mound, to become impractical.

2.2.2 Alternative 1: Relocation of Operations to the T-Building at the Mound Site

Under Alternative 1, the assembly and testing of the HS/RPS would be transferred to the T-Building located at the Mound site. The T-Building is a 9,290 square meters (m^2) (100,000 square foot/feet [ft^2]) underground facility located in the area that is being cleaned up for eventual transfer to the city of Miamisburg. Under this alternative, the HS/RPS operations would use up to 557 m^2 (6,000 ft^2) of the T-Building for HS/RPS operations. The only DOE operations currently taking place in the T-Building are in support of the site cleanup.

The T-Building would house all of the equipment needed for the nuclear operations associated with the HS/RPS Program as well as the storage of the materials and the finished products awaiting shipment to the customers and end users.

The test equipment and testing stations would be essentially the same as described in Section 2.1, which are currently used at Mound, allowing for potential upgrades and reconfiguration due to building layout and ergonomics.

The Control Room would be located in the T-Building and would provide a central monitoring location for all areas of the HS/RPS Facility. Closed-circuit cameras would be located throughout the facility and connected to the monitors in the Control Room and elsewhere.

Under this alternative, the operations at Mound would be reconfigured so as to provide the requisite security and safeguards at comparatively lower cost to the program. Operations that currently take place in Building 50 would be relocated to the T-Building in the center of the Mound site. The environmental restoration activities would continue until complete, and subsequently, the Mound site would be transferred to the city of Miamisburg, except for the facilities associated with the HS/RPS operations.

Modifications Required at the T-Building Alternative

Modifications to the T-Building would be required in order to comply with all the requirements for the HS/RPS assembly and test process. A new wall would be built in the T-Building to separate the space required for the HS/RPS operations from the rest of the building. Other structural modifications identified include demolition of some interior walls, modification of doorways, installation of duct barriers, independent heating, ventilation, and air conditioning (HVAC) systems, high-efficiency particulate air (HEPA) filtration systems, back-up power generators, and new alarm and security systems.

These modifications would not disturb any land. The underground facility would serve as its own security barrier and no new fencing would be required.

Transportation. The transportation of process materials to and from Mound would remain the same. The process materials would be transported from LANL, ORNL, and vendors to Mound via Interstates 25, 40, 70 and 75, as well as State Road NM 4.

The transportation of the materials and products would be carried out by the DOE Office of Transportation Safeguards (OTS) in accordance with their established procedures and protocol. The OTS uses specialized vehicles, procedures, and highly-trained personnel.

2.2.3 Alternative 2: Relocation of Operations to the Pantex Plant

Under Alternative 2, DOE would transfer the HS/RPS assembly and test operations to an existing facility at DOE's Pantex Plant, northeast of Amarillo, Texas. DOE would then cease HS/RPS operations at Mound and exit the site at the completion of the environmental restoration activities.

Pantex is used for the production of high~~ly~~ explosive components ~~for~~ used in nuclear weapons; assembly, modification, and disassembly of nuclear weapons; and maintenance and monitoring of the nuclear weapons stockpile.

Pantex Facilities. The existing candidate facility is a 1,850 m^2 (20,000 ft^2) warehouse style, reinforced concrete structure located within the Pantex Plant Material Access Area. Approximately half of the building would be used for the HS/RPS Program. The area being considered for the HS/RPS Program is approximately 30 m (100 ft) by 29.4 m (98 ft). The area would contain a vault and separate enclosures for vibration and magnetic testing.

Modifications Required at Pantex

Modifications to the existing facility would be needed in order to comply with all the requirements for the HS/RPS assembly and test process as well as for meeting the nuclear facility requirements of existing DOE orders. The structural modifications identified include adding a vault, a support base for the vibration test stand, access under the submarine glove box for the hoist, and installing bridge cranes. There would be no change to the utilities infrastructure to support the HS/RPS Program in the facility. Transportation access would be available through an existing loading dock located adjacent to the building. This loading dock and the ramp are enclosed areas protected from the elements.

Mechanical modification to the facility would include installation of a chiller unit to supply chilled water to equipment, a liquid argon bottle, a liquid nitrogen bottle, four roughing pumps for the high vacuum system, and minor modifications to the existing HVAC system.

Transportation. The transportation of the materials and products would be carried out by the DOE OTS in accordance with their established procedures and protocol. The OTS uses specialized vehicles, procedures, and highly-trained personnel. The process materials would be transported from LANL, ORNL, and vendors to Pantex via Interstates 20, 25, and 40. U.S. Highway 60 and State Road NM 4 would also be used.

Operations at Pantex

The Main Floor Area of the building would house the bulk of the equipment and materials needed for the HS/RPS Program. Storage of the materials would take place in the vault within the building. The finished product would be stored in the vault awaiting transportation to the customers and end users.

The test equipment and testing stations would be essentially the same as currently used at Mound, allowing for potential upgrades and reconfiguration due to building layout and ergonomics. The equipment includes glove boxes, pumps, hoists, bell jars, vacuum and inert gas chambers, fume hoods, a vacuum/gas storage manifold, HVAC services, pipe cutter, calorimeter, mass properties and magnetic testing equipment, vibration table and test equipment, overhead crane, and support equipment.

The Control Room would be located in the operations area and would provide a central monitoring location for all areas of the HS/RPS Facility. Closed-circuit cameras would be located throughout the facility and connected to the monitors in the Control Room.

2.2.4 Alternative 3: Relocation of Operations to ANL-W (Preferred Alternative)

Under the Preferred Alternative, DOE would transfer the HS/RPS assembly and test operations to the Zero Power Physics Reactor (ZPPR) complex at ANL-W located on the INEEL site. DOE would cease the HS/RPS operations at Mound and exit the site on completion of the environmental restoration activities.

ANL-W Facilities. The ZPPR complex is located within a Security Protected Area at ANL-W. It is composed of three major areas: the Control Room and associated offices; the earth-covered Mound area; and the Support Buildings. The ZPPR Reactor Cell, ZPPR Workroom, and Fuel Storage Vault are located within the earth-covered Mound area. The Support Buildings consist of the Materials Control Building (784), the Mockup Building (792), and the Ventilation Building (777).

The majority of the HS/RPS assembly and test operations would take place in the ZPPR Mockup Building (Building 792). Building 792 would house the majority of the equipment and operational personnel needed for the HS/RPS Program. The administration and management personnel would be located outside the protected area of the ZPPR complex.

The HS/RPS Control Room would be located in Building 792 and would provide a central monitoring location for all areas of the HS/RPS Facility.

The candidate facilities are currently only in partial use. The current utilization would not interfere with the proposed HS/RPS operations. The ZPPR support hardware currently stored in the facilities would be moved to another part of the site to allow for the HS/RPS operational requirements. Building 792 is a 280 m^2 (3,000 ft^2) facility.

Modifications Required at ANL-W

Modifications to the ANL-W facilities would be required in order to comply with all the requirements for the HS/RPS assembly and test process. The structural modifications identified include improving Building 792 of the ZPPR complex to higher nuclear facility hazard category standards, the addition of an argon supply system, and the addition of 650 m^2 (7,000 ft^2) of new rooms to the existing facility. These modifications would disturb approximately 1,672 m^2 (18,000 ft^2) of land centered on the existing facility that has been previously disturbed by the construction of the original building and subsequent operations. The existing ANL-W security fencing and security systems would not require any modifications.

Transportation. The transportation of process materials to ANL-W and the transportation of the finished product to the end users would be carried out by the DOE OTS in accordance with their established procedures and protocol. The OTS uses specialized vehicles, procedures, and highly trained personnel. The process materials would be transported from LANL, ORNL, and vendors to ANL-W via Interstates 15, 25, 20, 40, and 86. U.S. Highways 20 and 26 and State Road NM 4 would also be used.

Operations at ANL-W

The test equipment and testing stations would be essentially the same as currently used at Mound, allowing for potential upgrades and reconfiguration due to building layout and ergonomics. The equipment includes glove boxes, pumps, hoists, bell jars, vacuum and inert gas chambers, fume hoods, a vacuum/gas storage manifold, HVAC services, pipe cutter, calorimeter, mass properties and magnetic testing equipment, vibration table and test equipment, overhead crane, and support equipment. Closed-circuit cameras would be located throughout the facility and connected to the monitors in the Control Room.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

During the scoping period, the following alternatives were suggested for consideration; however, as explained below, these alternatives have not been evaluated in detail.

The potential of performing the HS/RPS operations at the Babcock and Wilcox Technologies (BWXT) facility in Lynchburg, Virginia, a private commercial facility, was suggested during scoping. The BWXT alternative was considered but eliminated from further analysis at this time. The available facilities at the BWXT are not currently within the existing protected area and would not meet DOE's stated purpose and need. For any commercial alternative, there is a high probability of delay in meeting programmatic commitments and schedules due to an expected competitive procurement process that would be required for privatizing the subject operations. In addition, the U.S. Government is the only user of these types of systems and no synergy exists with private industry in the area of HS/RPSs.

Permanent shutdown of the HS/RPS operations was also suggested as an alternative to continuing operations. This alternative is not consistent with DOE's mandate under the *Atomic Energy Act* of 1954, as amended, which requires AEC and its successor agencies to maintain capabilities for production of HS/RPS for the U.S. Government.

The Device Assembly Facility (DAF), which is located on the Nevada Test Site, was considered but eliminated from further analysis. This was due to the potential of increased security costs associated with ongoing HS/RPS operations at DAF, the potential high costs associated with maintaining the on-going operations at DAF, and the potential of conflicts with other significant defense related programs at DAF.

The Idaho Nuclear Technology and Engineering Center (INTEC), which is located on the INEEL site, was considered but eliminated from further analysis. INTEC does not have adequate nuclear facilities that are located within the existing protected area to support the HS/RPS Program.

2.4 RELATED ACTIONS

The Mound Consolidation EA (DOE/EA-1343) analyzed the environmental impacts associated with consolidating the continuing HS/RTG operations within a small DOE area at Mound. Existing operations in Building 36, Building 37, and Building 50 were to be maintained while operations that

previously existed in Building 46 were to be relocated into Building 36 and Building 50. Building 36 and Building 50 were to be upgraded to accommodate the relocated operations. A new Administration Building and a new Storage Building were to be constructed to house personnel previously located in Building 102 and to accommodate records storage functions previously performed in Building 36 and to provide additional inspection areas as well as equipment storage also taking place in Building 36. A FONSI was published in April 2000. Not all of the proposed consolidation activities have been completed as of this date.

Other Actions. During the internal scoping of this EA, the association of this EA with the *EA for Disposition of Strontium-90 Radioisotope Thermoelectric Generators* (DOE/EA-1351) was raised as an issue. The strontium (Sr) RTGs were not manufactured at Mound. They are not considered part of the Mound HS/RPS testing and assembly operations that are the subject of this EA. This EA is evaluating appropriate sites to place the operation to test and assemble new HS/RPSs made with Pu-238. The Sr-90 EA is evaluating waste storage sites to store the old Sr-90 RTGs as low-level waste (LLW). The two EAs are separate and their individual scopes do not overlap.

2.5 SUMMARY OF IMPACTS

The alternatives discussed in this EA evaluated the potential relocation of the HS/RPS operations as they currently exist at the Mound Site. The No Action Alternative would leave the HS/RPS operations at the Mound Site in their current location in a small area on the east side of the site. Alternative 1 would relocate the nuclear portion of the HS/RPS operation to the T-Building in the center of the Mound Site. Alternative 2 would involve the relocation of the HS/RPS operations to the Pantex Plant. Alternative 3 would involve the relocation of the HS/RPS operations to ANL-W at INEEL.

The HS/RPS operations would be conducted in the same manner as they are currently conducted at the Mound Site, independent of which site or building they are located. Therefore, the differences in impacts among the alternatives are associated with the characteristics of the proposed sites and facilities. For example, the involved worker dose, emissions, waste management, and utility usage would be the same for each site. The difference among the alternatives lies in the site characteristics. For example, under all three alternatives, the water use would be well within each site's capacity. However, the water use at the Pantex Plant is smaller than at Mound or INEEL. Therefore, the increased water use due to the HS/RPS operations would be relative greater at Pantex.

All of the alternatives would involve the use of existing industrial facilities. The impacts to land use, visual resources, noise, and ecological resources would be negligible at each site. Under all three alternatives, the workforce, air quality, electricity, and natural gas/fuel oil use would be well within the capacity of each site's permits and infrastructure. The consequences for the following resource areas would be slightly different among the alternatives.

Water Resources. Alternatives 1 and 3 would have minimal impact on the water use and wastewater generation at the respective sites. Under Alternative 2, the HS/RPS operations at the Pantex Plant would involve a 3 to 5 percent increment of the Pantex water use. This amount is within the recent decreases in overall water consumption at the Plant.

Geology and Soils. Alternative 1 and 2 would not involve any land disturbance. Alternative 3 would require the expansion of an existing facility. The construction of modifications to Building 792 would result in the temporary disturbance of 0.17 ha (0.41 acres).

Cultural Resources. Alternative 1 (T-Building) would involve the modification and use of an historic building. Use of the T-Building for HS/RPS operations could have an adverse impact on building as a cultural resource. Alternatives 2 and 3 would not impact cultural resources.

Socioeconomics. It is not anticipated that any of the alternatives would have any significant socioeconomic impacts on the area surrounding any of the alternative sites. All workers employed during any construction would come from within the region of influence (ROI). Under Alternative 1, there would be no change to the socioeconomic impacts to the Mound ROI. Under Alternatives 2 and 3, some of the specially trained staff may relocate from Mound to the selected site. Some of the remaining ~~The rest of the~~ Mound HS/RPS workforce would be absorbed into the workforce for the Mound environmental restoration activities. At the selected site the current available resources would absorb the additional demand for housing and community services. Any of the 20 required operations and maintenance staff hired from within the ROI population would not have an impact on socioeconomic resources.

Waste Management. While the HS/RPS operations would infrequently generate only very small volumes of liquid ~~(~~LLW~~)~~ and hazardous waste, this amount would be greater relative to the sites' waste volumes. The LLW and hazardous waste generation under Alternative 2 would be relatively greater than that under Alternatives 1 and 3. The Pantex Plant's LLW and hazardous waste generation (other than high explosive) is much less than either Mound or ANL-W. Therefore, even the small amount of waste due to HS/RPS operations are relatively greater.

Human Health. HS/RPS operations at any of the sites are not expected to release any radioactivity onsite or offsite to either the atmosphere or water resources because the HS/RPS would only receive fully-encapsulated radioactive material. Therefore, HS/RPS operations, irrespective of the operation locations, would not impact the offsite doses to either the maximum exposed individual or the general population within 80 km (50 mi). The doses to the maximum exposed involved worker and the total work force are not expected to exceed between 50 and 1,000 mrem and 20.1 person-rem, respectively. The maximum exposed offsite individual and general population dose for existing site-wide operations at each site is presented in Table 2.5-1 below.

TABLE 2.5-1. – ***Comparison of Individual and Population Doses for Existing Site-Wide Operations***

Alternative Location	Maximally Exposed Involved Worker	Average Non-Involved Worker (mrem)	Total Work Force (person – rem/LCFs)	Maximally Exposed Offsite Individual (mrem)	General Population Dose (person-rem/LCFs)
Alternative 1- Mound Site	<1,000	50	20.1 8.0×10^{-3}	0.31	3.9 2.0×10^{-3}
Alternative 2- Pantex Plant	905	0	29 1.2×10^{-2}	1.6×10^{-4}	1.59×10^{-3} 8.0×10^{-6}
Alternative 3- ANL-W	0.30	0.155	211 8.4×10^{-2}	0.031	0.30 1.5×10^{-4}

Alternatives 2 and 3 include facilities that would be subject to effects from a large aircraft crash. However, given the nature of the encapsulated material, a large release is not likely. The underground T-Building would provide robust protection against the effects of a large aircraft crash. It is not likely that such a crash would result in any release of radioactive material.

Transportation. The risks to the crews and the public from the shipment of Pu-238 from LANL to the HS/RPS operations and the shipment of the finished HS/RPS to the Kennedy Space Center, in Florida,

are related to the different routes and associated mileage. The transportation risk per shipment of Pu-238 from LANL would be least for Alternative 2-Pantex Plant and greatest for Alternative 1-Mound Site. The transportation risk per shipment of finished HS/RPSs is least for Alternative 1-Mound Site and greatest for Alternative 3-ANL-W.

Environmental Justice. For environmental justice impacts to occur there must be high and adverse human health or environmental impacts that disproportionately affect minority populations or low-income populations. There would be no adverse human health or environmental human impacts under any of the alternatives. Therefore, minority and low-income populations would not be disproportionately affected and there would be no environmental justice impacts.