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Sent: Thursday, October 04, 2007 11:42 AM
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Subject: Pu. Disposition SEIS Data Call Response

Attachments: SEIS INPUT INFORMATION1.doc

John

Attached are additional data from the project side. The technical contact is

Clayton Holloway
Mechanical Lead
PUDisp Project
[redacted]

[redacted]

Let me know if you have any questions.

Thanks.

C. Barry Shedrow
[redacted]

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Plutonium Disposition – General Description:

The Plutonium Vitrification process will vitrify up to 13 Metric Tons (MT) of DOE Environmental Management (DOE-EM)-owned Plutonium (Pu) into a lanthanide borosilicate (LaBS) glass matrix. This glass will then be packaged into Bagless Transfer Cans and placed inside a DWPF-type canister. The canister is transported to DWPF and filled with High Level Waste (HLW) glass.

The Plutonium Vitrification process selected location is the K-Area Complex (KAC) Reactor facility. The KAC Reactor facility is approximately 5.5 miles (8.86 km) from the nearest Site boundary. It is designated as a Hazard Category 2 Nuclear Facilities.

The KAC Reactor Facility was designed, built, and operated as a nuclear production reactor. On completion of the production mission, the facility was placed in a cold standby condition. Most reactor operating systems have been removed from service and have been out of service for up to 10 years. The facility currently serves as a Category 1 nuclear material storage facility and has a planned mission in this capacity until approximately 2020. Materials currently stored in KAC Reactor Facility include un-irradiated highly enriched uranium (HEU), heavy water, and plutonium. In addition, there are other small groups of material within the storage areas, though they are stored adjacent to the materials described and they do not occupy significant portions of the facility.

Top-level functions required to perform the Plutonium Vitrification process were developed. The subsequent paragraphs expand on these functions. **All the following information including scope of works, quantities and schedules are based on pre-conceptual data.**

Material Receipt & Storage: An area for opening and removing 3013s from 9975, performing Material Control and Accountability (MC&A) measurements and storing in a vault. Equipment required for shipping container receipts includes a fork lift, drum hoist, drum scale, barcode reader, Non-Destructive Analyses (NDA) confirmatory measurement device such as MCA-465, and instruments for RCO personnel. (Green Fuel from the Fast Flux Test Facility (FFTF) in Hanford will require receipt, storage, and disassembly of fuel pins into transport cans).

Oxidation: Oxidation receives 3013 metal containers from Material Receipt storage. The plutonium metal is converted to an oxide in Direct Metal Oxidation Furnace (450° C) and the resultant oxide is packaged in transport cans of 5 kgs for introduction into Feed Preparation.

Feed Preparation: Feed Preparation receives 3013 containers of oxide from Material Receipt storage and transport cans of oxide either from Oxidation or Green Fuel disassembly. The output from Feed Preparation is batching cans containing 2 kg of oxide, with a particle diameter less than 1 mm, for introduction into Milling/Mixing.

Milling/Mixing: The Milling/Mixing process combines the Pu feed with LaBS glass frit. Milling/Mixing is accomplished using an attritor mill to produce the necessary particle

size to ensure dissolution and incorporation of the plutonium into the glass frit to produce a homogenous mixture. The resulting mix is loaded into melter transport cans of 10 kgs (9 kgs Frit and 1 kg PuO) and sent to Vitrification. Plutonium oxide feed is received into the Milling/Mix glove box from the Feed Preparation glove box.

Vitrification: In Vitrification the Pu feed/LaBS frit mixture is vitrified into glass using a Cylindrical Induction Melter (CIM) and loaded into cans. The CIM is a compact, high temperature (1600° C capability) melter. A Platinum/Rhodium (Pt/Rh) vessel is used to contain the melt and a Pt/Rh drain tube is used to discharge the molten glass. The resultant Vitrification (Vit) cans are transported to Bagless Transfer.

Bagless Transfer: The Bagless Transfer allows the Vit can to be removed from the glove box in a non-contaminated state by emplacing the glass can in an outer can, welding the top, then cutting at the interface between the airhood and the glove box barrier transfer can. The bagless transfer system utilized in FB-line is expected to be the basis for the bagless transfer system for the Plutonium Disposition effort. The bagless transfer cans are directed to the NDA area for confirmatory measurements. The bagless transfer cans are then transported to Magazine Loading/Storage, Canister Load/Ship.

Non-Destructive Analyses: Once removed from Bagless Transfer a weight and MC&A measurements are made on material. The MC&A measurements are calorimetry, and gamma isotopic spectrometry. The material is then transported to the Magazine Loading area.

Magazine Loading/Storage, Canister Load/Ship: The Magazine Loading/Storage, and Canister Load/Ship receives bagless transfer cans, assembles cans into magazines, stores magazines, and assembles can-in-canister assemblies that are suitable for filling with high-level waste (HLW) glass in DWPF.

DWPF Modifications: Specific modifications to DWPF will be required to allow for receipt and handling of can-in-canister assemblies. The can-in-canister assemblies differ from typical DWPF canisters in that they contain significant quantities of special nuclear material, emit a significant amount of radiation, and weigh significantly more. DWPF will bring the canisters into the facility to the melter through the normal exit route for poured canisters. This will minimize both physical and radiological impacts to the facility.

Waste Handling/Loading: The Waste Handling/Loading handles waste generated from process. This includes removing waste from the generation point, performing the appropriate measurements, packaging waste, and preparing the waste for shipment to the disposal location.

Balance of Plant (BOP): The Balance of Plant makes up the support functions required by the Plutonium Disposition process and administrative support. The Balance of Plant systems include a exhaust ventilation system consisting of exhaust fans, duct, glovebox HEPA filter system and a sand filter. A fire protection system with an automatic fire

detection and automatic gaseous suppression system included in all none inerted gloveboxes. An automatic fire detection and automatic wet pipe sprinkler system will be installed throughout the Plutonium Vitrification Facility providing general area coverage. Fire water location and depth will be controlled to prevent a criticality event in the facility. Additional BOP services and utilities include: electrical, water, air, non-nuclear material handling, sanitary sewer and material transport.

Plutonium Disposition Construction/Modifications:

A detailed sequence will be developed as the project matures. General construction Work Scopes will be as follows. Scopes may be worked concurrently or out of order from how they are described below.

1. Investigative and Up-Front Planning Work

a. Line breaks
b. Lockout verification
c. Material characterization
d. Check Bingham pumps, pipes and other process equip for water/moisture
e. Verification of facility configuration

2. D&R

a. Pipe, electrical & mechanical equip on -20' Contaminated Areas (CA) & clean areas
b. Pipe, electrical & mechanical equip in 108-1K & 108-2K
c. Pipe, electrical & mechanical equip on, -40' CA & clean areas
d. Pipe, electrical & mechanical equip and structures of 190-K.
e. The 186-K basin structure
f. Emergency pump room and emergency pump electrical room
g. Pipe, electrical & mechanical equip in purification cells
h. Pipe, electrical & mechanical commodities on roof of 108-1K & 108-2K
i. Pipe, electrical & mechanical equip on -14' (pump room & hot tunnel)

3. Civil Prep Work

a. D&R Alternating Current (AC) motor pads, all tank saddles and piping pedestals
b. Cut new openings thru walls for doors, Heating, Ventilation and Air Conditioning (HVAC) & transport system
c. Core drill pipe and electrical penetrations.

4. Modifications at Elevation -40'

This level, located 40 feet below the exterior grade level, will be modified to provide space for the major vitrification processes. Modifications to the -40' elevation includes: 37,100 cubic feet of concrete for walls, wall openings, sumps, and trenches; 58 linear feet

of fire rated gypsum board and 123 linear feet of non-rated gypsum board for partition walls and 1,500 squared feet of suspended acoustical tile for the ceiling.

5. Modifications at Elevation -20’

5.1 Modifications to Building 108-1K at Elevation -20’

This building will be modified to add a standby diesel generator room and a new airlock. The basement area of this building will be filled with approximately 10,100 cubic feet of Controlled Low Strength Material (CLSM). Other modifications to 108-1K at -20’ elevation includes: 1725 cubic feet of concrete for walls, wall openings, sumps, and trenches; 47 linear feet of fire rated gypsum board and 16 linear feet of non-rated gypsum board for partition walls.

5.2 Modifications to Building 108-2K at Elevation -20’

Building 108-2K will be modified to provide the primary point of personnel access into the -20’ elevation of the KAC Building. A new access staircase will be installed in the existing access well. A new freight elevator shaft and vestibule will be constructed for adjacent to the new staircase. The existing basement area below the -20’ elevation of this building will be filled with approximately 10,100 cubic feet of CLSM. The interior layout of Building 108-2K at elevation -20' will be modified and subdivided by the addition of new concrete walls and partition walls. These modifications will provide the configuration required to install a personnel Material Access Area (MAA) Entry Control Facility (ECF), Radiological Control Operator (RCO), and offices and work spaces for the Protective Force at this level. This area will be the entry point for all personnel into the Plutonium Vitrification Process Area. Modifications to the 108-2K -20’ elevation includes: 14,300 cubic feet of concrete for walls, wall openings, sumps, and trenches; 22 linear feet of fire rated gypsum board and 107 linear feet of non-rated gypsum board for partition walls and 7,050 squared feet of suspended acoustical tile for the ceiling.

5.3 Modifications to the KAC Building at Elevation -20’

This level will be modified to house support functions for the primary Plutonium Vitrification processes that will take place on the floor below. Modifications to the -20’ elevation includes: 26,140 cubic feet of concrete for walls, wall openings, sumps, and trenches; 575 linear feet of fire rated gypsum board and 920 linear feet of non-rated gypsum board for partition walls and 1,328 squared feet of suspended acoustical tile for the ceiling.

6. Modifications at Elevation 0’

6.1 Modifications to Building 108-1K at Elevation 0’

A new liquid applied roof membrane will be applied to the existing roof slab of this building. Materials for 108-1K Elevation 0' Modifications:

6.2 Modifications to Building 108-2K at Elevation 0'

A new reinforced concrete structure (3,760 cubic feet of concrete) housing personnel stairs and a security man-trap will be erected on top of Building 108-2K. Also, a new metal building (7,300 square feet -Administrative Support Building) will be erected on top of Building 108-2K. This new structure will house personnel change room, restroom and administrative facilities for the Plutonium Vitrification Project. A portion of the Administrative Support Building will utilize the existing roof of 108-2K for its foundation/slab, and the remaining portion will require a new foundation/slab. A new liquid applied roof membrane will be applied to the existing exposed roof slab not covered by the new concrete structure and metal building structure.

6.3 Modifications to the KAC Building at Elevation 0'

Modifications to the KAC building at 0' elevation includes: 3,828 cubic feet of concrete for walls, wall openings, sumps, and trenches and 57 linear feet of fire rated gypsum board.

6.4 Low Level Waste Staging Building (adjacent to Building 717-16K)

This new building will be an open sided structure (34' wide x 50' long, eave ht 16') built on top of a reinforced concrete slab for staging of empty and filled low level waste containers.

7. Modifications at Elevation +15'

The modifications to this level include dividing the existing Central Control Room in half and enveloping it with 2-hour fire rated construction (175 linear feet of fire rated gypsum board and 2,775 squared feet of suspended acoustical tile for the ceiling).

8. Modifications at Elevation +21'

This level, located in the Purification Area, will be modified to provide space for the controls associated with the magazine and canister loading operations and provide a fire rated enclosure between the existing personnel access stairs and control room (8 linear feet of fire rated gypsum board and 43 cubic feet of reinforced concrete for stairs, floors and walls). This level will also receive new coatings on the floor, walls, and ceiling.

9. Modifications at Elevation +30'

This level, located in the Purification Area, will be modified to provide a fire rated enclosure around the existing personnel access stairs (500 cubic feet of reinforced concrete). This level will also receive new coatings on the floor, walls, and ceiling.

10. Modifications outside the PIDAS

The modifications outside the Perimeter Intrusion Detection and Assessment System (PIDAS) include the following new structures:

- Sand Filter Building
- Fan House
- Exhaust Stack
- Chiller Building & Cooling Towers
- Modular Office Buildings and Modular Restroom Building

10.1 Sand Filter Building

The Sand Filter Building will be constructed east of the KAC. It will be located on the site of the existing Pump House Building (Bldg. 190-K), which will be demolished and removed.

The Sand Filter Building will be a reinforced concrete structure approximately 120' wide x 220' long x 23' high. It will be primarily a subterranean structure with only the top 2 feet extending above grade level. It will have a 4 foot thick base slab, 2 foot thick walls and roof slab, and twenty-one 2'-6" diameter, 17' high cylindrical columns supporting the roof.

10.2 Fan House

The Fan House will be connected to the Sand Filter Building by an underground reinforced concrete tunnel which will enclose the exhaust system from the Sand Filter Building.

The Fan House will house the three Plutonium Disposition exhaust fans, two emergency diesel generators, a below-grade diesel fuel storage tank, and a control room.

The Fan House structure will be reinforced concrete approximately 88' wide x 104' long, with a 30' x 36' protrusion on the west side. The building will be 35' high. The exterior walls and roof of the building will be 2' thick.

10.3 Exhaust Stack

The Exhaust Stack will be a maximum of 100' high and 7' in diameter. It will be vendor supplied, and erected on a concrete foundation. The foundation will be of reinforced concrete and will have cast-in-place anchor bolts to receive the steel stack.

10.4 Chiller Building & Cooling Towers

The Chiller Building will be a pre-engineered metal building, 60’ wide x 60’ long x 30’ high. It will house the three chilled water pumps that provide cooling water to the plutonium vitrification processes in the K-Area Complex buildings.

10.5 Modular Buildings

Three (3) standard double-wide modular office buildings will be required to house personnel directly supporting the activities of the Plutonium Vitrification Project. Each modular office building will be approximately 27’-6” wide x 64’ long.

11. Turnover

A phased approach will be utilized for turnovers. Upon completion of Construction work, the Project Construction Manager will notify the design team that work has been completed in accordance with the requirements of the approved design output documents by providing completion notices. Changes that require field construction as a result of start-up testing will be documented on Design Change Forms (DCFs) and completion notices will be provided for these DCFs upon completion of the work. Assurance of the completion of construction activities and a process for transfer of jurisdiction control from construction to Startup will be documented by the project Turnover Plan and Turnover Package (s). A detailed Turnover Plan per E-11 2.20 will be developed as the project matures.

Plutonium Disposition Schedule:

Design Complete: 2009
Construction Complete: 2013
Operations: Six years (ending 2019)
Deactivation & Decommissioning: Begins 2019