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OPERABLE UNIT 4 PRELIMINARY 30 PERCENT DESIGN CRITERIA PACKAGE COMMENT RESPONSE DOCUMENT

11/16/95

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RESPONSES

Department of Energy
Fernald Environmental Management Project
P. O. Box 398705
Cincinnati, Ohio 45239-8705
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NOV 16 1995

DOE-0193-96

Mr. Tom Schneider, Project Manager
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, Ohio 45402-2911

Dear Mr. Schneider:

OPERABLE UNIT 4 PRELIMINARY 30 PERCENT DESIGN CRITERIA PACKAGE COMMENT RESPONSE DOCUMENT

Enclosed is the comment responses to the 15 comments formally expressed in your October 16, 1995, letter on the subject package. In accordance with the approved Final Work Plan for the Operable Unit 4 (OU4) Remedial Design, these comments will be incorporated as noted into the Design Criteria Package, Fernald Residues Vitrification Plant, Pre-Final (90%) document for further agency review and approval.

If you have any additional questions or require additional information, please contact Randi Allen at (513) 648-3102.

Sincerely,

Johnny Reising

FN:Allen

Johnny W. Reising
Fernald Remedial Action
Project Manager

Enclosure: As Stated

cc w/enc:

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Preliminary (30%) Design Criteria Package
Fernald Residues Vitrification Plant

RESPONSE TO COMMENTS

Fernald Environmental Management Project
Fernald, Ohio

November 1995

United States Department of Energy
Fernald, Ohio

COMMENT RESPONSE DOCUMENT TO OHIO EPA COMMENTS ON THE OU4 30% DESIGN CRITERIA PACKAGE FERNALD RESIDUES VITRIFICATION PLANT

1. Commenting Organization: Ohio EPA Commentor: DERR
Section #: General Comment Page #: Line #: Code: G
Original Comment #:

Comment: (a) The design calls for a high degree of automation and remote control in the vitrification area with minimal worker exposure during operation. However, in the event of some emergency or equipment malfunction, what is a credible worker exposure scenario, in terms of both radiation and time at high temperature?

(b) What personal protection equipment will be provided for such emergencies?

Response: (a) In parallel to the Title I/II design of the FRVP, a safety analysis will be performed which will provide a safety basis for the Operation of the Fernald Residues Vitrification Plant (FRVP). The safety basis includes the design objectives and those measures necessary to ensure that the facilities have been constructed and will be operated in a safe manner and in compliance with ARARs and DOE Orders. The basis will evaluate the risks associated with the operation of the FRVP, as well as, calculated risks related to postulated accident scenarios and identify mitigative measures. The degree of automation and remote control will be commensurate with ALARA principles for estimated worker exposure.

The following are some examples of operational concerns to be addressed by the safety basis:

- Radiation fields have been estimated to be less than 0.1 mrem/hr near the melter during operation, not counting any streaming effects. Maintenance activities in this area should not pose an undue radiation hazard.

- Melter skin temperatures are expected to be in the 200 °F range. Work on the melter vessel while it is at this temperature will be controlled and limited on a case-by-case basis.

- Radiation levels will be considerably higher near the waste form handling and packaging equipment while it is operating. Accordingly, it is expected that glass production will be temporarily suspended and glass removed during maintenance activities. Once the glass is removed radiation levels will be sufficiently low to allow contact maintenance.

- In the event that the glass cannot be removed from the waste form handling and packaging equipment (perhaps due to failure of that equipment), a means would be provided to manually remove the glass from the equipment. During the design of this equipment, the failure modes will be considered and recovery anticipated such that exposure levels are minimized.

(b) The safety basis will identify the appropriate level of personal protective equipment and response actions to off-normal events.

Action: No action required at this time.

2. Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 1.2 Page #: 1-2 Line #: 18 Code: C
Original Comment #:
Comment: The text describes the vitrification process as running 275 days/year. Why won't the melter be run continuously? Please provide information regarding the reasons for the anticipated down time. Stack emissions will be at their greatest during the melter warm-up period, therefore, care should be taken not to cycle the melter unless absolutely necessary.

Response: The intent is to run the melter continuously for its expected lifetime. However, due to the nature of the process and complexity of the supporting equipment, it is not reasonable to expect that a 100 percent capacity factor can be maintained for several years. A 75% utilization (275 days/year) for glass production is FERMCO's expectation. The 75% utilization is the factor that is used to size the facility and accounts for times when the melter is at idle or not running at full capacity. This condition can exist for various reasons including planned and unplanned maintenance activities. The design of the FRVP melter(s) and off-gas system will take into consideration the effects of downtime with regard to stack emissions.

Action: No action required at this time.

3. Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 1.4.1 Page #: 1-6 Line #: 9 Code: C
Original Comment #:
Comment: Please explain in further detail how the access openings will be cut into the central portion of the silo 1 and 2 domes.

Response: Design of Silo 1 and 2 access openings will be performed as part of the FRVP Title I/II design effort. It will likely involve high pressure, low flow, water jet cutting, a proven concrete cutting technique. This technique will be demonstrated on Silo 4 as part of a cold demonstration of the waste retrieval systems.

Action: No action required at this time.

4. Commenting Organization: Ohio EPA Commentor: DERR
Section #: 1.4.1 Page #: 1-5 through 1-9 Line #: Code: C
Original Comment #:

Comment: The final plan for the retrieval equipment ports at the top of the silos calls for extensive protection against releases of dust or gasses during operating and standby modes. What measures will be taken to protect against releases during the installation of the retrieval equipment when the silos may be open and heavy equipment could be passing in and out? Will there be some sort of temporary covering or containment to prevent releases during those operations? Also, have the personal protection measures for construction workers been evaluated?

Response: Detailed design for this activity has not been developed at this time; however, as a specific functional requirement, this will be addressed during the Silo Superstructure design. Section 7.1 of the EPA-approved *Functional Requirements Document, Fernald Residues Vitrification Plant*, Pre-Final (90%) - Revision 0, August 1995, states that, "Engineered and possibly administrative controls shall be used to prevent the spill, release, and spread of radiological contamination during waste retrieval construction and waste retrieval operations. Radon treatment, control, and monitoring shall be required during residue retrieval construction and operations, as well as in the standby mode via the New Radon Treatment System, seals, glove-bags, etc."

Action: No action required at this time.

5. Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 1.4.1 Page #: 1-8 Line #: 2 Code: C
Original Comment #:

Comment: Please provide additional information regarding the robot that will be used in the heel and object removal from the silos. Is more detailed information regarding this operation found elsewhere?

Response: Additional design information on the robot system, named "Houdini," will be provided with the Preliminary submittal of the Silo Superstructure design package. As part of the design of the superstructures, a complete conceptual design of the Residue Retrieval System, which will incorporate the Houdini system, will be developed to establish a basis on which detailed superstructure design can proceed.

Action: No action required at this time.

6. Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 1.4.4 Page #: 1-12 Line #: 9 Code: C
Original Comment #:

Comment: Section 1.4.4 describes an emergency off-gas venting system to prevent pressurization of the melter. In the event of emergency venting, will the resultant off-gas be released to the atmosphere or to the controlled off-gas system? If the emergency depressurization would be routed to the off-gas system, would the system be able to handle this surge condition without an overload or blowout of the control equipment?

Response: The melter emergency venting system, although not presently designed for the FRVP, is expected to be similar in principle and configuration to the VITPP melter emergency venting system. The emergency venting system will be independent from the main - controlled off-gas system. In the event of melter over pressure, a relieving device will open and allow excess melter gases to pass into the emergency venting system where the gases will pass through HEPA filters, and possibly other cleanup equipment (TBD), before the gases are vented to the plant stack. The design of this system is based on the maximum assumed surge that could occur under postulated upset conditions. Thus the independent emergency vent has sufficient capacity and will protect the melter as well as the equipment and controls in the main-controlled off-gas system.

Action: No further action required.

7. Commenting Organization: Ohio EPA Commentor: DERR
Section #: 1.4.5 Page #: 1-12 Line #: Code: C
Original Comment #:

Comment: (a) What is the approximate size and weight of the glass gems to be produced?

(b) Will this glass mixture have sufficient strength and toughness to withstand the packing and shipping process without damage?

Response: The current technical baseline for the FRVP identifies the "gem" form as the vitrified product of the silo residues. As part of the Title I/II design effort for the FRVP, DOE will be evaluating the gem product forming process data obtained from the VITPP project. An evaluation of alternate product forms (ie. frit, cullet) will be conducted before a final product form is determined for the FRVP. Additional information will be provided in the Pre-final (90%) DCP.

(a) The approximate size and weight of the glass gems expected to be produced under the FRVP is currently based on those expected to be produced under the VITPP project as follows: approximate size, 1/2 - 5/8 inch semi-spherical gems; approximate weight, 4 grams.

(b) Based upon previous bench-scale testing, the glass gems' durability will be dependent upon formulation and processing of the feed mixture. Glass mixtures have been produced with sufficient durability to endure the rigors of bulk

packaging. The durability of the finished product is not a specific criteria for the waste form acceptance and the fundamental requirements are to meet the TCLP. The placement of this waste into a container for shipping to the NTS is sufficient to meet the ultimate storage requirements. Since there is no requirement that specifically addresses the durability of the waste form within the packages, it is assumed that any appropriate waste form is suitable if it meets the leachability requirements. The primary consideration for the waste form will be to minimize exposure due to handling and meet the minimum NTS requirements. Additional information regarding the waste form will be furnished in the Pre-final (90%) DCP submittal.

Action: (a) No further action required.

(b) No further action required.

8. Commenting Organization: Ohio EPA Commentor: DERR
Section #: 1.4.6 Page #: 1-13 Line #: Code: C
Original Comment #:
Comment: Will the design of the Off-Gas Treatment System consider the potentially corrosive nature of the gas resulting from its SO_2 and NO_2 contents. Of particular concern are processes involving contact with condensed water, which include the cooling, scrubbing and dehumidification stages. Experience with stack gas scrubbers at coal-fired powered power plants shows that such processes can readily develop very acidic conditions, especially if process water is recirculated.

Response: Acidic liquid streams resulting from the quenching and scrubbing of off-gas would be neutralized with caustic. A material balance model will be developed during the Title I design of the FRVP which will predict the quantities of acid gases which will be dissolved in the liquid effluents from the off-gas system. The need and requirement for caustic will then be calculated. This information will be provided in the Pre-final (90%) Design submittal for the FRVP.

Action: No further action required.

9. Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 1.4.6 Page #: 1-13 Line #: 21 Code: C
Original Comment #:
Comment: At the August 8 meeting with FERMCO, DOE, Ohio EPA and USEPA, concern was expressed by FERMCO and DOE regarding the possible combustion of the carbon beds because of high levels of NO_2 and high exhaust temperatures. Section 1.4.6 describes how the off-gas temperature will be cooled in a quench tower to 115 degrees and a dryer/refrigeration system will cool the off-gas further, to 4 to 7 degrees Celsius. Won't the combination of the quench tower, scrubber and the dryer/refrigeration unit sufficiently cool the off-gas and prevent combustion? Please provide an update on DOE's position on this matter.

Response: NO_x species, primarily nitric oxide (NO), cannot be effectively removed from the melter off-gas by quenching and scrubbing. However, NO_x compounds are readily adsorbed on carbon. The adsorbed NO_x will eventually build to a level at which oxidation of the carbon could occur, regardless of the temperature of the incoming gas stream. Unless preventative action is taken, the oxidation could heat the carbon to its ignition temperature of 300 degrees C (significantly lower for aged carbon). Several literature sources contain reference to the ignition of carbon in the presence of NO_x; however, none address the issue of how much NO_x must accumulate (or for how long) to start the oxidation process. Thus, it must be concluded that there are, at present, no provisions in the VITPP or FRVP design to prevent the accumulation of NO_x on the carbon bed or the possible, but not certain, ignition of the carbon bed.

Currently, we are in the process of determining the possible alternative solutions for this concern. There are several alternatives, but validation that any of them will work in the specific service intended is not available. A specific position on this issue has not been determined, and the technical solution is being aggressively pursued. Studies, along with lab testing and testing of a larger scale module, will provide data for the ultimate design of the Radon control system.

Action: No further action required at this time.

10. Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 1.4.6 Page #: 1-13 Line #: 29 Code: C
Original Comment #:
Comment: Please explain from what source the water for the scrubber system will come from.

Response: Quench and scrub water will be continuously recirculated within the plant. In this manner, the quantities of waste water generated and fresh water required will be minimized. The water purge stream will be made up, as required, from the FEMP process water system.

Action: No further action required at this time.

11. Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 1.4.7 Page #: 1-15 Line #: 25 Code: C
Original Comment #:
Comment: Will the Interim Storage Area be covered? Please provide details on the proposed storage area.

Response: The design of the Interim Storage Area will be performed as part of the Title I/II design effort of the FRVP. Additional details of the Interim Storage Area will be provided in the Pre-final (90%) Design Criteria Package submittal.

Action: No further action required at this time.

12. Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 2.2.3 Page #: 2-8 Line #: 28-29 Code: C
Original Comment #:
Comment: At what intervals will the TCLP analysis for metals and radionucleides [sic] be performed? (i.e. per batch, or shipping container, etc.)

Response: It is envisioned that the full-scale vitrification process will be "certified" through an aggressive sampling and analysis program to establish, with a statistically based confidence level, that the vitrified product meets the waste disposal criteria (ie. TCLP-metals) for the Nevada Test Site (NTS). It is anticipated that once this process certification is established (i.e. NTS-approved), verification sampling (i.e. weekly, monthly) of the product will be performed to ensure that acceptable product is being produced for continued acceptance by the NTS for disposal. The details of this sampling program will be developed and coordinated with the NTS. Additional information will be provided in the Pre-final (90%) FRVP Design package submittal.

Action: No action required at this time.

13. Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 2.2.3 Page #: 2-9 Line #: 12 Code: C
Original Comment #:
Comment: Will the concrete containers that will be used to transport the vitrified waste be made of new or recycled concrete? If the containers will be made of recycled concrete, please provide details regarding where the materials to be used are located and how they will be surveyed for radioactivity.

Response: The decision to utilize waste disposal containers fabricated of new or recycled contaminated concrete has not been finalized. The use of concrete waste containers fabricated from "clean" aggregate are currently being developed and will be evaluated under the VITPP project. The performance of this container concept will be factored into the final waste container decision for the full-scale plant. An economic and logistical evaluation will be performed to determine the final container concept during the Title I/II design effort of the FRVP and container performance specifications will be presented in the Pre-final (90%) FRVP design package submittal.

Action: No action required at this time.

14. Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 2.3.5 Page #: 2-33 Line #: 28 Code: C
Original Comment #:

Comment: Will the vitrification area ventilation exhaust be vented through the same stack as the off-gas system? If not, will this stack undergo continuous isokinetic sampling similar to that of the off-gas stack?

Response: The decision to either ventilate the vitrification area exhaust through the same stack as the off-gas system or through another stack has not been determined yet. The determination will be made during Title I design (on the Process and Instrumentation Diagrams and the Process Flow and Control Diagrams) and will appear in the Pre-final (90%) FRVP design package submittal.

Action: No further action required at this time.

15. Commenting Organization: Ohio EPA Commentor: DERR
Section #: 1.4.9 Page #: 2-38 Line #: Code: C
Original Comment #:

Comment: The electric power system will have a diesel-powered backup generator. Will this backup system be adequate to protect against environmental and equipment damage during a prolonged power outage? Specifically, will it be able to maintain pollution control systems and prevent a damaging freeze-up in the melter and gem producing machine (if freeze-up would be damaging)?

Response: Specific systems or equipment to be connected to standby or emergency power will be determined as part of the Safety Basis and Title I design activities for the FRVP. Mitigating the consequences from a loss of normal power relative to worker safety, environmental impacts, and equipment damage will be the primary consideration for designating standby power loads. The diesel generator will be sized accordingly. The final determination and system details will be provided in the Pre-final (90%) FRVP design package.

Action: No further action required at this time.