

POLICY ISSUE NEGATIVE CONSENT

June 21, 2002

SECY-02-0112

FOR: The Commissioners

FROM: William D. Travers
Executive Director for Operations

SUBJECT: NRC REVIEW OF IDAHO NATIONAL ENGINEERING AND ENVIRONMENTAL LABORATORY DRAFT INCIDENTAL WASTE (WASTE INCIDENTAL TO REPROCESSING) DETERMINATION FOR SODIUM-BEARING WASTE

PURPOSE:

To inform the Commission that the staff plans to transmit the attached letter (see Attachment), unless instructed otherwise by the Commission, from the Director of the Division of Waste Management, U.S. Nuclear Regulatory Commission (NRC), to the Director of Idaho Nuclear Technology and Engineering Center (INTEC) Waste Programs, U.S. Department of Energy (DOE), at the Idaho Operations Office (ID). The proposed letter provides the results of the NRC staff's review of the Idaho National Engineering and Environmental Laboratory (INEEL) draft incidental waste [or waste incidental to reprocessing (WIR)] determination regarding the management of sodium-bearing waste as transuranic (TRU) waste.

SUMMARY:

This paper discusses DOE-ID's WIR determination regarding management of sodium-bearing waste as TRU waste. This paper also summarizes the results of the staff's review of the determination. The details of the staff's review, including conclusions and recommendations, are located in the technical evaluation report, attached to the proposed response to DOE-ID (see Attachment).

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BACKGROUND:

Since 1969, NRC has recognized the concept of incidental waste or WIR, concluding that certain material that otherwise would be classified as high-level radioactive waste (HLW) need not be disposed of as HLW and sent to a geologic repository, because the residual radioactive contamination after decommissioning is sufficiently low as not to represent a hazard to the public health and safety. Consequently, incidental waste is not considered HLW.

Incidental waste criteria were previously developed for management of certain wastes removed from tanks at DOE's Hanford site. The Commission approved these criteria in a Staff Requirements Memorandum (SRM) dated February 16, 1993, in response to SECY-92-391, "Denial of PRM 60-4 - Petition for Rulemaking from the States of Washington and Oregon Regarding Classification of Radioactive Waste at Hanford." These criteria are described in a letter from R. Bernero/NRC, to J. Lytle/DOE, dated March 2, 1993. More recently, the criteria, as modified, were included in the "Final Policy Statement: Decommissioning Criteria for the West Valley Demonstration Project," dated February 1, 2002 (67 FR 5003). In the Policy Statement, the Commission noted the criteria that should be applied to the incidental waste determinations at West Valley: (1) the waste should be processed (or should be further processed) to remove key radionuclides to the maximum extent that is technically and economically practical; and (2) the waste should be managed so that safety requirements comparable to the performance objectives in 10 CFR Part 61, Subpart C, are satisfied.

In July 1999, DOE issued DOE Order 435.1, "Radioactive Waste Management," and the associated manual and guidance, which requires that all DOE radioactive waste be managed as HLW, TRU waste, or low-level radioactive waste (LLW). The Order states that waste, determined to be incidental to reprocessing, is not HLW and shall be managed in accordance with the requirements for TRU waste or LLW, if it meets appropriate criteria. The Order discusses the WIR evaluation process, stating that incidental waste may be managed as TRU waste if the wastes: "... (1) have been processed, or will be processed, to remove key radionuclides to the maximum extent that is technically and economically practical; and (2) will be incorporated in a solid physical form and meet alternative requirements for waste classification and characteristics, as DOE may authorize; and (3) are managed pursuant to DOE's authority under the Atomic Energy Act of 1954, as amended, in accordance with the provisions of Chapter III of this Manual ["Transuranic Waste Requirements"], as appropriate." The guidance document for DOE Order 435.1 recommends consultation with NRC for WIR determinations.

DISCUSSION:

On February 7, 2001, DOE-ID requested NRC consultation on, and review of, two draft incidental waste determinations for INEEL. The first WIR determination involves waste currently stored in the Tank Farm Facility located within the INTEC at INEEL and addresses whether this waste may be managed as TRU waste. The second WIR determination addresses the decontamination and closure of tanks used to store liquid HLW and sodium-bearing waste; the determination evaluates whether the tanks and tank residuals may be managed as LLW. This paper focuses on the first determination only; the staff plans to provide the Commission with the results of its review of the second determination at a later date. DOE-ID is planning to remove, treat, and dispose of the waste, which mostly consists of

decontamination solutions from spent fuel reprocessing maintenance and closure activities. The decontamination solutions contain large quantities of sodium salts; therefore, this waste is designated "sodium-bearing waste" (SBW). SBW also consists of second- and third-cycle reprocessing extraction wastes, contamination from first-cycle reprocessing extraction wastes, settled solids in the tanks, and liquid wastes from ongoing and future maintenance and closure activities at the INTEC. DOE-ID developed a WIR determination to evaluate whether the SBW may be managed as TRU waste and disposed of at the Waste Isolation Pilot Plant (WIPP), rather than HLW.

In the Memorandum from William D. Travers, Executive Director for Operations, to the Commissioners, dated June 18, 2001, the staff notified the Commission of its plans to review the determinations and provide its recommendations to the Commission. After receiving no objection from the Commission, NRC and DOE-ID staffs developed a Memorandum of Understanding (MOU) that established the framework for NRC to provide technical assistance to DOE-ID in regard to the incidental waste determinations (see SECY-01-0150, "Memorandum of Understanding and Interagency Agreement between the U.S. Department of Energy and the U.S. Nuclear Regulatory Commission on the Review of Incidental Waste Determinations for the Idaho National Engineering and Environmental Laboratory," dated August 6, 2001, and related SRM, dated August 29, 2001). An Interagency Agreement (IA) implements the MOU and establishes that all costs incurred by NRC, including contractor support, will be reimbursed by DOE-ID. In addition, the MOU establishes that NRC's activities under the MOU are carried out in an advisory capacity, and that any advice given to DOE-ID under the MOU does not constitute regulatory approval, authorization, or license for DOE activities. The MOU and IA became effective on September 7, 2001.

On September 25, 2001, DOE-ID submitted the draft "Idaho Nuclear Technology and Engineering Center Sodium-Bearing Waste -- Waste-Incidental-to-Reprocessing Determination Report," for NRC review. As noted in the June 18, 2001, Memorandum, NRC's review focused on Criterion 1, assessing whether the waste has been processed, or will be processed, to remove key radionuclides to the maximum extent that is technically and economically practical. Since NRC's incidental waste guidance does not include a TRU disposal option, NRC staff considers it inappropriate to assess whether the TRU disposal option provides safety equivalent to the performance objectives of Part 61, since WIPP is regulated by the U.S. Environmental Protection Agency and is outside of NRC's jurisdiction. Therefore, although the WIR determination addresses all three criteria in DOE Order 435.1, NRC staff will not provide conclusions and recommendations for the TRU disposal portion of the determination (Criteria 2 and 3). Rather, NRC will only provide comments and observations on the methodology for meeting Criteria 2 and 3, that were identified during the review.

After initial review of the determination, NRC staff provided DOE-ID with a list of questions and comments in a request for additional information (RAI), dated December 12, 2001, to obtain the necessary information needed to complete its review. In response to NRC's observations and a change in direction for a preferred alternative for SBW treatment in the development of the Idaho High-Level Waste and Facilities Disposition Environmental Impact Statement, DOE-ID decided to revise its approach taken in the SBW WIR determination. DOE-ID responded to NRC's RAI on January 29, 2002, providing the additional information requested and summarizing the revised approach for the determination. The response explained that the revised determination would present a range of SBW direct stabilization options as a base

case, with an evaluation of the technical and economic practicality of additional key radionuclide removal prior to disposal. In addition, the determination would identify the key radionuclides as those that are important in meeting disposal performance objectives at WIPP.

On March 8, 2002, DOE-ID submitted the revised determination for NRC review. The revised determination states that DOE Order 435.1 provides flexibility for each site to identify key radionuclides as those that significantly impact disposal site performance objectives. This risk-informed approach allows DOE-ID to identify the key radionuclides for SBW treatment and disposal and focus its technical and economic analysis on those radionuclides that are important for meeting disposal performance objectives at WIPP, which require reasonable assurance that exposure to humans is within established limits (40 CFR Part 191). DOE-ID determined that americium (Am)-241, plutonium (Pu)-238, Pu-239, and Pu-240 are the key radionuclides, since they account for most of the calculated future risk in WIPP's performance assessment. In addition, DOE-ID noted that 96 percent of the key radionuclides and 99 percent of all radionuclides generated from spent fuel reprocessing have been removed from INTEC tank farm waste.

The revised determination presents a range of SBW direct stabilization options as a base case, including contact-handled TRU grout, calcination, steam reforming, and direct vitrification. The cost estimates (using only discriminatory costs -- costs that were considered to be essentially the same for each option were not incorporated in the cost analysis) of the direct stabilization options range from \$566 million to \$1359 million.

The revised determination treats SBW liquid and solids independently, by assuming that SBW solids are filtered from the process feed stream and treated separately. The filtered solids, including those from the tank heel removal, would be dried and packaged to meet WIPP waste acceptance criteria as remote-handled TRU waste. Further dissolution of solids would be necessary to make chemical separation of key radionuclides possible. However, because the solids have been exposed to the very acidic SBW liquid for a long period of time, further dissolution would be difficult, if not impossible. It is possible that strong acid mixtures at high temperatures could dissolve some constituents in the SBW solids; however, no production-scale technologies exist, and because of the relatively small solids quantity and the severe conditions anticipated for dissolution, it was not technically practical to develop a dissolution process. Therefore, since no technologies have been demonstrated for dissolving SBW solids, additional key radionuclide removal is considered to be not technically practical.

DOE-ID determined that it was technically possible to separate and remove additional key radionuclides from SBW liquids using various solvent extraction options. The solvent extraction options considered were TRU solvent extraction (TRUEX) and universal solvent extraction (UNEX). TRUEX removes actinides including transuranic radionuclides, which would be concentrated by evaporation and vitrified for eventual disposal at the HLW geologic repository. DOE-ID estimates that TRUEX could remove 100 terabecquerels (TBq) [3000 curies (Ci)] of key radionuclides from the SBW liquid, given its high separation efficiency. The bulk waste from the process would be concentrated by evaporation and grouted to produce a remote-handled low-activity waste, expected to be suitable for disposal as Class C LLW. The UNEX process is very similar to the TRUEX process; in addition, it removes cesium and strontium isotopes. Since the UNEX process removes cesium and strontium, the bulk waste from the process, after concentration and grouting, is expected to be suitable for Class A LLW disposal.

Since the solvent extraction methods of further key radionuclide removal were considered technically practical, they were retained for further economic evaluation. The economic practicality of removing additional key radionuclides from SBW liquid was evaluated by determining removal costs (using TRUEX and UNEX processes) and considering the effect of removing additional key radionuclides on reducing radionuclide releases to the public at WIPP.

The total project costs for TRUEX and UNEX processes are based on the design and construction of a complex of new facilities at INTEC to further process the SBW to remove and treat additional key radionuclides. The total discriminatory cost estimate for UNEX is \$1732 million; the total discriminatory cost estimate for TRUEX is \$2779 million. This is \$373 million to \$2213 million above the cost of the direct stabilization options, or \$124,000 to \$738,000 per curie for additional key radionuclide removal (assuming TRUEX and UNEX remove 3000 additional curies of key radionuclides).

The WIPP Compliance Certification Application and supporting performance assessment modeled TRU components from all waste planned for disposal. The performance assessment for WIPP estimates that the source term of key radionuclides is 1.51×10^5 TBq (4,070,000 Ci) from all sources at closure. The key radionuclide (Am-241, Pu-238, Pu-239, and Pu-240) source term from the SBW is estimated at 170 TBq (4500 Ci). It is estimated that the UNEX and TRUEX processes could remove an additional 100 TBq (3000 Ci) of key radionuclides from the SBW liquid, which is less than 0.1 percent of the total WIPP curies at closure. Since the large additional cost to remove 100 TBq (3000 Ci) of key radionuclides would not result in a significant reduction of the radionuclide inventory at WIPP, DOE-ID determined that it was not economically practical to remove additional key radionuclides from the SBW.

The details of the staff's review, including conclusions and recommendations, are located in the technical evaluation report, attached to the proposed response to DOE-ID (see Attachment). The conclusions and recommendations are summarized below.

CONCLUSIONS AND RECOMMENDATIONS:

Based on the staff's review of the information provided by DOE-ID, the proposed staff response to DOE-ID indicates that NRC staff agrees that it is not technically practical to remove additional key radionuclides from the SBW solids prior to disposal. NRC staff agrees that even though the technology exists to remove additional key radionuclides from SBW liquid, it is not economically practical, since removing additional key radionuclides for disposal at a HLW geologic repository would not significantly reduce the radionuclide inventory at WIPP. Therefore, NRC staff agrees that the SBW has been processed to remove key radionuclides to the maximum extent practical. The proposed response to DOE-ID indicates that NRC staff, in its role of providing technical assistance and acting in an advisory capacity and not providing regulatory approval in this action, reviewed DOE-ID's SBW WIR determination and concludes that Criterion 1 has been met. This conclusion is dependent on DOE-ID satisfactorily addressing the staff recommendations presented in the technical evaluation report.

Unless otherwise directed by the Commission within 10 days, the staff plans to send the attached proposed letter response and technical evaluation report to DOE-ID. The staff

considers this action to be within the delegated authority of the Director of the Office of Nuclear Material Safety and Safeguards, since the staff's review of the SBW WIR determination only assesses Criterion 1, and the staff is not making a determination regarding protection of public health and safety and the environment. However, action will not be taken until the SRM is received.

It is noted that NRC will provide comments regarding protection of public health and safety and the environment for the INEEL tank closure determination, which addresses the closure of tanks used to store HLW and SBW and evaluates whether the tanks and tank residuals may be managed as LLW. Therefore, the staff plans to provide its conclusions and recommendations on the tank closure determination to the Commission for approval.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objections.

/RA/

William D. Travers
Executive Director
for Operations

Attachment: Proposed ltr response fr J.T. Greeves/NRC to J.T. Case/DOE-ID, "NRC Review of Idaho National Engineering and Environmental Laboratory Draft Waste Incidental to Reprocessing Determination for Sodium-Bearing Waste - Conclusions and Recommendations"

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