

UPDATE OF THE INEEL HIGH LEVEL WASTE PROGRAM

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ABSTRACT

At the Idaho National Engineering and Environmental Laboratory (INEEL) the process of calcining has been successfully used for the past 37 years to convert liquid high level waste to a granular solid. Recently the calcining process was shut down due to new, stricter emissions standards. The Department of Energy (DOE) is preparing a final Environmental Impact Statement to determine a treatment method for the remaining 4,625 m³ (~1.22 million gallons) of liquid waste and the 4,386 m³ of granular (calcine) solid waste. The primary driver for treating the waste is a Settlement Agreement between the State of Idaho, the Department of Energy, and the Department of the Navy to treat the liquid waste by 2012 and treat the calcine so it is ready to be moved out of Idaho for disposal by 2035. This presentation will cover the current program status, the Environmental Impact Statement process and the path forward in removing the waste from Idaho.

INTRODUCTION

From 1952 to 1991, DOE reprocessed spent nuclear reactor fuel at the Idaho Nuclear Technology and Engineering Center (INTEC). Reprocessing operations at INTEC used solvent extraction systems to remove mostly uranium-235 from spent nuclear reactor fuel and, in the process, generated high level waste (HLW) mixed with hazardous materials (mixed HLW). Mixed HLW is the product of the first extraction cycle of the reprocessing operation. Subsequent extraction cycles, treatment processes, and follow-up decontamination activities generated additional liquids that were combined to form sodium-bearing waste (SBW), which is much less radioactive than the mixed HLW and is best characterized as mixed transuranic waste/SBW. At INTEC, all of these liquid wastes were stored in eleven 300,000-gallon underground tanks.

Over several years, much of the liquid waste was fed to a pretreatment facility and converted to a dry granular substance called calcine. The calcine, which is stored in large, robust bin sets, is a more stable waste form that poses less environmental risk than storing liquid radioactive waste in underground tanks. However, the calcine does not meet current working assumptions for waste acceptance criteria for acceptance at a disposal repository. Further treatment would be necessary to convert the mixed HLW into a waste form acceptable for disposal in a repository.

Spent nuclear fuel processing was discontinued at INTEC in 1991, so liquid HLW ceased to be generated. However, since that time, liquid mixed transuranic waste/SBW has

continued to accumulate in the tanks from calcine operations, decontamination, and other activities. In 1995, DOE and the State of Idaho reached an agreement called the Idaho Settlement Agreement/Consent Order, which specifies when the liquid waste will be removed from the tanks. It sets a target date of 2035 for all of the mixed HLW and mixed transuranic waste/SBW to have been treated and made road-ready for shipment out of Idaho.

Consistent with this agreement, DOE completed calcining all of the liquid mixed HLW in 1998. In June 2000 the Calciner was placed in stand-by until decisions are made on Calciner operation or closure. At present, approximately 4,386 cubic meters of mixed HLW calcine remain stored in bin sets, and 4,625 cubic meters (~1.22 million gallons) of liquid mixed transuranic waste/SBW remain in the underground tanks. DOE intends to manage these wastes according to regulatory requirements and commitments to the State of Idaho, and in a manner that helps to ensure the protection of human health and the environment.

CURRENT PROGRAM

The HLW Program is currently organized in four work areas:

1. High Level Waste Pretreatment, which addresses current operations
2. High Level Waste Immobilization, which includes project activities and applied technologies for SBW treatment
3. High Level Waste Treatment and Storage, which directs preparing for the future, and
4. High Level Waste Closure and Stabilization, which addresses closure of HLW facilities and systems

The objective of each is described below.

The purpose of current operations under High Level Waste Pretreatment is to store and treat radioactive liquid and solid wastes; process off-gasses; non-radioactive process water; hazardous, radioactive debris; and used HEPA filters generated by fuel storage, waste treatment, and decontamination activities at the Idaho Nuclear Technology and Engineering Center (INTEC).

The purpose of project activities and applied technologies under High Level Waste Immobilization is to provide the project definition, planning, execution and acceptance testing of the treatment facility specified in the *Idaho HLW and Facilities Disposition Environmental Impact Statement* (HLW & FD EIS). Some technology development and application will be required for the project, and planning for these efforts is included in this work.

The purpose of the preparation for future activities under High Level Waste Treatment and Storage is to provide the overall management planning for the Idaho National Engineering and Environmental Laboratory (INEEL) HLW Program. Specific scope includes HLW Program planning and integration; feasibility studies addressing methods

and facilities for the treatment of HLW Program wastes to final disposal forms; technology development in support of new treatment processes; administrative and technical support of the HLW & FD EIS; regulatory strategy development; and facility management activities in support of technology development. This work will be performed with the objective of meeting the Settlement Agreement which requires that the INEEL treat stored SBW and cease use of the existing 300,000 gallon INTEC Tank Farm waste storage tanks by December 31, 2012; treat the HLW so it is ready for disposal and made road-ready for shipment out of Idaho by December 31, 2035; and maintain ongoing activities such as liquid waste management, Resource Conservation and Recovery Act (RCRA) closures, and facilities. The long-term strategy for program management is dependent upon the HLW & FD EIS and the subsequent Record of Decision (ROD). The ROD is currently expected to be issued during March 2001.

The purpose of closure activities is to support closure and stabilization for the INTEC Tank Farm Facility and New Waste Calciner Facility, as well as closure of other permitted units as they are identified. The Tank Farm Facility and New Waste Calciner Facility will be closed in phases, as INTEC missions change and unit operations are shut down. Closure plans and activities will also be developed and implemented for other systems/facilities as they become available for closure.

ENVIRONMENTAL IMPACT STATEMENT (EIS) PROCESS

An EIS is a detailed environmental analysis for any proposed major Federal action that could significantly affect the quality of the human environment. A tool to assist in decision making, it describes the positive and negative environmental effects of the proposed undertaking and alternatives.

The *Idaho High-Level Waste and Facilities Disposition Environmental Impact Statement* will analyze the potential environmental consequences of managing two waste types at the INEEL, namely HLW in a calcine form and liquid mixed transuranic waste. It will also analyze the disposition of existing and proposed HLW facilities after their missions have been completed. The waste processing alternatives listed in the draft HLW & FD EIS were No Action, Continued Current Operations, Separations, Non-Separations, and Minimum INEEL Processing. Pending issuance of the final HLW & FD EIS and a ROD, the Department of Energy has directed BBWI to re-baseline HLW planning to Direct Vitrification of SBW, an option of the Non-Separations alternative.

PATH FORWARD IN REMOVING WASTE FROM IDAHO

The path forward for treating and removing waste from Idaho is separated into two broad categories – operation and closure of existing processes, and design, construction and operation of a HLW Immobilization Facility.

Operation of existing processes will continue to reduce the waste volume in the INTEC Tank Farm. Two stages of evaporation, followed by fractionation, will concentrate approximately 3,000 cubic meters (~800,000 gallons) of SBW currently stored in the

Tank Farm. The concentrated waste will be consolidated and stored until the HLW Immobilization Facility is completed. The Tank Farm will be closed in stages as the SBW is concentrated and consolidated.

Newly generated liquid waste will be treated in the same evaporation and fractionation processes that treat SBW, although the first stage of evaporation is not always required. High Efficiency Particulate Air Filters generated from post-calcination practices and ongoing operations continue to be treated in the Filter Leaching Facility.

Design and construction of a HLW Immobilization Facility is in the early planning phase. Direct Vitrification has been selected for the final HLW & FD EIS preferred alternative. Along with issuing a Record of Decision, completion of the EIS process is expected in the summer of 2001. A pre-decisional SBW technology development roadmap was completed in September 2000. The detailed work plan for implementing the roadmap and initiating the waste immobilization project were completed in November 2000. The SBW treatment facility will be designed, constructed, and operated to empty the Tank Farm by treating the SBW to a disposable form.

Some uncertainty exists with regard to the disposition of treated waste. Incidental waste determinations for the SBW and Tank Farm residuals will be finalized in 2001, and it is anticipated that after evaluation, the wastes will be categorized as incidental to reprocessing. Concluding that the SBW or Tank Farm residuals are not incidental to reprocessing would result in significant impact to the path forward for the HLW Program because the vitrified product would have to be sent to a federal repository for HLW.

REFERENCES

1. *Idaho High-Level Waste and Facilities Disposition Draft Environmental Impact Statement*, DOE/EIS-0287D, December 1999
2. Environmental Management Fiscal Year 2001-2003 Detailed Work Plan – High Level Waste Programs Summary, INEEL/EXT-2000-01176, October 2000.