National Environmental Policy Act

A thorough understanding of environmental impacts that may occur when implementing proposed actions is a key element of Department of Energy decision-making. The National Environmental Policy Act (NEPA) provides Federal agency decision-makers with a process to consider potential environmental consequences (beneficial and adverse) of proposed actions before agencies make decisions. An important part of this process is the opportunity for the public to learn about and comment on proposed agency actions before a decision is made.

Passed by Congress in 1969, NEPA requires Federal agencies to consider the potential environmental impacts of their proposed major actions before implementing them. If a proposed action could have a significant impact on the environment, the agency must prepare an Environmental Impact Statement (EIS).

Environmental Impact Statement:
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. A draft EIS is issued, followed by a final EIS.

Scoping:
An early and open process in which the public is invited to participate in identifying issues and alternatives to be considered in this EIS. DOE allows a minimum of 30 days for the receipt of public comments.

Alternatives:
A range of courses of action that would meet the agency's purpose and need for action. NEPA requires that an EIS consider a No Action Alternative.

Comment Period:
A regulatory minimum 45-day period for public review of a draft EIS during which the public may comment on the environmental analyses and suggest revisions or additional issues or alternatives to be evaluated in the final EIS. The agency considers these comments in its preparation of the final EIS.

Record of Decision:
A public record of the agency decision, issued no sooner than 30 days after publication of a final EIS. It describes the decision, identifies the alternatives (specifying which were considered environmentally preferable) and the factors balanced by an agency in making its decision.

Copies of the Idaho High-Level Waste and Facilities Disposition Final Environmental Impact Statement are available at the locations listed at the end of this document. The EIS also will be available on the internet at http://tis.eh.doe.gov/nepa/doctypepub.html.

To request a copy of this EIS, please call 1-208-526-0833 or send a note electronically to Brad Bugger at: buggerbp@id.doe.gov
Abstract: This EIS analyzes the potential environmental consequences of alternatives for managing high-level waste (HLW) calcine, mixed transuranic waste/sodium bearing waste (SBW) and newly generated liquid waste at the Idaho National Engineering and Environmental Laboratory (INEEL) in liquid and solid forms. This EIS also analyzes alternatives for the final disposition of HLW management facilities at the INEEL after their missions are completed. After considering comments on the Draft EIS (DOE/EIS-0287D), as well as information on available treatment technologies, DOE and the State of Idaho have identified separate preferred alternatives for waste treatment. DOE’s preferred alternative for waste treatment is performance based with the focus on placing the wastes in forms suitable for disposal. Technologies available to meet the performance objectives may be chosen from the action alternatives analyzed in this EIS. The State of Idaho’s Preferred Alternative for treating mixed transuranic waste/SBW and calcine is vitrification, with or without calcine separations. Under both the DOE and State of Idaho preferred alternatives, newly generated liquid waste would be segregated after 2005, stored or treated directly and disposed of as low-level, mixed low-level or transuranic waste depending on its characteristics. The objective of each preferred alternative is to enable compliance with the legal requirement to have INEEL HLW road ready by a target date of 2035. Both DOE and the State of Idaho have identified the same preferred alternative for facilities disposition, which is to use performance-based closure methods for existing facilities and to design new facilities consistent with clean closure methods.
READERS GUIDE

The Idaho High Level Waste and Facilities Disposition Environmental Impact Statement (EIS) is composed of a Summary, Chapters 1 through 13, and appendices. The EIS structure is illustrated in Figure 1. The EIS Summary stands alone and contains all the information necessary to understand the issues dealt with in detail in the EIS.

The public comment period on the Draft EIS was from January 21, 2000 to March 20, 2000 and was extended to April 19, 2000 in response to public request. Public hearings were held in Idaho Falls, Pocatello, Twin Falls, Boise and Fort Hall, Idaho; Jackson, Wyoming; Portland, Oregon and Pasco, Washington. Changes between the Draft and Final EIS, including those made in response to public comment, are printed in bold italics where occurring with text repeated from the Draft EIS, or are identified by the header "New Information" at the top of each page composed of all new text as shown in Figure 2.

Changes and information added to the Final EIS resulting from public comment on the Draft EIS or from further U.S. Department of Energy (DOE) and State of Idaho review include:

• DOE reorganized portions of the Final EIS. Purpose and Need for Agency Action is now presented as Chapter 1 and Background as Chapter 2. The glossary and distribution list (Appendix D and E, respectively, of the Draft EIS) are presented as Chapters 7 and 12. A new Chapter 8 lists the contents of the appendices. References were moved to Chapter 9. The list of preparers and organizational conflict of interest statements were merged as Chapter 10. The index for the Final EIS is in Chapter 13.

• Section 2.3.5 "Other Information and Technologies Reviewed" was added to address technologies and variations on alternatives proposed to DOE both during and apart from public comment.

• An additional alternative and an option have been added. They are the Direct Vitrification Alternative, which is the State of Idaho's preferred waste processing alternative, and the Steam Reforming Option. The Steam Reforming Option includes steam reforming for the treatment of mixed transuranic waste/sodium bearing waste and shipping the high-level waste calcine directly to a geologic repository without further treatment.

• Chapter 3 has been reorganized to present the State of Idaho and the DOE Preferred Alternatives.

• Section 3.3, "Alternatives Eliminated from Detailed Analysis" has been updated to review why some alternatives and technologies were not considered further by DOE.

• Discussion of Waste Incidental to Reprocessing Determination under DOE Order 435.1 has been expanded. The expanded discussion of the procedure is located in the text box on page 2-9.

• Tables 3-1 and 3-3 and Tables 3-2 and 3-5 were combined. Table 3-5 was added to summarize the impacts associated with the facility disposition alternatives evaluated in the Draft EIS as well as the State of Idaho and DOE Preferred Alternative for facility disposition.

• Chapter 4 "Affected Environment" has been updated.
Summary

- New Information -

• "CALPUFF" modeling was conducted to analyze air quality impacts from Idaho National Engineering and Environmental Laboratory (INEEL) emissions on Yellowstone and Grand Teton National Parks and Craters of the Moon National Monument. The results of this modeling are presented in Section 5.2.6 and Appendix C.2.

• A higher volume of waste would be produced from vitrification of calcine at the Hanford Site than presented in the Draft EIS analysis of the Minimum INEEL Processing Alternative (see Appendix C.8). The higher volume resulted in increases in transportation impacts, which are presented in Section 5.2.9 and Appendix C.5.

• Waste inventory information was refined including updated source term data in Appendix C.7. Corresponding changes were made in long-term facility disposition modeling (Appendix C.9) and facility accident analysis (Appendix C.4). The results of this analysis are shown in Section 5.2.14 and Tables 5.3-8, 5.3-16 and 5.3-17.

• Summaries of the public comments with responses prepared by DOE in coordination with the State of Idaho as a cooperating agency are located in Chapter 11 of this Final EIS. Copies of the written and transcribed comments are located in Appendix D.

If there are any questions concerning this EIS, the information or analysis it presents, or its availability please contact Richard Kimmel at (208) 526-5583 or by e-mail at kimmelrj@id.doe.gov.
# TABLE OF CONTENTS

**READERS GUIDE**

1.0 **PURPOSE AND NEED FOR AGENCY ACTION** .......................................................... S-1
   1.1 Purpose and Need ........................................................................................................ S-1
   1.2 Role of this EIS in the Decision-making Process ..................................................... S-3
   1.3 Proposed Action ........................................................................................................ S-3
   1.4 Timing and Regulatory Considerations for this EIS ................................................ S-4

2.0 **ACTIVITIES SINCE THE ISSUANCE OF THE DRAFT EIS** .................................. S-5
   2.1 Summary of Public Comments and Agency Responses ........................................... S-5
   2.2 Other Considerations for EIS Alternatives ............................................................ S-8
   2.3 Changes from the Draft EIS .......................................................................................

3.0 **ALTERNATIVES** .................................................................................................... S-10
   3.1 Identifying Alternatives ........................................................................................... S-10
   3.2 EIS Alternatives ....................................................................................................... S-10
      3.2.1 Waste Processing Alternatives ........................................................................ S-10
      3.2.2 Facility Disposition Alternatives .................................................................... S-33
         3.2.2.1 RCRA Closure of Facilities ............................................................... S-34
         3.2.2.2 CERCLA Coordination ................................................................. S-34
         3.2.2.3 Facility Disposition Identification ..................................................... S-34
         3.2.2.4 Alternative Descriptions .................................................................... S-35

4.0 **AREAS OF UNCERTAINTY** .................................................................................. S-36
   4.1 Waste Acceptance Criteria ...................................................................................... S-36
   4.2 Waste Incidental to Reprocessing ........................................................................... S-38
   4.3 Technical Maturity of Alternative Treatment Processes ........................................ S-38
   4.4 Timeframes .............................................................................................................. S-38
   4.5 Costs......................................................................................................................... S-38

5.0 **AREAS OF CONTROVERSY** ................................................................................ S-39
   5.1 Mixed Low-level/Low-level Waste Disposal Locations ........................................... S-39
   5.2 Repository Capacity - Metric Tons of Heavy Metal ................................................ S-39
   5.3 Differences in Flood Studies ................................................................................... S-39

6.0 **CONCLUSIONS OF ANALYSIS** .......................................................................... S-40
   6.1 Overview .................................................................................................................. S-40
   6.2 Impacts of the Waste Processing Alternatives ....................................................... S-41
      6.2.1 Air Resources .................................................................................................. S-41
      6.2.2 Traffic and Transportation .............................................................................. S-42
      6.2.3 Health and Safety ........................................................................................... S-43
      6.2.4 Waste and Materials ....................................................................................... S-45
      6.2.5 Facility Accidents (Off-Normal Operations) .................................................. S-46
   6.3 Impacts of the Facility Disposition Alternatives ...................................................... S-49
      6.3.1 Air Resources .................................................................................................. S-49
      6.3.2 Traffic and Transportation .............................................................................. S-49
      6.3.3 Health and Safety ........................................................................................... S-49
      6.3.4 Waste and Materials ....................................................................................... S-50
      6.3.5 Facility Disposition Accidents ....................................................................... S-50
# TABLE OF CONTENTS

(continued)

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.4 Cumulative Impacts</td>
<td>S-51</td>
</tr>
<tr>
<td>6.4.1 Air Resources</td>
<td>S-51</td>
</tr>
<tr>
<td>6.4.2 Water Resources</td>
<td>S-51</td>
</tr>
<tr>
<td>6.4.3 Traffic and Transportation</td>
<td>S-52</td>
</tr>
<tr>
<td>6.4.4 Health and Safety</td>
<td>S-53</td>
</tr>
<tr>
<td>6.4.5 Waste and Materials</td>
<td>S-53</td>
</tr>
<tr>
<td>6.5 Summary Comparison of Alternatives</td>
<td>S-53</td>
</tr>
<tr>
<td>7.0 OTHER ENVIRONMENTAL REVIEW REQUIREMENTS</td>
<td>S-69</td>
</tr>
<tr>
<td>7.1 Endangered Species Act</td>
<td>S-69</td>
</tr>
<tr>
<td>7.2 Clean Air Act</td>
<td>S-69</td>
</tr>
<tr>
<td>7.3 Floodplain/Wetlands Management</td>
<td>S-69</td>
</tr>
<tr>
<td>8.0 READING ROOMS AND INFORMATION LOCATIONS</td>
<td>S-69</td>
</tr>
</tbody>
</table>
## Acronyms and Abbreviations

DOE limited the use of acronyms and abbreviations in this Summary to provide a more reader friendly document. These acronyms and abbreviations are listed below.

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CERCLA</td>
<td>Comprehensive Environmental Response, Compensation, and Liability Act</td>
</tr>
<tr>
<td>DOE</td>
<td>U.S. Department of Energy</td>
</tr>
<tr>
<td>EIS</td>
<td>environmental impact statement</td>
</tr>
<tr>
<td>EPA</td>
<td>U.S. Environmental Protection Agency</td>
</tr>
<tr>
<td>ERPG</td>
<td>Emergency Response Planning Guideline</td>
</tr>
<tr>
<td>HLW</td>
<td>high-level waste</td>
</tr>
<tr>
<td>INEEL</td>
<td>Idaho National Engineering and Environmental Laboratory (formerly known as the Idaho National Engineering Laboratory or INEL)</td>
</tr>
<tr>
<td>INTEC</td>
<td>Idaho Nuclear Technology and Engineering Center (formerly known as the Idaho Chemical Processing Plant or ICPP)</td>
</tr>
<tr>
<td>LCF</td>
<td>latent cancer fatality</td>
</tr>
<tr>
<td>LLW</td>
<td>low-level waste</td>
</tr>
<tr>
<td>MTHM</td>
<td>metric tons of heavy metal</td>
</tr>
<tr>
<td>NEPA</td>
<td>National Environmental Policy Act</td>
</tr>
<tr>
<td>RCRA</td>
<td>Resource Conservation and Recovery Act</td>
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<tr>
<td>ROD</td>
<td>Record of Decision</td>
</tr>
<tr>
<td>SBW</td>
<td>sodium-bearing waste</td>
</tr>
<tr>
<td>WIPP</td>
<td>Waste Isolation Pilot Plant</td>
</tr>
</tbody>
</table>
High-level waste?

High-level waste (HLW) is the highly radioactive material resulting from reprocessing spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from the liquid waste that contains fission products in sufficient concentrations, and other highly radioactive material that is determined, consistent with existing law, to require permanent isolation. HLW stored at the Idaho Nuclear Technology and Engineering Center (INTEC) contains a combination of:

- Highly radioactive, but relatively short-lived (approximately 30 year half-life) fission products (primarily cesium-137 and strontium-90)
- Long-lived radionuclides - technetium-99, carbon-14, and iodine-129 as well as transuranics (elements with atomic numbers greater than uranium).

At INTEC, all the liquid HLW recoverable with the use of the existing transfer equipment has been converted to a granular solid called calcine, which is stored in bin sets. HLW calcine is considered mixed HLW because it contains hazardous waste subject to the Resource Conservation and Recovery Act (RCRA), as amended.

Transuranic waste?

Transuranic waste is radioactive waste that contains isotopes with 93 or greater protons (atomic number) in the nucleus of each atom (such as neptunium or plutonium), a half-life greater than 20 years, and an alpha-emitting radionuclide concentration of greater than 100 nanocuries per gram of waste.

Low-level waste?

Low-level waste (LLW) is radioactive waste that is not high-level radioactive waste, spent nuclear fuel, transuranic waste, byproduct material (as defined in section 11e(2) of the Atomic Energy Act of 1954, amended), or naturally occurring radioactive material. The Nuclear Regulatory Commission regulations (10 CFR Part 61) provide a classification system for LLW. This classification system includes:

- Class A waste - radioactive waste that is usually segregated from other wastes at disposal sites to ensure stability of the disposal site. Class A waste can be disposed of along with other wastes if the requirements for stability are met. Class A waste usually has lower concentrations of radionuclides than Class C waste.
- Class C waste - radioactive waste that is suitable for near surface disposal but due to its radionuclide concentrations must meet more rigorous requirements for waste form stability. Class C waste requires protective measures at the disposal facility to protect against inadvertent intrusion.

These waste classifications are not applicable to DOE LLW. However, the terms Class A-type and Class C-type are used in this Environmental Impact Statement (EIS) to refer to DOE LLW streams that could be disposed of at offsite facilities licensed by the Nuclear Regulatory Commission.

Mixed waste?

Mixed waste is waste that contains both source, special nuclear, or by-product material subject to the Atomic Energy Act of 1954, as amended, and hazardous waste subject to RCRA, as amended. When referring to a specific classification of radioactive waste that also contains hazardous waste, “mixed” is used as an adjective, followed by high-level, transuranic, or low-level, as appropriate.

Spent nuclear fuel?

Spent nuclear fuel is fuel that has been withdrawn from a nuclear reactor following irradiation. When it is taken out of a reactor, spent nuclear fuel contains some unused enriched uranium, radioactive fission products, and activation products. Because of its high radioactivity (including gamma-ray emitters), it must be properly shielded.
What is waste fractions?
Waste fractions are produced when radioactive waste is treated to separate radionuclides according to activity level. Depending upon the characteristics of resulting fractions, waste may be classified as high-level, transuranic, or low-level.

Sodium-bearing waste?
Sodium-bearing waste (SBW) is a liquid mixed radioactive waste produced from the second and third cycles of spent nuclear fuel reprocessing and waste calcination, liquid wastes from INTEC closure activities stored in the Tank Farm, solids in the bottom of the tanks, and trace contamination from first cycle reprocessing extraction waste. SBW contains large quantities of sodium and potassium nitrates. Typically, SBW is processed through an evaporator to reduce the volume, then stored in the Tank Farm. It has historically been managed within the HLW program because of the existing plant configuration and some physical and chemical properties that are similar to HLW. Radionuclide concentrations for liquid SBW are generally 10 to 1,000 times less than for liquid HLW. SBW contains hazardous and radioactive components and is a mixed waste. DOE assumes that the SBW is mixed transuranic waste. This EIS refers to SBW as mixed transuranic waste/SBW.

Newly generated liquid waste?
Newly generated liquid waste refers to liquid waste from a variety of sources that has been evaporated and added to the liquid mixed HLW and mixed transuranic waste/SBW in the below-grade tanks at INTEC. Sources include leachates from treating contaminated high efficiency particulate air filters, decontamination liquids from INTEC operations that are not associated with HLW management activities, and liquid wastes from other INEEL facilities. Newly generated liquid waste is used in this EIS because INTEC has historically used this term to refer to liquid waste streams (past and future) that were not part of spent fuel reprocessing.

Tank heel?
A tank heel is the amount of liquid remaining in each tank after lowering to the greatest extent possible by use of the existing transfer equipment, such as ejectors.

Tank residual?
The tank residual is the amount of radioactive waste remaining in each tank, the removal of which is not considered to be technically and economically practical. This could be the tank heel or the amount of radioactive waste remaining after additional removal using other methods than the existing transfer equipment.
Summary

1.0 Purpose and Need for Agency Action

1.1 Purpose and Need

From 1952 to 1991, the U.S. Department of Energy (DOE) and its predecessor agencies reprocessed spent nuclear reactor fuel at the Idaho Chemical Processing Plant, located on the Snake River Plain in the desert of southeast Idaho (Figure S-1). This facility, now known as the Idaho Nuclear Technology and Engineering Center (INTEC), is part of the Idaho National Engineering and Environmental Laboratory (INEEL), a nuclear research complex that has served the nation through both peaceful and defense-related missions.

Reprocessing operations at INTEC used solvent extraction systems to remove primarily uranium-235 from spent nuclear reactor fuel and, in the process, generated high-level waste (HLW) as well as other wastes. The first extraction cycle of the reprocessing operation generated mixed HLW. Subsequent extraction cycles, treatment processes, and follow-up decontamination activities generated liquid mixed transuranic waste/sodium-bearing waste, referred to as mixed transuranic waste/SBW. Newly generated liquid waste results from a variety of sources not associated with spent fuel reprocessing at INTEC. At INTEC these wastes are stored in ten of the eleven 300,000-gallon capacity below grade storage tanks (the eleventh tank is a spare), known as the “Tank Farm.”

Since 1963, much of the liquid waste was fed to a treatment facility and converted to a dry granular substance called calcine. The calcine, which is stored in large bin sets, is a more stable waste form that poses less environmental risk than storing liquid radioactive waste in below grade tanks. All the calcine currently in the bin sets is mixed HLW. Presently, the calcine does not meet expected waste acceptance criteria for the proposed repository at Yucca Mountain. Further treatment may be necessary to convert the mixed HLW calcine into a waste form acceptable for disposal in the repository.

Spent nuclear fuel reprocessing was discontinued at INTEC in 1991, so liquid mixed HLW ceased to be generated. However, since that time, 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, as to when the liquid waste would be calcined and set a target date of December 31, 2035 for all of the mixed HLW and mixed transuranic waste/SBW.
Summary

FIGURE S-1.
Idaho National Engineering and Environmental Laboratory vicinity map.
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. At present, approximately 4,400 cubic meters of mixed HLW calcine remain stored in bin sets, and 1 million gallons of mixed transuranic waste/SBW remain in the below grade tanks. DOE now has to decide how to treat and dispose of the mixed transuranic waste/SBW, how to place the mixed HLW calcine in a form suitable for disposal in the proposed national geologic repository, and how to disposition facilities at INTEC involved in HLW treatment. DOE has prepared this EIS to inform agency officials and the public of the environmental impacts of alternatives, including the no-action alternative, available for consideration in the decision making process.

1.2 Role of this EIS in the Decision-making Process

This EIS describes the environmental impacts of the range of reasonable alternatives for meeting DOE’s purpose and need for action. In finalizing this EIS, DOE considered public comments received on the Draft EIS and other relevant factors and information received after the Draft EIS was published. DOE will consider the information in this EIS and other relevant information before making a decision on the proposed action.

If on the basis of this EIS, DOE proposes modifications to the Settlement Agreement/Consent Order, the information in this document and the cooperative process used to ensure its adequacy will benefit related discussions between the State of Idaho and DOE.

1.3 Proposed Action

To meet the purpose and need for agency action, DOE proposes to:

- Select appropriate technologies and construct facilities necessary to prepare INTEC mixed transuranic waste/SBW for shipment to the Waste Isolation Pilot Plant

- Prepare the mixed HLW calcine so that it will be suitable for disposal in a repository

- Treat and dispose of associated radioactive wastes

- Provide safe storage of HLW destined for a repository

- Disposition INTEC HLW management facilities when their missions are completed
Summary

1.4 Timing and Regulatory Considerations for this EIS

Some INTEC wastes (mixed transuranic waste/SBW) are stored as liquids in 300,000-gallon tanks that do not meet current hazardous waste management standards. Five of the eleven tanks currently in use are known as “pillar and panel” tanks. DOE's objective is to cease use of the five pillar and panel tanks by June 30, 2003 and all remaining tanks by December 31, 2012 in compliance with the 1998 Modification to the Notice of Noncompliance Consent Order. Previously, DOE's plan was to cease use of the tanks by calcining all the liquid waste as described in the following documents:

- Record of Decision (ROD) for the Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs EIS (SNF and INEL EIS) (June 1995)
- Idaho Settlement Agreement/Consent Order (October 1995)
- INEEL Site Treatment Plan/Consent Order (November 1995).

However, because of new technologies and changes in regulatory requirements DOE is now reconsidering this plan by evaluating various waste processing alternatives. This EIS has been prepared as part of the evaluation and decision making process.

Other timing considerations important to the issuance of this EIS include the following:

- Data are needed on the cumulative impacts associated with cleanup activities at INTEC that are carried out under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

CERCLA remediation projects at INTEC are in progress. These projects involve the cleanup and/or removal of contaminated soils and other environmental media, portions of which are within those areas or projects being evaluated in the various alternatives in this EIS. To avoid the possibility that CERCLA decisions may inappropriately preclude some waste processing or facility disposition alternatives, the CERCLA and National Environmental Policy Act (NEPA) processes at INTEC are being coordinated.

- The lead-time required for facility development and funding of alternative technologies means that a DOE ROD on a treatment technology would be needed sooner than previously estimated.

This EIS is being prepared sooner than required by the Idaho Settlement Agreement/Consent Order in order to accommodate time estimates to obtain project approval and funding, and to complete treatment/storage facility design, construction, and operation. This should make it possible for DOE to meet the target dates of December 31, 2012 for ceasing use of the Tank Farm and December 31, 2035, for having the treated waste ready to leave Idaho.