

**HANFORD ADVISORY BOARD**

November 3, 1994

The Hanford Advisory Board advises the Department of Energy, the Department of Ecology and the Environmental Protection Agency that:

- \* They should continue to move toward expedited removal of spent fuel from the K-Basins as quickly as possible because it is most consistent with the Board's values described below.
- \* Study of unresolved technical questions is required to support any decision concerning the packaging, treatment or stabilization of spent fuel for temporary or interim storage.
- \* Resolution of unresolved technical questions should be done expeditiously to allow timely removal of spent fuel from the basins by December 2002.
- \* Safety upgrades and the path forward for removal of fuel should be fully funded in the 1995 reallocation and receive high priority for FY96 and FY97.

Furthermore, the DOE, Ecology and the EPA should give no further consideration to processing Hanford spent fuel at a foreign facility nor should they support further study of extended storage of spent fuels in the K-Basins.

**RELEVANT BOARD VALUES IMPACTING THESE CONCERNS**

1. Columbia River should be the highest priority. The river is a vital resources in the Northwest. Contamination entering the river causes concern for downstream drinking water, fishing, recreation, and agriculture.
2. Protect public\worker health and safety.
3. Put wastes in an environmentally safe form.
4. Get on with cleanup to achieve substantive progress in a timely manner. This means demonstrating waste containment, stabilization and safe storage as quickly as possible. "Getting on with it" also means using the most practicable, timely available technology while leaving room for future innovation.
5. Accept the fact that interim storage of the waste in an environmentally safe form will occur at Hanford.
6. Minimize transportation of radioactive and hazardous materials to and from the site to reduce the risks to the public and the environment. Assume treatment of Hanford's wastes will occur on site; it is not productive to study transportation of Hanford's wastes off-site for treatment.

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## SPENT FUEL REMOVAL FROM K BASINS

Amendment 4 changed the Tri-Party Agreement to include remediation of the K-East Basin and removal of all fuel and sludge from both K-East and K-West Basins in an encapsulated form (copy of change number M-34-9301 attached). Subsequently, the Spent Fuel Working Group identified the K Basins as one of the most pressing safety issues at Hanford as a result of their seismic vulnerability, the state of the spent fuel in K-East and its impact on worker health and safety.

Repackaging the spent fuel and sludges in the K-East basin is required to stop the chemical transformation of plutonium contained in damaged fuel elements into mobile oxides that augment the already sizable sludge component. Milestone M-34-00-T06 anticipated a target date of June, 1996 for initiating K-East sludge encapsulation with a target date of December, 1998, for completion of encapsulation of all fuel and sludge currently within the K-East basin. Encapsulation was to have been done with the type of containers currently used for spent fuel in the K-West basin. The target date for removal of all fuel and sludge from both K-East and K-West basins is December, 2002. It was, initially, planned that interim storage would be accomplished with dry cask storage of these materials.

Subsequently, use of K-West containers has been brought into question because of the theoretical possibility that potentially explosive hydrides have been generated in the aqueous but oxygen poor environment of the sealed containers. As a result, it was necessary to determine whether hydrides are a problem in the K-West Basin before proceeding with encapsulation of K-East basin spent fuel and sludges. This determination would, in turn, determine whether interim storage could be done in a dry rather than an aqueous environment and whether some pretreatment would be necessary to deal with the hydrides, if they exist.

### PROBLEM DEFINITION

The Spent Nuclear Fuel/K Basins Group brought three alternatives (issue summary prepared by the Group is attached) for the Safety and Waste Management Committee to consider:

1. Put the fuel in new containers. Continue storage in the K Basins until an interim storage option (for up to 50 years) is ready.
2. Remove the fuel and sludge from the basins. Put it in a temporary facility at Hanford. Store it wet or dry until interim storage is ready.
3. Send the material to a foreign nation for processing.

## ISSUES OF CONCERN

### INTERIM STORAGE AT K-BASINS

It is likely that spent fuel will continue to undergo chemical changes.

Leaving the spent fuel in the K-Basins for 10-20 years would involve environmental risks and risks for workers and the public.

K-Basins storage will remain inefficient; there will be higher worker radiation exposure, new waste generation, and continued costly operations.

Continued corroding of spent fuel could complicate its future handling, transport and processing.

Risk of basin leakage could be mitigated by encapsulation of spent fuel and sludge into new containers.

### EXPEDITED REMOVAL TO TEMPORARY STORAGE

Spent fuel must be characterized to determine suitable form for temporary storage.

New equipment and processes probably required to support temporary storage.

Temporary storage is likely to increase required handling of spent fuel.

The temporary storage facility could be designed to meet interim storage needs.

Faster removal from the K-Basins avoids K-Basin's operating inefficiencies as well as their seismic, environmental, worker & public health and safety vulnerabilities.

### PROCESSING FUEL AT A FOREIGN FACILITY

Transport of fuel overseas would be required.

Limits the need of near term spent fuel storage, construction of new facilities for interim storage or final disposition at Hanford.

Environmental impacts would effectively be transferred to foreign soil.

Off site shipment would require significant preparation of spent fuel.

It is unlikely that the target milestone to clear spent fuel from the K-Basins could be accomplished by December, 2002.

Foreign processing could be precluded by domestic or international political/policy constraints.

RELEVANT BOARD VALUES IMPACTING THESE CONCERNS

1. Columbia River should be the highest priority. The river is a vital resource in the Northwest. Contamination entering the river causes concern for downstream drinking water, fishing, recreation, and agriculture used.
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5. Accept the fact that interim storage of the waste in an environmentally safe form will occur at Hanford.
6. Minimize transportation of radioactive and hazardous materials to and from the site to reduce the risks to the public and the environment. Assume treatment of Hanford's wastes will occur on site; it is not productive to study transportation of Hanford's wastes off-site for treatment.

RECOMMENDATIONS FOR BOARD ACTION

Determine and advise the DOE, Ecology and the EPA that:

they should continue to move toward expedited removal of spent fuel from the K-Basins as quickly as possible because it is most consistent with the Board's values described above.

study of unresolved technical questions is required to support any decision concerning the packaging, treatment or stabilization of spent fuel for temporary or interim storage.

resolution of unresolved technical questions should be done expeditiously to allow timely removal of spent fuel from the basins by December, 2002.

Furthermore, the DOE, Ecology and the EPA should give no further consideration to processing Hanford spent fuel at a foreign facility nor should they support further study of extended storage of spent fuels in the K-Basins.

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Change Number <b>M-34-93-01</b>	<b>Federal Facility Agreement and Consent Order          Change Control Form</b> Do not use blue ink. Type or print using black ink.	Date <b>Sept. 30, 1993</b>
Originator <b>K. Michael Thompson</b>		Phone <b>376-6421</b>
Class of Change <input checked="" type="checkbox"/> I - Signatories <input type="checkbox"/> II - Project Manager <input type="checkbox"/> III - Unit Manager		
Change Title <b>Remediation of the K-East Basin</b>		
Description/Justification of Change <p>It is the common goal of DOE, Ecology and EPA to reduce a source of groundwater contamination from nuclear materials that have leached into the K-East Basin water. It is also the common goal of DOE, Ecology and EPA to move the fuel and sludge (once encapsulated) from the K-East Basin and the encapsulated materials from K-West Basin to a safer long-term storage facility and to remediate both basins as part of the 100-KR-02 CERCLA Past Practice Operable Unit activities. To meet these goals, the following Tri-Party Agreement milestones have been set:</p> <p>* M-34-01 Contaminated K-East basin water will be removed, replaced, or treated. The timing of this action must be coordinated with encapsulation and the cleaning of the residual contamination in the basin and (as noted below) the alternative selection is dependant on the feasibility of moving encapsulated K-East Basin fuel and sludge to the K-West Basin. The contaminated water will be dispositioned in accordance with reasonable available Hanford Site treatment and/or disposal processes and methods, available at the time of this action. Unless a better option becomes available, the water will be trucked to C-018 for disposal.</p> <p style="text-align: right;">(Continued on next Page)</p>		
Impact of Change <b>None</b>		
Affected Documents <b>Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Appendix D.</b>		
Approvals                      ___ Approved                      ___ Disapproved  DOE _____ Date _____ EPA _____ Date _____ Ecology _____ Date _____		

## Description/Justification of Change

If the K-East fuel and sludge, once encapsulated, can be moved to the K-West Basin (determined through a September, 1994 engineering study target date) the removal and disposal of the contaminated water shall be completed by September, 2000. This date is an eighteen month action, starting in March, 1999, three months after fuel and sludge encapsulation is completed.

If the transfer of encapsulated K-East Basin fuel and sludge to K-West Basin is infeasible, contaminated K-East Basin water will be replaced by fresh water, starting in September, 1996 at a rate of two million gallons/year and will continue until such time that the tritium concentration in the basin is decreased and is maintained at or below 300,000 pCi/L (The goal is to reduce the tritium concentration in the basin such that resulting groundwater tritium concentration meet drinking water concentration standards, recognizing a lag between basin and groundwater concentrations.

- \* M-34-02 June, 1996 - Initiate negotiations with Ecology and EPA on incorporation of transition activities including remediation of the basins, consistent with Section 3.1 of the Agreement (as amended) and the Record of Decision regarding long-term storage and ultimate disposition of the irradiated fuel. DOE will submit a signed Tri-Party Agreement change request proposing milestones for (1) the completion of removal of fuel and sludges from the K-Basins and (2) the completion of stabilization of the basins.
- \* M-34-00 Complete actions specified by agreed interim milestones related to remediation of the K-East Basins. Due Date: TBD

K-East Basin is an unlined rectangular, reinforced concrete basin, 125 feet long, 67 feet wide, 21 feet deep, with a cooling/shielding water depth of approximately 16 feet. The basin has a water recirculation system including filters, ion exchange and chillers. K-East basin was constructed in the early 1950's and operated in support of KE Reactor until 1971. The basin was reactivated in 1975 for short-term storage of N Reactor fuel. Approximately 1144 metric tons of irradiated metallic uranium fuel, contained in open-ended canisters and approximately 2,000 empty canisters are stored in the K-East Basin. Approximately 800 cubic feet of sludge and approximately 500 cubic feet of debris rest on the basin floor. Unlike the K-West Basin it is not epoxy lined and the nuclear materials stored there are not encapsulated.

It is the intent and long-term goal of DOE to remove all nuclear fuel and sludge from both the K-East Basin and the K-West Basin; however, a suitable facility is not presently available as an alternate storage facility. The DOE decision for long-term storage and ultimate disposition of the fuel is dependent upon the ROD of the EIS to be conducted regarding the fuel. DOE will develop options and plans concurrently with the EIS process to expedite the implementation of the decision.

The DOE is presently planning to encapsulate the fuel and sludge stored in K-East Basin to prevent further degradation of the exposed fuel and to provide an additional environmental containment barrier. Encapsulation is also necessary prior to the effective treatment of the water in the basin. Materials stored in K-West Basin are encapsulated. DOE is also assessing the possibility of reracking encapsulated materials in K-West Basin and moving materials from K-East Basin once encapsulated.

Description/Justification of Change

Ecology, EPA and DOE have agreed to attach target dates on key activities for the encapsulation, disposition of the fuel and sludge, and the initiation of the NEPA process that will determine the long-term storage and ultimate disposition of the fuel and sludge. Target dates are justified because the potential source for groundwater degradation, contaminated water in K-East basin, will be cleaned-up under TPA milestones, dependant on encapsulation. Failure to meet the target dates because of factors within the control of DOE will not be grounds for changing the enforceable milestone for contaminated water disposition. DOE has determined that the NEPA process is required to determine long-term storage and ultimate disposition of the nuclear materials. Encapsulation target dates, and the subsequent TPA milestone, are dependant on timely receipt of necessary permits and regulatory approvals necessary to proceed.

The following target dates have been selected:

M-34-00-T01 June, 1994 - Issue Notice of Intent for N-Reactor Fuel EIS.

M-34-00-T02 June, 1994 - Initiate K-East Basin fuel encapsulation.

M-34-00-T03 September, 1994 - Submit an engineering study to determine the feasibility of moving and temporarily storing K-East fuel and sludge (once encapsulated) to the KW-Basin.

M-34-00-T04 October, 1994 - Submit a schedule describing activities for the final disposition of contaminated K-East Basin water for planning purposes to support the 100-KR-4 Record of Decision.

M-34-00-T05 March, 1995 - DOE shall provide a schedule for fuel and sludge encapsulation and contaminated water removal or replacement to Ecology and EPA that supports the TPA milestone

M-34-00-T06 June, 1996 - Initiate K-East Basin sludge encapsulation.

M-34-00-T07 December 1998 - Complete encapsulation of the fuel and sludge within K-East Basin.

M-34-00-T08 December, 2002 - Remove all fuel and sludge from both K-East and K-West Basins in an encapsulated form.

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ISSUE PAPER  
SPENT FUEL REMOVAL FROM HANFORD K BASINS

The U.S. Department of Energy (DOE) plans to remove all spent nuclear fuel and sludge from the Hanford K Basins by December 2002. That is in accord with the Tri-Party Agreement. The material is stored in aging facilities near the Columbia River. Removal will reduce risks to people and the environment.

DOE's Spent Fuel Working Group and the Defense Nuclear Facilities Safety Board reviewed the K Basins' storage conditions. Both groups believe that fuel and sludge removal should be completed well before 2002, if it can be done without safety and environmental impacts.

To assure that outcome, the Spent Fuel Working Group must look at several alternatives. Some alternatives can't be fully evaluated until DOE's programmatic environmental impact statement is done. That EIS deals with spent nuclear fuel issues on a national basis. It is now undergoing public comment.

DOE is looking at these alternatives:

- Put the fuel and sludge into new containers. Continue storage in the K Basins until an interim storage option is ready. (Interim storage is up to 50 years.)
- o Remove the fuel and sludge from the basins. Put it in a temporary facility at Hanford. Store it wet or dry until interim storage is ready.
- o Send the material to a foreign nation for processing.

Discussion

Store at K Basins until Interim Storage

Put the fuel and sludge in new containers. Continue wet storage at the K Basins until interim storage is ready. Potential advantages: less fuel handling; temporary storage would not be needed, lessening future contamination.

Issues:

- o Interim storage requirements are not defined. Interim storage may require multiple regulatory oversight: license and permit reviews by the Nuclear Regulatory Commission and the U.S. Environmental Protection Agency and/or the Washington Department of Ecology. Specific requirements can't be defined until oversight is resolved. Oversight may impact future fuel removal from the K Basins by imposing more requirements on fuel handling and transport.
- o There are environmental risks and risks for workers and the public implied in leaving the fuel in the K Basins for 10 to 20 years.

- o Placing the fuel and sludge in new containers, and other planned actions, will lessen the risks in basin leakage.
- o K Basins storage will remain inefficient; there will be higher worker radiation exposure, new wastes, and continued costly operations.
- o Corroding fuel could complicate future fuel handling, transport, and processing.
- o Moving the fuel from the K Basins to interim storage likely means more fuel handling.

To judge this alternative, the risks of continued K Basins use must be better quantified.

#### Expedited Removal into Temporary Storage

This alternative would remove fuel and sludge from the K Basins for temporary wet or dry storage. This action meets DOE and regulatory requirements, but might not meet external oversight requirements for interim storage. Potential advantages: the temporary storage system could meet interim storage requirements without more major actions; faster removal avoids K Basin vulnerabilities and inefficiencies much earlier.

#### Issues:

- o The fuel and sludge must be characterized before temporary storage. That lessens the schedule benefit of temporary storage.
- o Equipment and processes must be developed to support temporary storage. This also reduces the schedule benefit.
- o Expediting temporary storage may increase fuel handling steps.
- o In time, the temporary storage facility must be decontaminated and decommissioned.
- o Defining regulatory requirements is not yet finished.

#### Process Fuel at a Foreign Facility

This alternative would transport fuel overseas for processing at a foreign facility (i.e., Sellafield, United Kingdom). Potential advantages: resolves fuel storage management issues and final disposition; limits construction and contamination of new facilities here.

#### Issues:

- o Foreign processing could be precluded by political and policy constraints. Requires inter-government agreements. Policy shifts later could halt shipments.
- o Off-site shipment would require much preparation.
- o The time needed for regulatory approvals and shipping would likely exceed the 2002 target.
- o Environmental impacts would be transferred to foreign soil.

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