



Department of Energy

Oak Ridge Office
P.O. Box 2001
Oak Ridge, Tennessee 37831

July 12, 2006

Mr. Kerry Trammell, Chair
Site Specific Advisory Board
DOE Information Center
475 Oak Ridge Turnpike
Oak Ridge, Tennessee 37830

Dear Mr. Trammell:

RESPONSE TO SITE SPECIFIC ADVISORY BOARD RECOMMENDATION ON THE FACT SHEET FOR THE EXPLANATION OF SIGNIFICANT DIFFERENCE FOR THE MOLTEN SALT REACTOR EXPERIMENT RECORD OF DECISION AT THE DEPARTMENT OF ENERGY OAK RIDGE RESERVATION

The Department of Energy (DOE) is very appreciative of the Site Specific Advisory Board's willingness to review the fact sheets prepared to better inform the public on changes to signed regulatory decision documents. You serve us and the community well in this respect and we greatly appreciate your efforts.

Enclosed with this letter you will find a copy of the latest version of this fact sheet. This version is available at the DOE Information Center for the public to access. It is our intent to have this Explanation of Significant Difference signed by the three Federal Facility Agreement parties this fiscal year.

Thank you for this very important role the Board serves in these endeavors.

Sincerely,

A handwritten signature in black ink, appearing to read "S. H. McCracken".

Stephen H. McCracken
Assistant Manager for
Environmental Management

Enclosure

cc w/ enclosure:

Dennis Boggs, EM-90
Brian DeMonia, EM-90
Mike Jugan, EM-91
Doug Frost, EM-30.1
Melissa Neilson, EM-30.1
SSAB
LOC
Connie Jones; EPA Region 4
John Owsley, TDEC DOE-O



DOE Environmental Management Program

Making a Change to the MSRE Record of Decision

Record of Decision for Interim Action to Remove Fuel and Flush Salts from the Molten Salt Reactor Experiment Facility at the Oak Ridge National Laboratory, Oak Ridge, Tennessee (DOE/OR/02-1671&D2)

The Molten Salt Reactor Experiment (MSRE) facility complex is located in Roane County, Tennessee, on the U.S. Department of Energy (DOE) Oak Ridge Reservation (ORR), approximately 1 km (0.6 miles) south of the Oak Ridge National Laboratory (ORNL) main plant in Melton Valley. MSRE operated from 1965 through 1969 to investigate the practicality and feasibility of the molten salt reactor concept. The circulating fluid in the reactor was a molten salt mixture composed of various fluorides. Uranium-235 (^{235}U), in the form of uranium tetrafluoride (UF_4), was the fissile component of the fuel salt that was used to produce a controlled nuclear chain reaction. In August 1968, the ^{235}U fuel was replaced with ^{233}U , and in September 1969, a small quantity of plutonium was added. After the reactor was permanently shut down three months later, the molten fuel salt was allowed to cool and solidify, and surveillance and maintenance were initiated. DOE is removing the reactor fuel salt from MSRE under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).

In 1994, investigation of the MSRE site indicated that unexpected levels of reactive gases (uranium hexafluoride and fluorine) were present throughout the off-gas piping connected to the fuel and flush salt drain tanks. It was further determined that the reactive gas pressure was above the atmospheric levels. In addition, uranium had migrated through the off-gas system to an auxiliary charcoal bed increasing the quantity of uranium detected in the charcoal bed. This resulted in a criticality concern where action was necessary.

Two CERCLA removal actions taken since 1994 mitigated several of the uranium migration concerns originally identified. Systems were depressurized and reactive gases were removed. Uranium recovered during the reactive gas removal processing was captured in NaF traps and transported to ORNL Building 3019 for interim storage. Additionally, uranium that had migrated to the MSRE auxiliary charcoal bed was removed as a part of the uranium deposit removal action and placed into a canister for interim storage.

A third CERCLA decision was the MSRE ROD to remove the fuel and flush salts from the drain tanks. Following are the major components of the selected remedy:

- Melt and chemically treat the salt in the drain tank cell [i.e., as the salt melts in a drain tank, the molten salt will be treated with hydrogen fluoride (HF) to adjust the salt chemistry and prevent plating out or precipitation of metals].

- Remove the uranium from the salts [i.e., when fluorine is added to the molten salt, uranium hexafluoride gas is liberated from the salt, cold trapped, and then transferred to vertical columns packed with sodium fluoride (NaF), referred to as “NaF traps”].
- Convert the uranium hexafluoride to uranium oxide, a chemically stable form of uranium.
- Package the uranium oxide in suitable containers and prepare the containers for storage with similar packages in a ²³³U repository in ORNL Building 3019.
- Transfer the residual salt in the drain tanks to storage containers (the salt will be chemically stabilized/packaged to capture fluorine gas that may be generated).
- Load the salt waste packages into shielded casks and place the casks in interim storage at an ORNL operating storage facility in Solid Waste Storage Area-5.

After completion of the remedy, the drain tanks and associated equipment will be managed in place as part of the facility maintenance program until decontamination and decommissioning (D&D) of the MSRE reactor building occurs. Final disposal of the salt was not addressed in the ROD.

Following issuance of the MSRE ROD, DOE initiated planning for processing of the total 3019 ²³³U inventory in storage in Building 3019 at ORNL. The ²³³U inventory includes uranium-laden sodium fluoride (NaF) traps from a previously completed MSRE removal action and will also include additional uranium-laden NaF traps from the current MSRE remedial action. The ²³³U recovered from MSRE is a small percentage of the total ²³³U inventory in Building 3019. Based on preliminary planning, it was determined that processing of the MSRE ²³³U materials as an integral part of the total 3019 ²³³U inventory would be more cost effective than the originally planned conversion of the materials to a stable oxide as prescribed in the MSRE ROD. Accordingly, DOE, with agreement of the Federal Facility Agreement (FFA) regulators, placed MSRE uranium conversion actions on hold pending completion of the planning for the processing of the total 3019 ²³³U inventory.

This post-ROD change impacts the scope and cost of the MSRE remedy. A side-by-side comparison of the original and proposed remedy components is given in Fig. 1 to clearly display the significant differences with regard to scope. A shaded box indicates a component of the proposed remedy that is different from the original remedy.

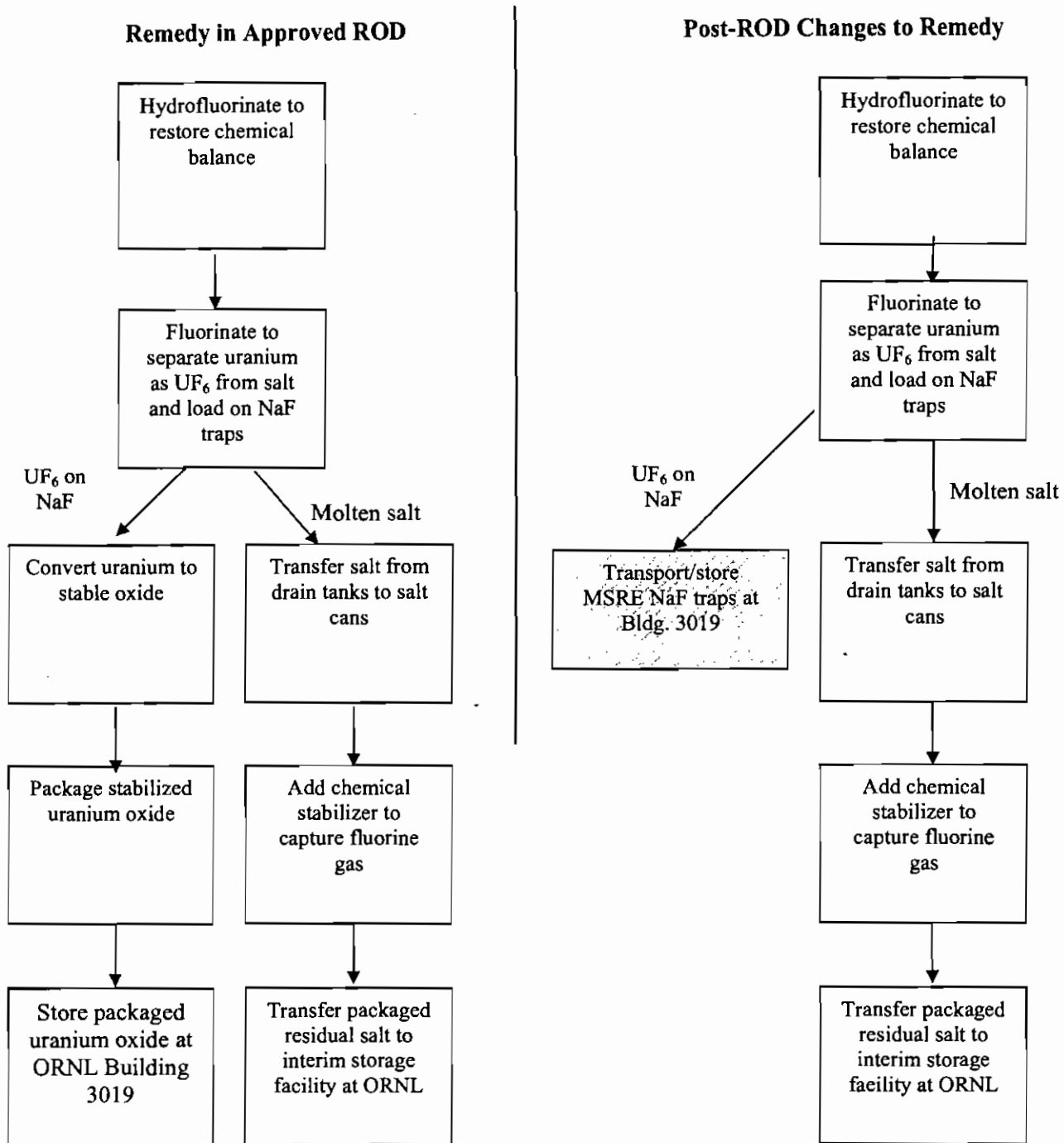
The original and proposed remedy components differ only after the point in the process where the uranium has been separated from the salt by fluorination and then collected on NaF traps.

The estimated cost of the remedy stated in the ROD was \$39.3M (unescalated), and included less than \$1M for conversion from UF₆ to U₃O₈ per the associated Feasibility Study (DOE/OR/02-1559&D2).

Table 1 shows a schedule comparison for the MSRE fuel and flush salts removal. The dates shown represent completion of ROD related operation. The first schedule is for the original ROD remedy, and the second schedule is for the proposed remedy.

For More Information

DOE welcomes public participation. Requests for additional information may be referred to the DOE Public Affairs Office, U.S. Department of Energy, P.O. Box 2001, Oak Ridge, Tennessee 37831. Phone: (865) 576-0885; toll-free 1-800-382-6938.



Notes:

A shaded box indicates a component of the proposed remedy that is different from the original remedy.

Fig. 1. Graphic comparison of approved ROD and ESD remedies.

Table 1. Schedule comparison for MSRE fuel and flush salts removal

Component	Estimated dates for completion of operation ¹	
	Original ROD remedy (July 1998)	Proposed remedy (2006)
Uranium separation from salt and recovery	Feb 2003	Sep 2006
Uranium conversion and placement in the ²³³ U repository at ORNL (via original ROD remedy)	Feb 2003	NA
Residual salt stabilization, packaging, and placement in interim storage at ORNL	Feb 2003	Sep 2006
Submittal of Remedial Action Report (D1 version)	May 2003	Dec 2006

¹Schedules for completion of the MSRE defueling, as set forth in this subsection, are estimates provided for informational purposes only and are not considered to be enforceable elements of the remedy. The enforceable milestones and nonenforceable FY +3 milestones for performance of remedial actions for MSRE are set forth in Appendix E and Appendix J of the FFA, respectively. Any additional milestones, timetables, or deadlines for sites included in this ROD will be identified and established independent of this ROD, in accordance with the existing FFA protocols.

FY = fiscal year
 FFA = Federal Facility Agreement
 NA = not applicable
 ORNL = Oak Ridge National Laboratory
 ROD = Record of Decision