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**[DOE LETTERHEAD]**

July 19, 1995

The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW, Suite 700
Washington, DC 20004

Dear Mr. Conway:

Enclosed for your information is the first Nuclear Materials Stabilization Task Group Quarterly Report on the Implementation of Defense Nuclear Facilities Safety Board Recommendation 94-1.

If you have any questions, please feel free to contact me or have your staff contact Mr. Henry F. Dalton, Director, Nuclear Materials Stabilization Task Group, (202) 586-7503.

Sincerely,

***Charles B. Curtis***

Enclosure

# DEFENSE NUCLEAR FACILITIES SAFETY BOARD RECOMMENDATION 94-1

# IMPLEMENTATION QUARTERLY REPORT

1st Report

Period Covered: February 28 - May 31, 1995

Developed by Nuclear Materials Stabilization Task Group

Approved:

Henry F. Dalton, Director
Nuclear Materials Stabilization Task Group

Dated: May 31, 1995

# DEFENSE NUCLEAR FACILITIES SAFETY BOARD RECOMMENDATION 94-1

# IMPLEMENTATION QUARTERLY REPORT

## I. EXECUTIVE SUMMARY

On February 28, 1995, the Department of Energy submitted an implementation plan to the Defense Nuclear Facilities Safety Board (DNFSB) in response to Recommendation 94-1 (Nuclear Materials Stabilization). The Implementation Plan contains the complex-wide plan of action and milestones to resolve various nuclear materials stabilization issues identified in Recommendation 94-1. This is the first quarterly report presenting the status of actions and milestones associated with the 94-1 Implementation Plan.

In a May 5, 1995 letter, the DNFSB accepted the Department's 94-1 Implementation Plan with three conditions:

1) 94-1 Implementation Plan should be directed by a dedicated project organization

2) DOE will remain committed to bringing all plutonium metal and oxide into conformance with the 50 Year storage standard by May 2002.

3) DOE will aggressively move to acquire all necessary resources, perform all needed research and development to meet the projected milestones, and fulfill all legal requirements.

The Nuclear Materials Stabilization Task Group (NMSTG) was established on February 28, 1995 to integrate the Department's programs for stabilizing excess nuclear material to achieve safe, stable states for interim and long-term storage pending ultimate disposition.

The status of Implementation Plan milestones scheduled to date is as follows:

- 152 Total Milestones in the Plan
- 30 milestones scheduled this quarter
  - 18 completed on time
  - 11 completed earlier in the quarter than scheduled
  - 1 missed (Issue Final IMNM EIS by May 1995)
- 6 milestones scheduled in future quarters completed this quarter
- 3 milestones scheduled for completion during the next quarter
- 4 milestones at risk

## II. PROGRESS TO DATE

### A. Nuclear Material Stabilization Task Group

The Nuclear Materials Stabilization Task Group (NMSTG) was established on February 28, 1995

to integrate the Department's programs of stabilizing excess nuclear material to achieve safe, stable states for interim and long-term storage pending ultimate disposition.

The NMSTG is organized to provide an integrated approach to the management of nuclear materials. Program Managers are assigned to the material categories in the Plan: Pu Residues, Pu Metals and Oxides, Uranium, Spent Nuclear Fuel, Pu Solutions, and Special Isotopes. Additional technical staff assist in managing Pu research, Systems Engineering, Program and Budget, Schedule Integration, and emerging issues. There is strong interaction among the members of the Task Group, the Integration Working Group, and the Research Committee.

B. Integration Working Group

The Integration Working Group (IWG), assembled to identify integration opportunities, was formally chartered on March 27, 1995. The IWG was specifically chartered to provide a complex-wide forum for integrating information, performing trades studies, and to develop the Integrated Facilities Plan for nuclear material stabilization by December 1995. Activities to date include:

- Developing and exercising a systems engineering screening process for identifying and scoping integration opportunities for analyses/resolution using trade studies.

- Establishing specific focus groups to evaluate, conduct analyses and form recommendations regarding the issues, barriers and requirements related to inter-site transportation plus considerations pertinent to inclusion of "small sites" within the purview of the NMSTG.

C. Research Committee

The Research Committee (RC) was established on March 15, 1995 to identify, develop, and screen technology necessary for the program.

Employing a systems engineering methodology, the RC will focus on the identification of requirements that R&D must address. As requirements are identified and defined, the RC will apply system engineering principles to assess the relative maturity of various technological solutions to stabilizing nuclear materials.

The Committee will produce a research plan that is expected to identify: (1) technology needs, (2) technology programs already in place, (3) "gaps" in technologies that must be addressed through R&D initiatives, (4) a systems analysis of technologies, including assessment of relative maturity of technologies, and (5) task statements or recommendations for R&D to support nuclear materials stabilization. R&D will include not only research and development, but also demonstration of the technology. The Plan will address technologies by material categories and highlight facility and transportation issues, where appropriate.

R&D needs identified by the RC will be presented to the NMSTG, which in turn will task the lab

with undertaking the R&D effort. The lead lab may direct those initiatives to other laboratories or sites or conduct the work itself. Where lead labs are not identified, the NMSTG will communicate the tasks to all interested laboratories which may then respond with proposals for evaluation by the RC.

D. Implementation Plan Milestones

The Nuclear Material Stabilization Task Group monitors the progress of the Department's stabilization efforts through the milestones in the Implementation Plan. While most milestones were identified explicitly in the chapters of the Implementation Plan, several others are also included in the text. All such milestones are being tracked by the NMSTG.

Implementation Plan milestones scheduled to date have been accomplished with the following results:

- 152 Total Milestones
- 30 milestones scheduled this quarter
  - 18 completed on time
  - 11 milestones completed early
  - 1 milestone missed (Issue Final IMNM EIS by May 1995)
- 6 milestones scheduled in future quarters completed this quarter
  3 milestones scheduled for completion during the next quarter
- 4 milestones at risk

Significant milestones completed. by nuclear material category, are as follows. Unless otherwise noted, the milestone was achieved on schedule.

Plutonium Solutions

- February 2, 1995. Issued the Environmental Impact Statement Record of Decision for F-Canyon plutonium solutions.

- February 3, 1995. Began Savannah River F-Canyon processing operations.

- April 25, 1995. Completed a NEPA Environmental Assessment for solution stabilization at Rocky Flats and issued a Finding of No Significant Impact (FONSI).

- April 28, 1995. Completed the transfer of 22,700 liters of PUREX solutions to Hanford's tank farms for disposal. (Scheduled August 1995)

- May 16, 1995. Completed inspections of all bottles of plutonium solutions at Hanford to ensure proper venting. (Scheduled September 1995)

Plutonium Metals and Oxides

- April 28, 1995. Demonstrated integrated repackaging operations at LANL.

- April 1995. Began the initial inspections of plutonium metal items on schedule at LLNL; as of May 19, 1995, inspections were 12% complete (30 of 250 items).

- May 22, 1995. Began repackaging of Pu metal and oxides at LANL.

- May 15, 1995. Completed a Nuclear Material Stabilization Task Group Trade Study on plutonium metals and oxides.

- (Status) Repackaged 70 of 256 packages (27%) with plutonium metal in direct contact with plastic at Rocky Flats. (All are to be repackaged by October 1995)

Plutonium Residues

- April 21, 1995. Stabilized 70 kgs of hydroxide solids at LANL. (Scheduled October 1995)

- April 7, 1995. Visually inspected 100% of the vault items at LANL. (Scheduled May 1995)

- April 21, 1995. Recovered 100 neutron sources at LANL. (Scheduled October 1995)

- April 21, 1995. Completed processing of 100 kgs of sand, slag, and crucible materials at LANL. (Scheduled October 1995)

- (Status) Vented 789 of 2,045 drums (39%) at Rocky Flats. (All are to be vented by October 1995)

Special Isotopes

- March 2, 1995. Completed venting containers of Pu-238 solids which had been stored under adverse conditions in Building 235-F at Savannah River. (One month ahead of schedule)

- (Status) Demonstrated vitrification of americium-curium solutions on a laboratory scale as part of the process development and test program for that stabilization option at Savannah River.

Spent Nuclear Fuel

- March 17, 1995. Released the Draft EIS for the Interim Management of Nuclear Material. The final EIS is expected to be issued in early June 1995. (Scheduled May 1995)

- March 28, 1995. Issued Notice of Intent for Hanford K-Basins Environmental Impact Statement (EIS).

- March 30, 1995. Started fuel characterization in the K-Basin hot cells, including efforts to determine the behavior of hydrided N-Reactor spent nuclear fuel.

- April 20, 1995. Installed Hanford K-Basin cofferdams.

- April 1995. Issued the Department's Programmatic Spent Nuclear Fuel Environmental Impact Statement.

- April 26, 1995. Issued the Hanford K-Basins Integrated Path Forward Schedule providing details of major system acquisitions and material movements. (Scheduled May 1995)

- May 12, 1995. Began removal of spent nuclear fuel at INEL's CPP-603 South Basin, this milestone was completed two months ahead of schedule (and meets the court order requirement to begin fuel removal from CPP-603). All fuel is to be removed by December 2000.

- (Status) Continued removal of spent fuel from CPP-603 North/Middle Basin. 114 of 189 shipments have been completed (December 1995 milestone).

Milestone Missed

1. Issue the Interim Management of Nuclear Management (IMNM) EIS (May 1995).

The IMNM EIS was not issued by the end of May 1995 as originally scheduled.

Milestones at Risk

Four milestones are "at risk."

1. Stabilization of F-Canyon Plutonium solutions; stabilization to be completed by Jan 1996.

The FB-Line is the part of the material stabilization process which converts material to metal. The FB-Line readiness for Hot Restart schedule has been affected by a number of significant emerging issues:

Indeterminate Valve Positions

In preparation for restart, the positions of a number of process valves ("open" or "closed") could not be determined. FB-Line staff created a test program to determine valve positions, during the execution of which, maintenance and operational problems were encountered that slowed progress. Also, the inability to use the normal valves for maintenance work isolation greatly increased the time required for the lockout/tagout process and the maintenance work itself. Visual

inspection practices have been instituted to determine remaining valve positions, using the test program determination only in conditions where visual inspection is impractical.

Corrective Maintenance

The material condition of the plant was not accurately forecast in the original schedule. During the cold runs, significant additional corrective maintenance items were identified. In addition to the direct maintenance and engineering, procurement time for replacement of components is impacting the schedule.

Process Issues

Operating limits established for cold runs were exceeded during initial evolutions. Until corrective actions have been completed, resumption of the key maintenance work is being delayed. Additionally, a vent line flushing procedure will also be required that was not included in the original schedule, but now is incorporated as a Hot Restart prerequisite.

WSRC is pursuing options for schedule improvement in restart preparations and for Hot operations. The following actions have been taken to attempt to regain the committed schedule. These include:

Facility manager change
Senior management coverage on shift
Creation of a War Room for in-plant planning/scheduling
Weekly schedule reviews by senior management
Increase in resources applied to FB-Line Operations, Engineering and Maintenance
Provisional qualification of operators to support Mainline equipment checkout

2. Issue Record of Decision (ROD) on Interim Management of Nuclear Materials (IMNM) EIS (July 1995)

There is a potential for delay in issuing the IMNM ROD. Should the Department be enjoined (even temporarily) from implementing actions in the ROD, other milestones associated with Pu processing and stabilization at Savannah River could be impacted.

3. Begin MK 31 target stabilization in Savannah River's F-Area. (November 1995)

This milestone is reported at risk because of uncertainties surrounding the scheduled issuance of the ROD for the IMNM EIS.

Based on the F-Canyon Phase 2 restart schedule, the first dissolver cold run must begin no later than July 24, 1995 to meet the scheduled restart date of November 27, 1995. Dissolver cold runs have been included based on lessons learned from FB-Line restart preparations (described above) to verify equipment operability and operator proficiency as a prerequisite to the initiation of the Operational Readiness Reviews. These cold runs cannot begin until the issuance of the ROD for

the following reasons:

- All required NEPA steps must be completed before substantial actions covered by the EIS are commenced or resources committed.

- Cannot take actions in anticipation of a ROD that may prejudice the decision or perform irreversible actions. Specifically:

- Cold runs would process stable material (unirradiated MK 31 targets) that would not otherwise be processed under the scope of the EIS.

- Cold runs would generate a waste volume that would not otherwise be generated, as well as generating a waste stream covered under the EIS.

4. Sampling of Plutonium in proximity to plastic to support hazard assessments. (August 1995)

The ventilation system in Building 371 at Rocky Flats became inoperable in March and has been under repair since then. The Operational Safety Requirements require an operable system to supply breathing air for "nuclear operations." This shortcoming prevents movement of 37 items planned for inspection from the Building 371 vaults and precludes repair of the stacker/retriever, which contains nine items planned for inspection.

The current schedule calls for the hazard assessment inspection of Pu in proximity to plastic to be completed by August 1995. The delay resulting from the Building 371 ventilation operability is expected to be two months. The impacts of this delay should be minimal, and should have no effect on the ability to meet future commitments associated with the repackaging of Pu in proximity to plastic (scheduled to be completed by October 1996). The only change may be the priority in which items are repackaged once the data from Building 371 is collected. No increase in risk is expected from this delay.

The proposed management action to work-around the ventilation system issue is to develop a Justification for Continued Operations (JCO) to establish a conditionally operable status of the Building 371 ventilation system. A conditionally operable ventilation system would allow these activities to continue. Repairs are expected to be completed by July 31, 1995.

## III. SYSTEMS ENGINEERING APPLICATIONS

### A. Plutonium Metal and Oxide Stabilization Trade Study

A trade study was undertaken to evaluate the benefits and impacts associated with the repackaging Pu metal and oxide (>50% assay) in accordance with DOE Standard 3013-94 by 2002 or delaying until 2006 or 2010. In conducting this trade study, the following performance measures were used:

- Risk to the Public
- Effluents to the Environment
- Worker Exposure from Stabilization and Repackaging Operations
- Risks to Workers from Packaging Failure
- Waste Generation
- Cost
- Impact on Other Activities

A number of techniques were employed to ensure a comprehensive and technically defensible study. The analytical techniques included review of the Pu Vulnerability Assessment, expert opinions, parametric methods, analogy methods and bottom-up engineering methods.

The results of this study concluded that the only performance area impacted by delaying stabilization from the original commitment date was the increased cost associated with maintaining facilities operable for the longer schedules. There were no significant differences in the remaining performance measures between completing stabilization and packaging by 2002 or delaying to 2006 or 2010.

B. Stabilization and Repackaging Equipment Procurement

Presently, none of the affected sites has in place all of the equipment necessary for oxide stabilization and repackaging of metal and oxide. The NMSTG is initiating a competitive procurement of standardized stabilization and packaging equipment.

The procurement will provide each affected site with standard modules of stabilization furnaces, packaging system, and supporting equipment placed in a line of glove boxes. Anticipated benefits of such a procurement include lower cost, Department-wide integration of repackaging techniques, consolidation of otherwise redundant support activities, and (potentially) an accelerated schedule. To accomplish this procurement and delivery of draft documentation, the NMSTG is initiating the Plutonium Stabilization and Packaging Procurement Project.

The Project will be carried out by a working group of representatives from each affected site, including individuals with equipment/facility engineering and operations expertise and a procurement team selected by the NMSTG. The working group will be responsible for developing technical design requirements, the conceptual design, and specification. The working group will also conduct all design reviews. The specification, design review and procurement activities will all utilize a systems engineering approach.

Because the Savannah River Site design for a container transfer system is envisioned to provide a basis for container transfer in the procured system, its further development is of interest to this project. The project will facilitate a "hot" demonstration of the technology in a plutonium facility at one of the sites. Also included in the process is a prototype installation and demonstration at one of the sites prior to full-scale production of the remaining systems.

Prior to installing the new equipment, each site will require appropriate safety documentation, operating and maintenance procedures, and personnel training/qualification plans. The working group will be responsible for drafting the necessary startup safety documentation.

C. Stabilization Requirements and Endstates:

1. Plutonium residues standard development

A "Standard for Safe, Long-Term Storage of Plutonium-Bearing Materials Containing Less Than 50 Weight-Percent Plutonium" will provide criteria for at least 50 years of safe storage or until final disposition of this material. The types of plutonium-bearing materials are metallic alloys, oxides, salts, combustibles (leaded rubber gloves, plastics, etc.), inorganic solids (filters, scrap metals, etc.), and solutions. These materials represent feedstock, materials-in-process to nuclear weapon production, and by-products of nuclear material production. Over 100 metric tons of solid residues and 400,000 liters of solution containing low concentrations of plutonium are currently in inventory. This plutonium-bearing material has remained in packages in processing areas, vaults, and process lines awaiting disposition. Conditioning (processing) and repackaging may be required to secure them in a safe, stable end-state.

This standard is being developed by a task group comprising field office technical experts and headquarters program offices, including the Nuclear Material Stabilization Task Group, the Office of Defense Programs, the Office of Environmental Management, and the Office for Environment, Safety, and Health. The task group is on schedule to publish a final draft standard for Department review by October 1995.

2. Uranium storage standard development

The Oak Ridge Y-12 plant has been designated as the Department's storage repository for highly enriched uranium. Y-12 has developed a draft standard for storage of enriched uranium similar in scope to the recently approved plutonium storage standard.

This standard was submitted to DOE for final approval on May 19, 1995. The standard addresses near and long-term storage of enriched uranium. It establishes requirements and management practices including material form (metal, alloyed metal, or compounds including oxides), containers (stainless steel can, drum, shipping container), and configurations (tube vault, modular storage vault, drum array). The standard requirements are intended to ensure unclassified, safe, stable, secure, and environmentally acceptable storage of enriched uranium. Storage is expected to be in static inventory with minimal material monitoring required. Gaseous or liquid forms of uranium will be converted to metals or oxides before storage in accordance with this standard. There has been considerable concern of late regarding the storage of uranium/fluorine compounds (re. DNFSB Recommendation 95-1) . Processes and standards used for DNFSB 94-1 stabilization activities will be used for potential DNFSB 95-1 operations as applicable.

## IV. ENVIRONMENTAL COMPLIANCE STRATEGY

The NMSTG has established an Issues Resolution Team at Headquarters to resolve NEPA, Transportation and Environmental Compliance issues, which is supported by EM and EH. This Issues Resolution Team is tasked with:

- Identifying 94-1 Implementation Plan requirements that may be impacted by pending NEPA actions and decisions

- Developing a calendar outlining impacts of new or proposed environmental regulations on 94-1 stabilization activities

- Examining the issues associated with transportation and off-site shipment requirements

The Team will also work closely with the Integration Working Group and the Research Committee in examining solutions to overcome potential problem areas.

## V. ISSUES

### A. Continuity of a Nuclear Materials Stabilization Organization

The Nuclear Materials Stabilization Task Group or another group dealing with the stabilization of nuclear materials should become part of a permanent organization within DOE as a result of the DOE Headquarters Strategic Realignment. The NMSTG has organized a group of highly competent professionals and has established an efficient functional organization to ensure that nuclear materials stabilization activities throughout the Department are accomplished according to the commitments included in the 94-1 Implementation Plan.

The NMSTG is moving forward with a long term program to integrate complex-wide initiatives to manage nuclear materials stabilization activities. In order to ensure the effectiveness of the initiatives being undertaken the resulting organization should be given programmatic and funding responsibilities to more effectively manage the key issues associated with nuclear materials stabilization. Effective evolution of this organization should be given priority to prevent delay in meeting commitments and managing emerging issues.

### B. Los Alamos Pu Metal and Oxide Stabilization and Repackaging

ISSUE: In Recommendation 94-1 the DNFSB recommends, "... The plan should include a provision that, within a reasonable period of time (such as eight years), all storage of plutonium metal and oxide should be in conformance with the draft DOE Standard on storage..." The Department is reviewing the potential option of whether a time period somewhat longer than eight years is appropriate and

reasonable for the Los Alamos National Laboratory.

DISCUSSION: The Department is considering, for LANL only, whether an approach involving a schedule somewhat longer than eight years is both reasonable and appropriate. This premise of this consideration is based on two principle issues:

(1) The risk to public and worker health and safety over a longer period would be acceptable.

(2) The technical resources of LANL would be used more effectively.

These points are summarized below.

Public and Worker Health and Safety

Public health and safety would not be affected. Risk to worker health and safety would be acceptably low, based on:

- A visual inspection of 100% of items in TA-55 vault was completed in April 1994.
- Statistical sampling of 160 items from 5 categories covering two age ranges.
- Review of experience at other DOE sites

Key elements of the approach include:

- Repackaging of plutonium metal and oxides will be integrated with stabilization and repackaging of other actinide bearing substances.
- Most reactive materials will be addressed first.
- Materials considered unstable will be stabilized in less than eight years.
- Observations from future repackaging efforts will be added to the database; thereby improving our ability to detect/predict impending packaging discrepancies.
- Stabilization and repackaging activities can be rapidly redirected and/or accelerated if a problem is detected through surveillance and monitoring.

- All items are currently planned to be packaged per the standard by 2009. Stabilization and repackaging efforts are in progress and ahead of schedule.

Resource Utilization

Among the DOE facilities that handle and store plutonium, LANL has some unique features and circumstances that should be considered:

- LANL has operational plutonium facilities with a continuing mission.
- The LANL capability is relied upon to perform activities that are important to the safety and reliability of the Stockpile.
- The LANL capability is also applied in support of efforts to stabilize materials at other DOE sites.
- To accelerate the schedule for repackaging all plutonium metal and oxide by May 2002 would require substantial temporary augmentation of the plutonium processing and associated support personnel. This would then be followed by substantial personnel cuts when the work is completed in 2002. These large fluctuations would detract from efforts to recruit and retain people possessing the needed technical qualifications. Conversely, by accomplishing the work as soon as possible using existing staffing levels provides added stability and supports the goal of maintaining the needed technical expertise.

SUMMARY: For LANL only, a schedule for stabilizing and repackaging plutonium metal and oxides that is somewhat longer than the eight years recommended by the DNFSB appears reasonable and appropriate. The capability exists to detect and rapidly respond to any new issues that may arise.