



98-0003934

**The Secretary of Energy**

Washington, DC 20585

December 16, 1998

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DNF SAFETY BOARD

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

Dear Mr. Chairman:

The Department of Energy (Department) has addressed the safety concerns raised by the Defense Nuclear Facilities Safety Board (Board) Recommendation 92-4 on the need for a defined, structured design approach on Tank Waste Remediation System (TWRS) projects.

Hanford's approach for institutionalizing these processes was established in two separate implementation plans. A site-wide systems engineering process was institutionalized at Hanford during execution of the Department's November 7, 1994, implementation plan. Implementation of systems engineering on TWRS projects was successfully demonstrated through the completion of all commitments made in the Department's October 8, 1997, implementation plan.

During the public meeting on August 4, 1998, the Richland Operations Office provided the Board with a detailed discussion on the status of actions addressing Board Recommendation 92-4. We are enclosing a report that provides an overview of that status.

We appreciate the assistance and cooperation of the Board's staff in completing all of the commitments identified in our implementation plan. Accordingly, the Department proposes closure of the Board's recommendation. If you have any questions, please contact Mr. James M. Owendoff, Acting Assistant Secretary for Environmental Management, at (202) 586-7745.

Yours Sincerely,

Bill Richardson

Enclosure



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## Summary of Activities in Response to DNFSB Recommendation 92-4

In July 1992, the Defense Nuclear Facilities Safety Board (Board) issued Recommendation 92-4 which raised safety concerns related to project management and engineering design for the planned Multi-Function Waste Tank Facility (MWTF) to be constructed at the Department of Energy's Hanford Site in the State of Washington. In its recommendation, the Board made two subrecommendations regarding the MWTF:

1. Establish a plan and methodology that results in a project management organization for the MWTF project team that assures that both DOE and the contractor organization have personnel of the technical and managerial competence to ensure effective project execution. This should emphasize management aspects of the project necessary to ensure adequate protection of public health and safety and should include the integration of professional engineering and quality assurance as necessary into the project, the application of appropriate standards and approved Department of Energy requirements, and the establishment of clear lines of responsibility and accountability.
2. Identify the design bases and engineering principles and approaches for the MWTF project that provide the data and rationale to show that the design for the MWTF conservatively meets the quantitative safety goals described in the Departments' Nuclear Safety Policy (SEN-35-91). The Board believes that this would include items related to standards, identification of safety related items, detailed design bases, functional design criteria, and safety analyses.

Having reviewed the situation at Hanford in light of the Board's subrecommendations, however, the Department concluded the problems which led to the Board's concerns at MWTF were symptomatic of a more general and fundamental problem --- the lack of an integrated systems approach to defining, planning, controlling, and executing the Hanford mission in the Tank Waste Remediation System (TWRS) organization.

In November, 1994, the Department issued its implementation plan in response to Recommendation 92-4. This implementation plan was accepted by the Board. The Department's 92-4 Implementation Plan described three general initiatives:

- development of systems engineering procedures to more effectively specify design bases;
- a set of actions to streamline and improve management systems and provide clear lines of responsibility and accountability, and
- a demonstration of TWRS staff technical qualifications.

### *Site Systems Engineering*

The Richland Operations Office (RL) developed several tools to provide the infrastructure

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necessary to support implementation of systems engineering on TWRS. Implementation of systems engineering on TWRS required development and implementation of site-wide guidance for implementation of systems engineering at the Hanford site. Beginning with a Site Systems Engineering Analysis, RL defined the site's mission, mission requirements, interface parameters, and initial synthesis of systems engineering architectures. The Hanford contractor put into place initial policies and procedures to manage and implement systems engineering at the site: a Site Systems Engineering Management Plan (SEMP) and SEMP Implementing Procedures. RL followed with a letter directing the site contractor to use a systems engineering approach to develop technical baselines for the planning described in the Multi-Year Program Plan.

Once these initial actions were completed, RL developed a site Systems Engineering Implementation Plan based upon the logic and planning process for the site's Multi-Year Program Plan. Institutionalization of the site-wide systems engineering implementation plans provided a framework from which systems engineering could be implemented at Hanford. These actions satisfied the Hanford site-wide commitments defined within the Department's 92-4 Implementation Plan.

### *Management Systems*

The Department also took action to address the Board's concerns regarding effectiveness of the project management organization. On the TWRS program, RL and contractor organizations were realigned to enhance "projectization" and to facilitate the use of project management tools such as the systems engineering approach. TWRS began to implement the systems approach to develop a technical baseline for its projects. Beginning with a TWRS Systems Engineering Management Plan and a TWRS Systems Engineering Working Plan, TWRS developed the infrastructure required to implement site-wide procedures down through TWRS projects. The TWRS Systems Analysis Report and TWRS Preliminary Functional Analysis Report were the first steps in documenting the functions and requirements associated with safe storage and retrieval of tank wastes.

### *TWRS Systems Engineering*

Another step in the Department's 92-4 Implementation Plan was to conduct a Systems Requirements Review (SRR) for TWRS. The SRR was conducted in November 1994 to validate the TWRS Functions and Requirements baseline from a systems engineering perspective. The SRR Report identified a need for significant improvement in the implementation of systems engineering, the quality of supporting documentation, and timeliness of testing required to minimize risks, ensure performance, meet schedules, and maintain a cost effective TWRS program. The SRR Report stated that the design bases available at that time used engineering assumptions that the TWRS Project did not adequately analyze or properly document. RL and the Contractor developed an SRR Action Plan and SRR Implementation Plan to address the findings.

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By 1997, the Department had completed a majority of the commitments made in the original implementation plan. Specifically, the Department had completed all implementation plan commitments to address improvement of the project management organization and had completed site-wide and TWRS program-specific commitments necessary to implement an effective systems engineering program in TWRS.

However, systems engineering analyses on TWRS projects and changes in project schedules rendered many of the remaining commitments obsolete. The infrastructure and procedures to implement systems engineering were in place; however, new "demonstration projects" were needed to prove the point. Therefore, in October 1997, the Department's 92-4 Implementation Plan was revised to identify new commitments to close out the Board's remaining concerns. The revised implementation plan identified specific systems engineering deliverables within TWRS to demonstrate the implementation of systems engineering at the project level. The revised implementation plan focused primarily upon three areas:

- implementing and institutionalizing a process for developing TWRS technical design bases
- integrating TWRS projects with the activity of a private vitrification contractor, and
- improving the technical capability of TWRS federal staff.

Table 1 provides a list of the commitments completed under the Department's first implementation plan and provides a crosswalk of the remaining commitments to new commitments made in the revised implementation plan. The final commitment of the revised implementation plan was completed in July, 1998. Commitments made in the revised implementation plan are listed in Table 2, and summarized in the following paragraphs.

### *TWRS Technical Design Bases*

As discussed earlier, TWRS had initiated a process for translating Technical Baseline information into project design specifications. The process eliminates the "stovepipes" which can form around individual projects by integrating the activities of other organizations when developing design bases documents for a specific TWRS project. On the Initial Tank Retrieval System Project, this process was used to demonstrate the capability to produce Technical Requirements Specifications. These define a graded technical baseline for the double-shell tanks, including a comparison of the revised specifications to baseline project specifications. TWRS also developed a methodology for periodically assessing progress in applying a graded approach for implementing systems engineering on TWRS projects. The methodology was successfully demonstrated by assessing the systems engineering processes in place on the TWRS Immobilized Low-Activity Waste Interim Storage Project.

## Summary of Activities in Response to DNFSB Recommendation 92-4

### *Integration with Vitrification Activity*

Other commitments in the revised implementation plan systematically addressed the interface between the TWRS project and the "privatized" scope of work to vitrify tank wastes. TWRS produced three representative samples of Interface Control Documents which systematically identify interface points between the private vitrification vendor and other Hanford projects. TWRS established criteria to assess integration of the vitrification vendor's Authorization Agreements with requirements established within other Authorization Agreements. Finally, TWRS performed an evaluation of the adequacy of the technical and safety deliverables required of the vitrification vendor.

### *Technical Capability of TWRS Federal Staff*

Although actions to address the competency of technical federal employees were transferred to the Department's 93-3 Implementation Plan, *Improving DOE Technical Capability in Defense Nuclear Facilities Programs*, TWRS committed to complete a staffing analysis for federal TWRS personnel. The staffing analysis identified the technical competency requirements for each position and mapped them to functions and responsibilities essential to completing the TWRS mission.

In summary, two implementation plans were developed to address Board concerns regarding the Department's ability to apply a defined, structured management and design approach at TWRS. Execution of the implementation plans led the Department to develop a systematic approach for defining, planning, controlling, and executing the Hanford mission in the TWRS organization. Institutionalization of the systematic approach has been successfully demonstrated through example work products on selected TWRS projects. These actions complete the Department's commitments to Board Recommendation 92-4.

**Table 1 -- DNFSB Recommendation 92-4 Implementation Plan, Revision 1  
Commitment Status**

<i>Commitment Number</i>	<i>Commitment Description</i>	<i>Status</i>	<i>Revision 2 Reference</i>
2.2.a	(1) Draft Hanford Site Functions and Requirements (January 1, 1994) and Addenda 1, 2, & 3 (2) Draft Architecture Synthesis Basis for the Hanford Cleanup System (3) Draft Systems Engineering Product Description Report for the Hanford Cleanup Mission	Complete	
2.2.b(1)	Systems Engineering Implementation Plan based on FY 1995 Multi-Year Program Plan (MYPP) logic and planning for the Hanford Site	Complete	
2.2.b(2)	Letter of direction to affected Hanford Site participants to include use of systems engineering in accordance with DOE policy to develop the technical baselines that will be used as the basis for Multi Year Work Plan updates	Complete	
2.4.a	Initial TWRS Systems Analysis Report reflecting the systems engineering work done to October 31, 1993	Complete	
2.4.b	TWRS Preliminary Functional Analysis Report	Complete	
2.4.c	TWRS Top-Level SRR Report	Complete	
2.4.d	TWRS Project Level Technical Requirements Review Report	Superseded	Commitment 5.2.1(a)
2.4.e	MWTF Project Baseline Comparison Report	Deleted - Project Canceled	
2.4.f	MWTF Project Independent Critical Design Review Report	Deleted - Project Canceled	
2.4.g	Aging Waste Transfer Line Project Baseline Comparison Report	Deleted - Project Canceled	
2.4.h	Cross-Site Transfer Line Project Baseline Comparison Report	Complete	
2.4.i	Project W-211 Design Requirements Document	Superseded	Commitment 5.2.1(b)
2.4.j	Initial Pretreatment Module Baseline Comparison Report	Superseded	Commitment 5.2.3(b)
2.4.k	Project Independent Design Review Schedule Dates	Superseded	Commitment 5.2.2(b)
2.4.l	Summary Report for each Stand-down Review	Complete	

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<i>Commitment Number</i>	<i>Commitment Description</i>	<i>Status</i>	<i>Revision 2 Reference</i>
3.2.a	TWRS Integrated Technology Plan	Completed; Revised	Commitment 5.2.2(e)
3.3.a	DOE-RL and Hanford Contractor Staff Qualification and Training Process (refer to DNFSB Recommendation 93-3, commitment 4.3)	Complete	
3.3.b	Hanford Performance-Based Training and Qualification Process (Refer to DNFSB Recommendation 93-3, commitment 4.3)	Complete	
3.3.c	DOE-RL Qualification and Training Evaluation and Assessment Process	Complete	
3.3.d	Report of Independent Assessment of DOE-RL and Contractor TWRS Qualification/Training Process	Complete	
3.4.a	DOE-HQ (EM-36) Preliminary Staff Analysis Report	Complete	
3.4.b	DOE-RL TWRS Preliminary Staff Analysis Report	Complete	
3.4.c	DOE-HQ (EM-36) Individual Development Plans	Complete	
3.4.d	DOE-RL TWRS Training Requirements Matrix Plans	Complete	
3.4.e	DOE-RL TWRS Orientation Report documenting status and initiation of orientation	Complete	
3.4.f	DOE-HQ (EM-36) Orientation Report documenting status and initiation of orientation	Complete	
3.4.g	Final Staffing Analysis Report for DOE-HQ and DOE-RL TWRS personnel	Open	Commitment 5.2.4
3.4.h	Report documenting completion of required technical training identified in Individual Development Plans (DOE-HQ) and Training Requirements Matrices (DOE-RL)	Open	Covered under DNFSB Recommendation 93-3 IP
3.5.a	Contractor TWRS Staffing Analysis and Contractor Position Qualification Standards	Complete	
3.5.b	Contractor TWRS Individual Qualification and Training Plans	Complete	
3.5.c	Contractor TWRS Selection Process Report documenting status and completion	Complete	

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<i>Commitment Number</i>	<i>Commitment Description</i>	<i>Status</i>	<i>Revision 2 Reference</i>
3.6.b	TWRS Management Systems Description Document and Policy Annexes	Complete	
3.6.c	Schedule to develop and issue Contractor TWRS Management Plan and associated documents	Complete	
3.7.a	TWRS Industry/Government Standards Review Report	Complete	
3.7.b	A letter report summarizing DOE and Department of Defense (DOD) systems engineering approaches	Complete	
3.7.c	DOE-FM Report on DOD Systems Engineering Standard Review	Complete	
3.7.d	Draft Hanford Site Systems Engineering Management Plan	Complete	
3.7.e	Final Hanford Site Systems Engineering Management Plan	Complete	
3.7.f	Develop and issue a set of Draft Hanford Site Systems Engineering Management Plan Implementing Procedures	Complete	
3.7.g	Draft TWRS Systems Engineering Management Plan	Complete	
3.7.h	TWRS Systems Engineering Management Plan Implementing Procedures	Complete	
3.7.i	Revised TWRS Systems Engineering Management Plan	Complete	
3.8.a	Draft TWRS Configuration Management Plan	Complete	
3.9.a	TWRS Multi-Year Work Plan	Complete	
3.10.a	TWRS Total Quality Management Policy Annex	Complete	
3.10.b	TWRS Health and Safety Management Policy Annex	Complete	
4.a	Quarterly Status Reports	Open	Modified to semi-annual briefings in Commitment 6.3
5.a	Revised DNFSB Recommendation 92-4 Implementation Plan	Superseded	Commitment 6.3
5.b	Discussions in Quarterly Status Reports	Superseded	Commitment 6.3



**Table 2 -- DNFSB Recommendation 92-4 Implementation Plan, Revision 2N  
Commitment Status**

<i>Commitment Number</i>	<i>Commitment Description</i>	<i>Effects on the TWRS Program</i>	<i>Status</i>
5.2.1(a)	Double-Shell Tank technical requirements specification for Project W-211	Supplies graded facility/project technical baseline development in a system specification (SS)	Complete
5.2.1(b)	Specification baseline comparison report for Project W-211 (FDC versus TRS)	Highlights the differences between an SS and previous specifications, for later evaluation	Complete
5.2.2(a)	Level 2 Specification Development Guide	Helps project form work packages from TWRS baseline data	Complete
5.2.2(b)	SE Maturity Assessment Guide	Provides a graded standard by which systems engineering on TWRS Projects can be measured and compared	Complete
5.2.2(c)	Project W-465 SE assessment report	Guides systems engineering improvements in the project, and prototypes new systems engineering measurement methods	Complete
5.2.2(d)	Project W-465 SE document schedule	Initially guides systems engineering improvements in the project	Complete
5.2.2(e)	Technology development in MYMP	Describes technology development for TWRS in FY 98, except for procurement-sensitive items	Complete
5.2.3(a)	Three TWRS Privatization Interface Control Documents	Shows TWRS privatization integration with other Hanford projects	Complete
5.2.3(b)	Report on adequacy of TWRS Privatization technical and safety deliverables	Integrates recommendations from RU and RL regarding Privatization Contractors' ability to meet requirements	Complete

**Table 2 – DNFSB Recommendation 92-4 Implementation Plan, Revision 2N  
Commitment Status**

<i>Commitment Number</i>	<i>Commitment Description</i>	<i>Effects on the TWRS Program</i>	<i>Status</i>
5.2.3(c)	Criteria for assessing integration of contractors' Authorization Agreements	Helps assure applicable Authorization Agreements are integrated	Complete
5.2.4	Final TWRS RL Staffing Analysis Report	Aligns TWRS technical position roles, responsibilities and competency requirements to TWRS mission	Complete
6.3.1	Semi-annual presentations on commitment, systems engineering progress	Keeps the DNFSB apprised of TWRS progress in institutionalizing systems engineering in TWRS	November, 1997 and May 1998 report complete. November, 1998 report being provided
6.3.2	Presentation on TWRS Privatization Contractors' technical and safety deliverables	Explains technical and safety details on the TWRS Privatization projects to the DNFSB	Complete