

A.J. Eggenberger, Chairman  
 John E. Mansfield, Vice Chairman  
 Joseph F. Bader  
 Larry W. Brown  
 Peter S. Winokur

## DEFENSE NUCLEAR FACILITIES SAFETY BOARD

625 Indiana Avenue, NW, Suite 700 Washington, D.C. 20004-2901  
 (202) 694-7000



July 10, 2009

Gerald L. Talbot Jr.  
 Assistant Deputy Administrator for  
 Nuclear Safety and Operations  
 National Nuclear Security Administration  
 1000 Independence Avenue, SW  
 Washington, DC 20585-0701

Dear Mr. Talbot:

Pursuant to the certification mandate provided in Section 3112 of the Duncan Hunter National Defense Authorization Act for Fiscal Year 2009, the Defense Nuclear Facilities Safety Board's (Board's) staff responsible for certification activities has reviewed design data for the Chemistry and Metallurgy Research Replacement (CMRR) Project provided to date by the National Nuclear Security Administration (NNSA). The Board's staff is focusing its review on topics previously raised regarding the nuclear safety strategy for CMRR, the Preliminary Documented Safety Analysis, and the design of safety-class and safety-significant systems. Those topics were provided electronically to NNSA on November 20, 2008. The staff has documented specific technical issues on a Findings Form. For purposes of the certification review, the staff considers a Finding a design topic related to an issue raised by the staff regarding the CMRR design that has not been adequately resolved and that could preclude certification by the Board.

Finding # 3, Design Control - Documenting and Maintaining Preliminary Documented Safety Analysis Safety-Related Functions and Requirements, was transmitted to your office on March 4, 2009. NNSA provided a response to this Finding on April 21, 2009. The Board's staff has evaluated that response and has determined that Finding # 3 can be considered closed. Enclosed is the completed Findings Form that includes the Board's Final Resolution to Finding # 3. Should you have any questions regarding this matter, please contact me at (202) 694-7128.

Sincerely,

Roy E. Kasdorf  
 Nuclear Facility Design and  
 Infrastructure Group Lead

Enclosure:

c: Mr. Mike Thompson  
 Mr. James McConnell  
 Mr. Patrick Rhoads  
 Mr. Herman LeDoux  
 Mr. Mark B. Whitaker Jr.

## Board Findings

Chemistry and Metallurgy Research Replacement Facility: Congressional Certification Review

### Topic: Design Control

#### Finding Title: Documenting and Maintaining Preliminary Documented Safety Analysis Safety-Related Functions and Requirements

**Finding:** The overall approach to establishing and maintaining functional and operational requirements can be found in the following CMRR documents: (1) CMRR Program Requirements Document (PRD) (CMRR-PLAN-PM-0101, Rev. 0) January 2009, (2) CMRR Functional and Operational Requirements (F&OR) (CMRR-PLAN-ENG-2801, Rev. 0) January 2009, (3) CMRR Systems Engineering Management Plan (SEMP) (CMRR-PLAN-1905, Rev. 0) September 2007, (4) CMRR Configuration Management Plan (CMP) (CMRR-PLAN-ENG-0301, Rev. 0) December 2008, and (5) CMRR Facility Design Description (FDD) (CMRR-FDD-001, Rev. 0B) January 2009.

Review of these documents indicates that requirements generated through the safety basis development process are not adequately and explicitly integrated into the overall approach to Design Control.

The Preliminary Documented Safety Analysis (PDSA) is the fundamental document that identifies safety-class (SC) and safety-significant (SS) structures, systems, and components (SSCs). Once identified, the PDSA establishes an appropriate set of safety functions (see PDSA Table 3-37), and for each safety function a set of functional requirements and performance criteria are established (see PDSA Chapter 4). The safety envelope for CMRR depends on maintaining control of these functions, requirements, and criteria. Review of the PRD, F&OR, SEMP, CMP, and FDD indicates that this control has not been established.

The PRD requires that CMRR develop a SEMP, and that the SEMP (1) establishes the hierarchy of technical documents and demonstrates how requirements are flowed down, (2) explains how requirements are allocated down to SSCs, and (3) that commits to crosswalk the safety case for SSCs with the design features. As noted above, the PDSA establishes the safety case. Review of the SEMP indicates that the systems engineering process does not include information generated from the PDSA. The SEMP describes an approach that can be labeled “a classic project management approach” (top-down derivation of functions and requirements), silent on the overall roll and preeminence of requirements generated from the PDSA.

The CMRR F&OR is consistent with the PRD, largely silent on requirements generated from the PDSA. The F&OR does include a requirement (R.0.7.m) that “Prior to Title I design of the CMRR, facility design features pertaining to meeting safety, security, and quality assurance criteria shall be identified and tracked as part of the project’s technical baseline.” It is not clear that the project has met this functional requirement.

The CMRR CMP establishes the overall approach to design control, using the CORE database to establish relationships between functions, requirements, and systems. The CMP indicates that requirements from the PDSA should be explicitly incorporated in the CORE database. However, review of the CMRR FDD suggests that key safety terms such as “safety functions” and “functional requirements” may not be consistent with how this terminology is intended in the PDSA. Review of the FDD design requirements indicates that the basis for these requirements is “code/standard” driven; the link and integration from the PDSA is missing. Given this, integration between the PDSA and System Design Descriptions (SDDs) is questioned.

The CMRR CMP also establishes the overall approach to change control. It is not clear how the change control process establishes appropriate change control of the PDSA safety envelope, specifically change control of SC and SS SSCs, and their safety functions and functional requirements. The change control process should include the appropriate level of control for critical safety-related decisions (note that the Safety Validation Report is how NNSA formally accepts the safety envelope).

Ultimately, SDDs have been developed for each CMRR structure and system. The content of SDDs is described in DOE-STD-3024; the intent of this standard is that SDDs should contain requirements that are derived from the PDSA. This requires that terminology (safety functions and functional requirements) between the PDSA and SDD be consistent to ensure that the safety envelope is properly translated into design requirements, and properly maintained throughout design and operation.

In conclusion, the CMRR project has not developed a requirements approach that formally integrates the safety envelope established by the PDSA. The SEMP is out-of-date and does not fulfill the requirements from the PRD. The CMRR FDD introduces terminology that results in inconsistency with the PDSA. As a result, there is lack of confidence that the FDD and SDDs will properly capture requirements from the PDSA.

**Basis for Finding:** (1) 10 CFR Part 830.122 (f) (2) Incorporate applicable requirements and design bases in design work and design changes.

(2) DOE Order 413.3A (5)(a) Requirements set forth in this Order are established to ensure adherence to the following principles: (2) Sound disciplined up-from planning, (4) Well-defined and managed performance baseline, and (5) Effective project management systems.

(3) DOE Order 413.3A (5)(i)(3) Change control ensure that project changes are identified, evaluated, coordinated, controlled, reviewed, approved/disapproved, and documented in a manner that best serves the project.

(4) DOE Standard 3024 The SDD is the central coordinating link among the engineering design documents, the facility authorization basis, and implementing procedures. The SDD should contain requirements that are derived from the associated safety analysis.

**Suggested Resolution or Path Forward:** The CMRR project needs to commit to revising the SEMP, CMP, and SDDs to explicitly incorporate requirements from the PDSA. The PDSA safety functions and functional requirements should be explicitly listed in the applicable SDDs. The CMRR project needs to develop a change control process that formally establishes an appropriate level of change control on SSC safety functions and functional requirements to maintain the safety envelope. Schedules for these revisions should be developed as part of the NNSA response.

**NNSA Response:** The NNSA is committed to revising the SEMP, CMP, and SDDs to explicitly incorporate the requirements from the PDSA. We agree that the safety functions and functional requirements should be explicitly listed in the appropriate SDDs. A detailed schedule for the completion of these activities (along with the remainder of the work to address the NNSA COAs contained in the PSVR (RO)) is in the attached document. The update of the plans and implementing procedures is included within COA-6.

To address the long term consistency of the safety function and functional requirements within the PDSA and the SDDs, these elements

will be included in the CORE database and reports for all of the documentation generated from CORE. This includes the PDSA and the SDDs. This is not intended to take the ownership of these descriptions from the safety basis team, but to place them into a common place for configuration control. The details of the schedule to accomplish this explicit conformance are included in the COA-6 portion of the schedule.

**DNFSB Final Resolution:** The CMRR project committed to revising the SEMP and CMP to explicitly incorporate the requirements from the PDSA. This commitment should ensure that PDSA safety functions, functional requirements, and performance criteria are properly integrated into the SDDs. The CMRR project provided a detailed schedule for the completion of these activities. The Board's staff has reviewed this schedule and found it acceptable.

The CMRR project committed to develop a formal change control process. The Board's staff reviewed several CMRR procedures and plans written to establish a formal change control process related to establishing a technical baseline and controlling technical changes to that baseline. The processes being put in place adequately establish a change control process.

The CMRR commitment to revising the SEMP and CMP, and establishing changes control procedures and plans results in Finding #3 being closed.

DNFSB:

  
Roy Kasdorf

7/16/2009  
Date

NNSA: NNSA Response Signed by James

McConnell, Acting NA-17 Date: April 21, 2009