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Department of Energy

Washington, DC 20585

July 2, 2010

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DOE SAFETY BOARD

The Honorable Peter S. Winokur
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, N.W., Suite 700
Washington, DC 20004-2901

Dear Mr. Chairman:

In a letter dated May 12, 2010, following a briefing on activities of the Hydrogen in Pipes and Ancillary Vessels (HPAV) Independent Review Team (IRT), the Defense Nuclear Facilities Safety Board (Board) provided input to Department of Energy (DOE) to help assure that the performance of this review will accomplish its objective. The Office of Environmental Management (EM), the Office of River Protection (ORP) and DOE's contractor (Bechtel National, Inc [BNI]) share the Board's perspective that this review has the potential to greatly assist DOE and BNI in assuring that the implementation of the HPAV criteria and methodology is technically sound and robust and achieves DOE's safety objectives. We thank the Board for their input and believe that attention to the key points you have made will help to assure the review objectives are met.

EM has communicated the key points of the Board letter to ORP and BNI to assure that they are addressed. The purpose of this letter is to update you on what BNI has done to address each of the points. Each of the key points and the project actions to address them is provided below.

"Based on the briefing, it appears to the Board that the review team is interpreting this direction to mean that it has already been demonstrated (e.g., DOE has issued a Safety Evaluation Report) that there is no public or worker safety issue, and that the review team's objective is to establish whether a hydrogen event could impair WTP's operability."

DOE and BNI have reinforced to the HPAV IRT that although DOE has issued a Safety Evaluation Report accepting BNI's proposed design criteria, the IRT is to perform its own assessment against the specific charge questions: 1) whether implementation of HPAV criteria and methods provide reasonable assurance that an HPAV event will not prevent Systems, Structures and Components from performing their intended safety function; 2) whether implementation of the HPAV criteria and methods provide reasonable assurance that an HPAV event will not significantly affect the Waste Treatment Plant (WTP) mission duration; and 3) whether the gas generation models used for HPAV design are suitable for their intended purpose.

"...DOE should seek to strengthen the review's emphasis on safety and to ensure that it delves into BNI's final criteria and methods in sufficient detail."



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DOE acknowledges that this is a critical area that required immediate reinforcement. To do this BNI directed two specific activities. First the HPAV IRT Charter was revised to reinforce that safety and reliability are the essential objectives of the HPAV criteria and methodology. Revision 3 of the Charter is provided as Enclosure 1 to this letter. Though previous revisions of the Charter charged the team with evaluating the safety adequacy of the HPAV criteria and methods, Revision 3 provides additional clarification and emphasis on safety. Second, the HPAV IRT Lead sent out a communication to all team members reinforcing the basic principles established for the review. This communication states, in part, "...we should not lose sight of the fact that safety is our most important concern." This communication is provided as Enclosure 2 to this letter. Safety will of course be a key focus of the HPAV IRT final report and conclusions.

"The briefing made it clear that the review team is focused on meeting its schedule. The Board believes this will be difficult to accomplish with high quality on a compressed schedule."

DOE agrees that the quality of the review is paramount over the schedule. That said, schedule targets are normally established to guide progress toward completion and to support the overall project schedule. BNI has been clear with the IRT that they will be afforded the required information, time and budget to complete a quality review that supports the review objectives. The review is still targeted to complete at the end of June 2010, however it is likely that certain review activities (i.e. final report) may extend into the first weeks of July. The revised Charter (Enclosure 1) also requires that the IRT assess in the final report whether sufficient time was afforded for the review. Additionally, BNI has also communicated to the IRT that it anticipates a subset of the team may be reconvened to review more mature design products when available, e.g. equipment qualification packages for in-line equipment.

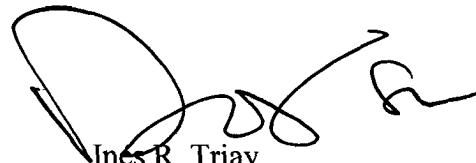
"...BNI significantly revised the criteria and methodology more than a week after the review was initiated...The team should review the final criteria and not rely on verbal discussion or partially completed work."

The HPAV Engineering Analysis Methods and Criteria Document revision (incorporating previous comments from other reviews) was issued after the start of the review; however, the IRT was provided the final draft of this revision at the start of their review, along with copies of all comments that provided the basis of the update. Therefore, the relevant technical information was available to the IRT at the start of the review. With that said, DOE and BNI agree with the intent of the Board's comment. BNI will provide written responses to IRT questions and comments. If any of the basis documents are revised to incorporate the resolutions BNI will identify specific changes in revised documents to the IRT. Committed changes to basis documents that result from the review will be documented using project action tracking procedures and reviewed with the IRT to ensure that they are technically acceptable.

Finally, DOE and BNI concur with the Board's concluding paragraph. The importance of preserving this independence was addressed in the recent communication from the HPAV IRT Lead to the team members (Enclosure 2). DOE and BNI will ensure through interaction with the team that the review charter is met and that sufficient time is allowed for a quality review. Since the goal with all major IRT review meetings and conference calls has been to include the Board Staff as observers, DOE and BNI hope that if the Board is concerned with any other elements as the review progresses that these concerns would be openly discussed with the Deputy Assistant Secretary for Safety and Security Program, Dr. Steven L. Krahn. As the Board clearly stated, "This review has the potential to greatly assist DOE and BNI [and DNFSB] in establishing a sound basis for hazard controls in WTP." DOE and BNI strongly believe that when the reviews are completed and the IRT recommendations are implemented the result will be a safer facility that will achieve greater operability, thereby contributing to a shorter waste processing mission life.

I again thank the Board for their input on this important review and look forward to briefing you on the results when it is complete. If you have any questions, please contact me or Dr. Steven L. Krahn, Deputy Assistant Secretary for Safety and Security Program at (202) 586-5151.

Sincerely,



Ines R. Triay
Assistant Secretary for
Environmental Management

Enclosures

cc: D. Chung, EM-2
Mark Gilbertson, EM-3 (Acting)
S. Krahn, EM-20
M. Campagnone, HS-1.1
S. Olinger, ORP
D. Knutson, ORP

HPAV Independent Review Team Charter

Project Description

The Hanford Tank Waste Treatment and Immobilization Plant (WTP) is a complex of radioactive waste treatment processing facilities designed and constructed by Bechtel National, Inc. (BNI) for the US Department of Energy (DOE). The facility will process the Hanford tank waste into a stable glass form. Hanford tank waste consists of approximately 190 million curies in 54 million gallons of highly radioactive and mixed hazardous waste stored in underground storage tanks at the Hanford Site. The tank waste includes solids (sludge), liquids (supernatant) and salt cake (dried salts that will dissolve in water, forming supernatant). The WTP will remediate, process, and store the radioactive and hazardous tank waste to meet regulatory requirements.

The DOE Office of River Protection (ORP) in Richland, Washington, is responsible for the activities necessary to remediate the Hanford tank waste. The Defense Nuclear Facilities Safety Board (DNFSB) oversees the safety of the WTP.

Through the WTP Prime Contract, BNI manages design, construction and commissioning of the WTP Site, which includes the following major facilities:

1. High-Level Waste (HLW)
2. Low-Activity Waste (LAW)
3. Pretreatment (PTF)
4. Analytical Laboratory (LAB)
5. Balance of Facilities (BOF)

At the suggestion of the DNFSB, BNI has chartered an Independent Review Team (IRT) to address the assurances of safety and reliability in designing to accommodate Hydrogen in Piping and Ancillary Vessels (HPAV) of PTF. The HPAV Review Team (HPAV IRT) will review the design criteria and implementation methods for evaluating postulated hydrogen events (deflagration and detonation) in piping and ancillary vessels in the PTF. The review is to provide added assurance that the criteria and methods provide a technically defensible, conservative approach to ensure the safety and reliability of the PTF design.

The 12 members of HPAV IRT are:

Team Lead

Dr. Roger Mattson, Mechanical Engineer

Gas Dynamics & Energetic Gas Events

Dr. Gabriel Ciccarelli, Mechanical Engineer, PE

Dr. John Lee, Mechanical Engineer

Design Acceptance Criteria & ASME Codes

Dr. William Koves, Mechanical Engineer

Rheology & Gas Bubble Formation

Dr. Avelino Eduardo Saez, Chemical Engineer

Modeling of Events Using Probabilistic Methods

Karl Fleming, Nuclear Science and Engineering
Structural Analysis of Dynamic Events

Dr. Robert Kennedy, Structural Engineer, PE
Stephen Short, Structural Engineer, PE

Dynamic Testing

Dr. David Williams, Civil Engineer, PE

Safety Analysis

David Pinkston, Chemical Engineer, Naval Reactor Engineer
Materials

Richard Moen, Metallurgical Engineer

Hydrogen Generation Rates

Dr. William Kubic, Chemical Engineer, PE

Scope Of Work

This review covers the development and implementation of the criteria and methods for preventing and mitigating the consequences of combustion of hydrogen and other gases in the piping and the ancillary vessels in PTF, including:

1. Calculations of the generation rates and lower flammability limits (HGRs and LFLs) for hydrogen and other flammable gases generated in PTF;
2. Calculations of the frequency and severity of postulated hydrogen events;
3. Modeling of hydrogen events (deflagrations and detonations) to provide input to the piping response analysis;
4. Calculation of the response of piping systems to hydrogen events;
5. Qualification of piping systems for hydrogen events;
6. Testing used to develop and validate criteria and methods;
7. Tools and procedures used to implement criteria and methods; and
8. The role and suitability of streamlined HPAV controls in the approved safety basis.

In each of these areas, the team will focus on the technical basis for and appropriateness of the analysis and assumptions used to establish and implement the HPAV criteria and methods.

Having reviewed these areas, the HPAV IRT is to answer three primary questions:

1. Will implementation of HPAV criteria and methods provide reasonable assurance that an HPAV event will not prevent Systems, Structures and Components (SSC) from performing their intended safety function?
2. Will implementation of the HPAV criteria and methods provide reasonable assurance that an HPAV event will not significantly affect the WTP mission duration (e.g., by disabling portions of the systems that cannot be repaired in a reasonable time)?
3. Are the gas generation models used for HPAV design suitable for their intended purpose?

Approach

BNI will hold an orientation meeting at its Richland offices to introduce the HPAV IRT members to one another and to the overall WTP design and HPAV criteria and methods. The meeting will include a site tour and an overview of the technical documents supporting the development of criteria and methods. DOE, URS and BNI consulting personnel will aid in this orientation phase of the project. BNI will provide access to all documents and name a technical point-of-contact for each review area and discipline. The HPAV IRT will have unlimited access to all WTP and HPAV related data, questions, responses, correspondence, and reports generated by BNI, its consultants, DOE staff and consultants and DNFSB staff and consultants.

The HPAV IRT members will form working groups along the lines of technical disciplines to facilitate the interactions among experts and to focus their reviews. For example, the working groups might be 1) quantitative risk assessment, 2) gas phenomena and 3) standards and analysis for piping design. In conjunction with the team leader, HPAV IRT members will define their individual and working group plans for conducting reviews in their area of cognizance. Possible approaches to be used by the HPAV IRT members include: document reviews; discussions with BNI technical personnel, BNI consultants, DOE personnel and DOE consultants; and check calculations or sensitivity analysis to be performed at HPAV IRT direction by BNI. HPAV IRT members shall render minutes of all meetings and discussions, including ad hoc meetings and discussions. All media used in the review or generated by the HPAV IRT shall be retained and filed by BNI in a HPAV IRT project file.

BNI will maintain a list of all scheduled review sessions, which list shall be made available to facilitate observation by DOE and DNFSB personnel. The team leader will maintain a log of the subject matter and attendees for all HPAV IRT discussions and include the log as part of HPAV IRT's final report.

Schedule

The team leader shall prepare a first draft report, a final draft report and a final report based on input from the HPAV IRT members. The tentative deadlines for completion of the draft reports are June 1 and June 22, respectively. Both drafts shall be reviewed by BNI for factual accuracy within one week of their completion. Editing and production of a final report shall be completed one week after receipt of BNI's review of the final draft report. The final report shall include a summary of the team's approach; identification of the people, documents and data relied upon and the findings, conclusions and recommendations of the working groups and the team. The Team shall also assess in its final report whether sufficient time was afforded for its review.

Full team meetings, open to observation by BNI, DOE and DNFSB personnel and consultants, are as follows:

1. April 13-16: Orientation and planning;
2. June 2-3: Review of first draft report;
3. June 22-23: Review of final draft report.

See Attachment 1, Team Availability and Meeting Chart, for additional information.

Communication from Dr. Roger Mattson to the HPAV Independent Review Team

From: Roger Mattson [rdmattson@comcast.net]
Sent: Thursday, May 20, 2010 6:05 PM
To: Bill Koves; Richard Moen; Karl Fleming; John Lee; David Pinkston;
Bill Kubic; David Williams; Stephen Short; Gaby Ciccarelli; Robert
Kennedy; Eduardo Saez
Cc: Ashley, Gregory; Shirley Olinger; Roy Kasdorf
Subject: Basic Principles of HPAV IRT

HPAV IRT Members,

Now that we are reaching the mid point of our review, I am writing to reinforce some of the basic principles that were established for our effort, as follows.

1. Our Charter lists three Primary Questions for us to answer. The first of those questions is, "Will implementation of HPAV criteria and methods provide reasonable assurance that an HPAV event will not prevent Systems, Structures and Components (SSC) from performing their intended safety function?" Although there are other words in the Charter that refer to the need to also assure that the reliability and the duration of the mission of PTF are not adversely affected by BNI's new design approach for HPAV, we should not lose sight of the fact that safety is our most important concern. We are expected to thoroughly probe whether the assurances of safety provided by the revised design approach are technically sound and robust.
2. As we have seen, some elements of the new approach are still being finalized by BNI while our review is underway. Our team needs to delve deeply enough into BNI's new design approach to assure that we fully understand the criteria and methods that it employs and that BNI has adequately documented its intentions for implementation of that approach. If we identify elements of the approach that are not finalized when we have otherwise completed our review, we should be careful to identify them in our report and we should address the impact on our conclusions.
3. It is important that we continue to preserve our independence. In selecting us for participation on this team, BNI was careful to assure that we were independent from the HPAV design effort. We must preserve our independence by exercising a professional, even-handed evaluation of the various views and concerns that have been expressed by others outside the team, including DNFSB members and staff, as well as BNI, DOE and their consultants. If we come to our work with a questioning attitude and if we value technical insights about the adequacy of the approach from wherever they arise, I am confident that our evaluations and conclusions will be independent.
4. Several of you have expressed concern with the amount of documentation that we must read and understand in our review. My sense is that we are coming to know which documents are most important for our particular technical disciplines and that DNFSB staff, BNI, DOE, their consultants and our fellow team members have assisted our efforts to do so. Please also recall that BNI provided us copies of its answers to questions raised by DOE and DNFSB before the creation of our team. That information should aid you in

Communication from Dr. Roger Mattson to the HPAV Independent Review Team

understanding the evolution of concerns that were raised in the past and in identifying which documents are most important in your technical discipline. However, as we press forward to document our evaluations and conclusions, if you feel that more resources are required, you should tell me as soon as possible and I will assure that you are afforded the additional resources. In addition, as we draft our report we should be as clear as we can in identifying what we reviewed and what we did not review in reaching our conclusions, including the identification of any important parts of BNI's methodology that are still under development.

In summary, I urge you to continue to exercise diligence in hewing to the standards articulated in our Charter. If you have questions about any aspect of those standards or the reminders offered above, please communicate them to me for further discussion.

Roger

Roger J. Mattson, PhD
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