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**DEFENSE NUCLEAR FACILITIES  
SAFETY BOARD**

Washington, DC 20004-2901



June 09, 2011

The Honorable Steven Chu  
Secretary of Energy  
U.S. Department of Energy  
1000 Independence Avenue, SW  
Washington, DC 20585-1000

Dear Secretary Chu:

On June 09, 2011, the Defense Nuclear Facilities Safety Board (Board), in accordance with 42 U.S.C. § 2286a(a)(5), unanimously approved Recommendation 2011-1, *Safety Culture at the Waste Treatment and Immobilization Plant*, which is enclosed for your consideration.

After you have received this Recommendation and as required by 42 U.S.C § 2286d(a), the Board will promptly make it available to the public. The Board believes that this Recommendation contains no information that is classified or otherwise restricted. To the extent that this Recommendation does not include information restricted by the Department of Energy (DOE) under the Atomic Energy Act of 1954, 42 U.S.C. §§ 2161-2168, as amended, please arrange to have it placed promptly on file in your regional public reading rooms. The Board will also publish this Recommendation in the *Federal Register*.

The Board will evaluate DOE's response to this Recommendation in accordance with the Board's Policy Statement 1, *Criteria for Judging the Adequacy of DOE Responses and Implementation Plans for DNFSB Recommendations*.

Sincerely,

Peter S. Winokur, Ph.D.  
Chairman

Enclosure

c: Mrs. Mari-Jo Campagnone

**RECOMMENDATION 2011-1 TO THE SECRETARY OF ENERGY**  
***Safety Culture at the Waste Treatment and Immobilization Plant***  
**Pursuant to 42 U.S.C. § 2286a(a)(5)**  
**Atomic Energy Act of 1954, As Amended**

**Dated: June 09, 2011**

**Introduction**

Secretary of Energy Notice SEN-35-91, *Nuclear Safety Policy*, issued on September 9, 1991, and superseding policy statement #2 of DOE Policy 420.1, *Department of Energy Nuclear Safety Policy*, issued on February 8, 2011, state that the Department of Energy (DOE) is committed to establishing and maintaining a strong safety culture at its nuclear facilities. The Defense Nuclear Facilities Safety Board (Board) has determined that the prevailing safety culture at the Waste Treatment and Immobilization Plant (WTP) is flawed and effectively defeats this Secretarial mandate. The Board's investigative record demonstrates that both DOE and contractor project management behaviors reinforce a subculture at WTP that deters the timely reporting, acknowledgement, and ultimate resolution of technical safety concerns.

**Background**

In a letter to the Secretary of Energy dated July 27, 2010, the Board stated that it would investigate the health and safety concerns at the WTP at Hanford raised in a letter to the Board dated July 16, 2010, from Dr. Walter Tamosaitis.

The Board's investigation focused on allegations raised by Dr. Tamosaitis, a contractor employee removed from his position at WTP, a construction project in Washington State funded by DOE and managed by Bechtel National, Incorporated (BNI). The Board's inquiry did not attempt to assess the validity of Dr. Tamosaitis's retaliation claim, but rather, as required by the Board's statute, examined whether his allegations of a failed safety culture at WTP, if proven true, might reveal events or practices adversely affecting safety in the design, construction, and operation of this defense nuclear facility.

The Board is required by statute to investigate any event or practice at a defense nuclear facility which it determines may adversely affect public health and safety. The Board conducted this investigation pursuant to its investigative power under 42 U.S.C. § 2286a(a)(2). During the course of the Board's inquiry, 45 witnesses were interviewed and more than 30,000 pages of documents were examined. The Principal Investigator was Joel R. Schapira, Deputy General Counsel, assisted by John G. Batherson, Associate General Counsel, and Richard E. Tontodonato, Deputy Technical Director. The record of the investigation is non-public and will be preserved in the Office of the General Counsel's files.

During the period of the investigation, the Board held a public hearing regarding safety issues at WTP. During that hearing the Board received additional information related to the kind

of safety culture concerns raised by Dr. Tamosaitis. Consequently, the investigation was expanded to review these new concerns.

Secretary of Energy Notice SEN-35-91, *Nuclear Safety Policy*, issued on September 9, 1991, and superseding policy statement #2 of DOE Policy 420.1, *Department of Energy Nuclear Safety Policy*, issued on February 8, 2011, state that DOE is committed to establishing and maintaining a strong safety culture at its nuclear facilities. The investigation's principal conclusion is that the prevailing safety culture at this project effectively defeats this Secretarial mandate. The investigative record demonstrates that both DOE and contractor project management behaviors reinforce a subculture at WTP that deters the timely reporting, acknowledgement, and ultimate resolution of technical safety concerns.

A key attribute of a healthy safety culture as identified by DOE's Energy Facility Contractors Group and endorsed by Deputy Secretary of Energy memorandum dated January 16, 2009, and in the Nuclear Regulatory Commission's proposed policy statement on safety culture (NRC-2010-0282, dated January 5, 2011), is that leaders demonstrate clear expectations and a commitment to safety in their decisions and behaviors. The Board's investigation found significant failures by both DOE and contractor management to implement their roles as advocates for a strong safety culture.

The record shows that the tension at the WTP project between organizations charged with technical issue resolution and development of safety basis scope, and those organizations charged with completing design and advancing construction, is unusually high. This unhealthy tension has rendered the WTP project's formal processes to resolve safety issues largely ineffective. DOE reviews and investigations have failed to recognize the significance of this fact. Consequently, neither DOE nor contractor management has taken effective remedial action to advance the Secretary's mandate to establish and maintain a strong safety culture at WTP.

Taken as a whole, the investigative record convinces the Board that the safety culture at WTP is in need of prompt, major improvement and that corrective actions will only be successful and enduring if championed by the Secretary of Energy. The successful completion of WTP's mission to remove and stabilize high-level waste from the tank farms is essential to protect the health and safety of the public and workers at Hanford. However, the flawed safety culture currently embedded in the project has a substantial probability of jeopardizing that mission.

## **Findings**

### **Finding One: A Chilled Atmosphere Adverse to Safety Exists**

In a letter to the Defense Nuclear Facilities Safety Board (Board) dated July 16, 2010, Dr. Walter Tamosaitis, a former engineering manager at the Waste Treatment and Immobilization Plant (WTP), alleged that he was removed from the project because he identified certain technical issues that in his view could affect safety. Dr. Tamosaitis also alleged that there was a failed safety culture at WTP. With full understanding that the formal claims of retaliation raised by Dr. Tamosaitis would be looked into by others, the Board decided that his assertions raised serious questions about safety culture and safety management at WTP. From late July

2010 to May 2011, the Board reviewed a large number of documents and interviewed a substantial number of persons, including Dr. Tamosaitis, to assess whether or not his allegations of safety issues and of a faulty safety culture were borne out. The Board's investigation later expanded in scope to address matters related to the Board's October 2010 public hearing at Hanford on safety issues at WTP. This phase of the investigation consisted of closed hearings at which sworn testimony was elicited from DOE and contractor personnel.

The Board finds that the specific technical issues identified by Dr. Tamosaitis in his July 16, 2010, letter were known and tracked by the WTP project. In a WTP project managers' meeting on July 1, 2010, Dr. Tamosaitis raised safety concerns related to the adequacy of vessel mixing, technical justifications for closing mixing issues, and other open technical issues. The next day he was abruptly removed from the project. This sent a strong message to other WTP project employees that individuals who question current practices or provide alternative points of view are not considered team players and will be dealt with harshly.

The Board finds that expressions of technical dissent affecting safety at WTP, especially those affecting schedule or budget, were discouraged, if not opposed or rejected without review. Project management subtly, consistently, and effectively communicated to employees that differing professional opinions counter to decisions reached by management were not welcome and would not be dealt with on their merits. There is a firm belief among WTP project personnel that persisting in a dissenting argument can lead, as in the case of Dr. Tamosaitis, to the employee being removed from the project or reassigned to other duties. As of the writing of this finding, Dr. Tamosaitis sits in a basement cubicle in Richland with no meaningful work. His isolated physical placement by contractor management and the lack of meaningful work is seen by many as a constant reminder of what management will do to an employee who raises issues that might impact budget or schedule.

Other examples of a failed safety culture include:

- The Board heard testimony from several witnesses that raising safety issues that can add to project cost or delay schedule will hurt one's career and reduce one's participation on project teams.
- A high ranking safety expert on the project testified that the expert felt next in line for removal after Dr. Tamosaitis because of the expert's refusal to yield to technically unsound positions on matters affecting safety advanced by DOE and contractor managers responsible for design and construction at the WTP. This safety expert's concern was validated by a senior DOE official in separate sworn testimony.
- A report prepared by a subcontractor on the WTP project, "URS Report of Involvement in WTP Investigation," discusses the "tension between organizations charged with technical issue resolution and development of safety basis related scope and those organizations charged with completing design and advancing construction. Some level of such tension is normal and healthy in projects of such scope and complexity; but at WTP, this tension is higher than what might be expected or desired. Some individuals whose personalities tend toward avoidance of conflict could view the organizational environment as not conducive to raising issues or

perhaps even potentially suppressing some issues that might deter progress or that might add cost.”

- The investigative record shows that the DOE Office of River Protection Employee Concerns program is not effective. One safety expert explicitly testified that employees would not and did not use the program, and believed that individuals running the program would “bury issues” brought to them. The record shows that in the removal of Dr. Tamosaitis, Human Resources (HR) for URS was interested only in implementing management’s demand that the employee be removed immediately. The record shows HR did not assert any consideration or concern regarding the effect the process and manner of his removal would have on the remaining workforce and the effectiveness of the contractor employee protection program required under 10 CFR Part 708.
- An independent review of the WTP safety culture performed by DOE’s Office of Health, Safety and Security (HSS) found that “a number of individuals have lost confidence in management support for safety, believe there is a chilled environment that discourages reporting of safety concerns, and/or are concerned about retaliation for reporting safety concerns. These concerns are not isolated and warrant timely management attention, including additional efforts to determine the extent of the concerns.” Although the HSS report stated that most WTP personnel did not share these opinions, the Board notes that personnel interviewed by HSS were escorted to their interviews by management. The Board’s record shows that involving management with the interviews clearly can inhibit the willingness of employees to express concerns. In its own way, DOE’s decision to allow management to be involved in the HSS investigation raises concerns about safety culture.

This environment at WTP does not meet key attributes established by DOE’s Energy Facility Contractors Group, and endorsed by the Deputy Secretary of Energy, that describe a strong safety culture: DOE and contractor leadership must have a clear understanding of their commitment to safety; they are the leading advocates of safety and the public trust demands that they demonstrate their commitment in both word and action. The Board’s investigation concludes that the WTP project is not maintaining a safety conscious work environment where personnel feel free to raise safety concerns without fear of retaliation, intimidation, harassment, or discrimination.

#### **Finding Two: DOE and Contractor Management Suppress Technical Dissent**

The HSS review of the safety culture on the WTP project “indicates that BNI has established and implemented generally effective, formal processes for identifying, documenting, and resolving nuclear safety, quality, and technical concerns and issues raised by employees and for managing complex technical issues.” However, the Board finds that these processes are infrequently used, not universally trusted by the WTP project staff, vulnerable to pressures caused by budget or schedule, and are therefore not effective. Previous independent reviews, contractor surveys, investigations, and other efforts by DOE and contractors demonstrate repeated, continuing identification of the same safety culture deficiencies without effective resolution.

Suppression of technical dissent is contrary to the principles that guide a high-reliability organization. It is essential that workers feel empowered to speak candidly without fear of retribution or criticism. In extreme cases, refusal to consider a different view of a safety issue can lead to catastrophic consequences. WTP is a complex and difficult project that is essential to the nation's nuclear waste remediation program. Therefore, federal and contractor managers must make a special effort to foster a free and open atmosphere in which all competent opinions are judged on their technical merit, to sustain or improve worker and public safety first and foremost, and then evaluate potential impacts on cost and schedule.

One of the primary examples of suppressing technical information is a study that was performed by BNI in July 2009 on deposition velocity, a parameter used in modeling the offsite transport of radioactive particles for nuclear facility safety analyses. The study found that the correct value of the dry deposition velocity for Hanford fell in the range of 0.1 to 0.3 cm/sec. The Board's investigation includes testimony by the former manager of DOE's Office of River Protection and the DOE Chief of Nuclear Safety in Washington, DC, that the results of this study were not shared with them. Consequently, DOE continued to follow its policy requiring the WTP project to use a less conservative default value of 1.0 cm/sec for dry deposition velocity. In the fall of 2010, the Chief of Nuclear Safety hired an independent consultant to investigate the issue. This consultant also found that deposition velocity fell in the range of 0.1 to 0.3 cm/sec, information that was already available to the project in the summer of 2009. Suppression of the 2009 study delayed the identification of properly conservative values for dry deposition velocity to use in the safety analyses that determine the need for safety-related controls for WTP facilities. Once this information was made available to DOE's Office of Health, Safety and Security, a technical study ensued that determined the need for a more conservative value of deposition velocity to serve as a default value.

This problem also manifested itself when one of the expert witnesses, a nuclear safety professional, specifically asked by the Board to testify at the Board's October 2010 public hearing on WTP safety issues, failed to support the DOE policy on the appropriate value for dry deposition velocity. This witness testified that using DOE's prescribed default value for the dry deposition velocity in safety basis calculations could not be justified if it were known to be non-conservative for the Hanford Site. At the time of the hearing, the witness understood the correct value of deposition velocity was not being used in calculations of potential dose consequences to the public receptor and was unwilling to simply state the DOE position that a default value could be used or justified. The expert witness later testified for the record that DOE was fully aware of the July 2009 study on dry deposition velocity at the time of the public hearing. The expert witness' testimony during the public hearing clashed with the position taken by senior management in the DOE Office of River Protection and by the DOE Chief of Nuclear Safety.

The testimony of several witnesses confirms that the expert witness was verbally admonished by the highest level of DOE line management at DOE's debriefing meeting following this session of the hearing. Although testimony varies on the exact details of the verbal interchange, it is clear that strong hostility was expressed toward the expert witness whose testimony strayed from DOE management's policy while that individual was attempting to adhere to accepted professional standards. Testimony by a senior DOE official confirmed the

validity of the expert witness' concerns. In addition, the expert witness testified that they felt pressure to change their testimony, but refused to do so.

Management behavior of this kind creates an atmosphere in which workers are reluctant to speak candidly for fear of retribution or criticism. Whether or not this behavior possibly violates federal law is not for the Board to determine; however, the Board does assert that fear of retribution visited on a competent professional for offering an honest opinion in a public hearing is incompatible with the objective of designing and building a safe and operationally sound nuclear facility and sustaining a healthy safety culture.

Another example of failure to act on technical information in a timely manner concerns a report related to the occurrence of a potential criticality event at WTP. In April 2010, the WTP project issued a plan of action to address recommendations of the WTP Criticality Safety Support Group, specifically, to review historical information on plutonium dioxide (PuO<sub>2</sub>) wastes discharged by the Plutonium Finishing Plant to the tank farms. The report of the review was completed and submitted to the WTP project in August 2010. A key finding of the report was that the maximum PuO<sub>2</sub> particle size of 10 microns assumed in WTP criticality safety analyses was not conservative. Instead of receiving immediate attention, the report languished without action until February 2011.

Once the report was finally reviewed, the WTP project reached the initial conclusion that it may no longer be possible to assume that criticality in WTP is an incredible occurrence. (Based on this information, the Hanford Tank Farms operating contractor halted activities involving the affected tanks.) If criticality is confirmed to be credible, changes in the WTP criticality strategy will be required. This will result in changes to the existing safety basis and require an assessment of the existing WTP design to determine if design changes are required. Depending upon the magnitude of the criticality hazard, significant changes in the WTP design may be necessary. DOE was not informed of this important finding in a timely manner, and actions to better characterize the PuO<sub>2</sub> problem were delayed by approximately 6 months because the WTP project delayed evaluation of the report.

## **Recommendation**

Taken as a whole, the investigative record convinces the Board that the safety culture at WTP is in need of prompt, major improvement and that corrective actions will only be successful and enduring if championed by the Secretary of Energy. The Board recommends that the Secretary of Energy:

1. assert federal control at the highest level and direct, track, and validate the specific corrective actions to be taken to establish a strong safety culture within the WTP project consistent with DOE Policy 420.1 in both the contractor and federal workforces,
2. conduct an Extent of Condition Review to determine whether these safety culture weaknesses are limited to the WTP Project, and

3. conduct a non-adversarial review of Dr. Tamoszitis' removal and his current treatment by both DOE and contractor management and how that is affecting the safety culture at WTP.

The Board urges the Secretary to avail himself of the authority under the Atomic Energy Act (42 U.S.C. § 2286d(e)) to "implement any such recommendation (or part of any such recommendation) before, on, or after the date on which the Secretary transmits the implementation plan to the Board under this subsection."



Peter S. Winokur, Ph.D., Chairman