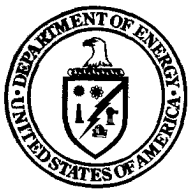

Department of Energy
Washington, DC 20585

June 30, 2010

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 your March 15, 2010, letter the Defense Nuclear Facilities Safety Board (Board) expressed concern over recently approved documented safety analysis in which the mitigated dose consequences to the public exceeded Department of Energy's (DOE) Evaluation Guideline presented in Appendix A to DOE Standard 3009. Your letter contained two sets of questions. On June 10, 2010, Daniel Poneman, Deputy Secretary of Energy, addressed your first set of questions related to the regulatory status of DOE Standard 3009 and our regulatory framework for ensuring adequate protection of the public. The Deputy Secretary requested the responsible program offices to provide information directly to you on their defense nuclear facilities in which accident analysis calculations do not demonstrate that safety class controls will mitigate dose consequences to below the DOE Standard 3009 Evaluation Guideline and what barriers exist to prevent DOE from meeting the Evaluation Guideline (i.e. the second set of questions).

This letter provides Environmental Management's (EM) response (Enclosure 1). The only DOE facility managed by EM that appears to exceed the Evaluation Guideline with Documented Safety Analysis (DSA) credited Safety Class controls is the Concentration, Storage, and Transfer Facility (CSTF) at the Savannah River Site (SRS). SRS CSTF (i.e., Tank Farms) have unmitigated dose consequences above the Evaluation Guideline. In our review, we noted that for the events where the dose consequence is above the Evaluation Guideline, the DOE Safety Evaluation Report (SER), which approved the DSA, appears to credit controls and analyses that should, more appropriately, be contained in the Documented Safety Analysis (DSA). Specifically, the controls that prevent explosions associated with seismic events and accompanying analyses are expected to be in the DSA rather than residing in the SER. Therefore, EM Headquarters requested SRS to resolve this by revising the SRS CSTF DSA to better document the controls and analyses applied to prevent these accidents, and to provide a schedule for completion of this activity (Enclosure 2). EM Headquarters will monitor completion of this work, and keep the Board staff informed. A report concerning the SRS CSTF and the response to your questions is enclosed.

If you have any questions or require further information, please contact me or Dr. Steven L. Krahn, Deputy Assistant Secretary for Safety and Security Program at (202) 586-5151.

Sincerely,

Inés R. Triay
Assistant Secretary for
Environmental Management

Enclosures

SEPARATION

PAGE

1. Which defense nuclear facilities do not have a set of Safety Class controls that reduce the mitigated dose consequences to the public below the Evaluation Guideline (EG)?

The Concentration, Storage, and Transfer Facility (CSTF) DSA at SRS has one scenario, Seismic Event, with a reported mitigated offsite consequence which exceeds the EG. The CSTF Documented Safety Analysis (DSA) postulates that a Seismic Event causes multiple failures to occur which release radioactive material. With the exception of a waste tank explosion, all the other failures, crediting the identified Safety Class controls, sum up to an offsite dose below the EG. However, a waste tank explosion, due to the release of trapped hydrogen within the waste, is postulated to occur and is assumed to cause the offsite consequence to exceed the EG.

Waste storage tanks in CSTF (aka Tank Farms) at Savannah River Site (SRS) generate flammable gases which, if ignited, have the potential to cause the release of radioactive materials. The amount of material released depends upon the amount of energy released (e.g., deflagration versus detonation) and the nature of waste materials present during the explosion. Rather than developing a bounding analysis of the radiological consequences associated with a postulated waste tank explosion, it was conservatively assumed such an event would exceed offsite EG and controls were developed to prevent the consequences.

With the exception of tank explosions resulting from trapped flammable gases released due to a Seismic Event, implementation of the Safety Class controls described below prevent the accumulation of flammable gases during normal operations and facility upsets:

- Waste Tank Purge Ventilation System – purges waste tank vapor space to prevent accumulation of flammable gases.

- Waste Tank Ventilation Low Flow Interlock and Alarm – For tanks where waste disturbing activities could release significant quantities of flammable gases, loss of the Waste Tank Purge Ventilation System trips a control room alarm and interlock to stop activities that could release trapped gas (e.g., sludge mixing).

- Flammability Control Program – In conjunction with a Safety Class Quiescent Time, Salt Dissolution/Interstitial Liquid Removal, and Pump Run Programs, the Flammability Control Program ensures flammable conditions will not be created upon loss of the Waste Tank Purge Ventilation System.

- Several other Safety Class controls were established to protect assumptions made during development of the Safety Class controls described above.

Tank explosions resulting from flammable gases released due to a Seismic Event represent a subcategory that requires additional measures to demonstrate reasonable assurance of adequate protection. A Seismic Event at SRS is postulated to disturb tank wastes and release flammable gases that can accumulate over time in saltcake, settled sludge, and slurried sludge. The CSTF safety analysis concludes having seven days after an earthquake would allow time to restore or

provide ventilation to prevent a waste tank explosion. Additional Safety Class controls were developed to prevent public exposure resulting from credible seismically induced tank explosions:

- Flammability Control Program – In conjunction with the Safety Class Quiescent Time Program, the Flammability Control Program ensures.
    - Only 7 tanks can reach LFL in less than 24 hours following a seismic event
    - Only an additional 7 tanks can reach LFL between one and seven days following a seismic event

Therefore, out of the remaining 49 SRS tanks containing radioactive waste, the safety analysis defines controls that prevent flammable conditions in 34 tanks following a Seismic Event. Of the remaining 14 tanks that could potentially develop flammable vapor space conditions within 7 days, significant amounts of alpha emitters (commonly found in sludge material) would have to be released for an explosion to challenge the offsite Evaluation Guideline.

Activities/conditions resulting in tanks reaching a flammable condition within seven days of a design basis Seismic Event fall into three broad categories:

1. Transfer of liquid waste (supernate) into waste tanks results in smaller vapor spaces which in turn result in shorter times to reach flammable conditions for a given gas generation rate.

2. Evaporator operation results in salt receipt tanks with accumulated saltcake (due to the cooling process), which results in trapped gas within the saltcake and a smaller vapor space. Often the supernate covering the saltcake is decanted off.

3. Evaporation of supernate from a settled sludge tank, leaving "dried" sludge exposed to the vapor space.

For the first two categories above, the explosion would occur when sludge is covered with supernate (far less dose per gallon released than sludge) or when only salt cake is exposed (again, far less dose per gallon released than sludge), which would result in lower dose consequences. Reference is made in the DSA to a calculation performed using bounding supernate as the Material at Risk and the resulting offsite consequences would be well below the offsite Evaluation Guideline.

Only one tank, Tank 15, falls into the third category, and the CSTF DSA and TSRs prohibit a new dry sludge tank from being created. Although current calculations using the DSA prescribed methodology show that Tank 15 would reach LFL within 24 hours post-earthquake, these same calculations would also over-predict Tank 15 would have an equilibrium flammable gas concentration exceeding LFL in the tank vapor space under normal operating conditions. However, actual measured equilibrium flammable gas concentration is below 1% of the lower flammability limit. Informal calculations have been performed, using the measured equilibrium

concentration as an initial condition, showing that Tank 15 would not become flammable within seven days of a Seismic Event.

DOE-SR is evaluating the need to change the methodology for Tank 15 to more accurately reflect its post-seismic time to LFL. Informal calculations were also performed for Tank 15 to show the consequences, if a deflagration were to occur, is within the range of consequences postulated for the first two categories above. In addition, plans are being made to re-wet Tank 15, which would result in Tank 15 being covered by the discussion above for the first category.

As further defense in depth, the CSTF Safety Basis credits the Event Response Program for the installation and operation of a supplemental ventilation system following a Seismic Event. Installation of supplemental ventilation is prioritized on whether tanks reach flammable conditions in less than 24 hours or less than 7 days, and this prioritization is tracked by the Safety Class Flammability Control Program. The supplemental ventilation systems consist of portable generators, blowers and flexible ducts/filters that are stored within a structure designed to withstand a seismic event (II over I) and are restrained such that they would not be damaged during the Seismic Event.

Thus, although the DSA states the offsite consequence exceeds the EG, DOE-SR concluded in the Safety Evaluation Report (SER) supporting approval of the CSTF DSA the likelihood of the earthquake actually causing the tank vapor space to reach flammable conditions is very low and the realistic consequences, if the vapor space did reach LFL and deflagrate, would be below the EG. The ability of an earthquake to mobilize the settled sludge such that a prompt release of trapped flammable gas as postulated in the DSA is very unlikely, given that it has required multiple, large slurry pumps to operate for significant periods of time in past sludge removal campaigns (e.g., Tanks 7F, 8F, 11H, 12H, etc.) in order to mobilize aged, settled sludge. Similarly, significant releases from saltcake due to an earthquake are unlikely in that no mechanism for dissolving the saltcake, removing the interstitial liquid, or reducing the static head pressure on the saltcake (the three postulated means to release trapped gas associated with saltcake) is involved. As discussed previously above, the consequences involving supernate, saltcake, or Tank15 dried sludge are all expected to be below the EG. Finally, the existing commitment to close waste tanks (which involves slurrying and removing the sludge and dissolving and removing the saltcake from waste tanks) is eliminating this risk. Therefore, DOE-SR concluded no direct actions were warranted.

2. For these facilities, what barriers exist to prevent DOE from meeting the Evaluation Guideline?

DOE evaluated the feasibility of installing ventilation system modifications that would be sufficient to prevent flammable conditions in a tank vapor space due to a seismically induced trapped flammable gas release. Conceptually, the modification would result in a system with a high enough flow rate to prevent accumulation of flammable quantities of gas in the tank vapor space. A calculation (U-CLC-G-00025, Rev. 0) was completed to determine the flow rate needed to prevent a flammable mixture from forming. The results indicated 30,000+ cubic feet per minute would be needed to dilute the hydrogen as it was being released. This calculation concluded providing such a high flow rate on a waste tank would not be practical.

3. Which of these facilities deviate from, or have been unable to meet, DOE's position in response to items 1 and 2 on the previous page, and to what extent?

The CSTF DSA was developed using DOE Standard 3009 as a Safe Harbor methodology. The DSA in conjunction with its associated SER provide the basis for DOE-SR's conclusion that the goals of DOE Standard 3009 were achieved. However, additional work is warranted to better define waste tank explosion consequences and to expand the DSA's tank explosion accident analysis discussion to demonstrate clearly how the facility meets the goals of DOE Standard 3009, Appendix A.

SEPARATION

PAGE

Department of Energy
Washington, DC 20585

JUN 2 2 2010

MEMORANDUM FOR JACK R. CRAIG
MANAGER
SAVANNAH RIVER OPERATIONS OFFICE

FROM: DR. STEVEN L. KRAHN
DEPUTY ASSISTANT SECRETARY FOR
SAFETY AND SECURITY PROGRAM
ENVIRONMENTAL MANAGEMENT

SUBJECT: Revision of the Documented Safety Analysis for the Concentration, Storage and Transfer Facilities

On March 15, 2010, the Defense Nuclear Facilities Safety Board (Board) sent a letter to the Deputy Secretary requesting clarifications regarding the application of Department of Energy (DOE) Standard 3009. The Board asked, among other things, which defense nuclear facilities do not have a set of safety class controls that reduce the mitigated dose consequences to the public below the Evaluation Guideline, and for these facilities, what barriers exist to prevent DOE from meeting the Evaluation Guideline.

On May 26, 2010, I asked EM site managers to answer these two questions. Savannah River's response indicated that Concentration, Storage and Transfer Facilities (CSTF) (i.e., Tank Farms) had unmitigated dose consequences above the Evaluation Guideline. As part of our evaluation of this response we reviewed the applicable parts of the CSTF Documented Safety Analysis (DSA) and the accompanying Safety Evaluation Report (SER). We noticed that for the events where the dose consequence is above the Evaluation Guideline, the SER appears to credit controls and analyses that should, more appropriately, be contained in the DSA. Specifically, the controls that prevent explosions associated with seismic events and accompanying analyses are expected to be in the DSA rather than residing in the SER.

Therefore, I am asking that that you resolve this by revising the CSTF DSA to better document the controls and analyses applied to prevent these accidents. Please provide me a schedule for completion of this activity. If you have any questions, please contact me at (202) 586-5151.

cc: M. Gilbertson, EM-3/EM-50
T. Spears, EM-21