Savannah River Site

Citizens Advisory Board

Recommendation #245

Liquid Waste Systems Approach

Background

The Defense Nuclear Facilities Safety Board (DNFSB) initially identified concerns related to the performance category (PC) in the confinement barriers necessary for worker protection during natural phenomena hazard events (e.g. seismic events - earthquakes) designations of the Salt Waste Processing Facility (SWPF) in August 2004. DOE agreed in November 2005, to modify the SWPF design, resulting in an approximate two-year delay in the planned startup of SWPF. The Savannah River Site (SRS) Citizens Advisory Board (CAB) reviewed the decision process used by the Department of Energy (DOE) to change the design basis of the SWPF at the SRS to PC-3 seismic qualifications. In Recommendation #227, the SRS CAB requested that DOE review the methodology used in reaching the PC-3 decision and explain how or if the methodology would be changed for future decisions (Ref. 1).

As reported, the decision was largely qualitative and did not use a risk-based systems analysis. Furthermore, no cost-benefit analysis was performed and the decision process did not include an evaluation of the risk the decision had on the extended long-term operation of the High-Level Waste (HLW) tank farm (Ref. 2).

In a companion recommendation related to the seismic decision (Ref. 3), Recommendation #230 noted the need for a risk-based systems approach for the HLW program using quantitative analyses wherever appropriate. The SRS CAB suggested that this analysis should consider how impacts to any single system affect the functional ability of the entire system and follow the National Academy of Sciences recommendations as outlined in the National Research Council report. In early 2005, The National Research Council published Risk and Decisions; About Disposition of Transuranic and High-Level Radioactive Waste. It pointed out weaknesses in the DOE risk assessment process and noted that other studies and organizations had previously identified these weaknesses. The report made specific recommendations concerning how DOE could adopt a risk-informed process that takes a broader look at the risk involved in any decision (Ref. 4).

In its response to this recommendation, DOE identified as a lesson learned the need to ensure all appropriate factors are considered in making critical decisions and pointed out that these factors include the results of appropriate risk and cost-benefit analyses as well as stakeholder input. DOE stated that it was in the process of updating the risk assessment for the liquid radioactive waste system. This risk assessment would look at

all parts of the liquid radioactive waste system and identify potential risks that could impact the successful completion of the mission of the system (Ref. 5).

In its recent letter to DOE, the DNFSB once again identified additional structural analysis deficiencies in the SWPF's Central Processing Area as it relates to the effects of earthquake-induced differential soil settlement. DNFSB also found deficiencies in the geotechnical engineering report for SWPF and several quality assurance program issues utilized by DOE's architect-engineer, Parsons (Ref. 6). Specifically, DNFSB said its review of the earthquake safety analysis for the SWPF indicated the facility as currently planned "may not be adequately designed" to safely contain highly radioactive wastes when subject to design loads of a major earthquake. DOE has acknowledged the concerns raised by DNFSB about the structural design for SWPF and has promised not to move forward with the project until earthquake safety and other geotechnical issues are resolved (Ref. 7). Currently, it is not clear how the additional geotechnical review would delay the SWPF or add to its cost estimate (Ref. 8).

Comment

The SRS CAB's constant and repeated theme has been to reduce the greatest risk at SRS – the large volume of radiological waste in the HLW tanks. Our consistent prioritization with regard to risk reduction at SRS is 1) salt waste disposition, 2) bulk removal of waste from the tanks, and, 3) ultimate tank closure.

The SRS CAB recognizes and agrees that SWPF must be designed, constructed, and operated to provide reasonable assurance for the safety of workers, the public and the environment. The emphasis here is on "**reasonable**" as it relates to the margin of safety and likelihood for a major earthquake during the SWPF operating life. What is reasonable for a limited life facility given the potential for a release from existing 50-plus year old tanks storing liquid radioactive waste if such an earthquake should occur. (Note: Twenty-four of the original 51 tanks are classified as Type I, II, and IV tanks and do not meet RCRA standards for secondary containment requirements. Seven of the twelve Type I tanks, all four of the Type II tanks, and two of the eight Type IV tanks have leaked. This leakage has occurred without exception through stress cracks located near weld joints.)

We are not convinced that marginal safety improvements in SWPF that require new and substantial funding dollars and significant start-up delays are the best means of serving the public's interests. Any further delays in the start-up of SWPF will reduce the rate at which radioactive waste is removed from the waste tanks and will increase the overall risk to the public, the worker, and the environment.

The SRS CAB very much wants to be supportive of the design issues raised by DNFSB and the responsive positions made by DOE and Parsons. However, the SRS CAB needs to see the quantitative analyses that support these decisions when all parties use a process that looks at the entire system, not just a single facility design. The SRS CAB wants DOE to incorporate a systems approach, which evaluates risks and cost-benefit analyses across the entire liquid waste operating system. The system perspective should be

quantitative as well as qualitative. It should reconcile the needs to build SWPF to withstand a major earthquake against the needs for the timely removal of waste from the liquid radioactive waste system.

Recommendation

Even though work is underway to resolve technical design issues between DOE and DNFSB, the SRS CAB wants issues between DOE and DNFSB resolved quickly. The SRS CAB recommends that DOE:

1. By May 22, 2007, provide the SRS CAB with quantitative systems-approach analyses for the liquid radioactive waste system that support the SWPF design decisions.

2. By May 22, 2007, explain to the SRS CAB the methods used to evaluate the liquid radioactive waste system and present all potential impacts on cost, schedule, and safety and any proposed mitigation strategies, including any "lessons learned" from previous risk informed decision analyses.

References

1. Citizens Advisory Board Recommendation No. 227 (adopted January 25, 2006), "SWPF Seismic Qualifications Decision".
2. Discussion on the Salt Waste Processing Facility Design Upgrade Decision, presentation to the Waste Management Committee by Bill Clark-DOE-SR, January 31, 2006.
3. Citizens Advisory Board Recommendation No. 230 (adopted March 28, 2006), "SWPF Decision – HLW Disposition Program Systems".
4. Risk and Decisions; About Disposition of Transuranic and High-Level Radioactive Waste, The National Research Council, 2005
5. Letter from Jeffery Allison, Manager DOE-SR, to Ms. Karen Patterson, SRS CAB Chair, May 3, 2006.
6. Letter from A. J. Eggenberger, Chairman, Defense Nuclear Facilities Safety Board, to James A. Rispoli Secretary for Environmental Management, U. S. Department of Energy, January 10, 2007.
7. Letter from James A. Rispoli Secretary for Environmental Management, U. S. Department of Energy, to A. J. Eggenberger, Chairman, Defense Nuclear Facilities Safety Board, February 9, 2007.
8. Salt Waste Processing Facility Response to Defense Nuclear Facilities Safety Board, presentation to the CAB WM Committee by Mike Mikolanis and Guy Girard, DOE-SR, February 20, 2007.

Agency Responses
Department of Energy-SR