

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

March 25, 2005

TO: K. Fortenberry, Technical Director
FROM: D. Grover and M. Sautman, Hanford Site Representatives
SUBJ: Activity Report for the Week Ending March 25, 2005

Tank Farms: During the first bottoms-up melt full scale test of the bulk vitrification system, two small portions (2-3" diameter) of the waste box exterior were seen to be glowing red. About 80 minutes later, one of these hot spots in the box melted through the 3/8" steel and approximately 10 kg of molten glass (non-radioactive/non-hazardous) leaked out before power was removed and the leak self sealed. An investigation into the cause of the breach is ongoing. If the breach occurred because the metal sheathing of the thermocouples (which penetrated the box at both hot spots) allowed electricity to pass through the glass and sheathing to the metal box, then this issue is an artifact of the test setup since these thermocouples are not present in the production unit. However, another potential cause could be that there was less than the intended 4 inches of refractory sand present which would be a quality control issue.

Vacuum retrieval of tank C-203 may have reached the limit of technology.

Waste Treatment Plant (WTP): The staff reviewed Bechtel's progress in addressing hydrogen buildup in piping and ancillary vessels. The staff was very skeptical of a strategy where detonable quantities of hydrogen would be allowed to develop in certain cases if prevention of this was impractical in Bechtel's view and both the ignition probability and safety impact of a detonation were low. These are rarely used technical positions to take for a new facility considering the extremely small amount of energy needed to ignite hydrogen and the energy involved in detonations as compared to deflagrations. The staff also questioned: 1) the reliance on computational fluid dynamics modeling for demonstrating the efficacy of full stroke pulse jet mixer operation to prevent gas pocket accumulation since the model is not validated for non-Newtonian fluids (which is why Bechtel performed experiments for last two years), 2) lack of data demonstrating that non-Newtonian tank waste would gravity drain through piping drain lines as intended after being allowed to solidify for up to four hours, and 3) reliance on operators to tie in purge air to vessel cooling jackets to prevent hydrogen accumulation during down times and post-design basis events. Some cooling jacket systems can accumulate 7 liters of hydrogen within 24 hours from background radiation induced radiolysis.

The Office of River Protection is developing a WTP-specific facility representative qualification card, which is something the Site Rep has been encouraging.

K Basin Closure Project (KBC): The leaking lid on the sludge transportation cask has been changed out and the second sludge container is ready to be shipped to T Plant.

The flocculent system has been installed in the K-East Basins to minimize the carryover of small particulate out of the sludge consolidation containers. The effect on basin visibility continues to be monitored.