DEFENSE NUCLEAR FACILITIES SAFETY BOARD

July 16, 2010

MEMORANDUM FOR: Timothy Dwyer, Technical Director
FROM: Jonathan Plaue, DNFSB Site Representative
SUBJECT: LLNL Activity Report for Week Ending July 16, 2010

Plutonium Facility: On July 13, 2010, handlers were in the process of washing uranium oxide thought to contain lithium oxide. When water was added, "sparks and glowing embers" were observed. The handler covered the material, moved the water bottles, exited the room, and made the proper notifications. Initial response by the Facility Safety Office and acting Facility Manager was appropriate. Subject matter experts were consulted and action was taken to remove combustibles from the immediate area, confirm no evidence of ongoing reaction, and restrict further operations in the room. The situation was deemed isolated and stable for the night. The next morning, the Facility Manager convened a recovery meeting and determined the situation was within the bounds of the Operational Safety Plan (OSP) used to perform the activity. Program personnel were charged with developing a recovery plan, which is ongoing.

The involved material consisted of two items of a uranium lithium compound packaged in 1973 and labeled as tritium contaminated. When first opened, the material was found to be in a powdered form, contrary to the description on the label. Both items were calcined under an existing OSP, which provides for conversion of lithium materials to lithium oxide in an inert glovebox; however, lithium has not been processed in the facility for several years. The material was calcined multiple times, as unexpected orange material was observed after initial treatment. Following calcination, the material was moved to an air glovebox for oxide washing. The OSP does not explicitly evaluate washing of lithium compounds. The cause of the reaction and the form of the lithium are currently unknown. The material remains isolated in an air glovebox.

On July 13, 2010, a handler's personal protective equipment was contaminated as a result of a glovebox glove breach. A facility quality assurance engineer examined the failed glove and its sister glove. Based on the results of this examination and an assessment of the history of glove changes for the workstation since 2003, facility and program management decided to replace the gloves with a more robust glove consisting of layered Hypalon and polyurethane.

Nuclear Criticality Safety: On July 7, 2010, handlers suspected a 500 g limit on dispersible fissionable materials (defined as items less than 10 g) had been exceeded while machining clad plutonium samples. The handlers stopped work and made the appropriate notifications. A recovery meeting was held and the workstation was returned to assured compliance with criticality posting on the next day. Analysis of the event revealed that the handlers began work with 485 g of dispersible materials and more than 100 g of other plutonium and uranium solids in the workstation. On July 1, 2010, the handlers planned to only machine material included in the 485 g amount, thereby preventing the generation of additional dispersibles; however, one of the solid plutonium pieces was mistakenly machined. This material was accounted for on July 7, 2010, and estimated to be 525 g. Detailed follow-up analysis revealed that the actual mass of plutonium involved in the event was 498.7 g and the incident was determined not to be a criticality infraction. The Site Representative notes that this value reflects precise accounting of the cladding mass and impurities alloyed with the plutonium—information that would not have been readily available to the handlers while machining. Facility critiques are not typically held for criticality infractions. While the Nuclear Criticality Safety Division's report identifies lessons learned and additional actions, a full critique may provide a deeper analysis and opportunities for improvement to work instructions and training.