DEFENSE NUCLEAR FACILITIES SAFETY BOARD

October 30, 2009

MEMORANDUM FOR: Timothy Dwyer, Technical Director
FROM: Jonathan Plaue, DNFSB Site Representative
SUBJECT: LLNL Activity Report for Week Ending October 30, 2009

Plutonium Facility: On Wednesday, a Potential Inadequacy in the Safety Analysis and an associated Technical Safety Requirement (TSR) violation were declared concerning the Hydrogen Gas Isolation System (HGIS). The safety function of this safety-significant system is to isolate the hydrogen supply to the facility in the event of an earthquake, loss of normal power, or excess flow condition (i.e., line break). This last function results in a performance criterion requiring the HGIS to isolate the supply when the flow of hydrogen exceeds 30 liters per minute. An excess flow valve implements this criterion. In discussions with the valve manufacturer, new information was received indicating that the setpoint on the currently installed valve was not independent of the type of gas used in the system. As a result, the valve is likely to isolate for hydrogen flowrates well above the TSR condition. Unfortunately, the required surveillance procedure to ensure the performance of this function was incorrectly executed. The surveillance procedure should be performed using argon gas and requires the use of a calibrated flowmeter and application of a correction factor if the meter is not calibrated with hydrogen. It appears that the operator dismissed the use of a correction factor based on the incorrect premise that the valve function was independent of gas type. Hydride/Dehydride/Casting operations are suspended pending resolution of these issues, including an extent of condition assessment for other key parameters that may have dependency on gas properties. In parallel, a third design of the casting crucible is underway (see weekly report dated October 2, 2009)

Tritium Facility: Special tritium compounds (STCs) are defined in the laboratory's *Environment, Safety and Health Manual* as compounds that contain tritium, either intentionally (e.g., by synthesis) or inadvertently (e.g., by contamination mechanisms). The physical properties of STCs may make their detection, characterization, and hazard assessment difficult. Further, depending on the precise form, the dose consequences resulting from exposure to an STC may be significantly greater than even the oxidized form of tritium. This behavior is largely a function of the solubility of the material in the body. Certain materials, such as metal tritides (e.g., titanium tritide), are highly insoluble resulting in a greater residence time in the body. The additional time results in tissues receiving a greater radiation dose. General awareness of the potential unique hazards of STCs is low despite an incident in 2006 involving metal tritide contamination of multiple laboratory facilities and offsite locations (see weekly report dated July 21, 2006).

Operations in the Tritium Facility involve the use of several STCs, including metal tritides, tritiated oils, and the particulate debris generated by the tritium device grinder system. The Facility Safety Plan provides general information regarding STCs and requires personnel to contact the Health Physicist prior to working with them; however, STCs are not explicitly described in the work scope or identified as a unique hazard in the documented safety analysis. As a result, it is unclear whether this hazard has been appropriately analyzed and adequate controls identified. Laboratory personnel are examining the above information.