

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

December 6, 2024

TO: Timothy J. Dwyer, Technical Director
FROM: Sonia G. Thangavelu, Ph.D., Cognizant Engineer
SUBJECT: Nevada National Security Site (NNSS) Report for November 2024

DNFSB Staff Activity: During the week of November 18, a DNFSB staff team met with Nevada Field Office (NFO) and Mission Support and Test Services LLC (MSTS) personnel to discuss the Enhanced Staging Project readiness assessment scopes and schedules, materials planned for staging, and safety control strategy. The staff team also conducted routine oversight and walkdowns of fire protection systems and seismic structures at NNSS facilities.

Positive Unreviewed Safety Question Determinations (USQDs) for Vessel Confinement System (VCS) at NNSS Facilities: As mentioned in the NNSS monthly report for July 2024, the Board submitted a letter to the Secretary concluding the VCS design did not meet several requirements stated in the *American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section VIII, Division 3*. The Board requested the National Nuclear Security Administration (NNSA) provide information on the equivalent means by which NNSA will demonstrate that the vessel can perform its safety function of confining radiological material prior to, during, and after experiment execution. In response to the Board's letter, Los Alamos National Laboratory (LANL) developed a report that contained technical reasons to deviate from some of the code requirements, recommending alternate solutions for each deviation. The report also uncovered additional code requirements specific to material fasteners and welding components that were either not met, or not described in the Device Assembly Facility (DAF) and Principal Underground Laboratory for Subcritical Experimentation (PULSE) safety bases. On October 3 and 7, 2024, MSTS declared two positive USQDs and submitted two evaluations of the safety of the situation (ESS) to NFO for approval. In the ESS, MSTS instituted compensatory measures to hold small scale dynamic vessel experiment operations at DAF and prohibit receipt of subcritical experiments at PULSE until the VCS issues are resolved and the safety bases updated.

Positive USQD for Comet Deimos Experiment at National Criticality Experiments Research Center: The Comet vertical critical assembly machine consists of an upper stationary top platform and a lower moveable platen, both containing nuclear material, moderators, and reflectors. These materials are brought together by raising the platen toward the stationary platform and decreasing the distance between them to achieve a predictable critical condition that is safe, reliable, and reproducible. The Comet machine relies on a safety significant sudden control rod activation by manual means (SCRAM) safety system to move materials rapidly away from each other at a SCRAM distance via hydraulic rams to stop the nuclear chain reaction and reach a subcritical level. In September 2024, LANL personnel performed the Deimos experiment to measure neutron multiplication for a fuel matrix as a function of separation distance. During the experiment, LANL personnel discovered the measured delayed critical separation distance is greater than the travel SCRAM distance of one of the hydraulic rams. MSTS concluded the credited system may not perform its safety function while the experiment is still critical. On October 8, 2024, MSTS declared a positive USQD, and revised Comet procedures. MSTS is currently developing the ESS for NFO approval.

Update of Z-Pinch Experimental Underground System (ZEUS) Preliminary Documented Safety Analysis (PDSA): On October 7, 2024, MSTS transmitted a second revision of the ZEUS PDSA for NFO approval. MSTS identified the VCS and high energy initiator USQD resolutions, hybrid fire extinguishing system design, and implementation of the PULSE seismic exemption request as open items to address but concluded the ZEUS test bed design and derived safety controls are not impacted.