Site Visit Report

Safety System Oversight Assessment of the Los Alamos National Laboratory Weapons Engineering Tritium Facility Tritium Gas Handling System

INTRODUCTION AND OVERVIEW

This report documents the results of the Office of Health, Safety and Security's (HSS) review of a safety system oversight (SSO) assessment of the Los Alamos National Laboratory (LANL) Weapons Engineering Tritium Facility (WETF) tritium gas handling system (TGHS). The assessment evaluated the TGHS's ability to perform as required by safety bases and other applicable requirements. The assessment was sponsored by the U.S. Department of Energy (DOE) Los Alamos Site Office (LASO) and was conducted October 25 – November 5, 2010. LASO was the overall lead organization for the evaluation, which included independent participation by an Office of Environment, Safety and Health Evaluations subject matter expert. The assessment also reviewed activities related to the operations of the TGHS, including the effectiveness of contractor work performance and practices, the cognizant system engineer (CSE) program, the contractor assurance system (as applied to processes related to TGHS operability), and the actions taken in response to selected engineering findings from the 2007 HSS Independent Oversight inspection that were directly related to the scope of the SSO assessment.

HSS decided to delay issuance of this report to facilitate evaluation of the final SSO report, which was issued to LANL on March 17, 2011, and to evaluate any new actions taken or planned to resolve a remaining non-conforming condition addressed in the 2007 HSS finding E-10.

SCOPE AND OBJECTIVES

The SSO assessment evaluated safety-credited portions of the WETF TGHS and interfacing support systems to confirm that: (a) TGHS safety basis documents are accurate and adequately maintained; (b) system operation, maintenance, and performance are in accordance with these basis documents and with DOE requirements, national consensus codes, and best management practices; and (c) the effect of aging on system equipment and components is addressed.

The assessment criteria were designed to determine whether the following objectives were met:

- Safety basis-related technical, functional, and performance requirements for the TGHS are identified and defined in appropriate documents.
- Changes to safety basis-related requirements, documents, and installed components are controlled.
- The system is maintained in a condition that ensures its integrity, operability, and reliability.
- Surveillance and testing of the safety system demonstrate that it is capable of accomplishing its safety functions and continues to meet applicable system requirements and performance criteria.

- A trained and qualified CSE is assigned to the TGHS to apply engineering expertise to maintain safety system configuration and assess system operability, reliability and maintenance.
- Selected HSS 2007 Independent Oversight inspection findings related to WETF conduct of engineering are resolved.

The SSO assessment activities included reviewing documentation that supports the design and safety basis requirements for the TGHS; observing the oral qualification board for the assigned CSE; interviewing LANL Engineering representatives, WETF management, the assigned CSE, operations, maintenance, engineering, safety basis, and support personnel; performing limited facility walkdowns of the system; and observing field performance of several surveillance testing and maintenance activities. The SSO assessment also included review of LANL evidence files that documented line management's actions to close HSS 2007 Findings E-1, E-10, E-11, and E-12, which addressed deficiencies applicable to WETF in implementation of the CSE program, procurement, and nonconformance reporting requirements

DISCUSSION OF RESULTS

Conduct of the SSO Assessment

Overall, the LASO SSO assessment was competently implemented by knowledgeable personnel using appropriate and challenging criteria. The assessment also included an appropriate balance of technical document reviews, interviews, and field activities.

None of the areas assessed by the team met all elements of the assessment criteria, and as a result, six findings were identified, which are summarized as follows:

- Several unreviewed safety question determinations (USQDs) did not adequately evaluate potential changes against safety basis requirements, resulting in the implementation of changes that were contrary to technical safety requirements.
- Several post-modification tests were not performed in accordance with safety basis and laboratory requirements.
- A nonconforming assembly was not segregated from approved items and was installed in a safety significant system.
- The Engineered Equivalent Determination process was inappropriately used to procure and replace a nonconforming part of a safety significant system.
- The Master Equipment List (MEL) was not being maintained current by the CSE as required by LANL procedures.
- Facility walkthroughs to complete facility condition assessments were not performed as required by the Maintenance Implementation Plan.

Several of the findings were applicable to multiple assessment criteria. Of particular note, the LASO SSO staff identified and effectively justified their position that WETF had misinterpreted the technical safety requirements for leak testing of the TGHS following maintenance or modification, despite significant discussion by WETF staff defending the practice and documentation of a negative USQD that incorrectly concluded that their testing was appropriate.

In the final analysis, SSO concluded that the vacuum rate of rise testing used by WETF for post-maintenance tests of the TGHS did not meet pressure safety requirements. The assessment also identified ten observations for WETF and LANL consideration to further improve engineering, maintenance, operations, and oversight activities. The specific results of the SSO assessment are documented in a November 2010 report entitled *LASO Safety System Oversight Assessment Report for the Weapons Engineering Tritium Facility, Tritium Gas Handling System (TGHS).*

Follow-up on Selected HSS 2007 Inspection Findings

Although the assessment determined that improvements had been made, two engineering findings related to the HSS inspection of LANL environment, safety, and health programs in 2007 had not been fully resolved, as discussed below.

HSS 2007 Finding E-1

Although LANL has substantially improved the system engineering program, several formality-of-operations implementation milestones that involve the system engineer program are not scheduled for completion until later in fiscal year 2011. As a result, the WETF TGHS CSE has not:

- Maintained the MEL current
- Ensured that the system's maintenance history is appropriately maintained
- Tracked or trended maintenance and performance history for the purpose of establishing appropriate corrective, preventive, and predictive maintenance
- Established system preventive and predictive maintenance requirements
- Developed and maintained set-point lists
- Identified critical spares
- Developed System Health Reports.

System engineer roles and responsibilities are listed in multiple LANL policies and procedures for conduct of engineering, maintenance, and operations; no single reference lists all the roles and responsibilities assigned to system engineers. Further, the TGHS CSE does not currently implement the institutional responsibilities to:

- Perform USQDs
- Maintain system design descriptions current
- Perform periodic (rather than sporadic) reviews of TGHS operability, reliability and physical configuration.

The LANL systems engineering program and supporting conduct-of-engineering administrative procedures do not meet the requirements of DOE Order 420.1B, in that the CSE is not specifically required to:

- Remain apprised of operational status

- Remain cognizant of system-specific operations history and industry operating experience, as well as manufacturer and vendor recommendations and any product warnings
- Identify trends from operations.

HSS 2007 Finding E-10

Although the use of a nonconforming rupture disk was appropriately dispositioned, LANL did not identify a basis for acceptance of the continuing nonconforming condition of a two-stage pressure regulator that did not meet design requirements for attachment to a gas bottle in the safety-significant tritium gas containment system. Further, LANL/WETF does not currently have an open item to track resolution of the latter nonconforming condition, and the two-stage pressure regulator remains attached to the safety significant system.

CONCLUSION

The assessment demonstrated that the WETF System Engineering organization had sound engineering and tritium processing knowledge, but weak knowledge of the nuclear safety envelope and expectations for compliance with safety basis requirements. Overall, the LASO SSO assessment was competently performed by knowledgeable personnel using appropriate and challenging criteria.

FOLLOW-UP ITEMS

Although significant improvements have been made and two of the 2007 HSS (Findings E-11 and E-12) have been adequately resolved, HSS Findings E-1 and E-10 warrant further follow-up.