U.S. Department of Energy
Office of River Protection
P.O. Box 450, MSIN H6-60
Richland, Washington 99352

AUG 04 2006

06-TED-053

Mr. M. S. Spears, President
and Chief Executive Officer
CH2M HILL Hanford Group, Inc.
2440 Stevens Center Place
Richland, Washington 99354

Dear Mr. Spears:

CONTRACT NO. DE-AC27-99RL14047 – ASSESSMENT REPORT A-06-AMTF-TANKFARM-006, TANK FARM CONTRACTOR (TFC) COGNIZANT SYSTEM ENGINEER PROGRAM ASSESSMENT

This letter transmits the results of the U.S. Department of Energy (DOE), Office of River Protection (ORP) assessment of the TFC Cognizant System Engineer Program. The assessment was completed on July 7, 2006.

The team evaluated compliance with the requirements of DOE Order 420.1A, *Facility Safety,* which requires the assignment of qualified system engineers to vital safety systems.

Based on this review, the ORP assessment team concluded the TFC Cognizant System Engineer Program is implemented and expanded at your discretion to additional systems deemed important to operations and the accomplishment of the Tank Farm mission. The team identified three Observations where minor weaknesses were found in the expanded part of the program. There are no Findings identified in this assessment report, therefore, no corrective action plan is required by ORP.

If you have any questions, please contact me or your staff may contact Walter Scott, Assessment Team Lead, (509) 376-0756.

Sincerely,

T. Zack Smith, Assistant Manager
for Tank Farms Project

TED:WBS

Attachment

cc: w/attach:
R. Cantwell, CH2M HILL
C. DeFigh-Price, CH2M HILL
R. S. Popielarczyk, CH2M HILL
C. R. Ungerecht, PAC
CH2M HILL Correspondence

U.S. Department of Energy
Office of River Protection

Tank Farm Contractor
Cognizant System Engineer Program Assessment

Final Report

A-06-AMTF-TANKFARM-006
06-TED-053

July 2006

Walter B. Scott
Team Leader

Report Approval

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Tank Farms Engineering Division
Office of River Protection

EXECUTIVE SUMMARY

An assessment of the U.S. Department of Energy (DOE), Office of River Protection (ORP) Tank Farm Contractor (TFC) Cognizant System Engineer (CSE) Program was performed by ORP from June 29, 2006, through July 7, 2006. The assessment evaluated the implementation and execution of the TFC CSE Program as defined in DOE Order (O) 420.1A. The scope of the assessment addressed programmatic and facility implementation elements.

A closeout meeting was conducted with the TFC on July 19, 2006. Following the meeting, the TFC provided additional information, clarification, and factual accuracy comments to the assessment results. The feedback was evaluated and appropriate changes were made to the final assessment report.

Conclusion

All criteria for the assessment objectives have been met. The TFC has established a comprehensive CSE program that extends beyond the minimum requirements of DOE O 420.1A and ensures the operational readiness of all systems managed by CSEs, maintains system configuration control, and supports operations and maintenance to achieve dependable service for major systems that are vital to the successful operation of the hazardous processes conducted by the TFC. The TFC has correctly identified the tank farm SSCs that are required by DOE O 420.1A to have an assigned and qualified system engineer. Additional tank farm SSCs are included in the system engineer program that comprise those that support a vital safety system, those identified as defense-in-depth, or those otherwise identified important by the TFC Chief Engineer. This is a positive initiative beyond the basic and minimum requirements of DOE O 420.1A. The same program enhancement could be applied to the 222-S Laboratory even though it is not required to have assigned and qualified CSEs by DOE O 420.1A (there are no safety-class or safety-significant SSCs in the facility) to assure important laboratory systems, such as the ventilation system, function optimally to support laboratory operations.

CSEs were found to be very knowledgeable of configuration control processes and are diligent in working to assure system configuration is maintained to meet safety and design functions. In addition to weekly system walkdowns and comprehensive quarterly system evaluations, the CSEs use the Engineering Change Notice (ECN) process to maintain and preserve safety system design configuration. The review team found that a potential exists in engineering procedures for ECNs affecting the design configuration of vital safety systems to be approved without the cognizance of the CSE assigned to the system. While the procedural potential exists, no instances were found by the team where ECNs on safety systems were actually approved by a system engineer other than the assigned system engineer.

The review team obtained feedback from both operations and maintenance personnel that the system engineers are providing an increased level of support to daily operations and field maintenance activities. Team observations of the interactions between the system engineers and operations and maintenance personnel confirmed that they are familiar with each other and are used to working together.

CH2M HILL Hanford Group, Inc., (CH2M HILL) has implemented an adequate and effective System Engineer Qualification Program for both the management and technical staff as defined by DOE O 420.1A, *Facility Safety*, and DOE 5480.20A, *Personnel Selection, Qualification and Training Requirements for DOE Nuclear Facilities*. The review team reviewed CSE training records and found they were consistent with the requirements of these two orders. All of the requirements for development plans and qualifications were met. The review found only minor issues in the implementation and documentation of continuing training. The TFC system did not correct the problems until they were identified by the review team.

Issues:

Findings:

None.

Observations:

Observation SE.2.1-O-1: The TFC Cognizant System Engineer Program does not have a documented systematic process or criteria for identifying non-vital safety systems for inclusion in the CSE program.

Observation SE.2.1-O-2: CSEs rely on their approval of vital safety system ECNs for maintaining configuration control of safety systems. The ECN approval process allows any qualified system engineer to approve an ECN that modifies a vital safety system. Therefore, ECNs for vital safety systems may not come to the attention of the CSE assigned to the system.

Observation SE.2.4-O-1: TFC follow-up to recognize and correct training deficiencies failed in two instances of incomplete continuing CSE training as required by TFC-BSM-TQ-STD-01, Revision C-5, Section 3.3.5. One CSE did not have the required training for one month and another CSE did not have the manager's sign off on the training that was completed.

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1.0 INTRODUCTION

The U.S. Department of Energy (DOE) Office of River Protection (ORP) performed an assessment of Tank Farm Contractor (TFC) Cognizant System Engineer (CSE) Program implementation from June 29, 2006, through July 7, 2006.

2.0 PURPOSE AND SCOPE

The purpose of this review was to conduct an ORP assessment of the TFC CSE program. The team evaluated the implementation of the CSE program; reviewed the CSE program to ensure it is implemented in accordance with contractual requirements; assessed the CSE staff qualifications and training; and assessed the effectiveness of CSE configuration control activities.

The objectives of the assessment were to:

- Verify that a comprehensive CSE Program is defined and implemented according to DOE Order requirements;
- Verify that vital safety system configuration is managed and controlled by the CSEs to assure systems meet their design functions and are capable of performing their safety functions;
- Verify that CSEs provide support to operations and maintenance staff with respect to their assigned safety system; and
- Verify that an effective training and qualification program is implemented according to the requirements of DOE 5480.20A that assures CSEs are properly trained and qualified to manage their assigned safety system.

3.0 APPROACH AND DELIVERABLES

The review was performed consistent with DOE O 420.1A, *Facility Safety*. Major elements of the review were developed from the DOE Order and Guidance developed in support of DOE's Safety System Oversight Program.

Major elements of the review consisted of:

- Preparation of the Criteria Review and Approach Documents (CRAD)
- Selection of the review team
- Pre-review activities
- Entrance Meeting with the TFC
- Fieldwork activities
- Development of the assessment results
- Exit Meeting with the TFC
- Development of a final report, including a factual accuracy review by the TFC

The CRADs were developed from the CSE program requirements in the DOE Order. The CRADs are included as part of the assessment forms in Appendix A.

The review team was selected from ORP staff based on technical expertise and experience. The team was comprised of Senior ORP staff, including an experienced Facility Representative. Biographical summaries for each of the team members are included as Appendix B.

Pre-review activities consisted of gathering and reviewing current TFC CSE program plans, procedures, CSE assignments, DSA (including TSR), and current DOE directives and standards.

The entrance briefing was conducted on June 27, 2006, and fieldwork began June 29, 2006, lasting until July 7, 2006. Fieldwork consisted of TFC staff interviews, walkdowns with CSEs, and facility inspections. Team meetings were held periodically to discuss strengths and weaknesses of the CSE program discovered in the assessment. These were communicated to the TFC point-of-contact as they were identified. Feedback from the TFC regarding additional information and immediately corrected deficiencies was received in real time. The exit briefing was held on July 19, 2006, with Senior TFC Management and ORP Line Management.

4.0 ASSESSMENT RESULTS

A summary of the results of the assessment, including findings and observations, by assessment criterion is provided below. Detailed discussions, references, personnel interviewed and additional considerations for the TFC are provided in Appendix A.

4.1. Performance Objective SE.1

The performance objective for evaluating this objective is:

> *The TFC has established an effective CSE program that is incorporated into the Integrated Safety Management System (ISMS) Program including flow down of implementing procedures and shall provide for the CSE authorities, responsibilities and accountability.*

The criteria for this objective have been met. Document reviews and interviews with CSE Managers and CSEs during the review determined that the TFC has established a comprehensive CSE program that extends beyond the minimum requirements of DOE O 420.1A and ensures the operational readiness of all systems managed by CSEs, maintains system configuration control, and supports operations and maintenance to achieve dependable service for major systems that are vital to the successful operation of the hazardous processes conducted by the TFC. The review determined that the TFC has completely and successfully established a CSE Program to implement the System Engineer requirements of DOE O 420.1A, *Facility Safety*.

No Findings or Observations were identified in the review of this performance objective.

4.2. Performance Objective SE.2

The performance objective for evaluating this objective is:

> *The TFC has implemented the CSE program using a graded approach with assigned and qualified Cognizant Systems Engineer in accordance with the established and approved program including identification of systems, configuration management of systems and system documentation, and support for operations and maintenance in order to assure of the operational readiness of systems within the scope of the program.*

The criteria for this objective have been met with three minor weaknesses.

The TFC has correctly identified the tank farm SSCs that are required to have an assigned and qualified system engineer by DOE O 420.1A. In addition, the TFC Chief Engineer designated additional tank farm SSCs to be included in the system engineer program. The designation of these additional tank farm SSCs are those SSCs that support a vital safety system, were identified as defense-in-depth, or were otherwise identified by the TFC Chief Engineer. This is a positive initiative beyond the basic and minimum requirements of DOE O 420.1A; however no documentation of the process or criteria used by the Chief Engineer was created.

Since the initial determinations of additional systems for oversight by CSEs, the TFC has received two major facilities from another site contractor, namely the 242-A Evaporator and the 222-S Analytical Laboratory. The TFC identified the safety significant systems in the 242-A Evaporator and assigned CSEs. No CSEs were identified and assigned to systems in the 222-S Laboratory because there no safety significant systems identified in the 222-S Laboratory safety basis. An evaluation of need for CSEs at the 222S Laboratory was performed during the development of the DSA in 2001. At that time 222-S Laboratory management determined that it was not necessary to implement the CSE program in the laboratory's engineering organization. However, the review team observes that a systematic and consistent approach and criteria for selecting systems for assignment of CSEs in both the 242-A Evaporator and the 222-S Laboratory might be beneficial for systems important to the accomplishment of the tank farms mission. **(Observation SE 2.1-O-1)**

Through interviews with CSEs and other TFC staff and through direct observations by the review team, CSEs demonstrated intimate knowledge of the ECN process and how this process assures safety system configuration is maintained to meet safety and design functions. CSEs use the ECN process to maintain and preserve design configuration of their assigned safety system, in addition to system walkdowns and assessments. In reviewing a sample of ECNs on systems assigned to various CSEs, the review team identified a procedural potential for ECNs affecting the configuration of vital safety systems to be approved without the cognizance of the CSE assigned to the vital safety system. The review team found one example of this situation that was self corrected by

coordination and communication between CSEs on related systems, but was not procedurally driven. **(Observation SE 2.1-O-2)**

The review team found that the TFC CSE controls vital safety system configuration in accordance with DOE-STD-1073-2003 through document reviews, interviews and walk downs. The CSEs have been given extensive training in configuration control and it is part of the qualification process. The CSEs have ownership of the configuration of their assigned systems. With the one weakness identified above, where engineers other than the CSE can approve ECNs, the procedures maintain configuration control.

The review team discussed with several system engineers the methods employed to support operations. The systems engineers stated there were five primary areas they support operations: 1) being knowledgeable of ongoing and planned system projects; 2) understanding equipment maintenance requirements; 3) answering impromptu operational questions; 4) maintaining system configuration control; and 5) keeping knowledgeable of DSA changes and how they impact their systems.

The review team interviewed six TFC operations managers individually and discussed system engineering support. All the managers stated that the system engineers were engaged in their work and knowledgeable of their assigned systems. Examples included trouble shooting the cross site encasement leak detection system, identifying the cause of the AP low pressure alarm, and specifying new gages for the water distribution skid in S Tank Farm. In each case the system engineer was timely in responding to operations needs and fixed the issue.

Additionally, the review team asked the CSEs what activities were performed to support the maintenance organization. The activities included preparation of work packages, seeking design input, answering questions during conduct of fieldwork, specification of post maintenance testing requirements, and support of preventive maintenance task scope and frequency. To validate this information, the review team interviewed maintenance personnel from management to field craft workers. The review team found that the maintenance personnel corroborated the statements of the CSEs regarding their support to maintenance personnel and activities. The review team also found opportunities to observe maintenance personnel and system engineers working together in the field. In all instances, the reviewers observed that maintenance personnel knew the system engineers and the interaction between them was positive and productive. As a final indication of CSE support, the review team asked maintenance personnel what could be done to improve system engineer support of maintenance activities. Several mentioned that the system engineers could be more diligent in consulting the craft early in a new design or modification project to solicit their input on maintainability and lock and tag configurations. Craft stated that this has improved substantially over the past year and a half to two years, but more could be done, particularly for design and modification work procured from outside the TFC.

Through document reviews and observations and interviews of CSEs, the review team found that the TFC has implemented a System Engineer Qualification Program for both the management and technical staff as defined by DOE O 420.1A, *Facility Safety*, and by DOE 5480.20A, *Personnel Selection, Qualification and Training Requirements for DOE Nuclear Facilities*. The CSE training records were consistent with the requirements of both DOE orders. All of the requirements for development plans and qualifications were met. The qualification process included the required knowledge base as required in DOE O 420.1A.

The review found one continuing training document lacked the document approval signatures and, upon identification by the review team, the records custodian immediately replaced the page with the electronically signed approval sheet. The two instances where the monthly continuing training was not documented as completed were noted, however the TFC failed to follow-up in a timely manner to correct the deficiencies. **(Observation SE 2.4-O-1)**

Issues:

Findings:

None.

Observations:

Observation SE.2.1-O-1: The TFC Cognizant System Engineer Program does not have a documented systematic process or criteria for identifying non-vital safety systems for inclusion in the CSE program.

Observation SE.2.1-O-2: CSEs rely on their approval of vital safety system ECNs for maintaining configuration control of safety systems. The ECN approval process allows any qualified system engineer to approve an ECN that modifies a vital safety system. Therefore, ECNs for vital safety systems may not come to the attention of the CSE assigned to the system.

Observation SE.2.4-O-1: TFC follow-up to recognize and correct training deficiencies failed in two instances of incomplete continuing CSE training as required by TFC-BSM-TQ-STD-01, Revision C-5, Section 3.3.5. One CSE did not have the required training for one month and another CSE did not have the manager's sign off on the training that was completed.

5.0 CONCLUSIONS

The review team concluded that the TFC CSE program is effectively implemented according to the requirements of DOE O 420.1A. Three areas for improvement were identified by the team in areas of the program that were added to the CSE program at the discretion of the TFC.

The team found that the CSE program is well documented and understood by TFC personnel, not solely the system engineers. Implementation is mature and interfaces and relationships with other organizations are well defined and developed. The CSE program effectively controls the configuration of the safety and important defense-in-depth systems identified in the Tank Farms and 242-A Evaporator. Coordination and integration with the operations and maintenance organizations is mature and working well.

The CSE qualification program meets the requirements of DOE O 420.1A and DOE 5480.20A. Qualified CSEs are assigned to all safety systems within the scope of the DOE order. CSEs demonstrated competency in the field with their systems and exhibited an expert level of knowledge of their systems.

6.0 REFERENCES

References and personnel contacted for each assessment performance objective are listed in Appendix A.

APPENDIX A

CRITERIA REVIEW AND

APPROACH DOCUMENTS

PERFORMANCE OBJECTIVE SE.1 – CSE PROGRAM DOCUMENTATION

The Tank Farm Contractor (TFC) has established an effective Cognizant System Engineer (CSE) program that is incorporated into the Integrated Safety Management System (ISMS) Program including flow down of implementing procedures and shall provide for the CSE authorities, responsibilities and accountability.

Criteria:

1.1. A CSE program has been established to implement DOE O 420.1A "Facility Safety" requirements for DOE facilities. (DOE O 420.1A, CRD, Section 4.5)

1.2. Procedures or other definitive documentation specify policies applicable to the CSE program. (DOE O 420.1A, CRD, Section 4.5)

1.3. Engineering Procedures provide the guidance necessary to implement CSE policies. (DOE O 420.1A, CRD, Section 4.5)

1.4. Engineering Procedures clearly define minimum expectations for the roles and responsibilities of Cognizant System Engineers (CSE) to implement those policies. (DOE O 420.1A, CRD, Section 4.5)

1.5. Procedures are established to develop, implement, and maintain a system engineer training and qualification program. (DOE O 420.1A, CRD, Section 4.5.1.3)

1.6. Procedures are established to define performance goals CSEs use to monitor and in tracking the health of the systems within the scope of the system engineer program. (DOE O 420.1A, CRD, Section 4.5.1.2)

1.7. Configuration management procedures are used to develop and maintain consistency among system requirements and performance criteria, system documentation, and physical configuration. Configuration management integrates the elements of system requirements and performance criteria, system assessments, change control/work control, and documentation control. (DOE O 420.1A, CRD, Section 4.5.1.2)

Approach:

Record Review:

TFC contract list A/B; TFC System Engineer Program Documentation, procedures, training and qualification program description, configuration management documentation.

Interviews:

TFC CSE program managers and system engineers. Line managers through whom system engineers report.

Observations:

Verify that the implementing documents, plans, procedures, policies, etc. are current compared to existing requirements documents.

PROCESS:

Records Reviewed:

- DOE Order 420.1A, Facility Safety, CRD, Section 4.5
- DOE 5480.20A, Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, Chg 1
- DOE-STD-1073-2003, Configuration Management
- TFC- PLN-03, Engineering Program Management Plan, Rev C-1
- TFC-PLN-06, Systems Engineering Management Plan for the Tank Farm Contractor, Rev A-5
- TFC- ENG-FACSUP-P-01, Conduct of System Engineering, Rev C-7
- TFC-ENG-FACSUP-D-01.1, System Health Report Preparation, Rev B-8
- TFC-ENG-FACSUP-D-01.2, System Notebook Preparation, Rev A
- TFC-BSM-TQ-STD-01, Technical Staff Qualification Requirements, Rev C-5
- Qualification Card for System Engineer, No. 350868, Rev 3a
- Qualification Card for Limited System Engineer, No. 351868, Rev 2d
- TFC-PLN-23, Configuration Management Plan, Rev A-8
- TFC-ENG-DESIGN-C-06, Engineering Change Control, Rev E-9
- TFC-ENG-DESIGN-C-09, Engineering Drawings, Rev C-1
- TFC-ENG-DESIGN-C-25, Technical Document Control, Rev C
- TFC-ENG-DESIGN-P-07, System Design Descriptions, Rev B
- TFC-BSM-IRM_DC-C-02, Record Management, Rev C-6
- TFC-OPS-MAINT-C-01, Tank Farm Contractor Work Control, Rev M
- System Notebook, DST Waste Tank Structures, Mixing and Monitoring
- System Notebook, DST Waste Tank 241-AY/AZ

Personnel/ Positions Interviewed:

- Director of Engineering Standards
- System Engineering Managers (2)
- Acting Director, Nuclear Safety and Licensing
- System Engineers (7)

Evolutions/Operations/Shift Performance Observed:

None.

RESULTS:

Discussion of Results:

The review team determined that the TFC has established an effective CSE program that includes all the elements described in DOE O 420.1A, CRD, Section 4.5, for operation of a nuclear facility. The TFC CSE program is incorporated into the Integrated Safety Management System (ISMS) Program including the flow down of implementing procedures on the facility level, and it provides the CSEs with authorities, responsibilities and accountability. This determination was a result of document reviews and staff interviews.

Implementation of Integrated Safety Management System (ISMS): TFC-PLN-03, REV,C-1, Engineering Program Management Plan, Section 6, dated 1/9/06, identified that hazard analysis and engineering controls are implemented to ensure ALARA. The feedback loop is implemented in engineering through the Management Observation Program (MOP), assessments, System Health Reports, and performance indicators. CSE Managers interviewed by the review team thoroughly understood this approach and were able to demonstrate the integration of ISMS and the CSE program.

Procedures/Processes used to implement the SE Program: TFC-ENG-FACSUP-P-01, REV C-7, Conduct of System Engineering, identifies responsibilities, procedures and requirements for the system engineering activities. TFC-ENG-DESIGN-C-25, REV C, Technical Document Control, defines the processes and responsibilities associated with technical document preparation, review, approval, distribution, and use, including design media, format, and the Engineering Data Transmittal (EDT) and Document Release Form (DRF) employed for release and distribution. The CSE Managers and CSEs interviewed were familiar with the procedures and processes used in performing System Engineering functions and duties.

System Engineer Responsibilities: TFC-PLN-03, Rev C-1, Engineering Program Management Plan, defines roles and responsibilities of CSE managers, as well as CSEs. TFC-ENG-FACSUP-P-01, REV C-7, Conduct of System Engineering, specified the responsibilities of CSEs. The CSE is required to demonstrate expertise and technical ownership of the assigned vital safety systems. The primary responsibilities include, but are not be limited to: Evaluating system performance; monitoring activities that effect system parameters; initiating actions to correct system and equipment problems; understanding the hazards evaluated in the DSA; being cognizant of the assumptions that form the bases of the safety envelop defined in the DSA; providing assistance to Operations, Design, and Maintenance personnel; providing technical input to procedure development; maintaining assigned System Design Descriptions (SDDs); and approving Engineering Change Notices (ECNs) that modify vital safety systems. The CSEs interviewed fully understood these roles and responsibilities.

Work Control: TFC-OPS-MAINT-C-01, REV M, Tank Farm Contractor Work Control, dated May 31, 2006, defines work management (or work control) from initiation of a work request through work order closeout (including post-maintenance testing and turnover to operations). This procedure uses a graded approach to implement requirements and to provide the level of discipline necessary to perform work in a manner that protects the workers, the environment, and the public. The CSE Managers and CSEs interviewed understand and use this process in handling the work control.

CSE Training and Qualification Program: TFC-BSM-TQ-STD-01, Rev C-5, Technical Staff Qualification Requirements, defines the TFC qualification requirements for CSE Managers and CSEs. It includes minimum entry requirements (for the CSE program), training requirements, qualification requirements, requalification requirements and continuing training requirements. Through the inspection of training and qualification records in file, the review team concluded that the TFC has developed a CSE training and qualification program that meets the requirements of DOE O 420.1A CRD, section 4.5.1.3 (which references the requirements of DOE 5480.20A).

Procedures for Tracking the Health of the Systems: TFC-ENG-FACSUP-P-01, Rev C-7, Conduct of System Engineering, describes the procedures for the CSE to generate a system health report on a quarterly basis**.** TFC-ENG-FACSUP-D-01.1, Rev B-8, System Health Report Preparation, is a guidance document which establishes a consistent format and structure for the production of system health reports. The system health report is a tool for the system engineer and the responsible manager to easily identify trends in system performance and issues that require attention. The reports also provide higher levels of management the ability to recognize emerging problems in order to ensure CSEs and facility managers are provided the support they need. The establishment of this procedure meets the requirements of DOE O 420.1A CRD, Section 4.5.1.2, Requirements.

Configuration Management: DOE-STD-1073-2003, Configuration Management, provides guidance for DOE contractors to follow when developing procedures and other work processes involving configuration management. Key configuration management elements are composed of design requirements, work control, change control and assessments. TFC-PLN-23, Rev A-8, Configuration Management Plan, establishes the principles, practices, and procedures for the implementation of configuration management by the TFC and meets the requirements of DOE-STD-1073-2003 and DOE O 420.1A, CRD, Section 4.5.1.2. The CSE Managers and CSEs interviewed were well-versed in this plan and its implementation.

Conclusion:

The criteria for this objective have been met. Document reviews and interviews with CSE Managers and CSEs during the review determined that the TFC has established a comprehensive CSE program that extends beyond the minimum requirements of DOE O 420.1A and ensures the operational readiness of all systems managed by CSEs, maintains system configuration control, and supports operations and maintenance to achieve dependable service for major systems that are vital to the successful operation of the hazardous processes conducted by the TFC. The review determined that the TFC has completely and successfully established a CSE Program to implement the System Engineer requirements of DOE O 420.1A, *Facility Safety*.

Issues:

None.

PERFORMANCE OBJECTIVE SE.2.1 – CSE PROGRAM IMPLEMENTATION – CONFIGURATION CONTROL

The TFC has implemented the CSE program using a graded approach with assigned and qualified Cognizant Systems Engineers in accordance with the established and approved program including identification of systems, configuration management of systems and system documentation, and support for operations and maintenance in order to assure of the operational readiness of systems within the scope of the program.

2.1 System Configuration Control: The system engineer program ensures that system configuration is adequately controlled in accordance with DOE-STD-1073-2003.

Criteria:

2.1.1. A Cognizant System engineer is qualified and assigned to each system within the scope of the System Engineer program for Hazard Category 1, 2, and 3 Nuclear Facilities and other facilities as designated by the established program. (DOE O 420.1A, CRD, Section 4.5)

2.1.2. The assigned CSE demonstrates a working knowledge of applicable procedure and guidance document requirements. (DOE O 420.1A, CRD, Section 4.5.1.2)

2.1.3. The assigned CSE assures that configuration management is adhered to in maintaining consistency among system requirements, performance criteria documentation, and physical configuration for the safety systems and components within the scope of the System Engineer process. (DOE O 420.1A, CRD, Section 4.5.1.2)

2.1.4. The assigned CSE ensures that system design basis documentation and supporting documentation is developed and up-to-date using formal change control and work control processes. (DOE O 420.1A, CRD, Section 4.5.1.2)

2.1.5. The CSE ensures that system maintenance, surveillance, and calibration setting/data are formally documented, controlled, and reflect the operating requirements as specified in the safety basis documentation. (DOE O 420.1A, CRD, Section 4.5.1.2)

2.1.6. The CSE ensures that system maintenance and repair is controlled through formal work control and change control processes to ensure that changes are not inadvertently introduced, that required system performance is not compromised, and that system configuration is maintained. (DOE O 420.1, CRD, Section 4.5.1.2)

2.1.7. The CSE reviews and concurs with design changes. (DOE O 420.1, CRD, Section 4.5.1.3)

Approach:

Record Review:

TFC System Engineer Program Documentation, procedures, training and qualification program description, configuration management documentation, CSE assignments, VSS essential drawings, SDDs, ECNs, CHAMPS work packages, PM data sheets.

Interviews:

TFC CSE program managers and system engineers. Line managers through whom system engineers report.

Observations:

Verify that VSS documentation (drawings, SDDs, etc.) are current with respect to field conditions. Observe CSE system walkdowns, reviews of ECNs, work packages, etc.

PROCESS:

Records Reviewed:

- DOE Order 420.1A, Facility Safety
- DOE-STD-1073-2003, Configuration Management
- TFC- PLN-03, Engineering Program Management Plan, Rev C-1
- TFC-PLN-06, Systems Engineering Management Plan for the Tank Farm Contractor, Rev A-5
- TFC- ENG-FACSUP-P-01, Conduct of System Engineering, Rev C-7
- TFC-ENG-FACSUP-D-01.1, System Health Report Preparation, Rev B-8
- TFC-ENG-FACSUP-D-01.2, System Notebook Preparation, Rev A
- TFC-BSM-TQ-STD-01, Technical Staff Qualification Requirements, Rev C-5
- TFC-PLN-23, Configuration Management Plan, Rev A-8
- TFC-ENG-DESIGN-C-06, Engineering Change Control, Rev E-9
- TFC-ENG-DESIGN-C-09, Engineering Drawings, Rev C-1
- TFC-OPS-MAINT-C-01, Tank Farm Contractor Work Control, Rev M
- Qualification Card and Guide for System Engineer, 350868, Rev. 3a
- Configuration Management Plan, TFC-PLN-23, Rev A-8
- Engineering Change Control, TFC-ENG-DESIGN-C-06, Rev E-9
- Technical Document Control, TFC-ENG-DESIGN-C-25, Rev C
- System Design Descriptions, TFC-ENG-DESIGN-P-07, Rev B
- Tank Farm Contractor Work Control, TFC-OPS-MAINT-C-01, Rev M
- RPP-13033, Rev 1-O, Documented Safety Analysis (DSA), Chapters 3.3.2.3 and Chapter 4.
- HNF-12125, 222-S Laboratory Documented Safety Analysis, Revision 2.
- RPP-16922, Rev. 12, Environmental Specifications Requirements,
- RPP-25722, Cathodic Protection Health Report, 1st Quarter, 2006.

- WFO Electrical Distribution System Notebook

Personnel/ Positions Interviewed:

- Director Engineering Standards
- Engineering Standards Specialist
- Vice President, Analytical Technical Services
- Radiological Control Director, Analytical Technical Services
- S Farm Project Director
- Deputy Vice President of Waste Feed Operations
- Cognizant System Engineers (7)
- System Engineering Manager

Evolutions/Operations/Shift Performance Observed:

Assessors interviewed operational and maintenance management and had discussions with craft.

Observed the CSE comprehensive walk down of the electrical distribution and the cathodic protection system behind the 242-A Evaporator.

Reviewed training records for two CSEs.

RESULTS:

Discussion of Results:

The review team evaluated the system engineer assignment list and discussed the criteria used for determining which systems were assigned a cognizant system engineer with the Director of Engineering Standards (DES) and an engineering standards specialist. The DES explained that DOE O 420.1A required a system engineer program for DOE hazard category 1, 2, and 3 facilities. The tank farms and the 242-A Evaporator are designated DOE hazard category 2 nuclear facilities and the 222-S Laboratory is designated a DOE hazard category 3 nuclear facility. For such facilities, DOE O 420.1A requires contractors to have a system engineer program for active safety-class and safety-significant structures, systems and components, and other active systems that perform an important defense-in-depth function for the protection of the public, workers, or the environment within the context of the safety basis, as designated by the line facility management. The TFC refers to these systems as vital safety systems and expanded their SSC selection criteria beyond that specified in the DOE order to include other SSCs the TFC Chief Engineer deemed as requiring a CSE. The Chief Engineer, with input from others, included the waste feed operations electrical distribution system and cathodic protection system as vital safety systems with assigned CSEs, even though these two systems were not required to have CSEs by DOE O 420.1A.

No system engineers are assigned to systems in the 222-S laboratory. None are actually required since the 222-S laboratory DSA does not identify any safety class or safety significant SSCs to protect the public, workers or the environment. Because the TFC Chief Engineer expanded the

scope of the system engineer program in the tank farms and 242-A evaporator, the reviewers considered the impacts of a complete 222-S Laboratory ventilation system shutdown and the environmental requirements for monitoring the laboratory's ventilation exhaust. The system design and a recent operating event, pertinent to the consideration of 222-S systems being assigned CSEs, were reviewed by the team.

The 222-S Laboratory has a complex ventilation system with seven different zones that are controlled by dampers to maintain the proper air balance. The most potentially contaminated areas have the highest negative pressure while the non-contaminated areas are maintained at the least negative pressure. An emergency diesel driven exhaust fan is available if the primary electric driven system fails. If the ventilation system and the diesel generator were to fail, the potential for the spread of contamination though the lab is possible, with the resultant potential, albeit small, to contaminate laboratory workers and impose a significant operational impact. All lab personnel would be evacuated from the lab until the ventilation system was restored to operation and the recovery plan was implemented. The ATS Radiological Control Director estimated about one day to conduct the radiological surveys of the lab after the ventilation system was restored before lab personnel could return for routine work. Furthermore, ventilation exhaust emissions are regulated by the Washington State Department of Health. In October 2005, CH2M HILL started continuous monitoring of the exhaust stack in response to a Department of Health commitment. The stack was changed from a minor to major stack.

On April 27, 2006, the 222-S Laboratory suffered an electrical outage to motor control center (MCC) 2, shutting down the normal laboratory ventilation system. The emergency diesel driven exhaust fan started as designed. The total power outage to MCC 2 was caused when the unit air conditioner 2 (UAC 2) circuit breaker tripped. The MCC 2 main breaker was configured (wired) to trip when the UAC 2 circuit breaker subsystem tripped. Generally, subsystems do not trip the main MCC main breakers and the need for an electrical coordination study was requested by Analytical Technical Services (ATS). The TFC electrical engineer that performs electrical coordination studies was busy working on another project and did not start the requested 222-S MCC 2 electrical coordination study. This engineer has recently left the TFC. The need to understand electrical configuration of the electrical distribution at the 222-S was heightened from the April 27, 2006, electrical power outage.

The system engineer program was discussed with the ATS Vice President who identified the need for 222-S system engineers, but acknowledged the fact the 222-S Laboratory DSA does not identify safety class, safety significant or defense-in-depth SSCs that would be required by DOE O 420.1A to be assigned a CSE. The review team agreed that the requirements for system engineers in DOE O 420.1A did not apply to the laboratory SSCs, however, the need for knowledgeable system engineers for the electrical and ventilation system appeared justified. The Vice President of ATS agreed and stated there were efforts to evaluate the benefits of system engineers for the 222-S Laboratory.

The review team discussed with three CSEs the applicable procedures and guidance documents used to perform cognizant system engineer work. Each of the CSEs knew the Engineering Change Notice (ECN) process and the specific procedure number. Two of the CSEs had the procedure readily available on their desks. When asked what procedure they used for guidance in performing system engineer duties, all CSEs identified Procedure TFC-ENG-FACSUP-P-01,

"Conduct of System Engineering." This procedure identifies the areas of system engineer involvement in vital safety system performance, efficiency, reliability and the requirements for system engineer activities. The CSEs demonstrated a good working understanding of the procedures and guidance documents they use to perform their duties.

The review team evaluated the methods system engineers use to control the configuration of their assigned systems. The system engineers stated the primary method for controlling system configuration was accomplished through the ECN process. Procedure TFC-ENG-DESIGN-C-06, "Engineering Change Control," defined the process and responsibilities associated with the engineering design development, review/approval, release, and incorporation of changes to approved and released engineering design media through the use of the ECN. All design work is required to follow this process. System engineers, in practice, were involved in the approval process of all significant design work for their systems. The approval process for ECNs requires that the "responsible engineer" sign the ECN. Procedure TFC-ENG-DESIGN-C-06, "Engineering Drawings," refers to Procedure TFC-PLN-03, "Engineering Management Plan," for the definition of a responsible engineer. Procedure TFC-PLN-03 defined a responsible engineer, as a minimum, to be qualified as a core engineer (the System Engineer qualification is a separate qualification that builds on the core engineer qualification). Therefore, a system engineer, a project engineer, or a component engineer could sign the ECN as the responsible engineer. This has the potential of not assuring the engagement of the assigned system engineer during the ECN approval process and undermining the system engineer's ability to adequately control system configuration.

One example where the assigned system engineer was not involved during the ECN development was ECN 723427, "DST Isolation Project: Weatherseal of 244-S," revision 0, dated April 20, 2006. The system engineer for C/T/TX/TY SST Waste Tank Structures, Mixing, and Monitoring was aware of a special project to isolate and foam the covers of double contained receiver tanks (DCRTs) at TX tank farm. This system engineer had engaged himself in the special project during the TX tank farm DCRT isolation design work. A fellow system engineer, responsible for S/SX/U tank farms, learned of the special project through the conversation with the C/T/TX/TY tank farm system engineer. In response, the S/SX/U tank farm system engineer attended a special project meeting and provided design information that was unknown to the special project group and was needed to assure successful completion of the 244-S isolation. The engagement of the assigned system engineer that led to the incorporation of important design information was a result of system engineer peer interactions; not a result of a systematic engagement process.

One of the CSE duties is to provide support to operations and maintenance staff. Interviews conducted by the review team found that system engineers generally have a good on-going working relationship with the craft that are required to maintain the vital safety systems. Maintenance staff expressed a desire to be consulted early in the design or modification process and commented that some newly installed projects will be difficult to maintain because their involvement came too late in the process. An example presented was the AW and AN exhausters. Maintenance indicated they were given the opportunity review the AW and AN exhauster design, however, it was too late in the project development to make changes to facilitate maintainability. According to maintenance staff interviewed, this occurs more frequently when outside contractors or vendors are retained to design a system or modification.

If system engineers were to engage maintenance and operation staff during the initial project development, appropriate opportunities to improve SSC maintainability and operability could be incorporated into the project design without much impact.

The review team observed the CSE comprehensive walk down of the electrical distribution and the cathodic protection system behind the 242-A Evaporator. The CSE was very knowledgeable of the system requirements and procedures. He knew the process to follow if a discrepancy or an adverse material condition with the safety system were to be found. The CSE was thorough and traced the one-line diagrams to the field configuration. The CSE had the electrician turn fuses so that the labels could be read and verified.

All systems listed in the DSA matched the contractor's System Engineer Assignment List except for the record samplers. The CSE indicated the record samplers are used as defense-in-depth (DID) but the system is not identified as such in the DSA under the DID features in the environmental management program (Table 3.3.2.3.2-2). The requirements for the record samplers are located in Environmental Specifications Requirements, RPP-16922. CH2M HILL could not produce the evaluation the systems on the System Engineer Assignment List to establish the basis for inclusion of non-vital safety systems in the system engineer program.

The review team also considered pertinent information about the CSE program from a recent ORP assessment of the Replacement Cross-Site Transfer System (RCSTS) instrumentation performed in February 2006. That assessment found:

1. The CSE can identify the system elements and their functions.

   The CSE gave a briefing on the elements of the RCSTS, provided narration during a walk down of the system and answered questions related to the system. The CSE demonstrated appropriate knowledge of system elements and functions.

2. The CSE understands the DSA and TSR requirements for the system.

   The CSE had excellent knowledge of the DSA and TSR requirements for the RCSTS. This was demonstrated in discussion and review of system and procedural documents. This information was also posted on the CSE logbook website.

3. The CSE is cognizant of the configuration management process applied to safety significant SSCs.

   Configuration management of safety significant SSCs for the RCSTS was implemented through the control of drawings. Documents undergo a review process and were updated by Engineering Control Notice (ECN). ECNs were incorporated into drawings within a specified timeframe that was dependent upon the drawing classification as Essential, Support or General drawings. The latest revisions of all drawings were maintained on the Hanford Document Control System (HDCS) to which access was limited.

4. The Integrated Safety Management System (ISMS) is being implemented.

   DSA and TSRs were developed using an ISMS process. Furthermore, changes to current procedures or configuration use inputs from engineers and field personnel. These were incorporated, reviewed and implemented. Input from field operators was returned and incorporated in future changes for continuous improvement. This was documented online in the CSE system notebook website.

5. The CSE responsible and accountable for the adequacy of the safety significant SSCs.

   The CSE ensures that the work to be performed is allowed by the DSA. He ensures that new equipment meets DSA requirements during ECN reviews. The CSE reviews functional test procedures to ensure that DSA requirements were satisfied. As required by the Shift Manager, the CSE performs operability evaluations on the RCSTS prior to start of transfer.

6. CSE walk downs, surveillances and assessments of the system.

   Walk downs were completed weekly and cover all aspects of RCSTS components. Quarterly Comprehensive Walk downs (equivalent to surveillances and assessments) are performed every 90 days. Quarterly Comprehensive Walk downs were performed in accordance with Conduct of System Engineering procedures, accessible online in the Engineers Toolbox. All of these walk downs, surveillances and assessments were documented online in the CSE notebook website.

7. The CSE adequately demonstrates knowledge of the existing material/operational conditions of the system.

   The CSE presented existing system conditions in a briefing the first day of the assessment and further showed this documented online at the CSE system notebook website.

8. Oversight of system modifications, maintenance and repair being performed to ensure system performance was not compromised.

   Post-Maintenance Testing was performed to determine the extent of modifications, maintenance and repair actions. Existing functional test procedures were used to ensure requirements of the DSA were met. The results of these tests were documented on the CSE logbook website.

9. Material condition of the system was evaluated and documented.

   Material condition of the system was evaluated and documented through weekly and quarterly walk downs, which were documented in the CSE notebook. The PER process is also used, as needed to identify and track system conditions that may require CA.

10. Corrective Action Plans (CAP) are prioritized, tracked and completed.

For items identified in walk downs, the walk down log tracks corrective actions taken. Items identified in the Quarterly Comprehensive Walk downs were tracked in the System Health Report, available on the CSE logbook website. Other corrective actions, and more significant actions identified from walk downs, use the PER process to prioritize, track and complete corrective actions.

11. Action to complete overdue work packages.

    Coordination and prioritization with Operations planning personnel was done to allocate resources to complete overdue work packages. These actions were updated in the System Health Report, available online at the CSE notebook website.

Conclusion:

The criteria for this subobjective have been met with 2 minor weaknesses.

The TFC has correctly identified the tank farm SSCs that are required to have an assigned and qualified system engineer by DOE O 420.1A. In addition, the TFC chief engineer designated additional tank farm SSCs to be included in the system engineer program. The designation of these additional tank farm SSCs are those SSCs that support a vital safety system, were identified as defense-in-depth, or were otherwise identified by the TFC Chief Engineer. This is a positive initiative beyond the basic and minimum requirements of DOE O 420.1A. The 222-S Laboratory, while not required to have assigned and qualified CSEs by DOE O 420.1A because there are no safety-class or safety-significant SSCs in the facility, could benefit from the assignment of CSEs to important laboratory systems, such as the ventilation system to contain airborne radioactive within designated areas of the lab and to heighten environmental focus on the ventilation system exhaust now that it is designated as a major release stack.

CSEs were found to be very knowledgeable of the ECN process and how this process assures system configuration is maintained to meet safety and design functions. Additionally, system engineers demonstrated in-depth knowledge of their specific system engineer guidance documents.

CSEs rely on the ECN process to maintain and preserve safety system configuration. The potential for ECNs affecting the configuration of vital safety systems to be approved without the cognizance of the CSE does exist. The review team found one example of this situation that was self corrected by coordination and communication between CSEs on related systems, but was not procedurally driven.

The review team found that the TFC CSE controls vital safety system configuration in accordance with DOE-STD-1073-2003 through document reviews, interviews and walk downs. The CSEs have been given extensive training in configuration control and it is part of the qualification process. The CSEs have ownership of the configuration of their assigned systems. With the one weakness identified above, where engineers other than the CSE can approve ECNs, the procedures maintain configuration control.

Issues:

Observation SE.2.1-O-1: The TFC Cognizant System Engineer Program does not have a documented systematic process or criteria for identifying non-vital safety systems for inclusion in the CSE program.

Observation SE.2.1-O-2: CSEs rely on their approval of vital safety system ECNs for maintaining configuration control of safety systems. The ECN approval process allows any engineer qualified as a core engineer to approve an ECN. Therefore, ECNs for vital safety systems may not come to the attention of the CSE.

PERFORMANCE OBJECTIVE SE.2.2 – CSE PROGRAM IMPLEMENTATION – OPERATIONS SUPPORT

The TFC has implemented the CSE program using a graded approach with assigned and qualified Cognizant Systems Engineer in accordance with the established and approved program including identification of systems, configuration management of systems and system documentation, and support for operations and maintenance in order to assure of the operational readiness of systems within the scope of the program.

2.2 Operations Support: System Engineers program provide support to operations to ensure that the safety system is operable and performs its intended safety function.

Criteria:

2.2.1. The CSE provides technical assistance to support line management ensure continued system operational readiness. (DOE O 420.1A, CRD, Section 4.5.1.3)

2.2.2. The CSE maintains overall cognizance of the system and is responsible for system engineer support to operations. (DOE O 420.1A, CRD, Section 4.5.1.3)

2.2.3. The CSE performs periodic system assessments that include a review of system operability, reliability, and material conditions. These reviews assess (a) the ability of the system to perform design and safety functions, (b) physical configuration as compared to system documentation, and (c) system component performance in comparison to established performance criteria. (DOE O 420.1A, CRD, Section 4.5.1.2)

2.2.4. The CSE provides Operations assistance in reviewing key parameters and evaluating system performance. (DOE O 420.1A, CRD, Section 4.5.2)

2.2.5. The CSE identifies and evaluates operating trends. (DOE O 420.1A, CRD, Section 4.5.1.3)

2.2.6. The CSE provides assistance in determining operability, correcting out-of-specification conditions, and evaluating questionable data. (DOE O 420.1A, CRD, Section 4.5.1.3)

2.2.7. The CSE provides analysis when the system is suspected of inoperability or degradation. (DOE O 420.1A, CRD, Section 4.5.1.3)

2.2.8. The CSE provides input to development of special operating/test procedures. (DOE O 420.1A, CRD, Section 4.5.1.3)

Approach:

Record Review:

TFC System Engineer procedures, SHRs, and CSE assignments.

Interviews:

TFC CSE program managers, system engineers, Operations Managers, and operations personnel (operators, transfer engineers, etc.).

Observations:

Observe interactions between CSE and operations personnel.

PROCESS:

Records Reviewed:

- DOE Order 420.1A, Facility Safety
- TFC- PLN-03, Engineering Program Management Plan, Rev C-1
- TFC-PLN-06, Systems Engineering Management Plan for the Tank Farm Contractor, Rev A-5
- TFC- ENG-FACSUP-P-01, Conduct of System Engineering, Rev C-7
- TFC-ENG-FACSUP-D-01.1, System Health Report Preparation, Rev B-8
- TFC-ENG-FACSUP-D-01.2, System Notebook Preparation, Rev A
- TFC-BSM-TQ-STD-01, Technical Staff Qualification Requirements, Rev C-5
- TFC-PLN-23, Configuration Management Plan, Rev A-8
- TFC-ENG-DESIGN-C-06, Engineering Change Control, Rev E-9
- TFC-ENG-DESIGN-C-09, Engineering Drawings, Rev C-1
- TFC-OPS-MAINT-C-01, Tank Farm Contractor Work Control, Rev M
- Qualification Card and Guide for System Engineer, 350868, Rev. 3a
- Configuration Management Plan, TFC-PLN-23, Rev A-8
- Engineering Change Control, TFC-ENG-DESIGN-C-06, Rev E-9
- Technical Document Control, TFC-ENG-DESIGN-C-25, Rev C

Personnel/ Positions Interviewed:

AP/AN/SY Tank Farm Facility Manager
S Tank Farm Retrieval Operations Manager
WFO Facilities Director
System Engineers (2)
Director of Engineering Standards
S Farm Project Director
Deputy Vice President of Waste Feed Operations

CO Maintenance Director

Evolutions/Operations/Shift Performance Observed:

System engineer field verification of the BY-102 pit foaming application.

RESULTS:

Discussion of Results:

The review team accompanied one of the system engineers assigned to SST Waste Tank Structures, Mixing and Monitoring vital safety system during a field verification of the BY-102 pit foaming application. The system engineer explained that system engineers were involved throughout the planning and field work phase for the BY-102 pit foaming. The system engineer demonstrated foaming product knowledge by knowing the cost, environmental conditions required for successful application, and required coating thickness. The review team observed that the craft and the system engineer appeared to know each other and the system engineer gave the craft some suggestions on foam application and coverage. The craft followed the advice given by the system engineer. The system engineer had also developed a check list for foaming that was part of the work instruction and was used during the application.

The review team discussed with several system engineers what methods were used to support operations. The systems engineers stated there were five primary areas they support operations. These areas were being knowledgeable of ongoing and projected system projects, understanding equipment maintenance requirements, answering impromptu operational questions, maintaining system configuration control, and keeping knowledgeable of DSA changes and how they impact their systems. The system engineers stated they worked directly with operations on a daily bases and toured their cognizant systems weekly. When problems or questions were brought to their attention they usually were able to respond within hours. They believed they have a good and productive working relationship with operations.

Six CH2M Hill operational managers discussed system engineering support. These managers were independently interviewed and asked questions pertaining to system engineer support of operations. All the managers stated that the system engineers were engaged in their work and knowledgeable of their cognizant systems. Examples included trouble shooting the cross site encasement leak detection system, identifying the cause of the AP low pressure alarm, and specifying new gages for the water distribution skid in S Tank Farm. In each case the system engineer was timely in responding to operations needs and fixed the issue.

System engineers are required to perform routine walk downs of their systems. Procedure TFC-ENG-FACSUP-P-01, “Conduct of System Engineering,” requires a walkdown (or approved alternate) at least four times per month (normally weekly), except for Single Shell Tank Farms in the rounds reduction program which was performed at least monthly. The system engineers assigned to SST Waste Tank Structures, Mixing and Monitoring vital safety system discussed that they had recently field checked the TX Tank Farm compressed air drawings and found no errors. The Retrieval and Closure Mechanical System Engineer stated during C-200 equipment

set-up he compared the equipment installation with the actual drawing and only identified minor problems. Most of the minor problems were with labeling that had falling off during equipment relocation. This labeling/configuration problem had also been observed by an ORP facility representative who noted the issues had been corrected.

System engineers discussed the System Health Report (SHR) development process and value of the SHRs. System engineers stated the SHRs forced them to analyze the status of their cognizant systems. The information they reviewed to evaluate operating trends, system performance, and system degradation was as follows:

- Last quarter's system health report,
- PERs written during the quarter,
- Problems noted during rounds and system walkdowns,
- Corrective maintenance work packages,
- Problems and system trends observed from PCSACS, and
- Problems noted through review of completed preventive maintenance service work.

Several operational managers from CO and WFO discussed the value of the SHRs to operations personnel. Senior operational management stated that the SHRs were of value because they systematically documented system issues. Senior operational management used the SHRs to support and justify equipment upgrades. One example discussed was the upgrade of the in-tank cameras that have continued to fail. The SHR was used to document the failure rates and justify the investment in new camera technology. Additionally, senior operational managers stated the SHRs were an excellent turnover tool for new system engineers and operational staff. However, all operational management stated they were already aware of problem equipment or systems identified in SHRs. Specifically, they thought improvements or enhancements with the SHRs would include:

- Analyzing data to project or identify equipment that will fail and recommend changes to maintenance activities to increase equipment life.
- Condensing the SHR length.
- Continue working with operations to develop a mutually agreed upon criteria for rating availability and reliability.

Through discussions with operational management the review team learned that SHRs were of greater value to senior operational management than working level operations staff and managers.

Conclusion:

The criteria for this subobjective have been met.

A system engineer demonstrated good knowledge of the foaming product used at the BY-103 pit and a good working relationship with craft during application.

System engineers believe that they are responsive to operations' request and operational managers supported this perception.

System engineers were performing system walkdowns as required and finding minor configuration problems that were addressed.

System health reports are used and of greater value to the system engineers and senior operations management.

Issues: none.

PERFORMANCE OBJECTIVE SE.2.3 – CSE PROGRAM IMPLEMENTATION – MAINTENANCE SUPPORT

The TFC has implemented the CSE program using a graded approach with assigned and qualified Cognizant Systems Engineer in accordance with the established and approved program including identification of systems, configuration management of systems and system documentation, and support for operations and maintenance in order to assure of the operational readiness of systems within the scope of the program.

2.3 Maintenance Support: The System Engineers provide support maintenance personnel and activities to ensure reliable system operation.

Criteria:

2.3.1. The CSE maintains overall cognizance of the system and is responsible for system engineer support to maintenance. (DOE O 420.1A, CRD, Section 4.5.1)

2.3.2. The CSE ensures that systems are tested after modification and repair to ensure continued capability to fulfill system requirements. (DOE O 420.1A, CRD, Section 4.5.1.2)

2.3.3. The CSE remains apprised of operational status and ongoing maintenance and modification activities. (DOE O 420.1A, CRD, Section 4.5.1.3)

2.3.4. The CSE initiates action to correct problems with assigned systems and equipment. (DOE O 420.1A, CRD, Section 4.5.1.3)

2.3.5. The CSE remains cognizant of system-specific maintenance and operations history and industry operating experience, as well as manufacturer and vendor recommendations and any product warning regarding safety structures, systems and components in their assigned system. (DOE O 420.1A, CRD, Section 4.5.1.3)

2.3.6. The CSE remains cognizant of component reliability and performance issues and takes the lead in developing recommendations to resolve unacceptable component failure rate and/or inadequate component performance that degrades or impairs the system to function reliably and to perform its intended safety function. (DOE O 420.1A, CRD, Section 4.5.1.2)

Approach:

Record Review:

TFC System Engineer procedures and CSE assignments.

Interviews:

TFC CSE program managers, system engineers, maintenance managers, and maintenance personnel (engineers, craft, etc.).

Observations:

Observe interactions between CSE and maintenance personnel.

PROCESS:

Records Reviewed:

- DOE O 420.1A, Facility Safety
- TFC- PLN-03, Engineering Program Management Plan, Rev C-1
- TFC-PLN-06, Systems Engineering Management Plan for the Tank Farm Contractor, Rev A-5
- TFC- ENG-FACSUP-P-01, Conduct of System Engineering, Rev C-7
- TFC-ENG-FACSUP-D-01.1, System Health Report Preparation, Rev B-8
- TFC-ENG-FACSUP-D-01.2, System Notebook Preparation, Rev A
- TFC-OPS-MAINT-C-01, Tank Farm Contractor Work Control, Rev M
- RPP-RPT-25729, System Health Report for T & TX & TY & C Farm Structures & Mixing & Monitoring For 1st Quarter CY2006
- RPP-RPT-25740, System Health Report for SY Farm Waste Tank Structures Mixing & Monitoring for 1st Quarter CY2006
- RPP-RPT-25570, System Health Report for Retrieval & Closure Mechanical Systems for 1st Quarter CY2006

Personnel/ Positions Interviewed:

- CO Field Work Supervisor
- CO Millwright
- CO Pipefitter
- CO Maintenance Director
- WFO Field Work Supervisor
- WFO Instrument Specialist
- WFO Electrician
- DST Component Engineers (2)
- System Engineers (5)

Evolutions/Operations/Shift Performance Observed:

Employee Accident Prevention Council tour/cleanup of SY Farm

RESULTS:

Discussion of Results:

The team reviewed a number of system health reports and then interviewed CSEs to assess their overall knowledge of their assigned safety systems and their activities to support maintenance of their systems. The CSEs demonstrated competent knowledge of their assigned systems and the support and ancillary systems supporting or adjacent to their systems. They described their involvement with maintenance personnel and the activities they perform to support maintenance. These activities included preparation of work packages, seeking design input, answering questions during conduct of fieldwork, specification of post maintenance testing requirements, and support of preventive maintenance task scope and frequency. To validate this information, the review team interviewed maintenance personnel from management to field craft workers. With the exception of maintenance managers, maintenance personnel were not aware of the assigned system engineers until the review team named them by name. All maintenance personnel immediately recognized the engineering staff by name and described the support provided by them. The review team found that the maintenance personnel corroborated the statements of the CSEs regarding their support to maintenance personnel and activities. Maintenance personnel did acknowledge that this current level of support has developed over the past year and a half to two years; previously, the support was not as responsive. This change generally coincides with establishment of the System Engineer Program in response to the requirements being added when DOE O 420.1A was issued.

The review team also found opportunities to observe maintenance personnel and system engineers working together in the field. In all instances, the reviewers observed that maintenance personnel knew the system engineers and the interaction between them was positive and productive. For example, as presented in Objective 2.2 of this assessment, the review team observed work to foam the BY-102 pit. The craft and the system engineer appeared to know each other and the system engineer gave the craft some suggestions on foam application and coverage. The craft followed the advice given by the system engineer.

The review team asked maintenance personnel what could be done to improve system engineer support of maintenance activities. Several mentioned that the system engineers could be more diligent in consulting the craft early in a new design or modification project to solicit their input on maintainability and lock and tag configurations. Craft stated that this has improved substantially over the past year and a half to two years, but more could be done, particularly for procured design and modification work.

In the area of post maintenance testing following modification and repair work, the CSEs explained to the reviewers that their objective was to demonstrate, as much as possible, the design and safety functions were met by the system and equipment. CSEs review post maintenance testing results and work to resolve problems that arise in testing.

CSEs maintain cognizance and knowledge of their safety systems by conducting weekly walkdowns of their systems and on a quarterly basis, a comprehensive system walkdown. Results of the walkdowns are documented in the CSE's system notebooks. Review team

members accompanied several CSEs on their weekly and quarterly walkdowns and found them to be thorough and documented correctly.

A review of the selected system health reports and discussions with CSEs resulted in the review team's conclusion that the CSEs watch and monitor system performance and conditions and when necessary, initiate actions to restore performance. The actions that CSEs take vary from using the Problem Evaluation Request process to informal discussions with maintenance and operations personnel on ways to restore or improve system performance. As a result of these activities, the review team found the CSEs cognizant of system maintenance and operating history, industry and vendor experience, reliability and availability.

Conclusion:

The criteria for this subobjective have been met.

Through interviews with maintenance personnel and CSEs and observations of field activities, the review team found CSEs to be cognizant and well-informed about their systems. Maintenance personnel expressed good support from system engineers, marking an improvement in the level and quality of support in the last couple of years. Maintenance personnel expressed a desire for further improvement in consultations about new equipment designs and modification packages to incorporate maintainability suggestions and ensuring that energy isolation can be performed easily. System engineers are cognizant of maintenance and operations history and viewed as knowledgeable system experts by maintenance staff.

Issues:

None.

PERFORMANCE OBJECTIVE SE.2.4 – CSE PROGRAM IMPLEMENTATION – CSE QUALIFICATIONS

The TFC has implemented the CSE program using a graded approach with assigned and qualified Cognizant System Engineers in accordance with the established and approved program including identification of systems, configuration management of systems and system documentation, and support for operations and maintenance in order to assure of the operational readiness of systems within the scope of the program.

2.4 Cognizant System Engineer Qualification: The qualification requirements for CSEs are adequate and commensurate with their responsibilities to ensure the successful performance of their duties.

Criteria:

2.4.1. The CSE qualification program is part of the overall training program for System Engineers. (DOE O 420.1A, CRD, Section 4.5.1.3)

2.4.2. Evaluation of the CSE qualification includes formal education, prior training, and work experience as described in DOE Order O 5480.20A. (DOE O 420.1A, CRD, Section 4.5.1.3)

2.4.3. The CSE qualification and training requirements include knowledge of (DOE O 420.1A, CRD, Section 4.5.1.3):

- related facility safety basis including any relationship to administrative controls;
- system functional classification basis;
- applicable codes and standards;
- system design, procurement, replacement, and related quality assurance requirements;
- the existing condition of the system;
- a working knowledge of the facility's operation;

2.4.4. Vendor recommendations, manuals, and any product warnings.

Approach:

Record Review:

TFC System Engineer procedures, CSE assignments, qualification program, qualification cards.

Interviews:

TFC CSE program managers, system engineers, training personnel, CSE supervisors.

Observations:

Observe CSE training classes/activities, if conducted, during assessment field work.

PROCESS:

Records Reviewed:

- DOE O 420.1A, Facility Safety, 5/20/04
- DOE 5480.20A, Personal Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, 7/12/01
- TFC-BSM-TQ-STD-01, REV C-5, Technical Staff Qualification Requirements, 11/25/05, System Engineer Qualification Card No. 350868, REV 3A, and Limited System Engineer Qualification Card No. 351868
- TFC-PLN-03, REV C-1, Engineering Program Management Plan, 1/9/06
- TFC-ENG-DESIGN-P-07, REV B, System Design Description, 3/17/06
- Qualification Card and Guide for System Engineer, 350868, Revision 3a.
- Qualification Card and Guide for System Engineer Prequalification, 357868, Revision 0b.
- Qualification Card for Limited System Engineer, 351868, Revision 2d.

Personnel/ Positions Interviewed:

- Engineering Standards Director
- System Engineer Manager
- System Engineers (2)
- Training Records Custodian

Evolutions/Operations/Shift Performance Observed:

- Matched the System Engineer (CSE) to their training records. All of the records for each of the CSEs were present.
- Performed an extensive training record search on two CSEs. One of the training records did not have the approval signatures on the Document Approval Sheet (page 2). The records custodian replaced the sheet with the signed sheet. All of the training records had a signature and date for each of the competencies.
- Reviewed the CSE records to determine if the two hours of continuing training per month is being met per CH2MHILL Technical Staff Qualifications Requirements, TFC-BSM-TQ-STD-01, and looked at the quality of the training performed. One CSE was waiting for the manager's approval for the May training and another CSE had no training in

March and showed the training to be incomplete on the spreadsheet. Reviewed a sampling of the CSE monthly training for adequacy in continued education.

RESULTS:

Discussion of Results:

The review team determined that the TFC has established a technical staff qualification requirements standard with elements that met all criteria specified in the qualification requirements in the DOE O 420.1A, CRD, Section 4.5.1.3. This determination was a result of document reviews, staff reviews, and field observation. The following details provide the results in each criterion.

The assessors review of the CH2M HILL Technical Staff Qualification Requirements document, TFC-BSM-TQ-STD-01, REV C-5 Dated November 21, 2005, which includes,

- Technical Staff Minimum Entry Requirements which are composed of education requirements, experience requirements, and medical requirements
- Qualification Requirements for TFC System Engineering Managers which are composed of entry requirements, training requirements, qualification requirements including written and oral examinations, requalification requirements, and continuing training requirements.
- Qualification Requirements for System Engineers which are composed of entry requirements, training requirements, qualification requirements including written and oral examinations, requalification requirements, and continuing training requirements.

The assessors interviewed the System Engineer manager as well as System Engineers and found that they have the knowledge related to qualification, training, and education.

Conclusion:

The criteria for this sub-objective have been met with a minor weakness.

CH2M HILL has implemented an adequate and effective System Engineer Qualification Program for both the management and technical staff as defined by DOE O 420.1A, *Facility Safety*, Contractor Requirements Document (CRD), section 4.5.1.3, *Cognizant System Engineer Support for operation and Maintenance*, and by DOE 5480.20A, *Personnel Selection, Qualification and Training Requirements for DOE Nuclear Facilities*, dated July 12, 2001, Chapter IV, Section 2.f, *Technical Staff for Non-Reactor Nuclear Facilities.*

The CSE training records were consistent with the requirements of DOE O 420.1A, CRD Section 4.5.1.3, for qualification requirements and DOE 5480.20A. All of the requirements for development plans and qualifications were met. The qualification process included the required knowledge base as required in DOE O 420.1A.

The review found one continuing training document lacked the document approval signatures and, upon identification by the review team, the records custodian immediately replaced the page with the electronically signed approval sheet. The two instances where the monthly continuing training was not documented as completed were noted, however the TFC failed to follow-up in a timely manner to correct the deficiencies.

Issues:

Findings:

None.

Observations:

Observation SE.2.4-O-1: TFC follow-up to recognize and correct training deficiencies failed in 2 instances of incomplete continuing CSE training as required by TFC-BSM-TQ-STD-01, Revision C-5, Section 3.3.5. One CSE did not have the required training for one month and another CSE did not have the manager's sign off on the training that was completed.

APPENDIX B

TEAM MEMBER

BIOGRAPHIES

Team Member Qualification Summary

Team Member Name: Walter B. Scott, Assessment Team Leader

Title and Organization: Senior Technical Advisor
Tank Farms Engineering Division
Office of the Assistant Manager for Tank Farms Project
Office of River Protection

Areas Assigned: Safety System Oversight Program
Authorization Basis Reviews
DNFSB Technical Liaison
Fire Protection Safety Management Program

Summary of Education and Technical Qualifications and Experience:

- Thirty years experience in the nuclear and environmental restoration fields
- Registered Professional Mechanical Engineer (expired)
- BS in Mechanical Engineering, Brigham Young University

Summary of Experience:

- Canister Storage Building and Cold Vacuum Drying Facility Final Safety Analysis Review Team Lead
- Team member for Fermi Lab Tiger Team
- Investigation of Anticipated Transient without Scram incident at Salem Nuclear Generation Station
- Restart assessment of Rancho Seco Nuclear Power Plant
- NRC maintenance assessment of Trojan Nuclear Plant
- Consultant to DOE EH Site Representatives, Richland Operations Office
- Power Production Engineer, Maintenance, Diablo Canyon Nuclear Power Plant
- Construction Coordination Office Lead, Diablo Canyon Nuclear Power Plant
- Prototype Liquid Metal Fast Breeder Reactor Design and Analysis Team, General Electric Company, Fast Breeder Reactor Division

Team Member Qualification Summary

Team Member Name: Courtney A. Blanchard

Title and Organization: Facility Representative
Tank Farms Operations Division
Office of the Assistant Manager for Tank Farms Project
Office of River Protection

Areas Assigned: Tank Farm Closure Projects and Demonstration Bulk Vitrification System Project

Summary of Education and Technical Qualifications and Experience:

- Bachelor of Science in Engineering, Michigan Technological University, 1981
- Qualified as NRC nuclear Materials Regional Inspector
- Qualified Resident Inspector and Senior Resident Inspector
- Qualified as DOE Facility Representative at the Hanford Tank Farms
- State of Washington Professional Engineer, Ref: 25348 - July 15, 1988, to present
- Twenty four years experience in various naval, commercial, and DOE nuclear facilities

Summary of Experience:

- ORP Facility Representative at the Hanford Tank Farms.
- ORP Federal Interface Engineer responsible for managing the interface activities between the WTP and Tank Farm (TF) contractors, DOE Richland Operations Office (RL), and the RL contractors to support the design, construction, and commissioning of the WTP.
- Performed Office of Safety Regulation (OSR) design process inspection of the WTP contractor in the areas of training, fire protection, occupational safety, work control, and vital safety systems.
- Temporary assigned to the Brookhaven National Laboratory as the EM Facility Representative. Responsibilities during this six month assignment included the over site of four EM clean-up projects. These projects were the decontamination of a highly contaminated Brookhaven Graphite Research Reactor ventilation duct, removal and remediation of two radioactive underground storage tanks, Peconic River remediation, and remediation of a former hazardous waste site on the Brookhaven site.
- NRC Senior Resident Inspector at the Paducah Gaseous Diffusion Plant (GDP), dealing with inspection and enforcement of the facility license and design basis. Supervised the activities of one resident inspector.
- NRC Resident Inspector at the Portsmouth GDP. Conducted numerous inspections of licensee activities to ensure compliance with NRC requirements.
- NRC Fuel Cycle Inspector with responsibilities that included conducting routine and special inspections at Uranium Fuel Cycle facilities.

- Industrial Planning Coordinator at Puget Sound Navel Shipyard (PSNS): Supervised a staff of engineers and technicians that developed the technical guidance instructions used by machine shop personnel to repair equipment.
- Production Engineering Supervisor at PSNS: Supervised a team of engineers that were responsible for answering all technical questions during the CGN 41 availability and negotiated funding issues with senior shipyard management.
- Mechanical Engineering Branch Manager at PSNS: Responsible for planning, organizing, and controlling the actions of the branch of 30 engineers and technicians to accomplish assigned design task.
- Mechanical Engineering Supervisor at PSNS: Supervised and approved the work of 10-20 engineers and technicians that developed design projects to install and modify fluid systems on naval vessels.
- On-Site Engineering Representative at PSNS: Assigned to Long Beach Naval Shipyard as the project engineer to address design issues with the PSNS design packages during the overhaul of the USS Jouett.
- Mechanical and Lead Engineer at PSNS: Performed design activities for several types of firefighting system on Navy ships and prepared written design procedures, taught fluid and magazine sprinkling system classes, and reviewed the design products of engineers and technicians.

Team Member Qualification Summary

Team Member Name: Russell G. Harwood, Team Member

Title and Organization: Electrical Engineer
Tank Farm Engineering Division
Office of Assistant Manager Tank Farms Project
Office of River Protection

Areas Assigned: Tank Farms Engineering Division. Instrumentation and Control Safety System Oversight.

Summary of Education and Technical Qualifications and Experience:

- Sixteen years experience in the nuclear and environmental restoration fields
- Safety System Oversight (SSO) Qualified, September 2005
- BS in Electrical Engineering, University of Idaho

Summary of Experience:

- Lead or a member of numerous electrical SSO assessments.
- Program manager of the tank farm system upgrades.
- Program Manager of the DNFSB 2000-2 Recommendation closure (operability of vital safety systems).
- National Electrical Code (NEC) and OSHA inspector for ORP.
- Project manager for the contractor implementation of Basis for Interim Operation (BIO) compensatory measures, instrumentation upgrades, configuration management, emergency preparedness.
- Puget Sound Naval Shipyard electrical design engineer for communication and alarm systems.
- Formal Specialized Training:
  Instrumentation and Process Control
  Variable Frequency Drives
  Programmable Logic Controllers

Team Member Qualification Summary

Team Member Name: Wen-Shou Liou

Title and Organization: General Engineer
Tank Farms Engineering Division
Office of the Assistant Manager for Tank Farms Project
Office of River Protection

Area Assigned: In-Tank Characterization

Summary of Education and Technical Qualifications:

- BS Chemical Engineering, ChungYuan University
- MS Chemical Engineering, South Dakota School of Mines & Technology
- Ph.D. Chemical Engineering, University of Missouri

Summary of Experience:

- Over 30 years experience in nuclear waste characterization/environmental cleanup, project/program management, and process design.
- At ORP, responsible for tank farms waste characterization, data management, and safety analysis assessment.
- At Office of Fossil Energy (FE), responsible for management of Coal Gasification Projects. Including academic research, industrial pilot scale development and commercial demonstration projects.
- At Dravo Corporation, responsible for process design of various chemical plants.