



U.S. Department of Energy
Office of River Protection

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08-WTP-026R1

APR 15 2008

Mr. L. J. Simmons, Project Manager
Bechtel National, Inc.
2435 Stevens Center Place
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Dear Mr. Simmons:

CONTRACT NO. DE-AC27-01RV14136 – TRANSMITTAL OF THE U.S. DEPARTMENT OF ENERGY (DOE), OFFICE OF RIVER PROTECTION (ORP) DESIGN OVERSIGHT REPORT NUMBER D-08-DESIGN-058, REVISION 1: CRITICALITY SAFETY PROGRAM ASSESSMENT FOR THE WASTE TREATMENT AND IMMOBILIZATION PLANT (WTP)

ORP recently conducted an assessment of the Bechtel National, Inc. (BNI) Criticality Safety Program. The primary focus of the assessment was to determine BNI's compliance with DOE O 420.1A, *Facility Safety*, Section 4.3 (Nuclear Criticality Safety) as the implementing standard in the Safety Requirements Document, Safety Criterion 3.3. The assessment resulted in three Findings and two Observations. The ORP assessment report and transmittal letter, 08-WTP-026, dated January 31, 2008, were sent to BNI.

On March 4, 2008 BNI provided additional documentation and ORP subsequently concluded that there was sufficient evidence indicating Nuclear Criticality Safety (NCS) staff involvement in the Engineering Design Review process. The ORP assessment team, therefore, eliminated the first Finding, but documented two additional Observations. The additional information on training and qualification records for NCS staff related to the second Finding was also evaluated by the assessment team. This information consisted of Quality Assurance training profile records of the Environmental and Nuclear Safety (E&NS) Radiological and Fire Safety manager and the Criticality Safety Engineer (CSE). The assessment team concluded that this additional information did not document training and qualification requirements as stated in DOE O 420.1A and its invoked standard, American National Standards Institute/American Nuclear Society-8.19-1984, *Administrative Practices for Nuclear Criticality Safety*. Therefore, the assessment team reiterated this result as a Finding.

The revised assessment resulted in two Findings and four Observations, as documented in Section 4.0 of the attached assessment report. The results concluded by the ORP assessment team are considered final. This revised assessment report supersedes the first report in ORP letter, 08-WTP-026, dated January 31, 2008.

Mr. L. J. Simmons
08-WTP-026R1

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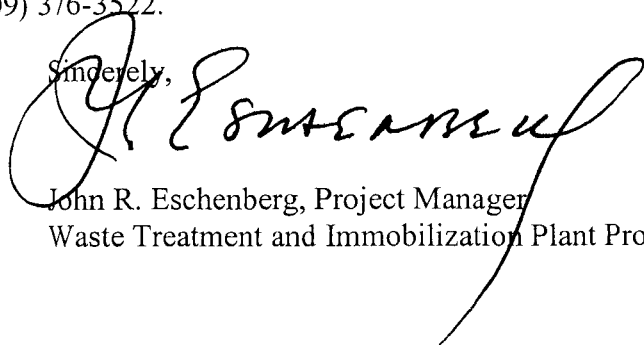
ORP expects BNI to provide, within 30 days of receipt of this letter, a response to the Findings. The response should be consistent with required actions identified in ORP M 220.1, Rev. 5. Additionally within 30 days, ORP requests that BNI provide a detailed response to address and correct issues identified in Observations D-08-DESIGN-058-001 and D-08-DESIGN-058-002.

The Criticality Safety Assessment Team expressed concern that the Contractor personnel participation in this assessment did not meet DOE-ORP's expectation. As the Owner/Regulator, the contract requires DOE to: "Perform design, construction and operability oversight of the WTP, and, where required ..." Further the contract requires the Contractor to: "Provide DOE or its designee(s) access to and the right to conduct assessments, audits, and/or surveillance of the Contractor (and its subcontractors/suppliers, at any level) records, premises, activities, and of radioactive materials in possession or use related to the WTP, as necessary to effectuate the responsibilities of DOE. The Contract also identifies a philosophy to be adopted by the Contractor in execution of DOE's assessment process ... "The Contractor shall provide resources necessary to establish and implement the partnering approach, throughout the Contract period of performance. The Contractor shall be responsible for actively participating in the partnering approach in a constructive manner. Be advised that I am concerned that during this assessment and as reported to me by my staff on another recent occasion, the Contractor's team has demonstrated a less than "Partnering approach in a constructive manner," in assisting us during our assessments.

This letter is not considered to constitute a change to the Contract. In the event the Contractor disagrees with this interpretation, it must immediately notify the Contracting Officer orally, and in writing within five working days in accordance with the Contract (Section H, Clause H.1 "Technical Direction").

If you have any questions, please contact me, or your staff may contact James H. Wicks, Director, WTP Engineering Division, (509) 376-3522.

Sincerely,



John R. Eschenberg, Project Manager
Waste Treatment and Immobilization Plant Project

WTP:VLC

Attachment

cc w/attach:
W. S. Elkins, BNI
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U.S. Department of Energy, Office of River Protection

DESIGN ASSESSMENT

CRITICALITY SAFETY PROGRAM ASSESSMENT FOR THE WASTE TREATMENT AND IMMOBILIZATION PLANT (WTP)

DECEMBER 2007

DESIGN OVERSIGHT: D-08-DESIGN-058, REVISION 1

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EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE), Office of River Protection (ORP) Waste Treatment and Immobilization Plant (WTP) Engineering Division (WED) staff conducted an assessment of the WTP Contractor (Bechtel National, Inc. [BNI]) Criticality Safety Program (CSP) using the implementing standard, DOE O 420.1A, *Facility Safety*, Section 4.3, as applied in the Safety Requirements Document (SRD), Safety Criterion 3.3. During its assessment, the team considered the following:

- Nuclear criticality safety (NCS) staff involvement in system design reviews that involve fissionable material through interaction with process engineering
- Training and qualification program for NCS staff
- Management responsibilities for demonstrating ownership and participation in the CSP
- Method of validating code bias of computer simulation software

Based on the requirements of DOE O 420.1A, which further identifies the American National Standards Institute/American Nuclear Society (ANSI/ANS) nuclear criticality safety standards for a criticality safety program, the Assessment Team identified two Findings and four Observations on the WTP CSP.

Findings

- **D-08-DESIGN-058-F01:** BNI does not have a comprehensive, documented criticality safety training program established for its staff. Applicable staff during design and construction includes Environmental and Nuclear Safety (E&NS) management, engineers involved in maintaining the Preliminary Safety Analysis Report (PSAR), criticality safety engineers (CSE), and Process Engineering staff. The Contractor's current CSE, who performs the majority of criticality safety-related work, is very experienced and appears well-qualified. Even though current CSE personnel are experienced, a documented CSE training program and a CSE training and qualification record that includes the applicable aspects of DOE-STD-1135-99, *Guidance for Nuclear Criticality Safety Engineer Training and Qualification*, are a necessary part of the CSP. DOE O 420.1A and its invoked ANSI/ANS standards require that a program for training and qualifying staff in criticality safety shall be implemented. BNI has stated a "graded approach" has been applied to criticality safety training based on its assessment that criticality is not credible at WTP. However, the use of a graded approach does not imply an exemption from training program requirements for facilities in which a criticality event has been demonstrated to be incredible by analysis in the WTP Criticality Safety Evaluation Report (CSER).
- **D-08-DESIGN-058-F02:** BNI does not currently have any formalized management assessment program for criticality safety. ANSI/ANS-8.19-1984, *Administrative Practices for Nuclear Criticality Safety*, Section 4.6, states: "Management shall participate periodically in auditing the overall effectiveness of the nuclear criticality safety program." No documentation was provided to indicate that E&NS management has previously performed periodic program oversight and audits.

Observations

- **D-08-DESIGN-058-001:** There is no evaluation/review process in the Contractor's authorization basis maintenance procedure (24590-WTP-GPP-SREG-002, *Authorization Basis Maintenance*) to review design changes against the WTP CSER or to review changes to the CSER against the PSAR. ORP recommends that the Contractor modify the procedure 24590-WTP-GPP-SREG-002 to include safety screening/evaluations for criticality safety information consistent with the role of the Criticality Safety Specialist discussed in the General Information PSAR (24590-WTP-PSAR-ESH-01-002-01), Section 6.5.1.4. Furthermore, ORP expects this safety screening/evaluation process to include the CSER and the final safety analysis report prior to operation of the WTP facilities.
- **D-08-DESIGN-058-002:** In Chapter 6 of the PSAR, all information about the results of the hazard and criticality parameter analysis in the CSER and controls derived by the CSER was deleted when Revision 1 of the PSAR was issued in 2003. In the context of the authorization basis maintenance procedure, this information is needed and a summary level discussion of the CSER should be reintroduced into the PSAR. The Assessment Team noted the criticality safety content in Chapter 6 of the PSAR is not consistent with the intent of the format and content guidance in the SRD, Appendix G, and excludes pertinent sections related to the CSER.
- **D-08-DESIGN-058-003:** ORP expects the Contractor's CSP to evolve over time as the project progresses through the design and construction phase. This evolution should be evident in the CSP document and detailed procedures that implement the CSP requirements. The Assessment Team concluded that the Contractor's CSP document should be updated on a continuing basis to include reference to the latest implementing procedures for its high-level requirements. The CSP should provide an explanation as to how the procedure implements CSP requirements, how the procedure should be used, and when it should be used.
- **D-08-DESIGN-058-004:** At present, the Contractor's CSP assigns all technical responsibilities and lower-level administrative (i.e., non-management) responsibilities to the CSE. The technical responsibilities assigned to the CSE represent somewhat distinct and separated work functions from the administrative ones. The Assessment Team concluded the Contractor's Criticality Safety organization might benefit by designating a separate staff role for criticality safety administrative functions such as developing training programs or reviewing operating procedures.

Criticality Safety Program Assessment for Waste Treatment Plant

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LIST OF TERMS

AB	Authorization Basis
ANSI/ANS	American National Standards Institute/American Nuclear Society
BNI	Bechtel National, Inc.
CNP	Cesium Nitric Acid Recovery Process System
CSE	Criticality Safety Engineer
CSER	Criticality Safety Evaluation Report
CSP	Criticality Safety Program
CSS	Criticality Safety Specialist
DOE	U. S. Department of Energy
E&NS	Environmental and Nuclear Safety
ISM	Integrated Safety Management
MCNP	Monte Carlo N-Particle
NCS	Nuclear Criticality Safety
ORP	Office of River Protection
PSAR	Preliminary Safety Analysis Report
QA	quality assurance
R&T	Research and Technology
SRD	Safety Requirements Document
WED	WTP Engineering Division
WTP	Waste Treatment and Immobilization Plant

1.0 INTRODUCTION

A major objective of the U.S. Department of Energy (DOE), Office of River Protection (ORP) mission is the design and construction of the Waste Treatment and Immobilization Plant (WTP) Project in the 200 East Area of the Hanford Site. The WTP design and construction contractor is Bechtel National, Inc. (BNI). As part of its oversight responsibilities, ORP performs various assessments of BNI activities during the design and construction phase as required by ORP M 220.1, *Integrated Assessment Program*, Rev. 5.

This assessment focused on the programmatic aspects of the WTP Criticality Safety Program (CSP). The assessment consisted of document reviews and BNI management and staff interviews. The Assessment Team evaluated the information and additional documents provided by BNI during the period of December 10, 2007, through January 15, 2008, and prepared a draft report. The preliminary report was sent to BNI for factual accuracy before issuing the final report. A meeting was convened between ORP and BNI on March 4, 2008, to discuss the Findings issued in the assessment report dated January 31, 2008¹. As a result of that meeting, additional documentation regarding the first two Findings was provided by BNI and evaluated by the ORP Assessment Team. Subsequently, the Assessment Team eliminated the first Finding and issued two Observations in its place. This revised assessment report, which contains two Findings and four Observations, is the result of this review.

2.0 BACKGROUND

The WTP Safety Requirements Document (SRD) (24590-WTP-SRD-ESH-01-001-02), Safety Criterion 3.3, describes the Contractor's commitment to design and operate WTP facilities in a manner that prevents nuclear criticality and that WTP complies with the requirements of DOE O 420.1A, *Facility Safety*, Section 4.3, "Nuclear Criticality Safety." The Contractor implemented its CSP through the document, 24590-WTP-PL-ENS-03-013, *Criticality Safety Program for WTP*, which provides an overall description of the program and uses a tailored approach for implementing applicable guidance from American National Standards Institute/American Nuclear Society (ANSI/ANS)-8.1, *Nuclear Criticality Safety in Operations with Fissionable Material Outside Reactors*, and ANSI/ANS-8.19, *Administrative Practices for Nuclear Criticality Safety*. These consensus standards represent the best practices for nuclear criticality safety (NCS) programs and are required under DOE O 420.1A, Section 4.3.3. As WTP design and construction progresses, the need to ensure that criticality safety concerns for processes, systems, and equipment that involve fissionable material are thoroughly addressed and validated is especially important prior to final design and installation of systems and equipment.

This assessment was performed in order to provide ORP evidence that the elements of the WTP CSP are implemented and comply with the above referenced documents.

¹ ORP letter from J. R. Eschenberg to L. J. Simmons, BNI, "Transmittal of the U.S. Department of Energy (DOE), Office of River Protection (ORP) Design Oversight Report Number D-08-DESIGN-058: Criticality Safety Program Assessment for the Waste Treatment and Immobilization Plant (WTP)," 08-WTP-02, dated January 31, 2008

3.0 OBJECTIVES, SCOPE, AND APPROACH

3.1 Objectives

The objectives of this assessment were to evaluate the Contractor's adherence to the following selected sections of DOE O 420.1A and ANSI/ANS-8.19:

1. NCS staff involvement in system design reviews that involve fissionable material through interaction with process engineering
2. Training and qualification program for NCS staff
3. Management responsibilities for demonstrating ownership and participation in the criticality safety program
4. Method of validating code bias of computer simulation software

Additionally, DOE-STD-1158-2002, *Self-Assessment Standard for DOE Contractor Criticality Safety Programs*, and DOE-STD-1135-99, *Guidance for Nuclear Criticality Safety Engineer Training and Qualification*, were used as assessment guides for the lines of inquiry in each of the listed objectives.

3.2 Scope

The Assessment Team reviewed documentation that included BNI procedures, calculations, guides, NCS personnel and training records, Integrated Safety Management (ISM) meeting minutes, and conducted interviews to determine compliance with the implementing standard, DOE O 420.1A as defined in the SRD, Safety Criterion 3.3. The team also reviewed information BNI provided in order to determine the extent of coordination with NCS and Process Engineering staff, and Environmental and Nuclear Safety (E&NS) management oversight through past audits of the WTP CSP.

3.3 Approach

ORP conducted this assessment within the guidelines of ORP DI 220.1, "Conduct of Design Oversight," Rev. 1. Information was collected from various BNI and DOE documents, and interviews with BNI Criticality Safety staff. See Section 6.0 for a full list of reviewed documents and personnel contacted.

4.0 RESULTS

4.1 Training and Qualification Program for NCS Staff

BNI does not appear to have a comprehensive, documented criticality safety training and qualification program established for its staff (e.g., E&NS management, E&NS staff including criticality safety engineers [CSE], and Process Engineering staff). During the assessment, the team received Quality Assurance (QA) program "training profile" records for the E&NS criticality safety manager and the CSEs. The QA record showed completion of certain general employee training courses and required reading lists including some required reading specifically for criticality staff. The Assessment Team reviewed Chapter 6 of the General Information

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Preliminary Safety Analysis Report (PSAR) (24590-WTP-PSAR-ESH-01-002-01), which contains the Contractor's training and qualification requirements for CSEs in Section 6.5.4. The Contractor submitted a "CSS Training and Qualification" record/form generated internally by the Criticality Safety organization (i.e., not a QA record) that appears to follow the qualification requirements in Section 6.5.4 of the PSAR. Also, the Assessment Team reviewed resumes showing education and past experience for the current CSEs and the manager of the criticality safety program.

The information submitted by BNI meets several of the individual elements required for training of CSEs and the manager of the criticality safety program. The Assessment Team concluded that while the Contractor Criticality Safety Specialist (CSS) Training and Qualification record documents important aspects of a training and qualification card for CSEs, the information BNI submitted does not contain enough of the elements for a comprehensive training and qualification program tailored or graded to the design and construction of the WTP Project. For example, the Assessment Team reviewed DOE-STD-1135 and identified training program elements (tailored from the standard) that should be captured by a training program for WTP CSE staff during design and construction. Appendix A compares the tailored CSE training elements to the information submitted by BNI. The Assessment Team recognizes that some requirements (such as knowledge of alarm system design) in DOE-STD-1135 are not applicable to CSE training at WTP because of the specific nature of the plant design and criticality control strategy. Other requirements in DOE-STD-1135 are not yet applicable to the training program because the project is still in the design and construction phase, but will become applicable as the facility approaches operation. Both types of requirements have been omitted from Appendix A. However, it is also apparent that some of the necessary training requirements are not met by the General Information PSAR and not documented in CSS Training and Qualification records or the QA Training Profile. The Contractor's CSS Training and Qualification record should document completion of the training elements in Appendix A such that this record is a standalone training and qualification document for the CSE.

The Assessment Team found that personnel besides the CSEs such as those who work in process design, engineering, and safety analysts responsible for the WTP Authorization Basis (AB) appear to lack basic criticality safety training. These personnel may not be aware of potential impacts to criticality safety in the design of process systems. The Assessment Team's position is that affected personnel need to have a knowledge level in criticality safety appropriate to the person's work responsibilities. DOE O 420.1A, Section 4.3.3.b, lists ANSI/ANS 8.19, which contains general training requirements in Section 5.3:

"Each supervisor shall provide training and shall require that the personnel under his supervision have an understanding of procedures and safety considerations such that they may be expected to perform their functions without undue risk."

Furthermore, ANSI/ANS 8.19-2005, Section 5.3, references ANSI/ANS 8.20, *Nuclear Criticality Safety Training*, for supervisor responsibilities to provide some form of criticality safety training to personnel besides CSEs. ANSI/ANS 8.20 is not a direct requirement for WTP, but its reference in ANSI/ANS 8.19 indicates it is an important source of information for interpreting how to apply the general training requirement in ANSI/ANS 8.19 to the WTP Project. ANSI/ANS 8.20, Section 3, states, the training program extends beyond the CSEs to design

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personnel, support personnel (e.g., E&NS staff responsible for AB material that may be impacted by criticality safety considerations), and management. Criticality safety training for these staff members is standard practice for facilities throughout the DOE complex.

As discussed above, the intent of the ANSI/ANS 8.19 training requirement extends beyond the CSEs to various other staff members whose function potentially interfaces or impacts criticality safety. Since the facility is not operating, this extension, at present, is limited to supervisory personnel overseeing criticality safety, certain E&NS staff involved with maintaining the safety AB, and project engineering personnel responsible for the design of systems that control criticality safety or could have important impacts on criticality parameters. Training programs should be developed to provide these staff members with:

- The basic concepts of criticality safety physics, criticality safety history, and criticality control methods.
- A general familiarity with the facility-specific criticality hazards and controls for WTP.

These general objectives could be accomplished by developing a criticality safety short-course for managers and engineers at the WTP Project.

The Assessment Team recognizes that tailored job-specific training may be needed in addition to the general short-course training. For example, E&NS management responsible for program oversight and audits may require training to familiarize themselves with the NCS administrative elements (e.g., audit procedures, CSP, etc.) and the essentials of the WTP Criticality Safety Evaluation Report (CSER) analysis and criticality controls. E&NS staff members responsible for safety screening of design changes or writing PSAR revisions should be familiar with the CSER analysis and criticality controls so they can competently incorporate CSER revisions into the PSAR and identify potential criticality safety impacts of design changes on the safety envelope documentation subject to the AB maintenance procedure (24590-WTP-GPP-SREG-002). Process engineering personnel involved in the design of systems that implement criticality controls (e.g., sampling systems) need to be familiar with the basis for and the requirements of the proposed controls.

The Assessment Team observed the Contractor's current in-house CSE has been performing this role for a number of years (6+) and appears well-qualified. Therefore, it is reasonable that existing senior staff members can be qualified under the equivalency requirements discussed in Appendix A. However, the fact that current NCS staff are experienced does not exempt the Contractor from the requirement for a documented training program and documented records showing the training requirements are met (even if by an equivalency exemption). It is worth noting that several personnel other than the current CSE have been involved with criticality safety on the WTP Project over the last 10 years. During discussions with BNI, the Radiological and Fire Safety manager expressed intent to train new staff. In this context, the presence of the training program and qualification card for CSEs is needed to provide clear and accessible documentation of the current staff qualifications and to provide a framework under which new CSEs can be trained in the future.

The training program will need to evolve as the facility approaches operation to include training elements related to development and review of operating procedures, criticality safety oversight

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of operations, etc. The program will eventually need to include operations staff that implement criticality controls.

In summary, the ORP Assessment Team interprets “implemented using a graded approach” to imply that a training program for WTP should exist and be designed to ensure that applicable staff members are knowledgeable in criticality safety at a level appropriate for their work responsibilities. The Assessment Team does not interpret the “graded approach” in DOE O 420.1A as an exemption from training program requirements for facilities in which a criticality event has been demonstrated to be incredible in the CSER analysis.

Conclusion: The Assessment Team concluded that the training and qualification requirements, in DOE O 420.1A and its invoked standard, ANSI/ANS 8.19, are not met and is considered an assessment **Finding (D-08-DESIGN-058-F01)**.

4.2 Management Responsibilities and Participation in NCS

BNI does not currently have any formalized management assessment program for criticality safety as required by 24590-WTP-PL-ENS-03-013, Section 3 (Responsibilities). No documentation indicating past audits of NCS were provided to the Assessment Team. During June 2007, a management assessment from BNI Headquarters was performed on the CSER (Sections 4 and 8 only) (24590-WTP-MAR-ENS-07-0036, *Review of the Preliminary Criticality Safety Evaluation Report*). This assessment was apparently in reaction to the April 2007 Defense Nuclear Facilities Safety Board review of the WTP CSER. This limited assessment was an isolated event that does not meet the intent of the requirements in ANSI/ANS-8.19. BNI also submitted an audit of the criticality safety program performed by the QA organization in 2004 (24590-WTP-IAR-QA-04-008). However, the audit was performed by QA staff without special knowledge of criticality safety and was only a self-consistency check to evaluate whether E&NS was following its established CSP. The Assessment Team noted that Finding 2 of the QA audit was that EN&S had “not performed an annual independent review of the Criticality Safety Program,” which was one of the requirements in the CSP at the time. The finding did prompt a response by E&NS management to delete the requirement for annual audits prior to the start of operations.

As stated in ANSI/ANS-8.19-1984, Sections 4.5 and 4.6, management shall establish a means for monitoring the criticality safety program and shall participate in periodic audits of the program. There is also a general requirement for conducting management assessments in 24590-WTP-PSAR-ESH-01-002-01, *Preliminary Safety Analysis Report to Support Construction Authorization; General Information*, Section 6.5.1.5, that states:

“Management assessment review of the criticality safety program will be conducted. A graded approach for assessment of the criticality safety program should be applied prior to processing of fissionable material. At that time, depending on the credibility of criticality, the criticality safety program assessment should assess the applicable elements of the criticality safety program. Areas of interest should include all criticality related incidents, causes or root causes, lessons learned, trends, assessment findings, and changes to any criticality limits and controls.”

Periodic audits of the program during the design and construction phase of the project are important to ensure the NCS program is evolving as needed (e.g., development of training and qualification programs as the facilities approach operation, reference of new criticality safety-related procedures in criticality documents as new procedures are developed, and, ultimately, development of operating procedures), and to confirm that staffing and funding levels are appropriate to resolve open criticality analysis and control issues prior to facility operation. ORP's expectation is that BNI develop an annual or bi-annual management audit of the CSP to ensure these requirements are satisfied.

Conclusion: The Assessment Team concluded that periodic audits by E&NS management were not performed in accordance with ANSI/ANS-8.19, Section 4.6, resulting in an assessment **Finding (D-08-DESIGN-058-F02)**.

4.3 NCS Staff Involvement in System Design Reviews

The Assessment Team reviewed BNI procedures and records to understand how NCS staff members are involved in design reviews. The requirements for design change review and design input are:

- Section 6.1 of ANSI/ANS 8.19 states "The Nuclear Criticality Safety staff shall provide technical guidance for the design of equipment and processes..."
- Section 3.4 of the WTP CSP document (24590-WTP-PL-ENS-03-013) establishes clear roles and responsibilities for NCS staff. One of the responsibilities of the CSS is to "Provide technical guidance for the design of equipment and processes that involve fissionable material and provide independent nuclear criticality safety review, analysis and approval of the design or modification of fissionable material processes, systems and equipment."

In response to the Assessment Team's requests, BNI provided:

- Procedure 24590-WTP-GPP-MGT-007, *WTP Document Administration*, Rev. 3
- Procedure 24590-WTP-3DP-G04T-00913, *Engineering Department Project Instructions: Review of Engineering Documents*, Rev. 5
- Several internal documents (e-mails, meeting minutes referenced in Section 6.3) that indicate an informal level of interaction between the NCS staff and Process Engineering and Research and Technology (R&T) staff regarding design issues.
- A record of engineering document reviews (EDR) performed by the CSE for the last 12 months, including sample EDRs.

Also, ORP is aware of a 2005 corrective action (24590-WTP-CAR-QA-06-035, *Evaluation of a criticality in the CNP evaporator*) related to the ion exchange column and Cesium Nitric Acid Recovery Process System (CNP) evaporator operating parameters during which NCS staff discussed control options with Process Engineering.

BNI's procedures for review of changes to design documents are 24590-WTP-GPP-MGT-007 and 24590-WTP-3DP-G04T-00913 (which applies to documents prepared by engineering personnel). E&NS documents its review by a signed Document History Record (DHR) or a

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signed EDR form in the case of engineering documents. 24590-WTP-3DP-G04T-00913 specifies that E&NS review is required for certain “listed documents” identified in the AB maintenance procedure (24590-WTP-GPP-SREG-002).

The Assessment Team judged the scope of documents falling under 24590-WTP-3DP-G04T-00913 was sufficiently broad. Also, the EDR records and sample EDRs provided by BNI demonstrate the CSEs are systematically receiving engineering documents so they should be aware of potential criticality safety impacts. In addition, there have been beneficial interactions between Process Engineering staff and the CSEs beyond the EDR process for special design issues of concern to the NCS staff. However, the Assessment Team did further observe the document administration procedure (24590-WTP-GPP-MGT-007) and the engineering document review procedure (24590-WTP-3DP-G04T-00913) are designed to *feed back* comments to the document originator, not *feed forward* impacts to other documents (e.g., the CSER). The Assessment Team was concerned there does not appear to be any direct procedural requirement to review design changes for how they might affect the hazards, analyses, and controls in the CSER (these observations are elaborated below). It could be assumed this is occurring informally on the part of the CSEs as a natural consequence of the EDR process. The Assessment Team concluded information submitted by BNI is marginally adequate to satisfy regulatory requirements for design review by NCS staff during this phase of the project.

From experience with criticality safety programs at other operating facilities (e.g., tank farms, Fluor Hanford facilities), the Assessment Team noted criticality safety review and approval of design modifications is normally implemented in the CSP via the project procedures that invoke the safety basis maintenance process. This process provides a formal mechanism for evaluating how design modifications change the safety basis documents. During design and construction, the safety basis maintenance process for WTP is 24590-WTP-GPP-SREG-002, which is a feed forward process that requires a safety screening to be performed on design and administrative changes to determine if changes need to be made to the WTP safety envelope documents. However, this procedure does not appear adequate to trigger a review of impacts to the CSER, and has not been applied in such a manner in previous design reviews.

The AB maintenance procedure (24590-WTP-GPP-SREG-002) identifies the CSER as an AB document, but excludes it (in Section 2 of the procedure) from the safety screening process because it is not a “safety envelope” document and defers change control for the CSER to the CSER preparation procedure (24590-WTP-GPP-SRAD-004). This exclusion effectively removes criticality safety from the AB maintenance process because (1) Chapter 6 of the PSAR does not summarize any information from the CSER (hazards, controls, etc.) and is not included in the safety envelope, and (2) the CSER preparation procedure does not have instructions for evaluating design changes for impact to the CSER. There is no mechanism to trigger safety screening for criticality issues except by review against the list of administrative controls for criticality safety in Chapter 5 of the PSAR. The Assessment Team also noted changes to the CSER itself (perhaps due to changes in other documents altering design or providing updated process or R&T data) will not trigger a safety screening on the PSAR because the CSER is not one of the “listed documents” subject to AB maintenance screening (unlike the Design Basis Event calc notes). Furthermore, the E&NS staff members that perform these safety screenings are: (1) not trained in criticality safety; (2) possibly unfamiliar with the CSER; and (3) not likely to recognize the impacts of design changes on criticality hazards. The supporting document to

24590-WTP-GPP-SREG-002 (24590-WTP-GPG-SREG-0009, *Guide for Authorization Basis Maintenance*, Rev. 0) does provide some very general guidance (Section 3.5) for identifying impacts to fissile material handling, but the guidance is too general to provide the safety screener with insight into the WTP criticality hazards.

Conclusion: Based on the information submitted by BNI, the Assessment Team confirmed NCS staff is systematically receiving and reviewing changes to design and engineering documents under the engineering document review process. Although there is no procedure that instructs the NCS staff to review design changes against the CSER, the team assumes this is occurring informally as a result of the EDR process. The team concluded information submitted by BNI is marginally adequate to satisfy the requirements for design review.

However, the Assessment Team made the following additional observations:

1. There is no evaluation/review process in the Contractor's AB maintenance procedure (24590-WTP-GPP-SREG-002) to review design changes against the WTP CSER or to review changes to the CSER against the PSAR. ORP recommends that the Contractor modify the procedure 24590-WTP-GPP-SREG-002 to include safety screening/evaluations for criticality safety information consistent with the role of the CSS discussed in the General Information PSAR (24590-WTP-PSAR-ESH-01-002-01), Section 6.5.1.4. Furthermore, ORP expects this safety screening/evaluation process to include the CSER and the final safety analysis report prior to operation of the WTP facilities. The Assessment Team considers this an assessment **Observation (D-08-DESIGN-058-O01)**.
2. In Chapter 6 of the PSAR, all information about the results of the hazard and criticality parameter analysis in the CSER and controls derived by the CSER was deleted when Revision 1 of the PSAR was issued in 2003. In the context of the AB maintenance procedure (24590-WTP-GPP-SREG-002), this information is needed and a summary level discussion of the CSER should be reintroduced into the PSAR. The Assessment Team noted the criticality safety content of the PSAR is not consistent with the intent of the format and content guidance in the SRD, Appendix G and excludes pertinent sections related to the CSER. The Assessment Team considers this an assessment **Observation (D-08-DESIGN-058-O02)**.

4.4 Validating Code Bias of Computer Software

The Assessment Team performed a limited review of the latest version of the Monte Carlo N-Particle (MCNP) code validation document (24590-WTP-Z0C-W11T-00003, *Validation of MCNP4C for WTP Criticality Safety Calculations*, Rev. 4,) used in Revision 5 of the CSER. This document calculates values for code bias and bias uncertainty in the k_{eff} estimates used to determine the criticality safety limits in the CSER. The code bias values are incorporated into a safety margin that limits the upper value of k_{eff} allowed for credible criticality scenarios in the CSER. Since criticality limits in the CSER are based on MCNP models, margins for code bias must be included in k_{eff} to meet the requirements of ANSI/ANS-8.1, *Nuclear Criticality Safety in Operations with Fissionable Material Outside Reactors*, Section 4.3.

The validation document established separate bias calculations for plutonium experimental systems, uranium-235 systems, and uranium-233 systems. The experimental benchmark results were obtained from the *International Handbook of Evaluated Criticality Benchmark Experiments*

– a widely used source for code validation. The experiments were modeled with MCNP and compared to the measured results from the Handbook. A statistical analysis developed for the Westinghouse Safety Management Solutions “nuclear criticality safety methods manual” was applied to the benchmark calculations to determine the estimated bias.

Conclusion: The Assessment Team concluded that the general format and content of the validation document and the application of its results in the CSER appear broadly consistent with the requirements of ANSI/ANS-8.1, Section 4.3. The team did not perform a technical review of the selection of experimental benchmarks, their applicability to CSER scenarios, the MCNP runs for the experiments, the statistical methods used to estimate bias, or the calculations in the validation document. That level of effort was considered beyond the scope of this assessment.

4.5 Content of the Criticality Safety Program Document

The Assessment Team reviewed the latest version of the Contractor’s CSP document (24590-WTP-PL-ENS-03-013). The team observed that the CSP primarily contains high-level administrative responsibilities and general requirements for criticality safety analysis that are restatements of the SRD and ANSI requirements for the project. The CSP has remained substantially unchanged since its initial development in 2001.

ORP expects the Contractor’s CSP to evolve over time as the project progresses through the design and construction phase. This evolution should be evident in the CSP document and detailed procedures that implement the CSP requirements. In the early stages of WTP design, CSP-related procedures were not yet written, and ORP accepted the initial versions of the CSP with this qualification in mind. However, over the course of the last seven years, the Contractor has developed several procedures that implement the high-level requirements in the CSP. These include:

- 24590-WTP-GPP-SRAD-004, *Criticality Safety Evaluation Report*
- 24590-WTP-GPP-SRAD-003, *Management of Criticality Control*, Rev. 4
- Qualification CRE_Q01 & CRE_Q02, Criticality Engineer qualification requirements
- 24590-WTP-GPP-MGT-007, *WTP Document Administration*, Rev. 3
- 24590-WTP-3DP-G04T-00913, *Engineering Department Project Instructions: Review of Engineering Documents*, Rev. 5
- Safety Envelope Non-Conformance Corrective Action Procedures

These and any other existing CSP-related procedures should be integrated into the CSP document by referencing an implementing procedure. Also, the CSP should explain how this procedure would implement CSP requirements, how the implementing procedure should be used, and when it should be used.

In addition, in Sections 4.1 through 4.3, the Assessment Team identified the need to develop new CSP administrative elements. These elements should also be integrated into the CSP document when they become available. In the near future, ORP expects to see the following information added to the CSP document:

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- Description of training requirements for managers, safety screeners, process engineering staff, and CSEs (tailored from DOE-STD-1135)
- References to training courses required by staff members (varies by work function)
- Reference to a training records procedure
- Reference to a management inspection/audit procedure
- Reference to an upgraded (criticality safety) E&NS safety-screening procedure
- New periodic criticality safety design review procedure to be carried out by the CSEs (should include review of latest incoming waste stream data and process parameter data)

Finally, ORP anticipates that during the approach to operation of the facility, the CSP will be further expanded to reference:

- Procedure for preparing “criticality prevention specifications” CPSs that implement criticality safety limits for operations. The role of a CPS is to provide an unambiguous guide to operations staff for developing operating procedures without reading and interpreting the CSER.
- Procedure for review of criticality safety related operating procedures.
- Operations nonconformance procedures.
- Operations inspection procedures

Conclusion: The Assessment Team concluded that the Contractor’s CSP document should evolve on a continuing basis to include reference to the latest implementing procedures for its high-level requirements. This conclusion is considered an assessment **Observation (D-08-DESIGN-058-O03)**.

4.6 NCS Organization

The Contractor’s Criticality Safety organization currently consists of (1) the Radiological and Fire Safety manager (playing a management oversight role) and (2) the CSE. At present, the CSP document assigns all technical responsibilities and lower-level administrative (i.e., non-management) responsibilities to the CSS. Technical responsibilities for the CSE include:

- Resolve open analysis and control issues in the CSER
- Review design or procedure changes for impact to the criticality safety analysis (continuous and following a screening procedure)
- Review changes in the Best Basis Inventory data for impact to the CSER (ongoing, periodic)
- Review process parameter information such as test data for new information or changes that could impact criticality safety (ongoing, continuous)
- Prepare a formal criticality hazard analysis

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Current and future administrative responsibilities for the CSE include:

- Develop training procedures
- Coordinate approval of training procedures with DOE
- Revise the CSP to reference training procedures, criticality program inspection or self-assessment plans, design review procedure, CSER preparation procedure, Criticality Safety List (CSL) implementation procedure
- Oversee criticality safety training of NCS staff, process engineering staff, and operations staff
- Develop a procedure to implement CSLs (i.e., criticality prevention specifications)
- Work with process engineering and operations personnel to verify that proposed CSLs can be implemented
- Work with operations in the development of operating limits to ensure CSLs are not violated (this is where margins for sampling uncertainty measurement uncertainty are assessed)
- Assist operations in the development of operating procedures to implement operating limits for criticality safety
- Develop a design change screening procedure
- Review new or revised DOE Orders, technical standards, and industry standards related to criticality safety for incorporation into the WTP CSP
- Periodically review project operations to verify that criticality safety procedures are being followed (self-assessment)

The ORP Assessment Team noted the above technical responsibilities represent somewhat distinct and separated work functions from administrative duties. Different staff members often perform the technical and administrative roles, each possessing a different area of expertise. ORP noted there are a number of outstanding technical issues with the CSER that remain to be resolved. The Contractor's Criticality Safety organization might benefit from separation of the technical work functions from the administrative ones so CSEs can focus on the technical CSER issues.

Conclusion: The Assessment Team concluded the Contractor's Criticality Safety organization might benefit by designating a separate staff role for criticality safety administrative functions such as developing training programs or reviewing operating procedures. This conclusion is considered an assessment **Observation (D-08-DESIGN-058-004)**.

5.0 SUMMARY OF FINDINGS AND OBSERVATIONS

Standard 7, paragraph (e)(2)(i) of the Contract² required the Contractor to develop and implement a program to ensure that radiological, nuclear, and process safety requirements were defined, implemented, and maintained. Furthermore, paragraph (e)(2)(ii) identifies one of the ORP Nuclear Safety Regulatory Documents, DOE/RL-96-0006, *Top Level Radiological, Nuclear, and Process Safety Standards and Principles for the RPP Waste Treatment Plant Contractor*, for which the Contractor was required to establish a set of radiological, nuclear, and process safety standards, and requirements. Section 4.2.2.5 requires “the facility should be designed and operated in a manner that prevents nuclear criticality.” Safety Criterion 3.3 (Criticality) of the SRD states that DOE O 420.1A is the implementing standard. Within the DOE Order, consensus standards following the American Nuclear Society’s nuclear criticality safety standards identify ANSI/ANS-8.19 as one of the basic elements for establishing nuclear criticality safety.

Based on the above requirements and standards, the Assessment Team identified two Findings and four Observations, summarized as follows:

- **D-08-DESIGN-058-F01:** BNI does not have a comprehensive, documented criticality safety training program established for its staff.
- **D-08-DESIGN-058-F02:** BNI does not currently have any formalized management assessment program for criticality safety.
- **D-08-DESIGN-058-O01:** BNI should modify the AB Maintenance procedure (24590-WTP-GPP-SREG-002) to include a screen against criticality safety information in the CSER and PSAR.
- **D-08-DESIGN-058-O02:** Chapter 6 of the PSAR needs a summary level discussion of information in the CSER.
- **D-08-DESIGN-058-O03:** The Contractor’s CSP document should be updated to reference the implementing procedures for its high-level requirements.
- **D-08-DESIGN-058-O04:** The Contractor’s Criticality Safety organization might benefit by designating a separate staff role for criticality safety administrative functions such as developing training programs or reviewing operating procedures.

6.0 REFERENCES AND PERSONNEL CONTACTED

6.1 Personnel Contacted

M. Perks, Radiological and Fire Safety Manager

6.2 References

24590-WTP-3DP-G04T-00913, *Review of Engineering Documents*, Rev. 5, Bechtel National, Inc., Richland, Washington

² Contract No. DE-AC27-01RV14136 between the U.S. Department of Energy and Bechtel National, Inc. (BNI), dated December 11, 2000

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- 24590-WTP-CAR-QA-06-035, *Evaluation of a criticality in the CNP evaporator*, Bechtel National, Inc., Richland, Washington
- 24590-WTP-GPG-SREG-0009, *Guide for Authorization Basis Maintenance*, Rev. 0, Bechtel National, Inc., Richland, Washington
- 24590-WTP-GPP-MGT-007, *WTP Document Administration*, Rev. 3, Bechtel National, Inc., Richland, Washington
- 24590-WTP-GPP-SRAD-003, *Management of Criticality Control*, Rev. 4, Bechtel National, Inc., Richland, Washington
- 24590-WTP-GPP-SRAD-004, *Criticality Safety Evaluation Report*, Rev. 6, Bechtel National, Inc., Richland, Washington
- 24590-WTP-GPP-SREG-002, *Authorization Basis Maintenance*, Rev. 16, Bechtel National, Inc., Richland, Washington
- 24590-WTP-IAR-QA-04-008, *Audit Report: Environmental and Nuclear Safety*, Bechtel National, Inc., Richland, Washington
- 24590-WTP-MAR-ENS-07-0036, *Review of the Preliminary Criticality Safety Evaluation Report (CSER)*, Rev. 0, Bechtel National, Inc., Richland, Washington
- 24590-WTP-PL-ENS-03-013, *Criticality Safety Program for the WTP*, Rev. 2, Bechtel National, Inc., Richland, Washington
- 24590-WTP-PSAR-ESH-01-002-01, *Preliminary Safety Analysis Report to Support Construction Authorization; General Information*, Rev. 2b, Bechtel National, Inc., Richland, Washington
- 24590-WTP-SRD-ESH-01-001-02, *Safety Requirements Document Volume II*, Rev. 4k, Bechtel National, Inc., Richland, Washington
- 24590-WTP-Z0C-W11T-00003, *Validation of MCNP4C for WTP Criticality Safety Calculations*, Rev. 4, Bechtel National, Inc., Richland, Washington
- ANSI/ANS-8.1, 1998, *Nuclear Criticality Safety in Operations with Fissionable Material Outside Reactors*, American National Standards Institute/American Nuclear Society, Washington, D.C.
- ANSI/ANS-8.19, 2005, *Administrative Practices for Nuclear Criticality Safety*, American National Standards Institute/American Nuclear Society, Washington, D.C.
- DOE O 420.1A, 2002, *Facility Safety*, May 20, U.S. Department of Energy, Office of Environment, Safety and Health, Washington, D.C.

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DOE/RL-96-0006, *Top-Level Radiological, Nuclear, and Process Safety Standards and Principles for the RPP Waste Treatment Plant Contractor*, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington

DOE-STD-1135-99, *Guidance for Nuclear Criticality Safety Engineer Training and Qualification*, U.S. Department of Energy, Washington, D.C.

DOE-STD-1158-2002, *Self-Assessment Standard for DOE Contractor Criticality Safety Programs*, U.S. Department of Energy, Washington, D.C.

NEA/NSC/DOC(95)03, 2002, *International Handbook of Evaluated Criticality Benchmark Experiments*, Nuclear Energy Agency, Vienna, Switzerland

ORP DI 220.1, "Conduct of Design Oversight," Rev. 1, U.S. Department of Energy, Office of River Protection

ORP M 220.1, *Integrated Assessment Program*, Rev. 5, U.S. Department of Energy, Office of River Protection

Qualification CRE_Q01, *Criticality Engineer qualification requirements*, February 2007

6.3 Other Documents

CCN:029878, "ISM Meeting on FEP, TLP, UFP Criticality – Confirmation of Control Strategies to Prevent Criticality," dated March 28, 2002

CCN:053427, E-mail memorandum from L. A. Burchfield to D. C. Losey, "Notes from Chemical Heterogeneity Discussion with Art Etchells," dated March 10, 2003

CCN:053809, "Discuss and Evaluate Criticality Sampling Requirements for Vessels FRP-VSL-00002A-D," dated May 2, 2003

CCN:136336, "Planning for Resorcinol Formaldehyde Implementation Report," dated March 23, 2006

CCN:137730, "Estimate of the Minimum Water Content of Dried Pretreated HLW Slurry," dated April 11, 2006

CCN:159363, "WTP Criticality Hazards Assessment," dated May 2, 2007 through August 1, 2007

E-mail Correspondence from A. D. Edmondson, BNI, to D. Anderson, et al., "Pu Particulate," dated April 28, 2006

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E-mail Correspondence from D. C. Losey to E. Slaathaug, "Eliminated Valve YV292 in the Discharge Header for the HLW Receipt Vessel," dated October 2, 2003

WSMS-CRT-01-0116, 2002, *Nuclear Criticality Safety Methods Manual (U)*, Rev 2, Westinghouse Safety Management Solutions LLC, Aiken, South Carolina

APPENDIX A.

Training and Qualification Requirements as Outlined in DOE-STD-1135-99

Training and qualification requirements for Nuclear Criticality Safety (NCS) engineers are provided as a guideline from DOE-STD-1135-99, *Guidance for Nuclear Criticality Safety Engineer Training and Qualification*, and should be considered as comprehensive.

Education requirements:

From DOE-STD-1135, “The minimum academic requirement for the NCS qualification program is a B.S. in Nuclear Engineering, Physics, or related field.”

Note: This element of the training program is implemented in Section 6.5.4, item 1 of the General Information Preliminary Safety Analysis Report (PSAR).

Nuclear physics competency requirements:

Candidate criticality safety engineers (CSE) must demonstrate understanding of nuclear physics theory, calculation methods, and experimental data required to prepare criticality safety evaluations. Relevant details can be found in Sections 1 – 3 of DOE-STD-1135. A graded approach could mean the requirements in DOE-STD-1135 stating CSEs be familiar with multiple criticality safety computer codes are tailored to a single requirement that CSEs need only be familiar with the Monte Carlo N-Particle (MCNP) code currently being applied to the Waste Treatment and Immobilization Plant (WTP) Criticality Safety Evaluation Report (CSER).

Training in this requirement can be completed through self-study of nuclear physics reference material (see DOE-STD-1135 for a list of potential references) and/or criticality physics course work. Self-study programs must be accompanied by written/oral examination to demonstrate competency. Past experience of senior level staff members may be credited in meeting this training requirement (see “qualification of experienced staff” below).

Rules, standards, guides:

The CSE must be familiar with DOE regulatory documents and American National Standards Institute/American Nuclear Society (ANSI/ANS) 8 series standards governing criticality safety practice for the facility. These include:

- 10 CFR 830, “Nuclear Safety Management”
- DOE/RL-96-0003, *DOE Process for Radiological, Nuclear, and Process Safety Regulation of the RPP Waste Treatment Plant Contractor*
- DOE/RL-96-0004, *Process for Establishing a Set of Radiological, Nuclear, and Process Safety Standards and Requirements for the RPP Waste Treatment Plant Contractor*

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- DOE/RL-96-0005, *Concept of the DOE Process for Radiological, Nuclear, and Process Safety Regulation of the RPP Waste Treatment Plant Contractor*
- DOE/RL-96-0006, *Top-Level Radiological, Nuclear, and Process Safety Standards and Principles for the RPP Waste Treatment Plant Contractor*
- DOE O 420.1A, *Facility Safety* (Note: this is already required in the reading list for BNI's "criticality safety engineer 02" training program)
- DOE-STD-3007-93, *Guidelines for Preparing Criticality Safety Evaluations at Department of Energy Non-Reactor Nuclear Facilities* (not a requirement for CSER preparation, but candidate CSEs should be familiar with its content in addition to the project CSER preparation procedure)
- DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*
- ANSI/ANS 8.1, *Nuclear Criticality Safety in Operations with Fissionable Material Outside Reactors*
- ANSI/ANS 8.10, *Criteria for Nuclear Criticality Safety Controls in Operations With Shielding and Confinement*
- ANSI/ANS 8.19, *Administrative Practices for Nuclear Criticality Safety*

ANSI 8.3, *Criticality Accident Alarm System*, has been excluded from the list because currently there is expected to be no requirement for a criticality accident alarm system at the WTP. However, recognizing that various open issues remain with the CSER analysis, ANSI 8.3 should be added to the list if the alarm requirements change.

Training in this requirement can be completed through self-study of a required reading list and oral/written examination.

CSER preparation:

CSEs in training must obtain hands-on experience in the preparation of criticality safety evaluations according to the project procedures (see the "facility knowledge" section below). This requirement should be completed under the supervision and approval of a CSE who is already qualified under the training program. Past experience of senior level staff members may be credited in meeting this training requirement (see "qualification of experienced staff" below).

Note: This element of the training program is already captured in Section 6.5.4, item 2 of the PSAR general information volume.

Safety Analysis:

The CSE must be familiar with nuclear industry standard hazard analysis methods, accident analysis methods that are used in the facility safety authorization basis documents. The CSER analysis acts as an extension of the hazard analysis in the PSAR and forms the basis for identifying criticality hazards, evaluating the probability of hazardous scenarios, providing input to derive a design basis criticality accident (if necessary), and analyzing consequences from such

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a design basis accident (if applicable). The CSER results provide the basis for criticality safety engineered or administrative controls described in Chapters 4 and 5 of the PSAR and the basis for parts of Chapter 6 of the PSAR.

The WTP PSAR preparation procedures rely on methods taken from *Guidelines for Hazard Evaluation Procedures Second Edition with Worked Examples* (AIChE 1992). CSEs must have the capability to identify and evaluate hazards using these techniques so they can: (1) actively participate in the hazard evaluation process for criticality safety (e.g., in preliminary hazard analysis [PHA] or HazOP meetings); and (2) apply the results of the criticality hazard evaluation to form the contingency analysis in the CSER.

The CSE should be familiar with elements of probability theory, system failure analysis, accident sequence analysis, and component failure data and analysis. This knowledge is needed to make order-of-magnitude qualitative estimates of the probability of hazardous conditions impacting criticality parameters and perform contingency analysis for the CSER. Further details can be found in Section 6 of DOE-STD-1135.

Training in this requirement can be completed through self-study of hazard evaluation, accident analysis, and risk analysis reference material (see DOE-STD-1135 for a list of potential references) and/or formal training course work. Self-study programs must be accompanied by written/oral examination to demonstrate competency. Past experience of senior level staff members may be credited in meeting this training requirement (see “qualification of experienced staff” below).

Safety basis and procedure knowledge:

The CSE should also be familiar with various project procedures governing the preparation of the safety basis to understand the PSAR “process” and how is tied to criticality safety. The CSE must be familiar with content of the safety authorization basis documents. For example, facility description and hazard analysis in the PSAR are essential input information for the CSER.

Criticality Safety procedures and requirements:

- 24590-WTP-PL-ENS-03-013, *Criticality Safety Program for WTP*
- 24590-WTP-GPP-SRAD-003, *Management of Criticality Control*
- 24590-WTP-GPP-SRAD-004, *Criticality Safety Evaluation Report*

Authorization Basis procedures and requirements:

- 24590-WTP-GPP-SANA-002, *Hazard Analysis, Development of Hazard Control Strategies, and Identification of Standards*
- 24590-WTP-SRD-ESH-01-001-02, *Safety Requirements Document Volume II*
- 24590-WTP-GPP-SANA-001, *Accident Analysis*
- 24590-WTP-GPP-SREG-002, *Authorization Basis Maintenance*

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Safety Authorization Basis documents:

- 24590-WTP-PSAR-ESH-01-002-01, *Preliminary Safety Analysis Report to Support Construction Authorization; General Information (note: not currently included in the Quality Assurance (QA) training requirements)*
- 24590-WTP-RPT-NS-01-001, *WTP Criticality Safety Evaluation Report*

Document review procedures:

- 24590-WTP-3DP-G04T-00901, *Design Change Control*
- 24590-WTP-GPP-MGT-007, *WTP Document Administration*
- 24590-WTP-3DP-G04T-00913, *Engineering Department Project Instructions: Review of Engineering Documents*
- 24590-WTP-GPP-QA-208, *Management of Corrective Action*

Training in this requirement can be completed through self-study of a required reading list and oral/written examination.

Note: With the exception of the PSAR, most of the above documents are captured in BNI's QA training program reading list requirements.

Process/Facility Knowledge:

The CSE must receive facility specific training to be familiar with the physical layout of the facility and the function and normal operating conditions of the systems handling fissile material (e.g., through facility walkdowns, review of system descriptions, etc.).

Training in this requirement can be completed through a combination of facility tours, facility introduction training courses (if available) and self-study of a required reading list and oral/written examination. Past experience of senior level staff members may be credited in meeting this training requirement (see "qualification of experienced staff" below).

Documentation Requirements:

Completion of criticality safety training requirements for the CSE should be documented in a special "training and qualification card" for criticality safety. From DOE-STD-1135,

"The Contractor shall document successful completion of each competency via written exam or oral board. Each individual in performing the duties of an NCS Engineer shall have a Training and Qualification Card. The Training and Qualification Card shall be signed by both the qualifying individual and the assigned facility qualifying official. Any competencies used in lieu of the above requirements for experienced personnel shall be specifically documented on a Training and Qualification Card."

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This is a “good practice” requirement that should be incorporated into the training program.

Re-qualification requirements:

From DOE-STD-1135, “A periodic re-qualification is required to address any NCS Engineers that may have been assigned to other tasks for an extended period of time. The Contractor shall document the periodicity and process for re-qualification.”

Qualification of experienced staff:

From DOE-STD-1135, “Past experience in the field of criticality safety may be used to qualify individuals with at least 3 years of criticality safety experience at the discretion of the Contractor Management and shall be documented on a Training and Qualification Card.”

The project may wish to incorporate this type of “equivalency” requirement into the training program. Documentation of past experience should be cited to provide a basis for equivalency.