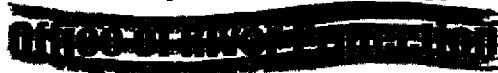




U.S. Department of Energy



P.O. Box 450, MSIN H6-60  
Richland, Washington 99352

08-WTP-026

JAN 31 2008

Mr. L. J. Simmons, Project Manager  
Bechtel National, Inc.  
2435 Stevens Center Place  
Richland, Washington 99354

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

ORP conducted an assessment to evaluate Bechtel National, Inc. (BNI) Criticality Safety Program (CSP) during the period of December 10, 2007 through January 15, 2008. The primary focus of the assessment was to assess BNI's compliance with DOE O 420.1A, *Facility Safety*, Section 4.3 (Nuclear Criticality Safety) as the implanting standard in the Safety Requirements Document, Safety Criterion 3.3. The assessment report is provided in the Attachment.

The Assessment Team concluded that BNI implemented the requirements of DOE 420.1A through its CSP in the document 24590-WTP-PL-ENS-03-013. However, specific program elements involving Nuclear Criticality Safety (NCS) staff interaction with system and process design, training and qualification of NCS staff, and management responsibilities and participation in NCS were not apparent.

The assessment resulted in three Findings and two Observations, as documented in Section 4.0 of the attached assessment report. ORP requires BNI to provide, within 30 days of the date of the letter that transmits this report, a reply to the Findings. The reply should include: 1) admission or denial of the alleged Findings; 2) the reason for the Findings, if admitted, and if denied, the reason why; 3) the corrective steps that have been taken and the results achieved; 4) the corrective steps that will be taken to avoid further Findings; and 5) the date when full compliance with the applicable commitments will be achieved. When good cause is shown, consideration will be given to extending the requested response time.

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").

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

-2-

JAN 31 2008

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  
D. Klein, BNI  
G. Shell, BNI  
BNI Correspondence

U.S. Department of Energy, Office of River Protection

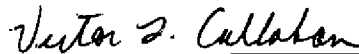
## DESIGN ASSESSMENT

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

DECEMBER 2007

DESIGN OVERSIGHT: D-08-DESIGN-058

Team Lead:



Victor L. Callahan, Nuclear Safety  
WTP Engineering Division

Team Member:



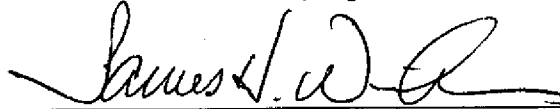
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James H. Wicks, Director  
WTP Engineering Division

Approved:



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

Criticality Safety Program Assessment for Waste Treatment Plant

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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 three Findings and two Observations in the WTP CSP.

#### Findings

- **D-08-DESIGN-058-F01:** Documentation indicates that NCS staff involvement in procedure driven design reviews or design change reviews with process engineering and Research and Technology staff is lacking. The level of involvement and independent criticality safety review, analysis, and approval of the design or modifications of fissionable material processes, systems, and equipment could not be verified. During the assessment, ORP received several internal documents (i.e., e-mails and meeting minutes) that indicate an informal level of interaction between NCS staff and Process Engineering staff regarding design issues. Also, a corrective action in 2005 related to the ion exchange column and Cesium Nitric Acid Recovery Process System evaporator operating parameters during which Criticality Safety staff discussed control options with Process Engineering was considered by the Assessment Team. However, it was not clear how these interactions were initiated and whether any systematic effort was made by NCS staff to review design changes. ORP later requested evidence of a procedural method (i.e., internal procedure or instruction) describing how NCS and design engineers coordinate criticality safety requirements for the design of equipment and processes that involve fissionable material. This was never provided to the Assessment Team.
- **D-08-DESIGN-058-F02:** There is a lack of a criticality safety training program all staff involved with the design of equipment and processes that involve fissionable material. The staff includes Environmental and Nuclear Safety (E&NS) management, safety screeners, Criticality Safety engineers, Process Engineering, and Operations. The Contractor's current criticality safety engineer, who performs the majority of criticality safety-related work, is very experienced and appears well-qualified. However, there are other former personnel in the past 10 years who have been involved in criticality

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safety where no records were provided to ORP to indicate the extent of their documented work experience or training in criticality safety. In addition, there are no formal training requirements for future staff placement as criticality safety engineers. DOE O 420.1A states that a program for training and qualifying nuclear criticality safety staff shall be implemented. BNI has stated that 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 as stated in the WTP Criticality Safety Evaluation Report.

- **D-08-DESIGN-058-F03:** BNI does not currently have any formalized management assessment program for criticality safety. ANSI/ANS-8.19, *Administrative Practices for Nuclear Criticality Safety*, Section 4.7, 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-O01:** 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 of 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-O02:** At present, the Contractor's CSP assigns all technical responsibilities and lower level administrative (i.e., non-management) responsibilities to the criticality safety engineer. The technical responsibilities assigned to the criticality safety engineer 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.

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**LIST OF TERMS**

ANSI/ANS	American National Standards Institute/American Nuclear Society
BNI	Bechtel National, Inc.
CAS	Criticality Alarm System
CNP	Cesium Nitric Acid Recovery Process System
CPS	Criticality Prevention Specification
CSE	Criticality Safety Engineer
CSER	Criticality Safety Evaluation Report
CSP	Criticality Safety Program
CSL	Criticality Safety List
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
R&T	Research and Technology
SRD	Safety Requirements Document
WED	WTP Engineering Division
WTP	Waste Treatment and Immobilization Plant

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## 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 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.

## 2.0 BACKGROUND

The WTP Safety Requirements Document (SRD), 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.

## 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



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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 provided by BNI in order to determine the extent of coordination with NCS staff and Process Engineering, 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 listing of reviewed documents and personnel contacted.

## 4.0 RESULTS

### 4.1 NCS Staff Involvement in System Design Reviews

It was not apparent to the Assessment Team through the review of BNI documents that NCS staff members were systematically involved in design input or design change reviews with the Process Engineering and Research and Development (R&T) organizations. The level of involvement and independent criticality safety review, analysis, and approval of the design or modifications of fissionable material processes, systems, and equipment could not be verified. 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 criticality safety specialist 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."

During the assessment, ORP received several internal documents (e-mails, meeting minutes) that indicate an informal level of interaction between the NCS staff and Process Engineering and R&T staffs regarding design issues. Also, a corrective action (24590-WTP-CAR-QA-06-035, *Evaluation of a criticality in the CNP evaporator*) in 2005 related to the ion exchange column and Cesium Nitric Acid Recovery Process System (CNP) evaporator operating parameters during which Criticality Safety staff discussed control options with Process Engineering was

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considered by the Assessment Team. However, it was not clear how these interactions were initiated and whether any systematic effort was made by NCS staff to review design changes. E&NS uses a procedure, 24590-WTP-GPP-SREG-002, *Authorization Basis Maintenance*, to review design and administrative document changes. However, this procedure does not appear adequate to trigger review of criticality safety issues by NCS staff, and has not been applied in such a manner in previous design reviews. 24590-WTP-GPP-SREG-002 requires a "safety screening" to be performed on design and administrative changes against the WTP safety envelope documents. However, the E&NS staff that performs these safety screenings are: (1) not trained in criticality safety; (2) possibly unfamiliar with the Criticality Safety Evaluation Report (CSER); and (3) not likely to recognize the impacts of design changes on criticality hazards to ensure these changes are forwarded for review by NCS staff. 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 (in 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.

ORP interprets the CSP requirements in Section 3.4 for the criticality safety specialist as a proactive role in design change reviews and requires a thorough review of criticality safety implications by qualified NCS staff. If NCS staff are not directly involved in performing initial "safety screening" activities, they should be involved in performing periodic (e.g., annual) comprehensive design reviews. As WTP operations begin, NCS staff review responsibilities will need to include annual review of process operations to ensure compliance with criticality safety limits and procedures.

**Conclusion:** In accordance with ANSI/ANS-8.19, Section 6.1, (NCS Staff Responsibilities), "The nuclear criticality safety staff shall provide technical guidance for the design of equipment and processes and for the development of operating procedures." This establishes a clear role and responsibility for the criticality safety engineer (CSE). Based on documents reviewed, the Assessment Team considers this an assessment **Finding (D-08-DESIGN-058-F01)**.

#### 4.2 Training and Qualification Program for NCS Staff

BNI does not have a criticality safety training program established for any of its staff (e.g., E&NS management, E&NS staff including safety screeners, CSEs, and Process Engineering staff). During the assessment, ORP received a training qualification reading list for CSEs (Qualification CRE\_Q01, *Criticality Engineer Qualification Requirements*), but the reading list, taken alone, does not meet requirements for a criticality safety training program. The Contractor's current in-house CSE has been performing this role for a number of years (6+) and appears well-qualified. However, it is worth noting that a number of personnel other than the current CSE have been involved with criticality safety over the last 10 years; one person is currently under contract with BNI to perform CSE responsibilities and is also well-qualified. During discussions with BNI, the Radiological and Fire Safety manager expressed intent to set up a training qualification program to train new staff. However, the manager did not indicate what standard BNI would use. The SRD implementing standard, DOE O 420.1A, Section 4.3.3.1, states:

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“A program for training and qualifying nuclear criticality safety staff shall be implemented. DOE-STD-1135-99, *Guidance for Nuclear Criticality Safety Engineer Training and Qualification*, is acceptable to DOE to provide guidance to assist DOE contractors in developing this Program. The requirements in DOE-STD-1135-99 shall not be requirements under this Order (*Facility Safety*), Section 4.3 (Nuclear Criticality Safety). DOE shall approve modifications to the Program... The Program for Training and Qualifying Nuclear Criticality Safety Staff should be implemented using a graded approach. This graded approach should be based on the duties and responsibilities of individual nuclear criticality safety engineers and should establish priorities that are appropriate to ensure all aspects of nuclear criticality safety.”

ORP 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. Thus, requirements in DOE-STD-1135 that CSEs be familiar with various criticality safety computer codes might be tailored to require familiarity with only one code such as Monte Carlo N-Particle (MCNP) (as referenced in DOE-STD-1135, Section 2.0). Likewise, requirements for knowledge of Criticality Alarm System (CAS) placement and coverage may be exempted (unless CAS requirements change). E&NS management responsible for program oversight and audits should receive training to familiarize themselves with the NCS administrative elements (e.g., audit procedures, CSP, etc.) and the essentials of the CSER analysis and criticality controls. E&NS staff members responsible for safety screening of design changes should also be familiar with the CSER analysis and criticality controls so they can identify potential criticality safety impacts of design changes and forward these issues to the CSEs.

An NCS training program needs to include Process Engineering personnel involved in the design of systems that implement criticality controls (e.g., sampling systems). In addition, the training program will eventually need to include Operations staff that will implement criticality controls. Furthermore, ORP 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, Section 4.3.3.1 are not met and is considered an assessment **Finding (D-08-DESIGN-058-F02)**.

#### 4.3 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-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

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ANSI/ANS-8.19. As stated in the ANSI/ANS standard, management shall establish a training and qualification program for NCS staff and Sections 4.5 and 4.6 require periodic monitoring of the criticality safety program. In addition, ANSI/ANS-8.19, Section 4.7 requires management to participate periodically in auditing the overall effectiveness of the NCS 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, referencing 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 4.5 resulting in an assessment **Finding (D-08-DESIGN-058-F03)**.

#### 4.4 Validating Code Bias of Computer Software

The Assessment Team performed a limited review of the latest version of the MCNP code validation document (24590-WTP-Z0C-W11T-00003, Rev. 4, *Validation of MCNP4C for WTP Criticality Safety Calculations*) used in Rev. 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, 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.

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**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 7 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, Criticality Engineer qualification requirements
- 24590-WTP-GPP-MGT-007, *WTP Document Administration*
- 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:

- 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

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- 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-O01)**.

#### 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 criticality safety specialist. 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

Current and future administrative responsibilities for the CSE include:

- Develop training procedures
- Coordinate approval of training procedures with DOE

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- 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-O02)**.

## 5.0 SUMMARY OF FINDINGS AND OBSERVATIONS

Standard 7, paragraph (e)(2)(i) of the Contract<sup>1</sup> 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

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<sup>1</sup> Contract No. DE-AC27-01RV14136 between the U.S. Department of Energy and Bechtel National, Inc. (BNI), dated December 11, 2000

Criticality Safety Program Assessment for Waste Treatment Plant

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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 three Findings and two Observations, summarized as follows:

- **D-08-DESIGN-058-F01:** Lack of documentation that indicates NCS staff involvement in procedure driven design reviews or design change reviews with process engineering and Research and Technology (R&T) staff.
- **D-08-DESIGN-058-F02:** Lack of a criticality safety training program for all staff involved with the design of equipment and processes that involve fissionable material.
- **D-08-DESIGN-058-F03:** BNI does not currently have any formalized management assessment program for criticality safety.
- **D-08-DESIGN-058-O01:** ORP expects the contractor's criticality safety program to evolve over time as the project progresses through the design and construction phase.
- **D-08-DESIGN-058-O02:** At present, the contractor's criticality safety program assigns all technical responsibilities and lower level administrative (i.e., non-management) responsibilities to the criticality safety engineer.

## 6.0 REFERENCES AND PERSONNEL CONTACTED

### 6.1 Personnel Contacted

M. Perks, Radiological and Fire Safety Manager

### 6.2 References

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24590-WTP-CAR-QA-06-035, *Evaluation of a criticality in the CNP evaporator*, January 2006

24590-WTP-GPG-SREG-0009, *Guide for Authorization Basis Maintenance*, Rev. 0, September 2006

24590-WTP-GPP-MGT-007, *WTP Document Administration*

24590-WTP-GPP-SRAD-003, *Management of Criticality Control*, Rev. 4

24590-WTP-GPP-SRAD-004, *Criticality Safety Evaluation Report*, Rev. 6, June 22, 2007

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Criticality Safety Program Assessment for Waste Treatment Plant

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- 24590-WTP-GPG-SREG-0009, *Guide for Authorization Basis Maintenance*, Rev. 0
- 24590-WTP-MAR-ENS-07-0036, *Review of the Preliminary Criticality Safety Evaluation Report (CSER)*, Rev. 0, July 26, 2007
- 24590-WTP-PL-ENS-03-013, *Criticality Safety Program for the WTP*, Rev. 2, December 22, 2006
- 24590-WTP-PSAR-ESH-01-002-01, *Preliminary Safety Analysis Report to Support Construction Authorization; General Information*, Rev. 2b, January 25, 2007
- 24590-WTP-SRD-ESH-01-001-02, *Safety Requirements Document Volume II*, Rev. 4k, October 10, 2007
- 24590-WTP-ZOC-W11T-00003, *Validation of MCNP4C for WTP Criticality Safety Calculations*, Rev. 4, November 30, 2006
- ANSI/ANS-8.1, *Nuclear Criticality Safety in Operations with Fissionable Material Outside Reactors*
- ANSI/ANS-8.19-2005, *Administrative Practices for Nuclear Criticality Safety*
- DOE O 420.1A, *Facility Safety*, May 20, 2002
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- DOE-STD-1135-99, *Guidance for Nuclear Criticality Safety Engineer Training and Qualification*, September 1999
- DOE-STD-1158-2002, *Self-Assessment Standard for DOE Contractor Criticality Safety Programs*, November 2002
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- WSMS-CRT-01-0116, *Nuclear Criticality Safety Methods Manual (U)*, Rev 2, October 2002, Westinghouse Safety Management Solutions LLC, Aiken SC.
- ORP DI 220.1, "Conduct of Design Oversight," Rev. 1, January 26, 2006
- ORP M 220.1, *Integrated Assessment Program*, Rev. 5, September 5, 2007
- 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

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

<b>Task# ORP-WTP-2008-0028</b>
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E-STARS<sup>R</sup> Report  
Task Detail Report  
01/31/2008 0313

<b>TASK INFORMATION</b>			
<b>Task#</b>	ORP-WTP-2008-0028		
<b>Subject</b>	(Concur 08-WTP-026) 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)		
<b>Parent Task#</b>		<b>Status</b>	CLOSED 01/31/2008
<b>Reference</b>		<b>Due</b>	
<b>Originator</b>	Licht, Sarah (Licht, Sarah)	<b>Priority</b>	High
<b>Originator Phone</b>	(509) 376-6611	<b>Category</b>	None
<b>Origination Date</b>	01/24/2008 1515	<b>Generic1</b>	
<b>Remote Task#</b>		<b>Generic2</b>	
<b>Deliverable</b>	None	<b>Generic3</b>	
<b>Class</b>	None	<b>View Permissions</b>	Normal
<b>Instructions</b>	<p>Hard copy of the correspondence is being routed for concurrence. Once you have reviewed the correspondence, please approve or disapprove via E-STARS and route to the next person on the list. Thank you.</p> <p>bcc: MGR RDG file WTP OFF file WTP RGD file T. M. Williams, AMD V. L. Callahan, WTP J. R. Eschenberg, WTP J. H. Wicks, WTP</p>		
<b>ROUTING LISTS</b>			
1	Route List	Inactive	
	<ul style="list-style-type: none"> <li>● Callahan, Victor L - Review - Concur - 01/24/2008 1553 <i>Instructions:</i></li> <li>● Wicks, James H - Review - Cancelled - 01/31/2008 1513 <i>Instructions:</i></li> <li>● Eschenberg, John R - Approve - Approved with comments - 01/31/2008 1453 <i>Instructions:</i></li> </ul>		
<b>ATTACHMENTS</b>			
<b>Attachments</b>	<ol style="list-style-type: none"> <li>1. 08-WTP-026.VLC.Attach.Draft Assessment Report R1.doc</li> <li>2. 08-WTP-026.VLC.Simmons.doc</li> </ol>		
<b>COLLABORATION</b>			
<b>COMMENTS</b>			
<b>Poster</b>	Eschenberg, John R (Perez, Anez) - 01/31/2008 0201		

**RECEIVED**

JAN 31 2008

**DOE-ORP/ORPCC**

<b>Task# ORP-WTP-2008-0028</b>	
	Approve
	Pete Furlong signed for John E. 1/1/08
<b>TASK DUE DATE HISTORY</b>	
<i>No Due Date History</i>	
<b>SUB TASK HISTORY</b>	
<i>No Subtasks</i>	

-- end of report --

**Task# ORP-WTP-2008-0028**

E-STARS<sup>®</sup> Report  
 Task Detail Report  
 01/24/2008 0318

TASK INFORMATION			
<b>Task#</b>	ORP-WTP-2008-0028		
<b>Subject</b>	(Concur 08-WTP-026) 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)		
<b>Parent Task#</b>		<b>Status</b>	Open
<b>Reference</b>		<b>Due</b>	
<b>Originator</b>	Licht, Sarah (Licht, Sarah)	<b>Priority</b>	High
<b>Originator Phone</b>	(509) 376-6611	<b>Category</b>	None
<b>Origination Date</b>	01/24/2008 1515	<b>Generic1</b>	
<b>Remote Task#</b>		<b>Generic2</b>	
<b>Deliverable</b>	None	<b>Generic3</b>	
<b>Class</b>	None	<b>View Permissions</b>	Normal
<b>Instructions</b>	Hard copy of the correspondence is being routed for concurrence. Once you have reviewed the correspondence, please approve or disapprove via E-STARS and route to the next person on the list. Thank you.  bcc: MGR RDG file WTP OFF file WTP RGD file T. M. Williams, AMD V. L. Callahan, WTP J. R. Eschenberg, WTP J. H. Wicks, WTP		
<b>ROUTING LISTS</b>			
1	Route List		Active
	<ul style="list-style-type: none"> <li>• Callahan, Victor L - Review - Awaiting Response - Due Date  <i>Instructions:</i> <i>mk 1-24-07</i></li> </ul>		
	<ul style="list-style-type: none"> <li>• Wicks, James H - Review - Awaiting Response - Due Date  <i>Instructions:</i> <i>JW 31 Jan 2007</i></li> </ul>		
	<ul style="list-style-type: none"> <li>• Eschenberg, John R - Approve - Awaiting Response - Due Date  <i>Instructions:</i> <i>JOE 31 Jan 2007</i></li> </ul>		
<b>ATTACHMENTS</b>			
Attachments	1. 08-WTP-026.VLC.Attach.Draft Assessment Report R1.doc 2. 08-WTP-026.VLC.Simmons.doc		
<b>COLLABORATION</b>			
<b>COMMENTS</b>			

*Rec'd 1/30/08  
 REC'd 1/30/08  
 Rec'd 1/30/08*

<b>Task# ORP-WTP-2008-0028</b>
<i>No Comments</i>
<b>TASK DUE DATE HISTORY</b>
<i>No Due Date History</i>
<b>SUB TASK HISTORY</b>
<i>No Subtasks</i>

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