The Deputy Secretary of Energy
Washington, DC 20585

July 9, 2014

The Honorable Peter S. Winokur
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue NW, Suite 700
Washington, DC 20004

Dear Mr. Chairman:

Enclosed please find the Department of Energy's Fiscal Year 2013 Annual Report on Nuclear Criticality Safety.

The report responds to the modifications specifically identified in your letter of October 23, 2013. The report includes summaries and input from the National Nuclear Security Administration's (NNSA), the Office of Environmental Management's (EM) field and site offices, and facilities operated by the Office of Science (SC).

If you have any questions or need further information, please contact Dr. Jerry McKamy, Director, Office of Environment, Safety, and Health, at (301) 903-7980 for NNSA-related issues, or Mr. Todd Lapointe, Director, Office of Safety Management, at (202) 586-4653 for EM-related issues, and Ms. Carol Sohn, Chief of Nuclear Security, Office of Science, at (505) 375-2320 for SC-related issues.

Sincerely yours,

Daniel B. Poneman

Enclosure

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2013
ANNUAL REPORT

THE DEFENSE NUCLEAR FACILITIES SAFETY BOARD
JUNE 2014

NUCLEAR CRITICALITY SAFETY PROGRAMS

National Nuclear Security Administration
United States Department of Energy
Washington, DC 20585

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SUMMARY

A Defense Nuclear Facilities Safety Board (DNFSB) letter dated October 23, 2013, requested that the Department of Energy (DOE) address six specific subject areas related to nuclear criticality safety in its Annual Report on Nuclear Criticality Safety (NCS) Programs. The Board's letter modifies the annual reporting requirement established for closure of DNFSB Recommendation 97-2, *Continuation of Criticality Safety at Defense Nuclear Facilities in the Department of Energy,* which requires DOE (including the National Nuclear Security Administration [NNSA]) to provide a report and briefing on the requested subject areas for its various nuclear criticality safety programs.

This report summarizes the detailed information provided in the NNSA, Office of Science (SC), and Office of Environmental Management (EM) reports, included as Appendices 1, 2, and 3 respectively. Appendix 1 (NNSA) has seven attachments and Appendix 3 (EM) has 15 attachments.

The DNFSB specified six areas to be addressed in this annual report. A brief summary by section follows.

1. Contractor Criticality Safety Staffing

   Overall throughout DOE, contractor criticality safety staffing levels are adequate. Several sites are continuing to add staff for additional capacity and to hedge against future attrition, notably, the Los Alamos National Laboratory (LANL), Y-12, and the Office of River Protection.

2. Infractions, Severity, and Lessons Learned

   The numbers of criticality safety infractions vary widely site-to-site from zero to over 70. This variability is largely determined by the variety and pace of operations at a site. None of the infractions constituted a loss of all barriers to a criticality accident and only one resulted in a significant lessons-learned regarding re-routing of cooling water and hydraulic fluid lines in casting furnaces at Y-12.

3. Non-Compliances with Requirements

   EM did not find any non-compliance with applicable criticality safety standards. NNSA is aware of instances of non-compliance at several sites which are in the process of strengthening programs to improve the quality of criticality safety evaluations to fully meet requirements (e.g. NSTec at the Nevada National Security Site [NNSS], LANL, and Y-12).

4. Status of Response to Criticality Safety Support Group (CSSG) Recommendations

   Four sites have open corrective actions relative to CSSG recommendations. LANL has a long-term program improvement plan to address CSSG recommendations. Y-12 has a near-term plan to close findings from the fourth quarter Fiscal Year (FY) 2013 review done there. NSTec at the NNSS will close the one remaining action with an upcoming revision to the Documented Safety Analysis for the National Criticality Experiments Research Center. Finally, the Hanford Waste Treatment

Plant has experienced delays due to new technical information about the process chemistry involved but the contractor plans to close these out by the end of FY 2014.

5. DOE Evaluation of Overall Performance

   NNSA has one site with excellent performance (Lawrence Livermore National Laboratory), three with solid performance, one with adequate performance, and one with inadequate but improving performance (LANL).

   Although most EM site contractors had performance issues, all were deemed by the Department to be addressing the discrepancies.

6. Performance Versus Specific Expectations

   All DOE defense nuclear facilities with criticality safety programs have implemented criticality safety performance metrics and measures which was the subject of a separate report to the DNFSB. Many of these are tied to the formal performance evaluation plan and affect award fee. Overall, these are serving management well by providing information relative to the health and performance of criticality safety programs.

The NNSA point-of-contact for this report is Jerry Hicks, who can be reached at 505-845-6287. The EM point-of-contact for this report is Dr. Robert Wilson, whose contact number is 303-236-3666. The SC point-of-contact is Gerald Sauve, and can be reached at 509-372-4083.

List of Appendices

Appendix 1 – National Nuclear Security Administration input to the Annual Report

- Livermore Field Office
- Nevada Field Office
- Los Alamos Field Office
- Sandia Field Office
- NNSA Production Office – Pantex
- NNSA Production Office – Y-12 National Security Complex
- UPF Project Office

Appendix 2 – Office of Science contribution to the Annual Report

Appendix 3 – Office of Environmental Management contribution to the Annual Report

Section 1 - CH2M Hill Plateau Remediation Company
Section 2 - Washington Closure Hanford
Section 3 - Bechtel National Incorporated, Waste Treatment and Immobilization Plant
Section 4 - Washington River Protection Solutions LLC, Tank Farms Operations
Section 5 - LATA Kentucky, Paducah, KY
Section 6 - Fluor-B&W Portsmouth, Portsmouth, OH
Section 7 - B&W Conversion Services, Portsmouth, OH/Paducah, KY
Section 8 - Idaho Cleanup Project CH2M WG Idaho, LLC (CWI)
Section 9 - Advanced Mixed Waste Treatment Project - Idaho Treatment Group
Section 10 - UCOR
Section 11 - Isotek
Section 12 - Wastren Advantage Inc. (WAI)
Section 13 - Savannah River Nuclear Solutions
Section 14 - Parsons
Section 15 - Savannah River Remediation

The NNSA sites are presented by Field Offices from west to east as follows:

Livermore Field Office (NA-LL)	Lawrence Livermore National Laboratory (LLNL)
Nevada Field Office (NA-NV)	Nevada National Security Site (NNSS)
Los Alamos Field Office (NA-LA)	Los Alamos National Laboratory (LANL)
Sandia Field Office (NA-SN)	Sandia National Laboratories (SNL)
NPO Pantex (NPO Pantex)	NNSA Production Office Pantex Plant (Pantex)
NPO Y-12 (NPO-Y-12)	NNSA Production Office Y-12 National Security Complex (Y-12)
Uranium Project Office (UPO)	Uranium Processing Facility (UPF) Project

There are no fissile material activities or design activities for fissile material operations underway under NNSA regulation at Savannah River. The Mixed Oxide (MOX) facility is under Nuclear Regulatory Commission (NRC) regulations and licensing.

The Department of Energy (DOE) Office of Science (SC) has only one defense nuclear facility, Pacific Northwest National Laboratory's (PNNL) Radiochemical Processing Laboratory, Building 325. Oversight is provided by the Pacific Northwest Site office, with assistance from the Office of River Protection if needed.

The Environmental Management sites are presented by Field Offices as follows:

Richland Operations Office (RL)	CH2M-HILL Plateau Remediation Company (CHPRC) Washington Closure Hanford (WCH)
Office of River Protection (ORP)	Bechtel National, Inc. Waste Treatment Plant (WTP) Washington River Protection Solutions Tank Farms Operations
Portsmouth/Paducah Project Office (PPPO)	Los Alamos Technical Associates, Kentucky (LATAKY)-Paducah Fluor-B&W Portsmouth (FBP) BWCS Paducah/Portsmouth
Idaho Operations Office (ID)	Idaho Cleanup Project (CWI) Advanced Mixed Waste Treatment Project (AMWTP)
Oak Ridge Office (ORO)	Wastren Advantage Inc. (WAI) URS|CH2M Hill (UCOR) Isotek Systems, LLC
Savannah River Operations Office (SR)	Savannah River Nuclear Solutions (SRNS) Savannah River Remediation (SRR) Savannah River Parsons

A summary of the NNSA, SC, and EM detailed reports that address the six specific subject areas referenced in the DNFSB letter of October 23, 2013, follows on the next page.

Specific Subjects Addressed in the DOE Annual Report on Nuclear Criticality Safety (per the DNFSB letter on 10/23/13)

1. Criticality Safety Staffing –

Current staffing levels, Department of Energy's assessment of whether staffing levels are adequate, existing plans to address staffing vacancies, and any compensatory measures taken in response to staffing shortages

The NNSA and EM contractors in general have difficulty hiring and retaining qualified criticality safety staff. SC has had less difficulty due to a smaller and more stable workload. This includes the development path of hiring recent graduates and training them in criticality safety.

In the NNSA, all field sites with the exception of the Los Alamos National Laboratory (LANL) and the (Y-12 National Security Site [Y-12]) report adequate staffing levels for criticality safety staff.

LANL is in the second year of a multi-year effort to rebuild its staff and criticality safety support capability. Experienced subcontractors are contributing to this effort. The criticality safety staff at LANL is currently larger than at any previous time in the Laboratory's history. While still relying on experienced sub-contractors, a senior experienced criticality safety engineer has joined the LANL staff and another is on long-term assignment from LLNL.

Y-12 has experienced some staff loss, and has taken action to retain staff. NNSA is monitoring Y-12 staffing levels. Staff loss may be mitigated by salary actions, but salary actions alone may be insufficient.

In EM, all field sites (with the exception of the Office of River Protection) report adequate contractor staffing; the Office of River Protection considers the Waste Treatment and Immobilization Plant contractor criticality safety staff too lean for the projected work load. The Oak Ridge and Savannah River Offices are monitoring their respective contractors for signs indicating more staff is needed.

Table 1 below shows the contractor criticality safety staffing levels at each of the NNSA and EM defense nuclear facilities, and the line management assessment of whether the staffing level is adequate or understaffed. Mission work has been slowed or delayed at both Y-12 and LANL operations.

Table 1: Contractor Criticality Safety Staffing

Site	Contractor criticality safety staff, end of Fiscal Year 2013	Line Management Assessment (Adequate or Understaffed)
LLNL	9 technical, 2 administrative, 3 part time retirees	Adequate
NNSS	3 technical, 1 manager	Adequate

Table 1: Contractor Criticality Safety Staffing		
Site	**Contractor criticality safety staff, end of Fiscal Year 2013**	**Line Management Assessment (Adequate or Understaffed)**
LANL	19 (some part-time)	Understaffed per staffing plan but aggressively rebuilding towards the projected need of 23
SNL	8 (about 2 Full-time Equivalent [FTE])	Adequate
Pantex	2 (about 1.5 FTE)	Adequate
Y-12	56 - 27 direct, 29 subcontractors (30 of the 56 supporting UPF)	Understaffed, adverse trend noted
UPO	31 (30 from Y-12 prime contract)	Adequate
PNNL (Office of Science)	3	Adequate
Richland – CHPRC	3 Criticality Safety Engineers, 2 Criticality Safety Engineer/Criticality Safety Representatives (combined qualification), 2 Criticality Safety Representatives, 1 manager, 1 in qualification	Adequate but minimum
Richland – WCH	2 part-time Criticality Safety Engineer/Criticality Safety Representatives (combined qualification)	Adequate
River Protection – WTP (Bechtel)	3, plus 2 in training	Understaffed
River Protection – Tank Farms (WRPS)	2 part-time	Adequate
PPPO – Paducah-LATAKY	0.2 FTE	Adequate
PPPO – Portsmouth-Fluor B&W Portsmouth (FBP)	10	Adequate
PPPO – BWCS	1 part-time	Adequate
Idaho – CWI	3	Adequate
Idaho – BWXT Idaho AMWTP	4 (3 FTE)	Adequate
Oak Ridge (ORO) – Transuranic Waste Processing Center TWPC (WAI)	4 part-time	Adequate
Oak Ridge – UCOR	5, plus 2 in qualification	Adequate but minimum; DOE monitoring
Oak Ridge – Isotek	3	Adequate

Table 1: Contractor Criticality Safety Staffing		
Site	**Contractor criticality safety staff, end of Fiscal Year 2013**	**Line Management Assessment (Adequate or Understaffed)**
Savannah River - SRNS	21 (12 fully qualified Senior Engineers; 6 fully qualified Engineers; 3 in training)	Marginally Adequate; recruiting in progress
Savannah River - SRR	1 plus 2 part-time	Adequate
Savannah River-Parsons	1 plus 1 part-time	Adequate

2. Infractions, Severity, and Lessons Learned –

The number of criticality safety infractions, the severity of these infractions, and any lessons learned in response to significant infractions.

Table 2. Fiscal Year 2013 Infractions and Severity Across the Department of Energy Complex				
Site	**Number**	**No Criticality Safety Control Parameters Challenged**	**One Criticality Safety Parameter Challenged**	**Only One Criticality Safety Control Parameter Remaining**
Livermore (~40 CSEs)	1	1		
Nevada (~6 CSEs)	1	1		
Los Alamos (~500 CSEs)	38	28	10 (Two or more remaining in all cases)	
Sandia (~12 CSEs)	None			
Pantex (1 CSE)	None			
PNSO PNNL	None			
Y-12 (~100 CSEs)	71 and 2 related to alarm systems	70	1	
Richland - CHPRC	3	3		
Richland - WCH	None			
River Protection –	1		1	

Table 2. Fiscal Year 2013 Infractions and Severity Across the Department of Energy Complex				
Site	**Number**	**No Criticality Safety Control Parameters Challenged**	**One Criticality Safety Parameter Challenged**	**Only One Criticality Safety Control Parameter Remaining**
Tank Farms (WRPS)				
PPPO – LATAKY (Paducah)	None			
PPPO - FBP (Ports)	14	14		
PPPO - BWCS (Ports)	None			
Idaho CWI	4	4		
Idaho AMWTP	6	4	2	
ORO - UCOR	23	21		2
ORO - Isotek	2	2		
ORO - Wastren	None			
SRS Savannah River - SRNS	7	5	2	
SRS Savannah River - SRR	None			

The variability in the number of infractions in the table above for NNSA sites is related to both the number of Criticality Safety Evaluations (CSEs) in use at the site as well as the operational tempo. The approximate number of CSEs in force at NNSA sites is included with the site listing to provide context.

NNSA had one infraction with a significant lesson learned. At Y-12, a potential for both uranium and a moderator to collect in the bottom plenum of the furnace concurrently was identified by contractor personnel. The issue raised was a potential for hydraulic fluid lines or cooling water lines to be damaged in the event of a casting stack tip-over. In such a scenario, enriched uranium metal and oxide would collect in the unfavorable geometry lower furnace plenum and the hot stack components could impact the water or hydraulic fluid lines and create the potential for moderating liquid to collect with the enriched uranium in the lower plenum. This was determined to be an Unreviewed Safety Question (USQ). The cooling lines were subsequently removed and the hydraulic lines rerouted before furnace operations were resumed. This information was also communicated to the UPF design team.

Many of the EM sites experienced non-conformances with criticality safety-related controls, but in all cases, at least one or more nuclear criticality safety parameter remained robustly controlled. However, even lower level and defense-in-depth non-conformances need to be investigated and corrected, as they are usually indicative of a system problem. Many of the EM sites require a root cause review for all non-conformances, regardless of the level.

Two instances at ORO UCOR were reported as having only one documented robust barrier remaining. Both involved discovery of more fissionable material than expected in equipment removed for cleaning and disposition.

3. Non-Compliances with Requirements

Non-compliances with Department of Energy and American National Standards Institute/American Nuclear Society (ANS) requirements identified during federal assessments, and any compensatory measures or corrective actions taken to address these non-compliances

All NNSA sites and contractors use a process to ensure all ANS-8 and DOE criticality safety requirements are followed. All NNSA sites use DOE Standard DOE-STD-1158-2010, *Self-Assessment Standard for DOE Contractor Criticality Safety Programs.*

Nevada – NSTec has taken action to assure that future evaluations meet the requirements of DOE-STD-3007-2007, *Guidelines for Preparing Criticality Safety Evaluations (CSEs) at Department of Energy Non-Reactor Nuclear Facilities,* as required by DOE Order 420.1, Facility Safety, but has not produced a criticality safety evaluation since weaknesses in this area were identified. NSTec has not yet had the requirement to develop a new CSE; hence they have not had the opportunity to fully demonstrate their capability to comply with DOE-STD-3007-2007.

Los Alamos – LANL has known weaknesses in providing personnel skilled in criticality safety and operations to serve as advisors to supervisors. Weaknesses have also been identified in clarity and completeness of developed controls, thoroughness of identification of abnormal conditions, and validation of criticality safety codes. The plutonium facility is also addressing posting and labeling issues. The LANL criticality program is about one year into a multi-year program rebuilding effort. Operations in the main plutonium facility at LANL were paused in June 2013. Resumption from the pause will occur on an operation-by-operation basis once the associated procedures are validated from a conduct of operations perspective, criticality controls are verified to be adequate and flowed into procedures, and operators trained. Other improvements to correct deficiencies from all known reviews and assessments are being captured in a long term corrective action plan and will be corrected post-resumption.

Y-12 Plant – Not all Y-12 criticality safety evaluations are documented with sufficient detail, clarity, and lack of ambiguity to allow independent judgment of results without in-depth process knowledge. However, review of evaluations by personnel with extensive process knowledge has verified that the fundamental requirement of subcriticality under normal and credible abnormal conditions is met. Y-12 is in a multi-year effort to improve the quality and clarity of evaluations. Due to the age and structure of the processing facilities, subcriticality cannot be definitively demonstrated under large but credible seismic conditions. Container labels in use do not always contain enough

information necessary to determine compliance to applicable NCS controls without accessing databases. The needed data is readily available to operating staff.

All EM sites and contractors use a process to ensure all ANS-8 and DOE criticality safety requirements are followed. Most use DOE Standard DOE-STD-1158-2010, *Self-Assessment Standard for DOE Contractor Criticality Safety Programs,* on at least a three-year cycle as a tool in this process. None of the EM sites or contractors has uncovered a non-compliance to the ANS-8 standards.

4. Criticality Safety Support Group Recommendations

Department of Energy's plans to address recommendations made by the Criticality Safety Support Group, including all open recommendations from previous years

Nevada –The Criticality Safety Support Group (CSSG) recommended that reactivity limits for Godiva be removed, as they can only be measured after a pulse occurs. The reactively limits specified have no impact on safety and are superfluous. These changes will be addressed in the next annual revision to the Documented Safety Analysis (DSA).

Los Alamos – There are five open CSSG recommendations. Action has been taken on all, but the actions are not yet complete. The recommendations are listed below.

- Eliminate nitric acid (fissile solution) backflow path into a non-favorable geometry that is outside the containment boundary
- Extent of Condition for other criticality concerns delay pending engineering resolution
- Criticality Safety Group Staffing and attrition
- Sustainable improvements in conduct of operations improvements
- Improve consistency and utility of postings

Many CSSG recommendations are being addressed through an institutional Nuclear Criticality Safety Program (NCSP) improvement plan. This was developed to define the target of how LANL wants the NCSP to function. The ultimate goal of this plan is to improve the LANL NCSP into a world-class, standards-based program.

Y-12 Plant – The CSSG issued an assessment report in early FY-2014. A number of issues were identified, and an action plan is due to the field office by the end of March 2014.

Hanford, WTP – The CSSG assessments of the WTP criticality safety program was conducted in 2008 and 2009. Notably, the CSSG assessment recommendations and areas for improvement were incorporated into the Conditions of Approval (COAs) written in the ORP safety evaluation report. Progress on closure of the COAs has slowed due to several technical challenges (e.g., presence of Pu-oxide particles greater than 10 microns, preferential settling of heavy Pu-oxide particles in WTP process vessels, and pulse jet mixer design issues to ensure adequate vessel bottom clearing requiring the need for a hydrodynamics study). These have caused a revision to the Criticality Safety Evaluation Report to be pushed out through 2014.

5. Evaluation of Overall Performance

Department of Energy's evaluation of the contractors' performance in the functional area of criticality safety, consistent with DOE Order 226.1 B, *Implementation of Department of Energy Oversight Policy*

NNSA has one site with excellent performance, three with solid performance, one with adequate performance, and one with inadequate performance. More detail is provided in the attachments to Appendix 1.

The performance at LANL is not adequate. The plutonium facility is under an operational pause that is being lifted in steps as corrective actions are implemented.

Although most EM site contractors had performance issues, all were deemed by the Department to be addressing the discrepancies. Details are further explained in attachments to Appendix 3.

6. Performance versus Specific Expectations

Department of Energy's evaluation of the contractors' success in meeting site-specific performance expectations (e.g., Performance Evaluation Plans and Performance Based Incentives) related to criticality safety

Livermore – The LLNL Criticality Safety program continues to exceed expectations through completions of management walkthroughs, reduction of fissile material items approved in B332 procedures, 100 percent compliance for criticality safety training, staff participation in national consensus standards development, and lead roles in two key experimental campaigns at NNSS. The LLNL Criticality Safety program was rated as Excellent.

Nevada – In coordination with LANL and LLNL, NSTec has put in place an Integrated Criticality Safety Program that supports multiple contractors at NNSS. The Nevada criticality safety program has improved significantly in the last 18 months. However, the development of CSEs fully compliant to DOE-STD-3007-2007 has yet to be demonstrated.

Los Alamos – Performance for FY-2012 and FY-2013 resulted in a site specific performance objective in the FY-2014 performance evaluation plan to "Complete implementation of corrective actions to ensure long-term viability of the LANL Criticality Safety Program."

Sandia – In FY-2013, the Sandia criticality safety program was assessed by four facility walk throughs, a biennial self-assessment of field office criticality safety oversight program, and a Special Focused Assessment directed by the Office of the Associate Administrator for Infrastructure and Operations (NA-00). No deficiencies were identified. However, the Sandia field office has directed that two older criticality safety analyses be brought up to the requirements of DOE-STD-3007-2007, *Guidelines for Preparing Criticality Safety Evaluations at Department of Energy Non-Reactor Nuclear Facilities.* It is noted however, DOE-STD-3007-2007 does not require that the Criticality Safety Analysis be updated merely to comply with 3007-2007. Performance is judged to be adequate.

Pantex – Performance indicators are tailored to the nature of the Pantex operations. They include staffing levels, walk downs of fissile operations by criticality staff, and management self-assessments. All of these were done as expected, and no deficiencies were found.

Y-12 – The contractor assurance systems for NCS at Y-12 include a robust set of performance indicators, and a mature self-assessment program based on DOE Technical Standard 1158-2010. The field office evaluates the status of these indicators weekly. The rating was "not meeting expectations" for most of FY-2013, but due to aggressive and responsive corrective actions and improvements, the rating was elevated to "meeting expectations" at the end of FY-2013. Other actions included were contractor senior management action regarding Nuclear Criticality Safety Engineering staffing trends and physical improvements made in Building 9212 to address noted degradation or other inadequacies. The Y-12 criticality safety program incorporates the UPF Project.

Some EM contractors have nuclear criticality safety related expectation in the contract for fee determinations. These include Washington River Protection Solutions, Fluor, B&W Portsmouth, CH2M WG Idaho, Idaho Treatment Group, Savannah River Nuclear Solutions, and Savannah River Remediation. Some lost fee as a result. Details are further explained in attachments to Appendix 3.

The Livermore Criticality Safety program continues to exceed expectations. The Lawrence Livermore National Laboratory (LLNL) Criticality Safety program was rated as Excellent for Fiscal Year 2013.

Staffing:	Contractor:	9 technical, 2 administrative, 3 part time retirees	Adequate
	Federal	0.5 Full-time equivalent	Adequate
Infractions:	1, minor		
Non-Compliances:	None		
Criticality Safety Support Group Recommendations:	None		
Overall Performance	Excellent		

1. Criticality Safety Staffing

Staffing of the core element of the LLNL Nuclear Criticality Safety Division (NCSD) is adequate and relatively stable. The current core staff is comprised of eight engineers (including the division leader), one full-time computer scientist, and two administrative staff. Additionally, three retired computer scientists provide numerical methods support for the LLNL Monte-Carlo methods (funded by the Department of Energy (DOE) Nuclear Criticality Safety Program (NCSP)). All but one of the LLNL Criticality Safety engineers are qualified per the LLNL criticality safety qualification program, which satisfies DOE-STD-1135-99, *Guidance for Nuclear Criticality Safety Engineer Training and Qualification*. Senior engineers supervise the remaining engineer's work.

The division continues to support Superblock, Radioactive Waste Management, non-superblock programmatic operations with fissionable materials and Transportation operations. In Fiscal Year (FY) 2013, criticality safety support for Superblock and Radioactive Waste Management operations was funded at two full-time equivalents (FTEs). The NCSD manager has requested that the Laboratory increase this funding level for FY 2014 to two and half FTEs. It should be noted that the current technical basis for criticality safety in the Superblock supports Category I operations with significant quantities of fissionable materials. Sufficient criticality safety resources will be needed to streamline the technical basis to support efficient Category III operations with less maintenance costs.

The division also continues to provide support to NNSS facilities, LLNL facilities with fissile materials that are not categorized as nuclear facilities, and the DOE NCSP program initiatives. LLNL also supported an external review of the Los Alamos National Laboratory (LANL) criticality safety program at the request of the LANL Director's Office.

The NA-LL criticality safety engineer maintains awareness of staffing levels to ensure adequate qualified staff remains on hand to support fissile material operations.

NA-LL remains staffed with one fully qualified criticality safety engineer at the 0.5 FTE level. This individual is also assigned oversight responsibilities for laser safety and participation as a team member on Documented Safety Analyses (DSA) reviews.

2. Infractions, Severity, and Lessons Learned

There was one criticality safety infraction at LLNL in FY 2013. In October 2013, an infraction was identified by material handlers when an item with approximately 20 grams of fissile material

was found with an incorrect posting. Because there was, a technical basis supporting the storage of this item in this location under a different posted criticality safety condition this infraction was categorized as minor.

3. Non-Compliances with Requirements

There were no non-compliances with DOE or American National Standards Institute / American Nuclear Society (ANSI/ANS) standards identified during federal assessments during FY 2013.

During FY 2013, NA-LL conducted Functional Area Review of LLNL's implementation of Management Responsibilities for Criticality Safety using the lines of inquiry from DOE STD 1158-2010, *Self-Assessment Standard for DOE Contractor Criticality Safety Programs.* No deficiencies resulted from this review.

NA-LL also evaluated LLNL's compliance with ANSI/ANS 8.26-2007, *Criticality Safety Engineer Training and Qualification Program.* Issues included one strength and two minor observations.

4. CSSG Recommendations

There are no open CSSG recommendations applicable to LLNL.

5. Evaluation of Overall Performance

Overall, LLNL implementation of Criticality Safety is excellent. FY 2013 contractor walkthroughs (performed quarterly) of all operations with significant quantities of fissionable material did not result in any significant findings. These results were consistent with NA-LL operational surveillances and walkthroughs for FY 2013. NA-LL also conducted Functional Area Reviews of (1) LLNL's implementation of Management Responsibilities for Criticality Safety and (2) the LLNL Training and Qualification program for criticality safety engineers. There were no significant findings resulting from either of these Functional Area reviews.

6. Performance versus Expectations

LLNL Criticality Safety continues to exceed expectations through completion of management walkthroughs, reduction of fissile material items approved in B332 procedures, 100 percent compliance for criticality safety training, staff participation in national consensus standards development, and lead roles in two key experimental campaigns at the NNSS. The LLNL Criticality Safety program was rated as Excellent.

Attachment 2 **Nevada Field Office**

The Nevada site criticality safety program has improved in the last two years. Some improvement is still needed.

Staffing:	Contractor:	3 technical, 1 manager	Adequate
	Federal:	1	Adequate
Infractions:	1, minor		
Non-Compliances:	NSTec has not demonstrated full compliance with DOE STD 3007		
Criticality Safety Support Group Recommendations:	The Criticality Safety Support Group recommendations for changes to the Godiva controls related to excess reactivity have not been fully implemented		
Overall Performance	Performance is judged adequate, but does not fully meet requirements		

1. Criticality Safety Staffing

Staffing Levels remain adequate to support NNSS. NsTec currently has three full-time Criticality Safety (CS) Engineers and one Criticality Safety Manager. The three criticality safety engineers are fully qualified per the NsTec program. The position of Criticality Safety Officer is currently in development and expected to fill in Fiscal Year (FY) 2014. NA-NV is monitoring the task performance of NsTec criticality support staff to assure that staffing levels remain adequate.

NA-NV currently has a fully qualified CS Engineer with additional resources available from NNSA Headquarter CS staff as needed.

2. Infractions, Severity, and Lessons Learned

One infraction was reported in FY 2013. The infraction involved a potentially unanalyzed package, but the issue was corrected prior to discovery. The infraction was considered a Level 4 (deviation within analyzed limits) per the approved program.

3. Non-Compliances with Requirements

In FY 2011, NA-NV assessed NsTec level of compliance, effectiveness, and performance associated with implementation of DOE-STD-3007-2007. The results of the assessment indicate that NsTec's Criticality Safety Program implementation of DOE-STD-3007-2007 was unsatisfactory. NA-NV required NsTec to develop and submit for approval compensatory measures and a corrective action plan (CAP) to address the issues identified in the assessment report. Currently, the majority of the corrective actions and program improvements have been completed. NSTec has not yet fully demonstrated its capability to develop Nuclear Criticality Safety Evaluations in compliance with DOE-STD-3007-2007. Three compliant NCSEs must be developed to demonstrate performance before the CAP and associated compensatory measures are removed. A lack of activities requiring full Nuclear Criticality Safety Engineers (NCSEs) has slowed this effort.

4. Criticality Safety Support Group Recommendations

Recommendations from Criticality Safety Support Group Tasking 2011-05 regarding application and use of reactivity limits for Godiva are still pending.

5. Evaluation of Overall Performance

FY 2013 included a shadow assessment on select DOE-STD-1158 criteria with no major issues. Additionally an oversight assessment was performed on the closure of a corrective action plan for DOE-STD-3007 compliance. It was found that full DOE-STD-3007 compliance had not been demonstrated due to lack of NCSE development. The CAP remains open. There have been no proposed changes in operations since the action plan was issued, so no process evaluations have been written. The Field Office has suggested alternate methods to close the corrective actions.

Although the program and performance have greatly improved in the areas of program integration, field time, and metrics, the ongoing (2 years) CAP and associated compensatory measures continue to limit overall performance in the area of criticality safety.

Performance is judged adequate, but does not fully meet requirements.

6. Performance versus Expectations

In coordination with Los Alamos National Laboratory and Livermore National Laboratory, NsTec has put in place an Integrated Criticality Safety Program that supports multiple contractors at NNSS. This integration has led to an improved criticality control review process. The NsTec criticality safety program has a greatly improved field presence in support of operations.

Currently NsTec remains under compensatory measures resulting from an NA-NV assessment of the Nuclear Criticality Safety Program conducted in FY 2011. The majority of the CAP actions involving program enhancements have been completed. The development of NCSEs fully compliant to DOE-STD-3007 has yet to be demonstrated. The protracted closure of the CAP has impacted overall program performance.

The staff at Los Alamos National Laboratory (LANL) is currently larger than at any time in the Laboratory's history. While still relying on experienced sub-contractors, a senior experienced criticality safety engineer has joined the LANL staff and another is on long-term assignment from Lawrence Livermore National Laboratory (LLNL).

Staffing:	Contractor:	8, (some part time) 11 in training	Understaffed
	Federal:	1, 1 in training	Adequate
Infractions:	38, 28 with no loss of control of any parameter 9 with partial loss of 1 parameter 1 with loss of control of 1 parameter In all cases with 2 or more parameters still providing criticality safety margin		
Non-Compliances:	Staff, Program Implementation		
Criticality Safety Support Group Recommendations:	Several Open		
Overall Performance	Does not meet expectations		

1. Criticality Safety Staffing

The Los Alamos Field Office oversight in Fiscal Year (FY) 2013 focused on Criticality Safety Program rebuilding efforts and implementation challenges created by attrition of Los Alamos National Security, LLC. (LANS) criticality group staff. LANS developed, and is executing, a corrective action plan (CAP) to address issues resulting from significant attrition of criticality safety analysts (CSAs). Issues have also been identified in quality of historical evaluations, supporting documentation, and operational implementation at the plutonium facility. On June 27, 2013, the Laboratory Director paused operations at the plutonium facility due to these and other conduct of operations issues. On July 15, 2013, the Defense Nuclear for Safety Board (DNFSB) issued a letter to the Secretary of Energy regarding criticality safety at LANL and transmitting a staff report documenting assessment results. On August 15, 2013, National Nuclear Security Administration (NNSA) responded to that letter with an update on status of the pause, program improvement initiatives, and a commitment to update the DNFSB on December 6, 2013.

LANS has hired new staff, subcontracted expertise, and implemented an aggressive training and qualification program. Additional senior staff is being pursued to supplement the re-building of the program.

As of December 9, 2013, LANS has eight fully qualified criticality safety staff (some part-time), and 11 personnel in training. The fully qualified staff includes four LANS employees and four sub-contractors, two of which were previous LANS criticality safety staff. The personnel in training include several personnel with nuclear experience including criticality safety experience, two sub-contractors with significant criticality safety experience, and four personnel with no previous experience.

In spring of 2013, LANS conducted a Criticality Safety 'Boot Camp' designed to provide all the new hires with all the academic training required to qualify as a criticality safety analyst. This robust training was shadowed by NNSA representatives for quality and efficacy. The Boot Camp was successful in bringing the new group up to speed with regard to the basics, and put them on a footing to be able to contribute to the success of the group.

Several experienced/senior criticality safety analysts have been brought on board to assist in mentoring and training the junior engineers. The criticality safety group has the service of two sub-contractors who were previously qualified LANL senior criticality safety analysts and one senior analyst who remains a LANS employee but has transitioned to another part of the organization. All five of these analysts assist in mentoring and training the junior engineers, leading to qualification.

NA-LA nuclear criticality safety engineering is fully staffed with one NNSA qualified Criticality Safety Engineer and a second in training. NA-LA continues to receive support from NNSA headquarters criticality safety staff on an as needed basis.

2. Infractions, severity, and Lessons Learned

The LANL Director appointed a causal analysis team to analyze a series of criticality safety infractions at TA-55 that occurred in calendar year 2013. The criticality safety program, the nuclear safety culture and associated management systems had been evaluated on more than one occasion in the recent past to include reports by the Criticality Safety Support Group in 2012 and by DNFSB in 2013. The team identified five root causes stemming from more than twenty contributing causes. These are being addressed as part of Nuclear Criticality Safety Program (NCSP) improvement plan.

The identified root causes are:

1. **Management Commitment & Communication:** Management has not yet fully embraced its commitment to criticality safety, self-discovery, communication to the worker, and continuous improvement.
2. **Roles, Responsibilities, Authorities, and Accountabilities (R2A2s):** R2s are not yet clearly documented, flowed down, or understood. A2s are not yet clearly defined or implemented.
3. **Conduct of Operations:** Improvement has not kept pace with expectations and the rigor necessary to compensate for reduced Criticality Safety Analyst resources.
4. **Performance Assurance:** Processes are not effective at identifying discrete problems in order to drive enduring improvements.
5. **Criticality Safety Resources:** Losses in personnel and corporate knowledge continue to challenge the viability of the criticality safety management program.

For FY 2013, there were 38 infractions consisting of 28 Level 5, 9 Level 4, and 1 Level 3 infractions. The number of Level 4 and Level 3 infractions align with prior history (FY 2010 through FY 2012) and are evidence of a sustained level of criticality safety for the facilities (relative to prior years). The number of level 5 infractions far exceeded prior years; however, level 5 infractions are considered as opportunities for improvement (OFIs). The increased number of FY 2013 Level 5 infractions is a direct result of the increased attention by operations "validation and verification" efforts supporting the PF4 resumption process. Eighty (80) percent of the Nuclear Criticality Safety events were identified by LANL personnel.

3. Non-Compliances with Requirements

LANS conducted, and NA-LA shadowed, 1 assessment focused on criticality safety program implementation. These assessments identified some issues in program implementation across the site.

At the Field Office's request, the Criticality Safety Support Group (CSSG) conducted an assessment of the LANL criticality safety program in March 2013. The assessment focused on the institutional program and current deficiencies in implementation. In May 2013, the DNFSB staff assessed the criticality safety program with a focus on plutonium facility operations. The issues from both of these assessments are being evaluated and included in evolving program improvement initiatives. NNSA reported to the DNFSB on these initiatives in August 2013 and updated the DNFSB on these initiatives in December 2013.

4. Criticality Safety Support Group Recommendations

An institutional NCSP improvement plan has been developed to refine the target of how LANL wants the Nuclear Criticality Safety Program to function. This plan is based on the 1999 Department of Energy Self Improvement Workshop, *Your Mission and Nuclear Criticality Safety*. The ultimate goal of this plan is to improve the LANL NCSP into a world-class, standards-based program. The intermediate goal is to upgrade the NCSP by addressing identified deficiencies, non-compliances, causal factors, and systemic problems that underlie those deficiencies. Once all of these issues are addressed, LANL will be on a footing to continually improve the NCSP so that realization of the ultimate goal can be achieved.

The Institutional NCSP is broken into 5 focus areas that contribute to a fully functioning, mature NCSP. The 5 focus areas are:

1. Nuclear Criticality Safety Division
2. Nuclear Criticality Safety Committee
3. Operations and Program Management
4. Nuclear Criticality Safety Program Execution
5. Performance Assurance

These five focus areas correlate to addressing the root causes of Management Commitment, R2A2, Conduct of Operations, Performance Assurance, and Criticality Safety Resources. Upgrades in each of these 5 areas will be managed as sub-projects. An overall project plan is being finalized to specifically define the scope for each subproject. The scope is being defined by addressing the findings, recommendations, opportunities for improvement, and lessons learned from all of the reviews that have been conducted on the NCSP since 2005 including the most recent causal analysis and external review. This includes reviews conducted by DNFSB, NNSA, the CSSG, and LANL. This thorough review of all past reviews ensures a comprehensive plan that addresses all issues.

5. Evaluation of Overall Performance

The LANL nuclear criticality safety program does not meet program requirements of applicable national consensus standards and DOE Order 420.1C. LANS efforts to improve program performance and compliance in FY 2013 have included: development of a staffing analysis and efforts to meet staffing goals; development and implementation of a compliant training program for criticality safety engineers; and ongoing conduct of operations and criticality safety program improvements to resume operations at the plutonium facility. These plans are currently undergoing revision, as described above, to ensure that corrective actions generate and sustain a compliant program capable of supporting continued safe operations.

6. Performance versus Expectations

The need for further Improvements in implementation of criticality safety controls and conduct of operations is reflected in the site's FY 2014 performance evaluation plan.

Sandia Field Office

In Fiscal Year (FY) 2013 the Sandia Field Office's criticality safety program was assessed by facility walkthroughs, a biennial self-assessment of the field office criticality safety oversight program, and a Special Focused Assessment directed by the Office of the Associate Administrator for Infrastructure and Operations (NA-00). No deficiencies were identified. Performance is judged to be adequate.

Staffing:	Contractor:	8 (about 2 FTE)	Adequate
	Federal:	1 (0.1 FTE)	Adequate
Infractions:	None since Fiscal Year 2009		
Non-Compliances:	None		
Criticality Safety Support Group Recommendations:	None		
Overall Performance	Adequate		

Sandia Field Office has no Security Category I or II material.

1.1. Criticality Safety Staffing

Eight Sandia National Laboratory (SNL) engineers are qualified to DOE-STD-1135-99, *Guidance for Nuclear Criticality Safety Engineer Training and Qualification*, as Nuclear Criticality Safety Engineers (NCSEs). The program has been updated to address American National Standards Institute/American Nuclear Society (ANSI/ANS) 8.26, *Criticality Safety Engineer Training and Qualification Program* requirements. NCS program work is approximately two full-time equivalents (FTEs) in FY 2013 and is anticipated to remain at two FTEs for FY 2014. Staffing is adequate for the level of effort for the next few years considering that SNL has now disposed of most of the fissile material and fewer analyses will be required in the next few years.

One NA-SN engineer has completed the Technical Qualification Program (TQP) standard for DOE-STD-1173-2003, *Criticality Safety Functional Area Qualification Standard*, in December 2007 and requalified in 2011. Criticality safety oversight is not a full time responsibility for the engineer, approximately 10 percent of his time. Staffing is considered adequate for the level of effort for the next few years.

1.2. Infractions, severity, and Lessons Learned

No infractions have occurred since 2009.

1.3. Non-Compliances with Requirements

NA-SN approves the SNL's Nuclear Criticality Safety Program (NCS) in ESH 100.2.SB.2, *Ensure Nuclear Criticality Safety*, in accordance with Department of Energy (DOE) Order (O) 420.1B, *Facility Safety*, and any exceptions to the order. It is noted that DOE O 420.1C, *Facility Safety*, is being implemented into the SNL contract. During FY 2013, no non-compliances with DOE O 420.1 or ANS/ANSI-8 Standards were identified during federal assessments and therefore no corrective actions were required.

1.4. Criticality Safety Support Group Recommendations

No items were identified in the previous three years by the Criticality Safety Support Group specific to SNL and no follow-up reviews were required.

1.5. Evaluation of Overall Performance

NCS performance measures to meet DOE O 226.1 were established in a letter to SNL on May 31, 2006. These performance measures established metrics in 1) Non-Conformances, 2) Self-Assessments and Committees, 3) Staff Responsibilities, and 4) Criticality Safety Assessments. A brief status follows:

1. Non-Conformances

There have been no reported non-conformances since 2009.

2. Self-Assessments and Committees

DOE-STD-1158, *Self-Assessment Standard for DOE Contractor Criticality Safety Programs*, has been used extensively to meet ANSI/ANS 8.19 requirements for self-assessments since 2009. SNL started an initiative in 2007 to complete self-assessments of their program per DOE-STD-1158-2002. All nuclear facilities are reviewed annually with the reports issued within two to three months of the review. In 2013, SNL planned 10 DOE-STD-1158-2010 self-assessments of facilities representing all the facilities where fissile mass is greater than threshold quantities. Through November 2013, four of the ten NCS self-assessments have completed their walkdowns. This is the sixth-year where SNL has performed self-assessments on facilities. The 10 self-assessments in 2013 represent 100% of the facilities where fissile mass is greater than threshold quantities. NA-SN reviews all of the self-assessments through the Contractor Assurance System (CAS). At the conclusion of the annual self-assessments, a final self-assessment reviews all of the facility self-assessments to identify trends, if applicable. Corrective actions are performed consistent with resource loading and safety and compliance importance. Information from self-assessments and walkthroughs in 2013 is included in a local action tracking system.

Through November 2013, the Radiological and Criticality Safety Committee (RCSC) met 11 times to review criticality safety for facilities within TA-V (e.g. ACRR, SPR, AHCF), and the Sandia Nuclear Criticality Safety Committee (SNCSC) met two times to review criticality safety for facilities outside TA-V (e.g. MNF, HERMES). Additional meetings were conducted in December of 2013. Two or three qualified SNL criticality safety engineers are present at all meetings. The Annular Core Research Reactor (ACRR) and SPR review committees also met to review procedures that implemented criticality safety. NA-SN personnel have been included in the meeting notices and have attended several meetings. Meeting minutes were developed, reviewed, approved and distributed usually within three months of the meeting date and maintained on a server accessible to NA-SN. Committee minutes also document closure of previous action items from the committee.

3. Staff Responsibilities

The NCS training program is based on DOE-STD-1135-99 and ANSI/ANS 8.26. SNL has eight qualified NCSEs in FY 2013. Of the eight qualified NCS engineers, six are members of safety committees that require criticality expertise. So far, seven of the eight NCSEs have participated or observed the critical experiments at Sandia Pulse Reactor Critical Experiments Facility (SPR/CX). One of the NCSEs is the lead designer and nuclear engineer for the SPR/CX experiments and five of the eight are instructors for the SPR/CX classes. Over 50 NCSEs and 15 managers from throughout DOE have completed the training at SPR/CX.

4. Criticality Safety Assessments [Process Evaluations for Criticality Safety]

Prior to operations, the Criticality Safety Assessments (CSAs) are developed, reviewed, and approved. There are 16 active CSAs for SNL. To date, no CSAs have required NA-SN approval but almost all have been reviewed by the NA-SN Criticality Safety staff member. There was one new CSA completed and reviewed by NA-SN in 2013 for the *Nuclear Criticality Safety Assessment for the AHCF Activities Occurring During Campaign Plan #13 Processing.* The Auxiliary Hot Cell Facility (AHCF) has begun inspection and repackaging activities related to legacy spent fuel pins in accordance with the CSA and operating procedures.

1.6. Performance versus Expectations

The federal assessments performed in FY 2013 were the four facility walkthroughs, a biennial self-assessment of the NA-SN criticality safety oversight program, and a Special Focused Assessment directed by NA-00. Since there were no deficiencies, no corrective action plans (CAPs) were required although for the 4 facility walkthroughs, there were minor observations identified. The NA-00 Special Focused Assessment was a deep dive into implementation on NCS controls, staffing and qualification, and operational review process. One issue identified for the NA-00 Special Focused Assessment is that SNL has several older analyses that are being used as CSAs that predate when DOE-STD-3007, *Guidelines for Preparing Criticality Safety Evaluations at Department of Energy Non-Reactor Nuclear Facilities*, was originated. These analyses do not meet the current standard. These analyses support one semi-active storage operation where material is present but has not been moved into or out of the storage area in five years and one non-active storage operation where no material is present in the storage area. NA-SN has directed that before any operations can occur in either location, a CSA that meets DOE-STD-3007-2007 needs to be completed. (DOE STD 3007-2007 does not require that the CSAs be updated merely to comply with 3007-2007.) The need for these CSAs to be completed was during assessments for each facility. Both of these CSAs are currently being worked by SNL. Another minor issue that is seen in almost all levels of assessments is an inconsistency in criticality safety postings. SNL has made progress in making the criticality safety postings consistent but there continues to be a few postings that need to be updated. Since these are observations, no response from SNL is required. Performance is judged to be adequate.

NNSA Production Office (Pantex)

The NNSA Production Office (NPO)–Pantex Criticality Safety Program continues to perform as expected.

Staffing:	Contractor:	2 (Less than 2 FTE)	Adequate
	Federal:	1 (Approximately 0.25 time)	Adequate
Infractions:	None for over 2 decades		
Non-Compliances:	None		
Criticality Safety Support Group Recommendations:	None		
Overall Performance	Adequate		

The NPO – Pantex Plant is the Department of Energy (DOE)site for nuclear weapons dismantlement, maintenance, upgrades (e.g., life extension programs), assembly, and storage of weapons components such as pits and radioisotope thermoelectric generators (RTGs). Pantex fissile material operations involve encapsulated weapons grade plutonium (^{239}Pu) and highly enriched uranium (^{235}U) weapons components. By design, operations do not involve 'bare' or liquid fissile material. Weapons components that are staged at Pantex are packaged in containers analyzed to be criticality safe for large arrays and subsequently approved by DOE for on-Site storage and transportation operations. The Criticality Safety Program technical basis document shows that a criticality event at Pantex is not credible.

1. Criticality Safety Staffing

The Babcock & Wilcox Technical Services Pantex, LLC (B&W Pantex) Nuclear Criticality Safety (NCS) Program is currently staffed with two qualified criticality safety engineers. Two Criticality Safety Engineers are sufficient to maintain the NCS technical basis document and provide criticality safety oversight for Pantex operations. Both B&W criticality safety engineers have Ph.D.s; one in nuclear engineering (NCS lead) and one in Chemistry. Both NCS engineers are qualified to the B&W Pantex Nuclear Criticality Safety Engineer Qualification program (which meets the requirements of DOE-STD-1135-99, *Guidance for Nuclear Criticality Safety Engineer Training and Qualification)*. If necessitated by operational events, additional NCS support may include using a sub-contractor or support from other NNSA or DOE sites. In addition, the forthcoming Pantex and Y-12 Plant consolidation under one contract is expected to yield operational efficiencies such as shared criticality safety support across the two plants. In the interim, NPO has determined that the B&W Pantex Criticality Safety Program is effective and staffed to meet the needs of safe Pantex operations.

NPO oversight of NCS is the responsibility of the Assistant Manager for Nuclear Safety & Engineering (AMNSE) and is managed out of NPO's Y-12 office where the NPO Senior NCS Engineer resides. The AMNSE organization at Pantex has one staff member who is qualified as an NCS engineer to provide on-site response to NCS issues and events. Because of the form of the fissile material and the nature of the weapons component handling operations at Pantex, NPO staffing is sufficient to oversee the B&W Pantex Criticality Safety Program.

2. Infractions, severity, and Lessons Learned

Pantex has had no infractions for over two decades.

3. Non-Compliances with Requirements

Pantex limited scope operations have not identified any systematic non-compliances with ANSI/ANS requirements, nor have federal assessments identified ANSI/ANS based requirement non-compliances.

4. Criticality Safety Support Group Recommendations

There were no open Criticality Safety Support Group recommendations specific to NPO Pantex plant in Fiscal Year (FY) 2013.

5. Evaluation of Overall Performance

NPO Pantex typically assigns performance measures, as necessary, to provide a focus for the B&W Pantex NCS Program. In FY 2013, the Contractor continued developing an NCS safety management program description and properly categorizing an NCS control set for revising the Pantex Site-wide Safety Analysis Report (SAR), and technical safety requirements. The NCS Safety Management Program (Chapter 6 of the Site SAR) was revised and the former NCS Technical Safety Requirements (TSRs) were re-categorized as programmatic controls. B&W Pantex implemented a three-year cyclic assessment program based on DOE-STD-1158-2010 and ANSI/ANS-8.19-2005 in which all NCS Program elements would be assessed on a triennial basis. All NCS-related assessments are formally scheduled through the CAS. The B&W Criticality Safety Program remains a very stable and effective oversight program in the Contractor's Integrated Safety Management System.

6. Performance versus Expectations

Performance indicators are tailored to the nature of the Pantex operations.

- NCS-related Infractions are still considered a metric, even though none have occurred in over 21 years.

- The number of qualified NCS engineers is monitored: Two are needed; two are on board.

- Amount of time spent in nuclear facilities by the NCS staff is monitored. NCS Engineer time in nuclear facilities is tracked by walkdown visits; each year the Contractor provides a plan at the beginning of the year which dictates the facilities to receive an NCS walkdown and at the end of each FY, a follow-up report documents how successful they were in meeting their plan. The federal NCS Engineer monitors the Contractor walkdown status with respect to the plan.

- In FY 2013 the Contractor planned three management self-assessments (MSAs) covering Sections 4 (Management Responsibilities), 5 (Supervisory Responsibilities), and six (Staff Responsibilities) of ANSI/ANS-8.19-2005. All three MSAs were shadowed by the federal NCS Engineer and all successfully completed with no deficiencies or weaknesses.

- Quality of Criticality Safety Evaluations: The technical basis for the Pantex NCS Program is based on one major Criticality Safety Evaluation (CSE): NCS-031, Issue 4, (U) *Pantex Plant Criticality Safety Program Analysis (PPCSPA).* Issue 2 of this CSE was reviewed as part of

the NNSA Assessment of the Contractor NCS Program. An independent assessor from NNSA reviewed the CSE and determined it met STD-3007 requirements. Although the CSE was revised twice in FY 2013, no new CSEs were added to the NCS Program at Pantex. Issues 3 and 4 of this CSE were reviewed by the NPO Pantex NCS Engineer; Issue 3 added some additional analysis to the CSE and Issue 4 updated references to DOE O 420.1B to DOE-O-420.1C.

Performance is judged to be adequate.

NPO - Y-12 is addressing staffing issues, and has continued effort underway to improve container labeling and the process evaluations for criticality safety.

Staffing:	Contractor:	56 - 27 direct, 29 sub-contractors (30 of the 56 supporting UPF)	Understaffed, adverse trend noted
	Federal:	2	Adequate
Infractions:	71		
Non-Compliances:	Partial in Criticality Safety Evaluation documentation; cannot meet natural phenomena threat; Container labeling issues.		
Criticality Safety Support Group Recommendations:	None for Fiscal Year (FY) 2013; Action plan pending for FY 2014		
Overall Performance	Adequate		

The NPO Y-12 Plant is the Department of Energy (DOE) production site for enriched uranium fissile material operations including assembly and disassembly of weapons components, chemical recovery, casting, machining, and storage. Fissile material operations at Y-12 involve high equity solutions processing, casting, and a variety of operations dealing with various solid forms ranging from finely divided forms to large parts. Because of the variety, forms, and nature of enriched uranium materials handled at Y-12 combined with extensive administrative control and aged facilities the risk of a criticality accident is non-trivial and requires an intensive Nuclear Criticality Safety (NCS) program implementation.

1. Criticality Safety Staffing

At the Y-12 NSC, NCS engineers are part of the Safety Analysis Engineering (SAE) organization in the Engineering Division. At the end of FY 2013, there were 27 B&W Y-12 and 29 subcontractor engineers practicing the NCS discipline. Of those, 26 support plant operations and 30 support the UPF project. Babcock & Wilcox Technical Services Y-12, LLC (B&W Y-12) continues to pursue filling fulltime NCS engineer positions to meet immediate needs for plant support and to reduce reliance on subcontractor engineers. In addition to filling immediate needs, there are five entry-level nuclear engineers in an engineering rotation program (not included in the statistics below) that will be candidates for NCS engineer positions in the near future. The contractor estimates that about ten more NCS engineers are needed to support plant needs and improvement initiatives.

The qualification status of the NCS engineers (NCSEs) is shown on the table below:

	B&W	Subs
Staff level, (Persons, not FTE):	27	29
Qualified Engineers in Training	100%	76%
Qualified NCSEs	78%	41%
Qualified Senior NCSEs	15%	Note 1
NCS Operational Reviews	89%	59%
NCS Evaluation and Documentation	85%	69%
Implementing Documentation Approval	89%	59%
Computations	93%	76%
Computation Peer Review	30%	41%
NCS Evaluation Peer Review	26%	38%
Criticality Accident Alarm System Support	11%	Note 2

Note 1: Subcontractors do not routinely qualify as Senior NCSEs.
Note 2: Subcontractors do not routinely qualify in this task.

NPO Y-12 reviews and performance feedback in Fiscal Year (FY) 2013 have reported an overall concern with the decreasing level of NCS engineering staffing. This concern is considered the most pressing issue since it will impact needed NCS Program improvements, and requisite staff stability to support ongoing operations. Contractor management has demonstrated an interest in reversing this trend, and this issue has been identified as a top management priority for Production.

NPO's oversight of NCS is the responsibility of the AMNSE and is managed out of NPO's Y-12 office by the NPO Senior NCS Engineer who is a fully qualified and experienced NCS professional. The staff at Y-12 includes an additional NCS Engineer, who recently completed qualification at the end of FY 2013.

2. Infractions, severity, and Lessons Learned

There was one reportable NCS occurrence (Group 3, Subgroup C) per DOE O 232.2 in FY 2013. The occurrence was a type 3C-4 and was filed due to a concern with the casting furnaces and a potential for both uranium and a moderator to collect in the bottom plenum of the furnace concurrently. The issue was raised by contractor personnel and handled per the PISA process. The issue raised was a potential for hydraulic fluid lines or cooling water lines to be damaged in the event of a casting stack tip-over. In such a scenario, enriched uranium metal and oxide would collect in the unfavorable geometry lower furnace plenum and the hot stack components could impact the water or hydraulic fluid lines and create the potential for moderating liquid to collect with the enriched uranium in the lower plenum. Evaluation of the potential concern did not preclude this as being a credible scenario and resulted in a positive Unreviewed Safety Question (USQ) determination. The cooling lines were subsequently removed and the hydraulic lines rerouted before furnace operations were resumed. The issue was also filed under 3B-1 because of the positive USQ.

There were also three 3B-3 occurrences related to NCS and filed as a result of Potentially Inadequate Safety Analyses (PISA) for which the USQ determination was negative. One involved a weakness in a Criticality Accident Alarm System (CAAS) analysis discovered by contract personnel. The weakness involved criticality accident detection coverage for a certain area of the building not being analyzed. Further analysis determined that the area under question was indeed covered by the existing CAAS detectors in the facility. The 2 other 3B-3 occurrences involved operation of a gas furnace used for enriched uranium recovery. The first was filed due to the discovery of degradation inside the furnace that could represent a new initiator for an explosion event. The second was filed due to additional concerns being raised about the explosion scenario creating the potential for a criticality accident. Further analysis of the explosion scenario revealed that the magnitude of the deflagration would not be sufficient to create conditions that could result in a criticality accident.

There were 2 TSR violations filed under 3A-2 involving noncompliances with Criticality Accident Alarm System TSR requirements. One involved an employee entering a high-noise area with a required personal radiation detection instrument (PRDI) that was overdue for calibration and the other involving a person entering a high-noise area that was improperly down-posted from a CAAS inaudible area.

There were three 10-2 management concern occurrences associated with NCS. One was discovery by contract personnel of spacing between 2 fissile storage arrays less than the required spacing. The fissile material contents of 1 array were removed and the array was

taken out of service. Another was an issue related to the alignment of NCS-credited valves during a lockout/tagout (LOTO). The system under LOTO has active engineered features and administrative requirements intended to prevent uranium solution from reaching the steam condensate drain system. After an individual questioned the required "as-left" position of a valve prior to LOTO release, it was discovered that the correct valve position was different from that required by the LOTO. Despite the improperly aligned valve, the NCS and TSR requirements for the protection of the steam condensate system were still met. The other 10-2 occurrence was filed due to discovery that software quality assurance requirements had not been completed for a new high performance computer but the computer was being used to perform calculations supporting a new CAAS analysis for one of the plant's nuclear facilities. The CAAS calculations were still under development at the time of discovery and were moved to another computer system meeting the applicable quality assurance requirements for NCS computing before being completed.

There was one 4A-1 occurrence filed due to the discovery of degradation in design features related to NCS. The related design features are fasteners used to secure fissile material storage positions to storage racks. Several of the storage positions were discovered by contract personnel to be missing bolts and/or nuts. An extent of condition review revealed two other storage racks with missing fasteners. The positions without adequate fasteners were initially taken out of service and were returned to service once the fasteners were repaired.

As a result of some of the NCS issues early in FY 2013 (e.g. storage rack hardware and array spacing) and in FY 2012, mainly related to implementation of NCS requirements, the contractor developed an action plan to carefully review implementation of NCS requirements in the plant's nuclear facilities. The plan involves verifying the implementation plans developed for identifying how NCS requirements are implemented. The plan also involves reviewing the features in the field and the implementing documents to verify adequate implementation. As of the end of FY13, approximately 30% of the effort is completed with several compliance issues identified and resolved. Also, the plan includes improving the processes for developing, implementing, and verifying NCS requirements.

3. Non-Compliances with Requirements

A formal NCS Standards Review and Identification Document Implementation Plan (S/RID IP) has been published (Y/DD-1256) for Y-12 providing details on systematic non-compliance issues based upon DOE O 420.1C, DOE standard 3007-2007, and current ANSI/ANS 8-series standards. The IP details the requirement, status, implementation assumptions, plan to achieve compliance, and compensatory measures in tabular form. Relative to ANSI/ANS requirements these items are summarized as:

1. ANSI/ANS 8.19-2005 § 8.3: Partial Compliance - Not all Y-12 CSEs are documented with sufficient detail, clarity, and lack of ambiguity to allow independent judgment of results without in-depth process knowledge. There is an ongoing plan for CSE documentation upgrade as documented in Y/DD-1257. Substantial progress has been made on upgrading CSEs over the past several years. The majority of the CSE ranking high in upgrade needs have been upgraded or are currently in progress leaving only the container and storage CSEs still in need of upgrade.

2. ANSI/ANS 8.1-1998/4.1; 8.19-2005/8.1: Partial Compliance - Until aged Y-12 Cat-II facility fissile material operations are replaced by the new UPF, the capability to demonstrate compliance for credible natural phenomena events is not met.

3. ANSI/ANS 8.19-2005 § 7.; ANSI/ANS 8.1-1998 § 4.1.3 & 4.1.4; ANSI/ANS 8.19-2005 § 9: Partial Compliance – Container labels in use do not always contain enough information necessary to determine compliance to applicable NCS controls without accessing databases. Implementation of Y14-02-006, Storage, Tracking, and Material Movement Program (STAMMP) Labels – November 2006 has provided compliant labels including legacy containers moved to the High Enriched Uranium Materials Facility. However, some legacy containers remain in storage without compliant labels – as those containers are moved in the future application of STAMMP requirements will ensure proper labeling.

4. CSSG Recommendations

The Office of Infrastructure and Operations (NA-00) performed a review of items including the Y-12 Operational Review process in coordination with the DOE CSSG and NPO between the dates of July 22 - 26, 2013 (CSSG Tasking 2013-04). This report was finalized and sent to the contractor on October 23, 2013. A response to applicable performance problems has been requested. There are no other open CSSG findings or recommendations.

5. Evaluation of Overall Performance

NPO staff oversight in conjunction with use of the contractor assurance system identified the need for contract direction in 4 areas:

1. A review of several infractions related to storage indicated weakness in implementing criticality safety requirements. The contractor developed and implemented a corrective action plan, including hands on verification and compliance documentation of essentially all containers in 9204-2E.

2. Operational Awareness activities identified delay in implementing process analyses for criticality safety that had been upgraded due to issues identified in prior years. In response to direction, the contractor brought the implementation from 20% to 75%. This item remains open for FY 2014.

3. A negative trend in NCS Engineering staffing was noted at mid-year that threatens to sideline needed support for continued fissile material operations and NCS program improvements. The contractor has developed a retention plan to ameliorate the issue, and may identify that more action is needed.

4. Facility and equipment wear in 9212 continue to be an issue. Events of concern included water ingress into the E-wing stack filter house, a process condensate leak in the basement, and several leaks in chemical recovery equipment, one of which resulted in a large geometry exclusion area control violation. The contractor took conservative actions to mitigate these events and develop engineered repairs. Note: The large geometry exclusion area control program is a continuing lesson learned from the 1958 accident.

6. Performance versus Expectations

Key contractor assurance systems for NCS at Y-12 include a robust set of performance indicators, and a mature self-assessment program based on DOE Standard 1158-2010. These contractor assurance systems are reviewed as part of the NPO assessment process documented in the NCS Oversight Strategy document. The DOE evaluation status is provided in weekly metrics input to NNSA HQ elements and has been rated "Yellow" (not meeting

expectations) for most of FY 2013 as a result primarily of issues identified in the 9204-2E NCS Implementation as documented in a January 2013 AMNSE letter to the contractor. As a result of aggressive and responsive corrective actions being engaged by the contractor and significantly completed for 9204-2E as well as other actions the rating was elevated to "Green" (meeting expectations) at the end of FY13. Other actions that were included in this elevation was senior contractor management attention to NCS Engineering staffing trends resulting in an approved incentive plan which is expected to improve staff retention, and the physical improvements made in 9212 to address noted degradation or other inadequacies. In general, the contractor's responsiveness and conservative decision making to noted NCS concerns and issues highlighted by a questioning attitude towards safety is regarded as noteworthy. Corrective actions have progressed significantly beyond the scope of the first letter and have included actions resulting in plant wide NCS implementation improvements. This questioning attitude and conservative decision-making are also evident in the increased level of attention to ongoing fissile operations. Examples include: identification of new casting stack upset contingency resulting in suspension of operations while furnace alterations were made to preclude event; review of wet chemistry mopping operations resulting in new NCS evaluation and improved process controls; heightened attention to seemingly minor passive design feature discrepancies resulting in improved implementation rigor (e.g., flask drawing dimensions). The independent CSSG review completed and transmitted to the contractor in FY 2014 does not identify any "Finding" level deficiencies in the program, however the contractor is working to develop plans to address areas noted for improvement which will be in place in FY 2014.

Attachment 7 **NNSA Uranium Project Office (UPO)**

The Uranium Project Office under the Office of the Associate Administrator for Acquisition and Project Management (NA-APM) has oversight for the design and construction of the Uranium Processing Facility (UPF).

1. Criticality Safety Staffing

In Fiscal Year (FY) 2013, twelve Nuclear Criticality Safety (NCS) engineers were added to the existing 19 UPF contractor staff. The new total of 31 is a 63% increase over the previous year.

One federal NCS Engineer on detail assignment to UPF from Oak Ridge Environmental Management (EM) provided oversight in FY13. Support from National Nuclear Security Administration (NNSA) Nuclear Criticality Safety Program (NCSP) was also received in 2013. The NNSA UPF Production Office added one full-time subcontract NCS Engineer in July 2013.

2. Non-Compliances with Requirements

No non-compliances with Department of Energy (DOE) and American National Standards Institute/American Nuclear Society requirements were identified for the UPF Project during FY 2013.

A federal level assessment of the UPF Project was conducted in FY 2012 and again in FY 2013. A technical independent project review (TIPR) and a pre-TIPR review of UPF were conducted in FY 2012. A DOE directed peer review of the UPF was performed in FY 2013. The peer review team was tasked to evaluate whether the project could reasonably establish its performance baseline on the current schedule and whether the project has gained momentum, kept pace, or is falling behind expectations since the last full review in FY 2012. The peer review results indicated that the TIPR recommendations were satisfied and made one NCS recommendation: Address the impacts of construction of the deferred scope items in the CD-3 PDSA.

NPO NCS and the Office of Occupational Health (NA-SH-70) completed the review of the Preliminary Safety Design Report in FY 2013.

A Sandia criticality safety subject matter expert (SME) supporting NA-00 provided a focused independent review for the casting process in March 2013.

3. Criticality Safety Support Group Recommendations

The Criticality Safety Support Group (CSSG) last reviewed the UPF in 2011 specifically regarding seismic design. There are no open recommendations from the CSSG for the UPF Project.

4. Evaluation of Overall Performance

The UPF contractors' performance in the functional area of criticality safety is monitored annually by independent oversight groups. Independent reviews were conducted through a federal level assessment of the UPF Project in FY 2012 and again in FY 2013. A TIPR and a pre-TIPR review of UPF were conducted in FY 2012. A DOE directed peer review of the UPF was performed in FY 2013. The peer review results indicated that the TIPR recommendations were satisfied and made one NCS recommendation.

Evaluation of the UPF contractors' performance in the functional area of criticality safety is also monitored by DOE Field Elements. An assessment of the UPF integration of the Y-12 B&W

NCS Program was started in FY 2013. The assessment will conclude in FY 2014. An assessment schedule has been established for FY 2014 to include NCS program elements for Natural Phenomena Hazards, Safety Basis Control Selection, and NCS Calculations Processes.

Pacific Northwest National Laboratory's (PNNL) Radiochemical Processing Laboratory, Building 325

Office Manager: Roger Snyder NCS POC: Joe Christ

The DOE Office of Science (SC) has only one defense nuclear facility, Pacific Northwest National Laboratory's (PNNL) Radiochemical Processing Laboratory, Building 325.

1. **Staffing**
   Pacific Northwest National Laboratory's (PNNL) current staffing levels are adequate based on DOE's review of the criticality safety program description conducted in Fiscal Year 2012. PNNL maintains a staffing of three qualified criticality safety analysts and one program manager. PNNL's succession planning includes one experienced senior analyst, a second recently qualified senior analyst, and one qualified analyst pursuing senior qualification.

2. **Non conformances**

   There were no criticality safety infractions for PNNL this year.

3. **Non Compliance with Standards**
   There were no non-compliances for criticality safety identified by DOE assessments of PNNL performed in FY 2013.

4. **CSSG Recommendations**
   No CSSG Recommendations were specific to PNNL

5. **Performance Evaluations**
   The Pacific Northwest Site Office (PNSO) (or PNNL) has determined that PNNL's criticality safety performance is satisfactory based on an established schedule of assessments that is consistent with DOE Order 226.1B.

6. **Performance Expectations**
   PNNL's criticality safety program has maintained satisfactory performance. In FY 2013, PNNL enhanced its criticality safety performance by applying criticality safety analytical tools when evaluating the effects of a potential criticality accident. This effort created new emergency response planning tools which help mitigate the consequences of a criticality accident and should greatly improve exercise performance.

Appendix 3

EM Criticality Safety Programs Report for FY 2013

The letter from Chairman Peter Winokur to Deputy Secretary Daniel Poneman (October 23, 2013) requested a revision to the annual reporting requirement on the Departments Criticality Safety Program. In particular, the Chairman wished to see reports on:

- Criticality Safety practitioner staffing
- Non conformances with criticality safety requirements and lessons learned
- Non-compliance with any industry or DOE standards requirements
- Addressing recommendations of the Department's Criticality Safety Support Group
- Evaluation of contractor's criticality safety performance
- Evaluation of Specified Expectations related to criticality safety

Staffing

With the exception of the Office of River Protection, who feel the WTP contractor criticality safety staff is too lean for the projected work load, all EM field sites report currently adequate contractor staffing. The Oak Ridge Office is watching the UCOR contractor and the Savannah River Office is watching the Savannah River Nuclear Solutions contractor for signs of needing more staff.

Non-conformances

Many of the EM sites experienced non-conformances with criticality safety related controls but none saw a level with the significance of losing the double contingency protection approved in the safety basis. Never the less, even lower level and defense in depth non conformances need to be investigated and corrected as they are usually indicative of a system problem. Many of our sites require a root cause review for all non-conformances regardless of the level. One PPPO contractor (see Attachment 6) had several container spacing violations and responded with enhanced operator training. An Idaho contractor (see Attachment 8) had several non-conformances that also illustrated the need for additional operator training and oversight. Another Idaho contractor (Attachment 9) had many problems with affixing bar code stickers to containers and needed to enhance the formality of that practice.

Noncompliance's with Standards

All of our sites and contractors use a process to ensure all ANS 8 and DOE criticality safety requirements are followed. Most use DOE Standard 1158-2010 on at least a three year cycle as a tool in this process. None of our sites or contractors have uncovered a Standard non compliance.

CSSG Recommendations

The only site specific Criticality Safety Support Group reports and Recommendations are the Hanford Tank Farms (2009) and the Waste Treatment Plant (2008 and 2009). The Tank Farm contractor has completed the revised documentation recommended by the CSSG. The Recommendations for the Waste Treatment Plant were largely overtaken by events and a subsequent (2013) review team, largely

CSSG members, provided numerous Recommendations that are now being evaluated by the Office of River Protection and the contractor.

Evaluation of Performance

Although most site contractors had performance issues, all were deemed by the department to be addressing the discrepancies. See the attachments for details

Evaluation of Expectations

Some contractors have nuclear criticality safety related expectation in the contract for fee determination. These include Washington River Protection Solutions, Fluor, B&W Portsmouth, CH2M WG Idaho, Idaho treatment Group, Savannah River Nuclear Solutions and Savannah River Remediation. Some lost fee as a result. See attachments for details.

Appendix 3 EM input to Annual Report on Nuclear Criticality Safety Programs
Attachment 1 **CH2M Hill Plateau Remediation Company (CHPRC)**

Office Manager: Michael McCormick NCS POC: Paul MacBeth

1. **Staffing**
The CHPRC criticality safety (CS) staff during most of Fiscal Year (FY) 2013 included one program manager, two qualified criticality safety engineers (CSEs), two criticality safety representatives (CSRs) and three staff who have dual qualifications as a CSE and CSR. One new Engineer is undergoing CSR/CSE qualification. Given the planned reduction in fissile work in the Waste and Fuels and 100K Projects for FY 2014, this is considered adequate but minimum staffing. CHPRC may need to hire additional CSE staff and/or outside contractor CSE support, on an as needed basis, to develop CSERs to support PFP project schedules.

2. **Non Conformances**
The metrics utilized to monitor contractor NCS performance include:

- Number and Type of Criticality Safety Non-conformances Reported. These range from internally managed "discrepancies" to loss of contingency events reportable through ORPS.
- Record of Closure of Corrective Actions identified as a result of the Nonconformance events. RL tracks the contractor closure of the nonconformance itself as well as the associated corrective actions.
- RL requires a review of the root causes of the nonconformance events and an assessment of trends whether negative or positive.

The CHPRC has experienced three nonconformance events in the past year. The three nonconformance events were recorded at the Plutonium Finishing Plant (PFP). In addition, two potential criticality safety nonconformances were initially identified at the PFP. These two potential criticality safety nonconformances were later determined to represent conforming conditions. The first nonconformance identified this fiscal year was associated with the removal of Criticality Safety Postings from three non-standard containers (NSCs) without proper authorization. The second nonconformance was associated with the Maintenance Cell total throughput inventory. The total throughput inventory was recorded at 8843 g Pu and exceeded the 8000 g Pu mass throughput limit. Then pencil tank size reduction activities were initiated without first performing cell cleanout. The actual Maintenance Cell inventory was significantly lower since fissile material had been removed after each tank size reduction and this fissile material leaving the Cell was not credited in the total throughput inventory. The third nonconformance was associated with a rolled-up shielding blanket (exceeding the allowed shielding thickness limit and covering a small surface area) that was found placed on top of the HC-1 conveyer in room 228C. These three nonconformances were not reportable per DOE O 231.1-2. The second nonconformance resulted in changes to the CSER to modify the instructions for accounting for holdup that is recorded on the plutonium throughput inventory total. The work package (procedure) governing pencil tank reduction activities was modified to implement this CSER change. The other two nonconformances did not have any significant impact on operations.

NCS occurrences are tracked and trended within the CHPRC issues management process (Condition Reporting and Resolution System [CRRS]). There were no reportable nuclear criticality safety occurrences during the past fiscal year. Non-reportable nonconformances are tracked by the Criticality Safety Program and shared with RL. The CHPRC Criticality

Safety Program (Revision 24 of HNF-7098) requirements for nonconformance reporting align with DOE O 232.2. The CHPRC Criticality Safety Organization (central organization) is responsible for trending the nonconformances on a quarterly basis. The CHPRC Criticality Safety Organization has been watching the trend in posting/labeling nonconformances at PFP. PFP has been proactive in addressing this issue. No trend in the nonconformances was observed in FY 2013.The last posting/labeling nonconformance at PFP was in November 2012. The corrective actions implemented by PFP have been judged to be effective in reducing the frequency of this type of nonconformance.

3. **Non-compliances with Standards**
   There were no non-compliances with DOE and American National Standards Institute/American Nuclear Society requirements identified at CHPRC facilities during the past year.

4. **CSSG Recommendations**
   There are no open issues from past Criticality Safety Support Group recommendations at CHPRC facilities.

5. **Performance Evaluation**
   Formal Assessments are not performed each fiscal year unless a particular issue or deficiency is identified requiring that level of oversight. During the fiscal year, however, the RL criticality safety SME conducted separate oversight events that resulted in reports issued through the Operational Awareness Database.

   Three Management Assessments were conducted by CHPRC following lines of inquiry from DOE-STD-1158 and ANSI/ANS-8.19. This year the focus was on the roles and responsibilities of management, supervisors, criticality safety support and other support staff. The overall conclusions of these management assessments were that the project staff had an acceptable level of understanding of their roles and responsibilities with respect to criticality safety for the job functions they performed. At PFP the program requirements for the CAS performance and maintenance and emergency preparedness were also assessed. A number of opportunities for improvement and three findings resulted from these three management assessments. One finding was associated with selected staff positions not demonstrating an adequate understanding of the risks associated with a criticality accident. The other two findings were associated with required evacuation postings and the conduct of an annual evacuation drill. The opportunities for improvement and the findings have been entered into the CHPRC Condition Reporting and Resolution System (CRRS) and are being addressed. Eleven Work Site Assessments were also conducted to look at criticality safety at K Basins, PFP, Waste and Fuels and other facilities implementing the CHPRC Criticality Safety Program. Both the opportunities for improvement and findings have been entered into the CHPRC CRRS and are being addressed.

   DOE-RL participated in portions of these contractor management assessments as an oversight activity. Additionally, the RL criticality safety SME receives copies of the CHPRC management assessments and work site assessments and reviews them for completeness and adequacy of corrective actions.

6. **Performance Expectations**
   Except as covered by general nuclear safety criteria, nuclear criticality Safety metrics have not been used in fee determinations for CHPRC.

Appendix 3 EM Input to Nuclear Criticality Safety Programs Annual Report
Attachment 2 **Washington Closure Hanford (WCH)**

Office Manager: Michael McCormick NCS POC: Paul MacBeth

1. **Staffing**
   Washington Closure Handford (WCH) retains two dual-qualified CSR/CSEs who provide support on a part-time basis. This level of staffing is judged to be sufficient for the facilities and work scope being performed.

2. **Non Conformances**
   The metrics utilized to monitor contractor NCS performance include:

   - Number and Type of Criticality Safety Non-conformances Reported. These range from internally managed "discrepancies" to loss of contingency events reportable through ORPS.
   - Record of Closure of Corrective Actions identified as a result of the Nonconformance events. RL tracks the contractor closure of the nonconformance itself as well as the associated corrective actions.
   - RL requires a review of the root causes of the nonconformance events and an assessment of trends whether negative or positive.

   No nonconformance events have been reported at WCH, largely due to the nature of the work (burial grounds remediation and building demolition). WCH operates under an incredibility analysis in criticality safety, thus there are no limits or controls.

3. **Non-compliances with Standards Institute**
   There were no non-compliances with DOE and American National Standards Institute/American Nuclear Society requirements identified at WCH facilities during the past year.

4. **Criticality Safety Support Group Recommendations**
   There are no open issues from past Criticality Safety Support Group recommendations effecting WCH facilities.

5. **Performance Evaluation**
   Formal Assessments are not performed each fiscal year unless a particular issue or deficiency is identified requiring that level of oversight. During the fiscal year, however, the RL criticality safety SME conducted oversight reviews to ensure that the WCH program remained compliant.

   WCH completed their annual programmatic management assessment of the Criticality Safety Program in March. No significant findings were identified. The Federal CSE reviewed the completed assessment and there were no resultant corrective action plans. The WCH Criticality Safety Program appears to be well staffed and provides adequate assurance of criticality safety in WCH operations.

   Due to the nature of the work (largely burial grounds remediation and Decontamination and Decommissioning of buildings), the criticality safety program is limited in extent and the WCH facilities operate under incredibility analyses. The WCH program is appropriately graded, comprehensive, and effectively implemented. No nuclear criticality safety issues have been identified during this fiscal year.

6. **Performance Expectations**
   Except as covered by general nuclear safety criteria, nuclear criticality safety metrics have not been used in fee determinations for WCH.

Field Office Manager: Kevin Smith NSC POC: Tom Nirider

1. Staffing

Bechtel National, Inc. (BNI), the contractor responsible for construction of the WTP, retains three qualified criticality safety engineers and two criticality engineers-in-training. Two of the criticality safety engineers are subcontractors. BNI intends to replace one of the subcontractors as a permanent BNI staff employee. A planned update/rewrite of the Preliminary Criticality Safety Evaluation Report (CSER) will require additional support and expertise to augment the present BNI staff. As stated in Fiscal Year (FY) 2012, this expertise will need to evaluate areas such as hydrodynamics, plutonium chemistry based on the presence of plutonium oxide (Pu-oxide) in the tank farms waste as well as a revised hazards analysis. The contractor continues to use Monte Carlo N-Particle modeling and is actively updating criticality calculations previously performed using an earlier version of Monte Carlo N-Particle.

The criticality safety function at U.S. Department of Energy (DOE), Office of River Protection (ORP) resides within the Nuclear Safety Division. All qualified federal criticality safety engineers (CSE) are also qualified nuclear safety specialists. Currently, one senior qualified federal CSE assigned to the Pretreatment Facility as a nuclear safety specialist oversees the WTP Criticality Safety Program. A total of four federal CSEs oversee the tank farms and WTP facilities. Additionally, the Nuclear Safety Division Director is a qualified CSE.

DOE field management at ORP considers federal staffing adequate to oversee criticality safety programs for WTP and the tank farms contractor.

2. Non-conformances

As reported for FY 2012, the Waste Treatment and Immobilization Plant (WTP) Project has not advanced to the point where performance metrics specific to operations have been implemented. The project is approximately at 60 percent completion. Performance metrics specific to the performance of criticality safety evaluations, training, and qualification of contractor criticality safety staff, management assessment, periodic inspections, and identification and resolution of problems in criticality safety will be implemented prior to operational readiness reviews of affected WTP facilities. Thus, there are no operational criticality safety infractions to report.

3. Non-compliance with Standards

There were no formal assessments of the contractor criticality safety programs conducted during FY 2013. ORP conducts assessments of the criticality safety programs on an as-needed basis because WTP is not an operating facility, and for FY 2014 a formal programmatic assessment will be conducted. The WTP contractor submitted a revised WTP criticality safety program description document to ORP for approval as required by DOE Order 420.1B, *Facility Safety*. ORP evaluated the program description documented and approved it. The document has now been implemented in the BNI program.

In 2009, the ORP federal CSE conducted a review of the WTP CSER and issued a safety evaluation report conditionally approving the document with nine conditions of acceptance (COA). One of the COAs has been closed. Five of the COAs pertain to the Preliminary

Documented Safety Analysis, while the remaining three will require resolution by the time the Documented Safety Analysis is finalized. ORP is working closely with the contractor and is tracking these issues. As previously reported, the DOE Criticality Safety Steering Group (CSSG) assessments of the WTP criticality safety program were conducted in 2008 and 2009. Notably, the CSSG assessment recommendations and areas for improvement were incorporated into the COAs written in the ORP safety evaluation report. Progress on closure of the COAs has slowed due to several technical challenges (e.g., presence of Pu-oxide particles greater than 10 microns, preferential settling of heavy Pu-oxide particles in WTP process vessels, and pulse jet mixer design issues to ensure adequate vessel bottom clearing requiring the need for a hydrodynamics study), which have caused a revision to the CSER to be pushed out through 2014.

4. CSSG Recommendations

As previously reported, the DOE Criticality Safety Steering Group (CSSG) assessments of the WTP criticality safety program were conducted in 2008 and 2009. Notably, the CSSG assessment recommendations and areas for improvement were incorporated into the COAs written in the ORP safety evaluation report. Progress on closure of the COAs has slowed due to several technical challenges (e.g., presence of Pu-oxide particles greater than 10 microns, preferential settling of heavy Pu-oxide particles in WTP process vessels, and pulse jet mixer design issues to ensure adequate vessel bottom clearing requiring the need for a hydrodynamics study), which have caused a revision to the CSER to be pushed out through 2014.

5. Performance Evaluation

When it becomes operational, the WTP Project expects to have technical safety requirement level criticality safety controls, additional evaluations, and implementation programs. Criticality safety considerations are being included in the facility design. A preliminary criticality safety evaluation addressing the process flow, process chemistry, and safety of operations have been developed, but needs to be updated with process design changes. Facility designs have incorporated these basic control concepts.

A significant lesson learned from ORP oversight to date is that federal CSEs and WTP federal engineering division staff personnel must be actively involved with the contractor design changes and how they can affect the CSER. Also, closer coordination between ORP and WTP contractor NCS staff is necessary in order to properly review and assess design changes that potentially affect criticality safety. ORP conducts joint bi-weekly interface meetings with BNI and Washington River Protection Solutions LLC (WRPS) criticality safety. These meeting are also attended by One System (tank farms and WTP interface) managers and engineers. These meetings have proven invaluable in enabling a constructive team approach to addressing criticality safety issues at both WTP and tank farms.

As reported last year, technical issues and questions involving the mixing of the WTP Pretreatment Facility waste feed receipt process vessels using pulse jet mixers are ongoing. These technical issues involve questions associated with the following:

- Sample nonrepresentativeness
- Effect of coprecipitated plutonium and metal absorber agglomerations
- Effects of gravity segregation and preferential settling of heavy particles such as Pu-oxides

- Solids accumulation in process vessels
- Particle size distribution.

These are being tracked to closure through Defense Nuclear Facilities Safety Board (DNFSB) commitments to Recommendation 2010-2, Pulse Jet Mixing at the WTP.

In February, 2011, WRPS, the contractor operating for the tank farms, declared a potential inaccuracy in safety analysis associated with the presence of large, dense Pu-oxide particles previously unidentified in tank wastes. There has not been significant progress in resolving this issue since reported last year. As described in this report, progress is awaiting the results of several technical reports and the full scale mixing studies. These issues are summarized as follows:

- Mixing studies conducted by WTP indicated that large dense particles (greater than 10 micron and greater than 8 g/cc) will not remain suspended in non-Newtonian process vessels.
- A study commissioned by the WTP and released in January 2013 concluded that there was a possibility for Pu-oxide and metal particles of larger than 10 micron equivalent spherical diameter and with densities exceeding 8 g/cc to be present in significant quantities in tank farm wastes destined for processing within the WTP.
- WRPS determined that this issue affected their operations (e.g., mixing, waste transfer) and certain operations involving tanks with significant quantities of Pu-oxides were placed on hold. These large dense particles are of concern for tank farms operations principally because they do not form agglomerations with credited neutron poisons (i.e., iron, chromium, and nickel) as assumed in previous criticality safety evaluations and preferential settling could occur during mixing or waste retrieval operations.
- A review team composed of URS Corporation personnel was assembled and chartered to evaluate the extent of the problem and confirm or dismiss the conclusions of the earlier WTP report. This team concluded that:

– Approximately 100 kg of plutonium (all forms) was sent to tank farms from various facilities, of which up to 30 kg were dense Pu-oxides or metal fines greater than 10 microns in equivalent spherical diameter.

– Sixteen tanks received this waste: eight received greater than 750 grams and eight received less than 400 grams.

The review team was able to verify that the earlier study was correct and conservative with regard to the conclusions on possible inventories of Pu-oxides and metal fines.

Because these results will directly impact the operation of the Pretreatment Facility, resolution of the technical issues associated with the presence of large quantities of previously unanticipated forms of plutonium will require significant changes to the criticality safety strategy for WTP operations and a significant revision to the preliminary CSER.

In the past few years, reviews of the preliminary criticality safety control strategy at WTP have been performed by various external groups, such as the Consortium for Risk Evaluation with Stakeholder Participation, CSSG, and DNFSB. These reviews have provided a range of expert input that typically includes further perspective on issues

needing to be addressed in the final criticality safety evaluations. Response to the review comments will be documented as part of hazards analyses supporting the revision of the current preliminary CSER. The reviews provide important information to be considered if additional criticality control strategies are needed and if additional facility design changes to be evaluated in hazards analyses and control selection processes are needed.

As discussed previously, an unresolved issue with the presence of Pu-oxides in the tank farms waste solids requires specific technical studies. First, is the study of the hydrodynamics of large, high-density particles. This study will be conducted by a team of independent experts under contract to BNI and will involve the Pacific Northwest National Laboratory. Second is a paper that addresses the chemistry processes in the Pretreatment Facility from a criticality safety perspective. Additionally, the CSER work is also awaiting the results of full scale mixing studies. As these three studies are completed, the hazards review/analysis will commence to support the revised CSER.

In December, 2012, an Independent Review Team (IRT) was established by the previous Secretary of Energy and tasked with making specific recommendations for resolution of criticality safety issues associated with high-solids waste streams in the Pretreatment Facility. The IRT reviewed the WTP preliminary CSER and its supporting documents and determined that there were the following areas of concern:

- The hazard assessment supporting the preliminary CSER had not fully addressed possible upset conditions or recent discoveries of non-co-precipitated plutonium in the tank farms.
- The calculational basis for assessing the risk of the non-co-precipitated plutonium was not part of the CSER.
- The technical basis for settling characteristics of the plutonium material and the nuclear poisons was not adequate.

In order to deal with each of these areas of concern, the IRT chartered the following tasks, but was only able to accomplish the first two tasks by the time of this report's completion:

- A criticality safety hazard review was performed of the current design of the WTP to assess areas for additional criticality safety controls not previously identified and to determine if there were parameters that could be controlled.
- Computational calculations were performed as part of a parametric study to determine plutonium mass loading to achieve critical configurations in WTP process vessels.
- A task description and statement of work are provided in the report to substantiate a technical basis for assumptions on settling characteristics of plutonium and iron and other selected absorbers in actual tank farm materials.

In the report, the IRT recommended that the WTP contractor:

- Use the information and recommendations of the report to develop a revised criticality safety basis for the WTP.
- Proceed with the settling test in order to evaluate a major unresolved criticality safety issue.

- Assure that an adequate sampling capability is available so that the WTP waste acceptance criteria for fissile-to-metal loading ratios is met before waste is accepted at the Pretreatment Facility.
- Proceed with further criticality safety analysis using the recommendations provided in the WTP criticality hazard review (Appendix A).
- Perform an integrated project review of the process vessel heel management system and locations for deployment throughout the Pretreatment Facility.
- Develop a testing strategy to establish hydrodynamic equivalence as a viable control strategy including associated waste acceptance criteria testing requirements.
- Establish a protocol for developing a defense of limited fissile mass for a given scenario or plant process/location/vessel using probabilistic risk assessment and/or event trees.
- Review and confirm that the scope of the (to be developed) WTP chemistry report includes information to support assumptions in the hazard review related to the impact of acid, caustic, and water additions on the potential to segregate fissile material and absorbers as well as the mechanical integrity of co-precipitated solids under pulse jet mixer operation.
- Identify specific actions to maintain the evaluation of criticality safety hazards current with evolving changes in plant design.
- Identify and establish configuration control linking the technical basis documents to the criticality hazard review and CSER documents to support any key assumptions.

6. Contractor Performance in Meeting Site-Specific performance expectations

There are no formal Performance Expectations or Performance Based Incentives related to criticality safety

Field Office Manager: Kevin Smith NCS POC: Tom Nirider

1. Staffing

Washington River Protection Solutions LLC, (WRPS) employs one Nuclear Safety Manager responsible for criticality safety, two qualified Criticality Safety Engineers (CSEs) on a task-order contract basis (the CSE's are not full-time staff), and 3 qualified CSRs. Staffing appears to be adequate based upon the current mission needs; however, monitoring by ORP will be continued through periodic assessments to ensure that CSE support is available when needed.

Federal oversight staffing appears to be adequate; with four qualified NCS federal nuclear safety specialists and criticality safety engineers (two assigned to Tank Farms and two assigned to the Waste Treatment and Immobilization Plant acting as backup).

2. Non-conformances

There was a tank farms non-conformance identified in 2011which came about as a result of a sample analysis report of a double-shell tank potentially containing larger and denser PuO2 particles than were allowed for in the tank farms CSER. An independent task force team composed of URS personnel conducted an in-depth analysis of historical records which resulted in WRPS declaring a "positive" USQ involving 8 tanks (2 double-shell and 6 single-shell) that potentially contain more than 450 grams of PuO2 or Pu metal fines (PuO2 or Pu metal not co-precipitated with the credited metal absorbers as defined in the CSER; or with sufficient mass; or if these particles are large and dense enough, could concentrate with mechanical agitation such as mixing or retrieval.) The USQ was closed through the addition into the Tank Farms Documented Safety Analysis (DSA) of a prohibition of any activities in these tanks that might disturb the solids (i.e. mixer pump operation, retrieval, or waste additions which might compact existing solids until the completion of a CSER to determine the effects on the criticality hazard in the tank. In addition, there were 8 other single-shell tanks that contained less than 450 grams of the PuO2 particles, and addition of more fissile materials to these tanks are controlled through evaluation of the CSR. Consistent with previous years, periodic contractor inspections, assessments, etc., have identified several areas for programmatic improvement that result in the generation of PERs. Issues identified include:

- Program documentation and maintenance
- Requirements documentation
- Training/qualification
- NCS/Projects interface

Trends are rolled up and reported to senior management semi-annually. In addition to these programmatic improvements, four PERs (two in 2012 and two in 2013) involved the potential to add small volumes of pH water (either potable water or steam condensate) to the tank farms with less than the allowable pH. Each PER was closed with an evaluation showing that the potential volume and pH of the addition would not result in a criticality concern. Of the four PERs that remain open, two are tied to the ongoing effort to upgrade the program to be complaint with DOE-STD-3007-2007. The third open PER identified an error in a procedure which misidentified the type of assessment that was performed to fulfill the criticality inspection requirement. The final remaining open PER identifies that the current computer-based training for technical staff and management does not result in the desired

level of retention of information. Classroom based training is being developed to replace the computer based training.

3. Non-Compliances with Standards

There were no instances of non-compliance with Standards.

4. CSSG Recommendations

In response to a CSSG recommendation from 2009, WRPS has completed a re-write of the CSER safety basis for Tank Farms Operations. ORP will conduct surveillances of the WRPS CSP during 2014 to assess the implementation of the upgraded program and the revised CSER.

5. Performance Evaluation

ORP conducts reviews of the WRPS Criticality Safety Management Self-Assessment and reviews the quarterly facility inspections. Because of infrequent changes to the CSER, ORP has raised concerns whether the existing technical bases developed many years ago for the CSER were considered adequate. As a result, ORP requested the DOE Criticality Safety Steering Group (CSSG) to assess the technical bases of the tank farms criticality safety program. The CSSG reviewed the WRPS criticality safety program in December 2009. The CSSG review uncovered no underlying safety issues; however several recommendations and areas for improvement were identified. These recommendations or areas for improvement were included in a plan for CSP improvements submitted by WRPS to ORP in July 2010. The scope of these improvements was approved by ORP in 2011. WRPS has initiated the program upgrades as identified in the approved plan for CSP improvements. Program upgrades completed to date include the revision and upgrade of the surveillance and inspection procedure to include lines of inquiry from the DOE orders and standards, ANSI/ANS Standards, and the revision of the WRPS procedure to identify what documents require CSR approval. WRPS is also in the process of upgrading the CSER to implement the current guidelines provided in DOE-STD-3007-2007. Additionally, WRPS recently completed the qualification of two CSRs resulting in a total of three qualified CSRs for the tank farms. This addresses a long standing staffing issue that had been identified by ORP in previous assessments and the most recent ORP assessment of August 2012.

Tank farms nuclear criticality safety is based upon: 1) preserving the form and distribution of the fissile bearing waste; and 2) maintaining the total fissile (plutonium) gram-equivalent (FGE) inventory below ½ minimum critical mass (MCM) in the 222-S Laboratory. The scope of routine waste operations (i.e.; storage, transfer, sampling, surveillance, evaporation, etc.) was incorporated into the NCS safety basis when it was developed. Therefore, the waste storage mission yielded little chance of non-conformance with established limits and controls.

The addition of waste retrieval activities and the design of new waste treatment processes have made it necessary to update and broaden the scope of the tank farms NCS program. This in turn, has provided an expanded opportunity for identifying process improvements and application of past lessons learned.

The Tank Farm Contractor's NCS performance is measured through assessments, quarterly inspections, and close interaction between the Criticality Safety Representative (CSR) and Operations personnel as shown below:

- Perform regular management self-assessment of nuclear criticality safety program implementation. Washington River Protection Solutions, LLC (WRPS) conducted a management assessment of their criticality safety program in April 2013. The Office of River Protection (ORP) conducted surveillance and issued two findings in January 2012, based on concerns of lack of technical basis with criticality safety ANS standards, of recent criticality safety evaluation report (CSER) submittals in support of project retrievals. ORP also completed an overall assessment of the Tank Operations Contractor (TOC) nuclear criticality safety program in August 2012 and issued three findings and four observations.
- Qualify Criticality Safety Engineers (CSE) and Criticality Safety Representatives using DOE STD 1135-99 as a guide. Presently all TOC criticality safety staff working in facilities and preparing evaluations are qualified to the Standard. Training and qualification were assessed as part of the management assessment process in August 2012.
- Frequent interaction of the CSRs with Operations staff in operating facilities. Facility criticality safety programs emphasize participation of the CSR in facility walk downs, job planning, pre-job briefs, and interactions with operations.
- Frequent interaction of the CSRs with Process Engineering staff. CSRs review waste compatibility assessments prior to waste transfers and retrievals.
- Perform quarterly criticality safety inspections of fissionable material storage areas/arrays and laboratory areas.
- Any identified issues or deficiencies are identified in a Problem Evaluation Report (PER). PERs are entered into a corrective action management system for tracking and trending. WRPS tracks criticality safety issues through the Problem Evaluation Request system. Seven PERs in criticality safety were identified in 2013, and thirty-two for 2012. Most were low-level concerns or opportunities for improvement, and were closed through the PER process. The high number of criticality safety PERs identified in 2012 were not due to a lack of regulatory compliance, but increased awareness by the WRPS criticality safety staff in documenting concerns so that they are tracked for resolution. Of the 2012 PERs, eight were identified by ORP (through findings from the 2012 surveillance and assessment), and the remainder were identified by the TOC. Only four of these PERs remain open.

6. Performance Evaluation

Metrics are used to evaluate criticality safety performance:

- Timely identification and resolution of non-conformances (leading indicator)
- Progress towards program improvement milestones (leading indicator)
- Type of assessment findings (leading indicator)
- Type of non-conformances (leading indicator)

- Number of repeated non-conformances (lagging indicator)
- Timely performance of required assessments (lagging indicator)
- Number and type of DOE comments on contractor safety evaluations (CSE) and the quality of CSEs (lagging indicator)
- Number of assessment findings (lagging indicator)
- Number of non-conformances (lagging indicator).

Judgment is used in combining each metric into an overall measure of performance. Changes to these metrics are infrequent, although they will be reexamined as the mission needs change and the Tanks Farms adds waste feed preparation and delivery operations to the currently authorized storage and retrieval operations. Metrics are reviewed by DOE criticality staff after identification of a non-conformance or after issuance of an assessment or CSE. Any identified weaknesses or trends identified by the DOE criticality staff are immediately communicated to the contractor. This communication may be formal or informal depending on the severity of the issue. For example, a review of a draft CSE identified a weak technical justification for the resultant conclusions. This was judged to be sufficient to be transmitted formally and required a formal response. These metrics are considered in federal staff attendance at bi-weekly criticality safety staff meetings with the contractors, in quarterly contractor performance evaluations, and in year-end fee determinations. Criticality safety performance is considered in the evaluation of the contractor's nuclear safety performance. Nuclear safety performance is tied to approximately $1,400,000 in fee. In fact, slow progress towards program improvement milestones has negatively impacted the Fiscal Year 2013 year-end fee determination.

Office Manager William Murphie NCS POC Tom Hines

1. **Staffing**.

   LATA Kentucky (LATAKY) has several storage Nuclear Criticality Safety (NCS) evaluations for stable, limited storage arrays. The D&D and shipment efforts have reduced the fissile material in the Department of Energy (DOE)-regulated portion of the Paducah Gaseous Diffusion Plant to almost nil. As a result, only one part-time LATAKY NCS Engineer is needed to provide NCS oversight (equaling to about one day per week) to ensure NCS compliance at the plant. DOE oversight is also minimal and is provided by the Nuclear Safety Oversight Lead and part-time of one NCS contractor to DOE-PPPO. There are no vacancies or shortages.

2. **Non Conformances**

   LATAKY has had no criticality safety infractions or non-compliances for two years. This is due to the small amount of fissile inventory within facilities operated by LATAKY. Therefore, there were no lessons learned issued.

3. **Non-compliances with Standards**

   There are no NCS non-compliances with DOE or ANSI/ANS requirements at facilities operated by LATAKY except for those DOE-approved exceptions and clarifications to DOE and ANSI/ANS requirements included in the LATAKY NCS Program Description Document.

4. **Criticality Safety Support Group Recommendations**

   No Criticality Safety Support Group Recommendations are specific to LATAKY.

5. **Performance Evaluations**

   DOE oversight reviews of the LATAKY NCS program are performed each year as a part of the annual Safety Basis update process. Performance is acceptable.

6. **Performance Expectations**

   There were no specific NCS-related performance goals in the Performance Evaluation Plan or Performance Based Incentives.

Appendix 3 EM Input to Nuclear Criticality Safety Programs Annual Report
Attachment 6 **Fluor-B&W Portsmouth, Portsmouth, OH**

Office Manager: William Murphie NCS POC: Tom Hines

1. **Staffing**

Fluor-B&W Portsmouth (FBP) has approximately 10 full time equivalents (FTEs) Nuclear Criticality Security (NCS) staff (FBP employees and subcontractors) in the NCS Organization, more than half are qualified as Sr. NCS Engineers. This meets the needs of the present scope of operations at the plant as reviewed by Department of Energy (DOE). Subcontractors under contract to FBP could provide additional resources if any of the present staff leave or if scope at the site increases requiring additional NCS support and oversight. DOE is monitoring the FBP NCS staffing regularly to ensure that NCS support is available when needed.

DOE oversight requires approximately 2.5 FTE NCS engineers. This is provided by the Nuclear Safety Oversight Lead, the Safety Systems Oversight Engineer and 2.2 FTE contractor Sr. NCS engineers to DOE. There are no vacancies or shortages.

2. **Non Conformances**

There were fourteen Anomalous Condition Reports generated in Fiscal Year 2013 in PORTS FBP facilities; none were infractions as double contingency was maintained in all of the non-compliances. Since 11 of the 14 were as-found administrative spacing violations, containers or equipment located at slightly less than the required spacing or containers leaned towards one another, extent of condition reviews were conducted and FBP Operations decided that in large arrays of man-portable items, a margin of safety of several inches would be added to the NCS requirement to prevent further violations.

A "Daily Safety Sheet" was issued regarding the importance of maintaining NCS spacing controls as lessons learned.

3. **Non-compliances with Standards**

There are no NCS non-compliances with DOE or ANSI/ANS requirements at facilities operated by FBP except for those DOE-approved exceptions and clarifications to DOE and ANSI/ANS requirements included in the FBP NCS Program Description Document.

4. **CSSG Recommendations**

No Criticality Safety Support Group (CSSG) Recommendations are specific to FPB

5. **Performance Evaluation**

DOE oversight reviews of the FBP NCS program are performed each year through NCS assessments, periodic walkdowns, corrective action close-out reviews, NCS document reviews, periodic meetings, regularly scheduled teleconferences, and as a part of the annual Safety Basis update process.

The FBP Nuclear Criticality Safety organization performs well and requires little Government intervention. The NCS organization supports D&D activities by completing its required

actions in a timely manner. Documents are provided to DOE for review and comment prior to final submission, generally with sufficient time for DOE review. Performance is acceptable.

6. **Performance Expectations**

The "award fee evaluation process" is part of the contract management process. DOE oversight staff provides a subjective review of the contractor's safety management program. The overall evaluation of FBP's performance in the area of Nuclear Criticality Safety is that the organization performs well with little Government intervention. The NCS organization supports D&D activities by completing its required actions in a timely manner. Documents are provided to DOE for review and comment prior to final submission, generally with sufficient time for DOE review.

DOE intervention was required when there was reluctance on the part of FBP to change documentation and practices from those that satisfied Nuclear Regulatory Commission regulations to DOE-compliant documentation and practices; one such incident applied to NCS. DOE directed FBP to write a Criticality Incredible Project Plan for the process buildings. FBP ultimately produced an acceptable product; however, DOE intervention was required to have the plan produced.

Office Manager William Murphie NCS POC Tom Hines

1. **Staffing**

B&W Conversion Services (BWCS) has some UF_6 cylinders in particular cylinder yards that have greater than 1.0 wt. % ^{235}U that are covered by Nuclear Criticality Safety (NCS) evaluations. The BWCS operations only process material ≤ 1.0 wt. % ^{235}U and therefore, the only requirement is to ensure that no cylinder is brought to the processing areas that exceeds this limit. As a result, only one part-time NCS Engineer is needed to provide NCS oversight to ensure NCS compliance at both plants. Department of Energy (DOE) oversight is also minimal and is provided by the Nuclear Safety Oversight Lead and the Safety Systems Oversight Engineer, as required. There are no vacancies or shortages.

2. **Non Conformances**.

BWCS has had no criticality safety infractions or non-compliances at either plant since beginning operations in 2012. This is due to the limited number of fissile UF_6 cylinders and the processing of only non-fissile material within facilities operated by BWCS. Therefore, there are no new lessons learned.

3. **Non-compliances with Standards**.

There are no NCS non-compliances with DOE or ANSI/ANS requirements at facilities operated by BWCS except for those DOE-approved exceptions and clarifications to DOE and ANSI/ANS requirements included in the BWCS NCS Program Description Document.

4. **Criticality Safety Support Group Recommendations**

No Criticality Safety Support Group Recommendations are specific to BWCS.

5. **Performance Evaluations**.

DOE oversight reviews of the BWCS NCS program are performed each year as a part of the annual Safety Basis update process. The performance is satisfactory.

6. **Performance Expectations**

There were no specific NCS-related performance goals in the Performance Evaluation Plan or Performance Based Incentives.

Appendix 3 EM Input to Nuclear Criticality Safety Programs Annual Report
Attachment 8 **Idaho Cleanup Project CH2M WG Idaho, LLC (CWI)**

Office Manager: J. Cooper NCS POC: Kermit Bunde

1 Staffing

The CWI Criticality Safety Program has one full time criticality safety engineer, one full time subcontract criticality safety engineer, and one full time criticality safety manager. All three employees are fully qualified as criticality safety engineers. Staffing levels are adequate. There are no plans for compensatory measures and Department of Energy (DOE) line management determined that the contractor had adequate staffing for Fiscal Year (FY) 2013 activities.

Environmental Management (EM) programs have one qualified federal criticality safety engineer and the DOE-ID Quality and Safety Division (QSD) has two qualified federal criticality safety engineers. DOE line management determined the office has adequate staffing for current activities.

2 Non Conformances

Four infractions including one Occurrence reporting and Processing System (ORPS) reportable event occurred during FY 2013.

- November 2012, non-ORPS reportable. A fuel bucket at the Irradiated Fuel Storage Facility (IFSF) was not properly landed in a fuel canister during canister loading. The rigging was disengaged from the bucket leaving the bucket suspended approximately 3 feet above another fuel-loaded bucket in the canister. This resulted in an increase in probability of dropping fuel over what was assumed in the criticality safety evaluation (CSE). Double contingency was not lost in this event.

  Lessons Learned – A formal lessons learned was not performed, however a fact finding was held and corrective actions identified. Corrective actions included procedure changes to address this situation and training of operations crews on what expected stack-up configurations look like, hoisting and rigging snag points, unique or unusual aspects of the components involved, and physical interactions between the components, even for subtle changes (such as adding a third bucket to a stack-up). Had the crew understood what the expected stack-up configuration looked like, the bucket would have been fully landed before disengaging. Simply asking the Operations Crew the question, "what is the expected result" during future training will provide Operations with an opportunity to prevent a similar event.

- December 2012, non-ORPS reportable. It was discovered that the end fitting on some sealed fuel cans prevented the cans from venting, contrary to accepted belief. This resulted in a violation of the criticality safety control requiring sealed cans to either be vented or evaluated to show venting is not necessary. Venting is required to prevent a potential hydrogen explosion with fuel reconfiguration. Double contingency was not lost in this event.

  Lessons Learned – A formal lessons learned was not performed, however a fact finding was held and corrective actions identified. Corrective actions included development of a formal recovery plan, an extent of condition review, and engineering analysis of potential hydrogen build up in this specific fuel can configuration. Operations crews and engineering were briefed on the issue.

Apparent cause was identified as "human performance less than adequate, knowledge based error, less than adequate review based on assumption that process will not change."

- January 2013, non-ORPS reportable. A fuel basket was placed into a canister and then into storage without a lid on the basket. Criticality safety controls require a lid on these fuel baskets before being placed into a canister to protect against drop scenarios in which fuel is spilled out of a canister and reconfigured or fuel is spilled into an already fuel-loaded canister. Double contingency was lost in this event.

  Lessons Learned – A formal lessons learned was not performed, however a fact finding was held and corrective actions identified. Apparent cause was identified as "human performance less than adequate, knowledge based error, less than adequate review based on assumption that process will not change." Corrective actions were:

  1. Develop a written recovery plan.
  2. Implement the written recovery plan to restore compliance with the applicable limits or controls.
  3. Revise procedure to prevent similar problems which resulted in this event and alert supervisors and certified fuel handlers of TSR related requirements incorporated into fuel and cask handling forms.
  4. Evaluate the preparation and use of the various fuel handling forms in relation to the technical procedures to ensure information is adequate to properly manage fuel handling and storage activities.
  5. Brief fuel handling supervisors on expectations for procedure execution in accordance with the Guide of Supplemental Directions Associated with Idaho Nuclear Technology and Engineering Center (INTEC) Operations, GDE-502, and ensure adequate direction is provided about how fuel handling forms should be reviewed and or discussed during pre-job briefings.
  6. Evaluate the language used in GDE-502 used to describe when Senior Supervisory Watch (SSW) or a Subject Matter Expert (SME) should be assigned to support a fuel handling activity to ensure the criteria are clear when those assignments are needed and the level of coverage/oversight is adequate.
  7. Evaluate the condition of the NAC cask to determine what requirements apply to the handling of the empty cask and authorize entry into the appropriate step of the procedure to complete return of the cask.

- April 2013, ORPS EM-ID--CWI-FUELRCSTR-2013-0001. Two dissimilar fuels were stored in the same rack storage port at Fuel and Storage Facility (FAST) pool 5 resulting in an unauthorized storage configuration. Double contingency was not lost in this event.

  Lessons Learned – INTEC operations management completed an initial review of the event, participated in the fact finding meeting and reviewed the key elements of the overall situation. A number of corrective actions were addressed to prevent recurrence. The important lesson to be learned from this event is the three factors that allowed it to occur. First, the computer program allowed an incorrect fuel type to be selected for relocation that was not consistent with the selection criteria. Second, the description of the incorrect fuel type included in the relocation activity was changed to mimic the selection criteria. Finally, the information contained in the computer program that described the incorrect fuel type was not transferred to the relocation form. This resulted in two dissimilar fuels being stored in the same port,

which did not comply with the storage requirements. Apparent cause was check of work less than adequate.

3 Non-compliances with Standards

No non-compliances with DOE or ANSI/ANS standards have been identified.

4. Criticality Safety Support Group Recommendations

No open recommendations from the Criticality Safety Support Group for this contractor.

5 Performance Evaluation

The contractor has a criticality safety program that is rated as effective.

6 Performance Expectations

The contractor is meeting performance expectations.

Appendix 3 EM Input to Nuclear Criticality Safety Programs Annual Report
Attachment 9 **Advanced Mixed Waste Treatment Project (AMWTP)**
Idaho Treatment Group (ITG)

Office Manager: J. Copper NCS POC: Kermit Bunde

1. Staffing

In Fiscal Year (FY) 2013, AMWTP Nuclear Criticality Safety (NCS) staffing was three full-time AMWTP employees (two criticality safety officers and one qualified criticality safety engineer). In addition, AMWTP employs three criticality safety engineers on a subcontracted basis (sharing 80 hours per week). Department of Energy (DOE)-ID line management determined that the contractor had adequate staffing for FY 2013 activities.

EM programs have one qualified federal criticality safety engineer and the DOE-ID Quality and Safety Division (QSD) has two qualified federal criticality safety engineers. DOE line management determined the office has adequate staffing for current activities.

2 Non Conformances

Three Technical Safety Requirement (TSR) violations related to nuclear criticality safety and three criticality deficiencies occurred in FY 2013. All three TSR violations involved failure to comply with Operational Restrictions imposed as a result of the Potential Inadequacy in the Safety Analysis (PISA) process. Two of the criticality deficiencies were the result of Less-than-Adequate procedural implementation/compliance. One criticality deficiency dealt with failure to recognize an unexpected waste form during Expert Technical Review. This criticality deficiency initiated the PISA process. Corrective actions were developed and implemented for each of the referenced occurrences.

- August 13, 2013 – *TSR Violation Due To Waste Tracking System (WTS) Updated Before Independent Expert Technical Review (ETR) Of Downgraded Box* - Failure to comply with Operational Restriction (EM-ID--ITG-AMWTF-2013-0016). On August 11, 2013, an Expert Technical Reviewer downgraded the Assay Fissile Gram Equivalent (FGE) value for box 10498084 in the Waste Tracking System (WTS) from 900 plus FGE to 286 FGE prior to an independent review by a second ETR. The requirement to perform an independent review of box assay FGE values prior to downgrade in WTS and Fissile Tracking System (FTS) is a Specific Administrative Control implemented by an Evaluation of the Safety of the Situation (ESS) for a High FGE container created in the Treatment Facility (TF) from a box that had assay results downgraded when it should not have been downgraded. Double contingency was not lost in this event.

  Lessons Learned – AMWTP Criticality Safety Evaluations recognizes and accepts ETR as a process by which assay values generated from NDA systems can be reviewed and changed. It is only through the Expert Technical Review process that FGE values for a container can be changed. The ETR evaluation in 2006, although performed in accordance with the training and experience available at the time, underestimated the amount of attenuation present within the container and did not recognize the point source characteristics of the neutron data resulting in the assignment of a non-conservative fissile content value. Waste boxes with highly concentrated fissile content, rather than uniformly distributed content, and with high degrees of gamma attenuation pose the risk of being assigned non-conservative FGE values through the ETR process which could result in their introduction into the Treatment Facility in excess of the Nuclear Material Safety Limits established in the Documented Safety Analysis.

- July 6, 2013 – Criticality Deficiency not Occurrence Reporting and Processing System (ORPS) reportable: Boxes allowed into the box line with an invalid status code. The assay was not valid because the box was a soft-sided over pack and was not listed on the approved list of containers. The box should have been kept at the bottom of the elevator until the issue was resolved. Double contingency was not lost in this event.

- June 9, 2013 – Technical Safety Requirement Violation - Dual Verification Failed to Identify Mismatched Barcode. Failure to comply with Operational Restriction (EM-ID--ITG-AMWTF-2013-0012). On June 9, 2013, the WMF-676 Treatment Facility Supercompactor (SC) Operator, was staging a 55-gallon compaction drum for import to the SC when the SC operator noted that two barcode labels were numbered 10493277 and one barcode label was numbered 10493276. Upon noting the discrepancy the SC operator stopped SC operations and notified the Shift Supervisor. A Technical Safety Requirement (TSR) control requires dual verification that all barcode label numbers on a 55-gallon compaction drum being imported into the WMF-676 Treatment, are identical. Because in this instance all label numbers did not match, the TSR control was violated. Double contingency was not lost in this event.

  Lessons Learned – Implement engineered controls whenever possible to reduce the possibility of human error. Duplicate barcodes were inadvertently placed on two different waste drums. This resulted in a fact finding, the filing of an ORPS report, the initiation of a Corrective Action Report (CAR), and entering into the Potentially Inadequate Safety Analysis (PISA) process.

- April 11, 2013 – A Technical Safety Requirement (TSR)–related event occurred that affected the Nuclear Safety Index (NSI) metric. A failure to comply with operational restrictions implemented from a Potential Inadequate Safety Analysis (PISA) determination resulted in a TSR violation (EM-ID—ITG-AMWTF-2013-0008). The TSR violation was identified on April 11, 2013 due to mismatched barcode numbers on a drum that had entered into the Treatment Facility Supercompactor Glove Box. During Supercompactor Direct Feed operations, a 55-gal waste drum was being imported to the Supercompactor via the conveying system when the Supercompactor operator noted a .01 FGE discrepancy between the value recorded in the Waste Tracking System (WTS) for the container and the value recorded in the Fissile Tracking System (FTS) for the container. Upon noting the discrepancy the Supercompactor operator paused Supercompactor operations to investigate the cause of the discrepancy. The Supercompactor operator then performed a physical inspection of the drum and noted there were seven labels affixed; six indicated barcode label number 10359404 and one had barcode label number 10335904. WTS read the former number and FTS the latter number which accounted for the FGE measurement discrepancy. The actual drum number was 10359404. Drum 10335904 had been previously shipped to the Nevada National Security Site earlier in the month. It is unclear how and when this label got attached to the drum.
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  Due to a potentially inadequate safety analysis (PISA) determination from a previously identified barcode label discrepancy, a TSR level control was implemented to check and ensure all barcode label numbers match upon handling of the waste container. Because in this instance all label numbers did not match, this control was violated. Double contingency was not lost in this event.

Lessons Learned – Implement engineered controls whenever possible to reduce the possibility of human error. Duplicate barcodes were inadvertently placed on two different waste drums. This resulted in a fact finding, the filing of an ORPS report, the initiation of a Corrective Action Report (CAR), and entering into the Potentially Inadequate Safety Analysis (PISA) process.

- March 24, 2013 – Criticality Deficiency – Repackaged Drum Exceeds Allowable Fissile Content, Resulting in a Positive USQ (EM-ID—ITG-AMWTF-2013-0005). There was a ORPS reportable NSI event when a repackaged drum exceeded the allowable fissile material content resulting in a positive USQ; however, it was classified under ORPS Classification 3B(1), which is not included in the NSI metric. The situation was managed properly upon discovery and appropriate notifications were made. Double contingency was not lost in this event.

  Lessons Learned – AMWTP Criticality Safety Evaluations recognizes and accepts Expert Technical Review (ETR) as a process by which assay values generated from Non-Destructive Analysis (NDA) systems can be reviewed and changed. It is only through the Expert Technical Review process that Fissile Gram Equivalent (FGE) values for a container can be changed. The ETR evaluation in 2006, although performed in accordance with the training and experience available at the time, underestimated the amount of attenuation present within the container and did not recognize the point source characteristics of the neutron data resulting in the assignment of a non-conservative fissile content value. Waste boxes with highly concentrated fissile content, rather than uniformly distributed content, and with high degrees of gamma attenuation pose the risk of being assigned non-conservative FGE values through the ETR process which could result in their introduction into the Treatment Facility in excess of the Nuclear Material Safety Limits established in the Documented Safety Analysis.

- January 18, 2013 – Criticality Deficiency not ORPS reportable: Failure to recognize and take appropriate action upon indication of a failed Daily Performance Check Container assay on January 18, 2013 at 0941 hours and again at 1112 hours. The operator incorrectly categorized the failure as an "investigative" level failure instead of the more severe "action" level failure. Entry into Abnormal Operating Instruction (AOI)-12 for a potential High-Fissile Gram Equivalent (FGE) container was not initiated. Double contingency was not lost in this event.

- December 5, 2012 – Duplicate Barcode Labels On Different Waste Containers Results In Entry Into PISA Process (EM-ID—ITG-AMWTF-2012-0024). Operators attempted to bring a drum with an inactive barcode number into the Treatment Facility. A drum with this barcode number had been shipped to a low-level waste disposal facility five years earlier. Double contingency was not lost in this event.

  Lessons Learned – Implement engineered controls whenever possible to reduce the possibility of human error. Duplicate barcodes were inadvertently placed on two different waste drums. This resulted in a fact finding, the filing of an ORPS report, the initiation of a Corrective Action Report (CAR), and entering into the Potentially Inadequate Safety Analysis (PISA) process.

3 Non-compliances with Standards

No non-compliances with DOE or ANSI/ANS standards have been identified.

4 Criticality Safety Support Group Recommendations

No open recommendations from the Criticality Safety Support Group for this contractor.

5 Performance Evaluation

The contractor has a criticality safety program that is rated as effective.

6 Performance Expectations

The contractor is meeting performance expectations.

Appendix 3 EM Input to Nuclear Criticality Safety Programs Annual Report
Attachment 10 **UCOR Criticality Safety Program Annual Report**

Field/Site Manager: Mark Whitney NCS POC: Jay Mullis

1. Staffing

The URS|CH2M Hill (UCOR) NCS program currently has four full-time equivalents (FTEs), plus the Nuclear Criticality Safety (NCS) Program manager who is also qualified as a Senior NCS Engineer. In addition to the full time staff, two engineers are currently completing their NCS engineer qualifications under the UCOR NCS Program, and will be available to support the NCS program on a part time basis once qualified. Other individuals currently qualified under the UCOR NCS Program can be made available as needed. (These individuals are employed as NCS engineers at other Oak Ridge Department of Energy (DOE) sites.) The DOE NCS oversight continues to monitor the contractor's staffing level for adequacy. The UCOR Criticality Safety Officers are not included in the total FTE count but are vital to the UCOR NCS Program as applied specifically to the K-25 and K-27 Projects. The DOE NCS oversight will continue to observe the CSO staffing levels for adequacy, as well.

Oak Ridge EM (OREM) has one full-time subcontract NCS Engineer on staff. A federally qualified NCS Engineer is also available to OREM on a part-time, as-needed basis. Additional support is available on an as-needed basis from the Oak Ridge Office of Science. The Oak Ridge NCS staffing level is adequate.

2. Non Conformances

On average, less than two new ACRs occurred per month (23 ACRs during Fiscal Year (FY) 2013). Severity levels are assigned to each ACR, on a scale of 1 to 5, with 1 being the most severe (the occurrence of an actual criticality) and 5 being the least severe (e.g., administrative errors that do not result in non-compliance with any implemented NCS controls). The UCOR ACRs for FY 2013 are tabulated below:

ACR #	Subject	Severity Level
ACR-ET-13-0021	A loose volute in K-27 building 402-3, Cell 2, was measured using neutron slab and determined to contain more fissile material than shown safe (under moderation upset conditions)	3
ACR-ET-13-0020	An annual surveillance was not conducted within the allotted time.	5
ACR-ET-13-0019	A valve containing more than 252 grams of fissile loaded into a box, while in compliance with the bases of NCSE-ET-K25-1613, exceeded the work package loading limit for a box configuration without a design feature.	4
ACR-ET-13-0018	HEPA filters and hoses loaded into boxes without required CSO verification of scans used to assign gram values and box loading verification	4
ACR-ET-13-0017	Box measure in NDA shop determined to have more than 252 g, WP states to STOP and contact NCS for guidance...box was removed from NDA chamber before contacting NCS	5
ACR-ET-13-0016	Conex Box Y contains 7 bottles of fissile material, stored in design feature-stickered cabinets, in compliance with NCSE-ET-K25-1517, but Conex box not posted properly	5

ACR-ET-13-0015	Crew performing pipe cutting had HEPA unit hose configured under pipe cut location resulting in debris being "vacuumed" by HEPA unit. Crew stated this was per Rad Con direction	4
ACR-ET-13-0014	Water noticed entering HEPA unit used for purging from process gas equipment on 311-1 Ops floor	4
ACR-ET-13-0013	Water (approx. 1 pint) discovered in HEPA unit hose	4
ACR-ET-13-0012	Procedure for movement of fissile material revised (PROC-KD-9036) and was in the field ready to work without verification of NCSE implementation	5
ACR-ET-13-0011	Water (approx. 1/2 gallon) discovered in HEPA unit hose while trying to dislodge small piece of metal in hose.	4
ACR-ET-13-0010	Box containing G17 valve determined through UNCS measurement to contain more fissile material (three times ISOCS measurement) than analyzed in evaluation	3
ACR-ET-13-0009	Water discovered in asbestos waste box during repack operation in 1313J Rubb Tent.	4
ACR-ET-13-0008	NCS Approved catch pans were stacked during a compressor draining evolution	4
ACR-ET-13-0007	Duct cutting procedure (PROC-KD-9019) was in the field ready to work without verification of NCSE implementation	5
ACR-ET-13-0006	A seal was discovered to be dislodged (leaving an unattended opening) in Surge Tank J00153.	4
ACR-ET-13-0005	Water discovered in Surge Tank J00225. Water was discovered during required inspection before moving tank.	4
ACR-ET-13-0004	During filter change out involving a HEPA unit in the 1313J tent, approximately one cup of water was discovered in the filter housing. The unit was scanned since its last use and the levels were below the trigger values (less than 40,000 cpm), and therefore is estimated to contain less than 25 grams U-235.	4
ACR-ET-13-0003	A safe vac, posted with controls from NCSE-ET-K25-1532, was stored in a Conex box outside of documented CAAS coverage near the K27 Building	5
ACR-ET-13-0002	NCSE-ET-K27-1486 cancelled through DMC (Rev. 2 and all previous revisions) while still posted around fissile material in K27	5
ACR-ET-13-0001	Work package referencing NCSE-ET-K25-1657 R2 approved, but NCSE not implemented	5
ACR-OR-12-0016	An individual moved fissile sources at 7883 after his annual training for the NCSE had expired.	5
ACR-ET-12-0015	The training for the work crew removing compressors under NCSE-1647 was discovered to be expired for multiple members. This was discovered as part of the NCSE annual surveillance.	5

The average time to close ACRs in FY 2013 was 23 days. This remained about the same as FY 2012 and 65% of ACRs in FY 2013 were closed within 10 days. Four were open longer than 30 days, with the longest being 63 days.

All ACRs are tracked and trended internally by the UCOR corrective action tracking system (I/CATS), as required by the NCS program. All Level 1, 2, and 3 ACRs are also tracked through the Occurrence Reporting system, which is independent of the NCS Program.

A common cause was identified in several of the ACRs involving not complying with procedures/work packages. The UCOR NCS staff met with all of the D&D fissile material workers and reiterated basic NCS controls, the proper use of safe geometry containers, and compliance with procedure and work documents.

3. Non Compliances with Standards

There were no non-compliances with either DOE or ANSI/ANS standards requirements identified during Federal assessments in FY 2013.

4. Criticality Safety Support Group Recommendations

There are no open Criticality Safety Support Group recommendations applicable to OREM sites.

5. Performance Evaluation

Contractor performance has been adequate. Although the number of ACRs experienced did increase over FY 2012, emphasis on closing ACRs continues (such that field conditions are safe and compliant), as evidenced by the average time to close ACRs. Expedient and appropriate actions were taken in response to all ACRs; including additional operator training conducted in response to the most operationally significant ACR (defeat of NCS passive design feature by stacking safe slab pans). A NCS analysis of building demolition for the last remaining units of the K 25 building was successfully completed and approved. NCS staffing levels are adequate, and the NCS staff (including CSOs) spends an appropriate amount of time in the field supporting fissile material operations.

6. Performance Expectations

NCS performance is included in the UCOR Performance Evaluation Measurement Plan as part of the overall worker safety and health measure, but there are no performance based incentives or performance evaluations directly related to NCS. UCORs NCS program performance has been generally satisfactory, but recent issues were noted with quality of UCOR NCS summary documents submitted to DOE for approval of single parameter controlled activities.

Field/Site Manager: Mark Whitney NCS POC: Jay Mullis

1. Staffing

The Isotek Nuclear Criticality Safety (NCS) program currently has a stable workforce consisting of a Lead NCS Engineer and two full-time NCS Engineers. All personnel are qualified in the development of NCS evaluations, and all but one full-time person are qualified peer reviewers. The NCS staff consists of highly experienced personnel and the staff size is adequate for the current state of the project.

Oak Ridge EM (OREM) has one full-time subcontract NCS Engineer on staff. A federally qualified NCS Engineer is also available to OREM on a part-time, as-needed basis. Additional support is available on an as-needed basis from the Oak Ridge Office of Science. The Oak Ridge NCS staffing level is adequate.

2. Non Conformances

Only two NCS non-compliances occurred during Fiscal Year (FY) 2013. Severity levels are assigned to each ACR, on a scale of 1 to 5, with 1 being the most severe (the occurrence of an actual criticality) and 5 being the least severe (e.g., administrative errors that do not result in non-compliance with any implemented NCS controls). One of the two FY 2013 ACRs was a severity level 4, and the other was a severity level 5.

The severity level 4 ACR involved use of a lubricant on a storage vault shield plug in a manner and for a purpose that is inconsistent with NCS requirements. The NCS control allows a small amount of water or lubricant to be present in the vicinity of the storage tube vaults to lubricate drill bits that are used in an approved operation. General use of lubricants in and around the vaults is not approved. This ACR was closed within 41 days.

The severity level 5 ACR involved an MCNP coding error that was reported by the MCNP Users Group in 2012. The reported coding error affects analytical treatment of Doppler broadening for photon transport. This error was determined by the MCNP Users Group to have very little impact on overall flux, dose, or heating results. It primarily affects applications such as medical physics calculations in which detailed flux spectra at low energies are needed. However, there is no evidence that Isotek identified the software error or evaluated the impact of the error on previous calculations used to support the safety basis. This was determined to be a severity level 5 ACR under the Isotek NCS program. However, MCNP is not currently used by Isotek, and no MCNP calculations are used to support currently effective safety basis documents or Nuclear Criticality Safety Evaluations. Historical use of MCNP by Isotek was limited to Criticality Accident Alarm System detector placement analysis for the design of dissolution and down-blending systems for Building 3019A. That design effort was discontinued after completion of DOE's Alternatives Analysis for U-233 Disposition.

Isotek assigns cause codes and tracks identified anomalous conditions via its Condition Reporting Procedure. Trending is conducted and reported in accordance with the contractor's Occurrence Reporting procedure. All NCS condition reports are included in this process. There have been an insufficient number of NCS-related issues identified during the reporting period to establish trends or indications.

3. Non Compliances with Standards

There were no non-compliances with either Department of Energy or ANSI/ANS standards requirements identified during Federal assessments in FY-2013.

4. Criticality Safety Support Group Recommendations

There are no open Criticality Safety Support Group recommendations applicable to OREM sites.

5. Performance Evaluation

The Isotek NCS Program remains fully capable of supporting fissile material handling activities. NCSEs are current, rigorously maintained, and frequently evaluated against operating activities to ensure that the full set of normal and abnormal conditions have been analyzed. NCS limits and controls are thorough, well-understood and effectively implemented to maintain the likelihood of inadvertent criticality "not credible".

NCS training is considered to be a very strong aspect of the program, and is acknowledged as such throughout the Isotek organization. Surveillances and assessments are performed frequently to maintain awareness of field conditions. Operators are knowledgeable of NCS Controls and appropriate emphasis is provided by Senior Management as evidenced by the few, and low-level significance of NCS-related anomalous conditions.

6. Performance Expectations

There are no performance expectations (e.g., Performance Evaluation Plans and Performance Based Incentives) directly related to criticality safety.

Field/Site Manager: Mark Whitney NCS POC: Jay Mullis

1. Staffing

The TRU Waste Processing Center (TWPC) requires minimal Nuclear Criticality Safety (NCS) staff support to address items such as Nuclear Criticality Safety Engineer's (NCSE) annual reviews, identified non-conformances having NCS significance Anomalous Condition Reports (ACRs), procedure reviews, and program adjustments. A part-time subcontracted staff is retained by Wastren Advantage Inc. (WAI) to perform these functions, including the NCS Manager (who is also a qualified Senior NCS Engineer) and three NCS Engineers. Staffing is adequate and no shortfall exists.

Oak Ridge EM (OREM) has one full-time subcontract NCS Engineer on staff. A federally qualified NCS Engineer is also available to OREM on a part-time, as-needed basis. Additional support is available on an as-needed basis from the Oak Ridge Office of Science. The Oak Ridge NCS staffing level is adequate.

2. Non Conformances

Wastren Advantage Inc. (WAI) manages the TRU Waste Processing Center (TWPC) in Oak Ridge. WAI has a Department of Energy (DOE)-approved graded-approach NCS program applied to the TWPC. As such, only the number of ACRs, their causes, and their severity levels are monitored as they occur. The number of ACRs is monitored by the NCS Manager and the causes of the ACRs are tracked and trended. However, no ACRs having NCS significance were identified during this reporting period and trends cannot be established.

3. Non Compliances with Standards

There were no non-compliances with either DOE or ANSI/ANS standards requirements identified during Federal assessments in Fiscal Year 2013.

4. Criticality Safety Support Group Recommendations

There are no open Criticality Safety Support recommendations applicable to OREM sites.

5. Performance Evaluation

The WAI NCS Program is adequately scoped and implemented at TWPC. The contractor maintains awareness of the need for NCS organization input to operating activities and appropriately executes the NCS Program. WAI recently re-issued its NCS support contract and has employed a highly experienced cadre of NCS Engineers. The Technical Services Manager is applying increased rigor to the execution of the NCS Program by encouraging program improvements where appropriate. Management attention to issues continues to be prompt and appropriate and OREM considers the performance acceptable.

6. Performance Expectations

There are no performance expectations (e.g., Performance Evaluation Plans and Performance Based Incentives) directly related to criticality safety.

Field/Site Manager: Dr. David Moody NSC POC: Connie Blanton

1. Staffing

SRNS manages the majority of DOE-EM facilities and is responsible for development and maintenance of a comprehensive criticality safety program. SRNS has established and maintains the Criticality Safety Program Description Document (CSPDD) as well as an ANS-8.26 and DOE-STD-1135 compliant criticality safety (CS) engineer qualification program.

SRNS accomplishes its portion of the Savannah River mission using 12 fully qualified Senior CS Engineers, 6 fully qualified CS Engineers, and 3 staff members currently working to complete the CS Engineer qualification. A substantial majority of the qualified Senior CS and CS engineers are also qualified as CS Officers in one or more facilities. Two staff members are qualified as CS Officers, but not as CS Engineers. SRNS also has a CS Technician that serves as a qualified assessor. Despite staff gains and losses during FY 2013, this staffing level remains the same as the FY 2012 level.

SRNS considers the current staffing level to be marginally adequate for the currently anticipated work scope with very little capacity to accommodate unforeseen work. Additionally, a significant number of SRNS criticality safety staff members are or will be retirement eligible within the near future. Efforts to acquire additional staff members are on-going and a program to incentivize the staff to achieve further qualifications has been established.

The adequacy of the SRNS criticality safety staffing level is routinely discussed at monthly DOE-SR / Contractor CSP interface meetings. While DOE-SR recognizes that SRNS criticality safety resources are below desired levels, lack of facility criticality safety support resources has not yet been identified as a contributor to inadequate nuclear criticality safety evaluation or failure to fulfill operations support functions. It has been noted that FY 2013 loss of senior criticality safety resources has the potential to result in diminished prioritization of some criticality safety program related functions and, furthermore, that the average age of existing criticality safety staff represents a vulnerability for additional loss potentially impacting both program and facility functions. This situation is being monitored by DOE-SR criticality safety staff.

During most of FY 2013, DOE-SR staffing included three Criticality Safety Specialists qualified to DOE-STD-1173. In the second half of FY 2013, one qualified CSS retired and two qualified CSS were reassigned from other positions. Thus, the current DOE-SR criticality safety staff includes four qualified criticality safety specialists. This number is consistent with the most recent DOE-SR CS staffing needs analysis. No personnel changes are anticipated in the near future and no plans are currently in place to acquire additional criticality safety resources.

2. Non Conformances

A total of seven criticality safety related ORPS reportable events occurred in five Savannah River facilities during FY 2013. The most significant of these, a 3C3 event involving incorrect parameter specification affecting fissile mass calculation in an operating procedure, occurred in the H Canyon Facility. Two additional 3C4 events were reported for the

H Canyon Facility that involved criticality safety control implementation. The first occurred under normal operating conditions and the second during maintenance activities. Two additional events were reported as 3B3 Documented Safety Analysis Inadequacies, an inventory control error in the Savannah River National Laboratory and an NCSE methodology error in the K Area Facility. Additionally, an HB Line NIM bell test failure was reported as a 4A1, Safety SSC degradation. Finally, an indeterminate fuel bundle condition event in L Area was reported as a 10(2), management concern. A criticality accident was never approached in any of these events because of the presence of multiple additional controls.

While, in some cases, event classification type, identified error precursors or category codes were common among two of the seven events, observed similarities were insignificant and no common causes were attributed to multiple events. Thus, no broadly applicable lessons learned were developed.

3. Non Compliance with Standards

Non-compliance with DOE and ANSI/ANS requirements noted during federal assessment of SRNS related primarily to aspects of NCSE consistency and completeness identified during the safety basis document approval process. Corrective action, in most cases, was accomplished through document revision prior to implementation. Non-compliances related to criticality safety control implementation were also identified during operational readiness assessment, resulting in pre-start NCSE and procedure revisions. Finally, non-compliance associated with 10CFR830 mandated independent assessment, as applied to the Criticality Safety Program, was identified during federal assessment of a facility criticality safety self-assessment. Corrective actions related to this issue were being developed at the close of FY 2013.

4. CSSG Recommendations

No SRS specific CSSG recommendations were issued during FY 2013 and no recommendations remain open from previous years.

5. Performance Evaluation

Savannah River contractor criticality safety performance is evaluated through review of criticality safety evaluations and related safety basis documents, consideration of contractor self-assessment processes and results, and performance of operational awareness activities. The evaluation process is supported through regular interface with contractor criticality safety program management and staff that includes review of criticality safety performance metric data.

Overall, SRNS criticality safety performance during FY 2013 was found to be satisfactory. Nuclear criticality safety evaluations were found to be generally adequate. DOE-SR identified areas of concern were limited and SRNS was found to be appropriately responsive. Regular assessment of facilities containing fissile mass in excess of threshold quantities was conducted by criticality safety program and facility staff in reasonable accord with a well-defined assessment plan. Corrective actions are in progress as a result of DOE-SR findings and opportunities for improvement noted during evaluation of the self-assessment program. Operational awareness activities conducted at SRNS managed facilities did not identify any additional significant issues.

Significant improvement was made in the area of performance measurement during FY 2013. Expanded analysis of criticality safety related non-conformance and issue tracking data afforded greater insight into the distribution of non-conformances across severity classifications, facilities, and issue type, and helped to distinguish the primary sources of non-conformance identification (internal and external). Additional metrics have been identified for FY 2014 development that will address criticality safety staff qualification, contractor self-evaluation and nuclear criticality safety evaluation quality, increasing the role of performance measurement in the DOE-SR oversight process.

6. Performance Expectation

At SRS, the Performance Evaluation Management Plan establishes both general (subjective) and specific expectations whereby DOE assesses contractor criticality safety performance during evaluation, handling, storage, surveillance, transportation, and disposition of fissile bearing materials. Subjective performance assessment is typically provided throughout the contract period as part of monthly feedback meetings and reports. Criticality safety is addressed subjectively as part of overall technical performance which also includes Conduct of Operations, Radiological and Nuclear Safety. Specific expectations are defined through performance based incentives (PBIs) which, less frequently, address particular aspects of criticality safety performance (e.g., nuclear criticality safety evaluation, identification of criticality safety controls, and criticality safety conduct in operations).

The subjective evaluation of SRNS technical performance, including the contribution from criticality safety performance, was generally judged to be strong during the first half of FY 2013. Some degradation of technical performance was observed in the second half of FY 2013, largely due to a reduction in conduct of operations performance unrelated to criticality safety. SRNS was generally found to perform adequately in criticality safety specific activity assessment as communicated through monthly feedback.

Several SRNS PBIs were defined in the FY 2013 Performance Evaluation Plan that relate specifically to criticality safety. New fuel type receipt planned for L Basin necessitates limited equipment modifications in the underwater storage facility. PBI elements established for the associated designs of nuclear criticality safety blocks and a new fuel unloading station were heavily dependent on satisfactory demonstration of supporting criticality safety analyses. Similarly, criticality safety analysis was explicitly defined as a PBI element required for successful elimination of K Material Storage Area Potential Inadequacy in the Safety Analysis (PISA) compensatory measures. In these cases, performance was evaluated to be adequate with the associated incentive fully awarded. Conversely, a safety basis development related PBI established for K Area Complex (KAC) was not fully awarded due largely to poor implementation and communication of a revised NCSE methodology.

Field/Site Manager: Dr. David Moody SC POC: Connie Blanton

1. Staffing

Parson's is responsible for the design and construction of the Salt Waste Processing Facility (SWPF). The project is in the construction phase with criticality safety evaluation ongoing.

Parson's accomplishes this portion of the Savannah River mission using one full time engineer and one part time engineer, both of whom are qualified as Senior Criticality Safety Engineers in accordance with DOE-STD-1135. DOE-SR concurs with the Parson's conclusion that this staffing level is adequate for the scope of work.

2. Non Conformances

The SWPF is not yet operational. There were no criticality safety infractions during the Fiscal Year (FY) 2013.

3. Non-compliances with Standards

While a federal assessment of SWPF nuclear criticality safety evaluations was begun in late FY 2013, it remained incomplete at the close of FY 2013 and any resulting non-compliances, compensatory measures, or corrective actions will be reported in FY 2014.

4. Criticality Safety Support Group Recommendations

No SRS specific Criticality Safety Support Group recommendations were issued during FY 2013 and no recommendations remain open from previous years.

5. Performance Evaluation

Parson's criticality safety performance is evaluated primarily through review of the SWPF Criticality Safety Program Description Document, the Preliminary Documented Safety Analysis (PDSA), and nuclear criticality safety evaluations. The evaluation process is supported through periodic communication with Parson's criticality safety engineers and program management. As no Department of Energy (DOE) reviews were completed during FY 2013, no evaluation of criticality safety performance was made.

6. Performance Expectation

At SRS, the Performance Evaluation Management Plan establishes both general (subjective) and specific expectations whereby DOE assesses contractor criticality safety performance during evaluation, handling, storage, surveillance, transportation, and disposition of fissile bearing materials. Subjective performance assessment is typically provided throughout the contract period as part of monthly feedback meetings and reports while specific expectations are defined through performance based incentives (PBIs) which, less frequently, address particular aspects of criticality safety performance (e.g., nuclear criticality safety evaluation, identification of criticality safety controls, criticality safety conduct in operations). As SWPF is a construction-phase project, no criticality safety related PBIs were defined for FY 2013.

Field/Site Manager: Dr. David Moody NSC POC: Connie Blanton

1. Staffing

Savannah River Remediation (SRR) is responsible for the operation of waste processing related facilities at Savannah River Site (SRS), including the Defense Waste Processing Facility (DWPF), Concentration, Storage and Tank Facilities (CSTF), and Saltstone Facility. SRR utilizes the Savannah River Nuclear Solutions (SRNS) maintained Criticality Safety Program Description Document as well as the SRNS maintained ANS-8.26 and DOE-STD-1135 compliant criticality safety (CS) engineer qualification program.

SRR accomplishes its portion of the Savannah River mission using one full-time engineer and two part-time retirees available on an as needed basis. All three are Senior Criticality Safety Engineers, qualified in accordance with DOE-STD-1135. An additional SRR engineer is in the process of CSE qualification. Department of Energy (DOE)-SR concurs with the SRR conclusion that the current criticality safety staff level is adequate for the facilities and operations, however, it is noted that efforts to prioritize the qualification of a second resource are needed to preclude the negative impact of inevitable unavailability of the retiree resources.

2. Non Conformances

No criticality safety related ORPS reportable events occurred in SRR facilities during Fiscal Year (FY) 2013.

3. Non Compliance Evaluation

SRR had no criticality safety related ORPS events during FY 2013.

4. Criticality Safety Support Group Recommendations

No SRS specific Criticality Safety Support Group recommendations were issued during FY 2013 and no recommendations remain open from previous years.

5. Performance Evaluation

Savannah River contractor criticality safety performance is evaluated through review of criticality safety evaluations and related safety basis documents, consideration of contractor self-assessment processes and results, and performance of operational awareness activities. The evaluation process is supported through regular interface with contractor criticality safety program staff.

Overall, SRR criticality safety performance during FY 2013 was found to be satisfactory. Nuclear criticality safety evaluations were found to be adequate. The only area of concern was related to Documented Safety Analysis treatment of criticality safety controls and SRR was appropriately responsive to DOE-SR recommendations. Regular assessment of facilities containing fissile mass in excess of threshold quantities was conducted by criticality safety staff in reasonable accord with a well-defined assessment plan. Operational awareness activities conducted at SRR managed facilities identified only one concern related to inadequate treatment of analytical uncertainty when implementing criticality limits. SRR took actions to resolve the observed issue and modified the evaluation methodology to ensure proper consideration of analytical uncertainty in future waste qualification evaluations.

6. Performance Expectation

At SRS, the Performance Evaluation Management Plan establishes both general (subjective) and specific expectations whereby DOE assesses contractor criticality safety performance during evaluation, handling, storage, surveillance, transportation, and disposition of fissile bearing materials. Subjective performance assessment is typically provided throughout the contract period as part of monthly feedback meetings and reports. Criticality safety is addressed subjectively as part of overall Program Management performance incentive which includes cross-cutting areas such as safety, use of trained and qualified personnel, and continuous improvement. Specific expectations are defined through performance based incentives (PBIs) which, less frequently, address particular aspects of criticality safety performance (e.g., nuclear criticality safety evaluation, identification and implementation of criticality safety controls).

The subjective evaluation of SRR criticality safety performance, which is encompassed under the general Program Management performance incentive, was judged to be satisfactory during FY 2013. SRR was generally found to perform adequately in criticality safety specific activity assessments as communicated through monthly feedback. There were no PBIs defined in the SRR FY 2013 Performance Evaluation Management Plan that related explicitly to criticality safety and no award fee reduction resulted from performance within the SRR criticality safety functional area.