National Nuclear Security Administration

Department of Energy
National Nuclear Security Administration
Washington, DC 20585

FEB 2 8 2012

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

Dear Mr. Chairman:

This letter transmits the Department of Energy Annual Report on Nuclear Criticality Safety for Fiscal Year (FY) 2011. The appendices to the report, which respond to the eight topics specifically identified in the Defense Nuclear Facilities Safety Board's January 29, 2008, letter, provide the National Nuclear Security Administration (NNSA) and the Office of Environmental Management (EM) summaries and input from the site and field offices.

If you have any questions or need further information, please contact Mr. Jerry Hicks at (505) 845-6287 for NNSA-related issues and Mr. Kenneth G. Picha, Jr., Acting Director for the Office of Safety Management, at (202) 586-2281 for EM-related issues.

Sincerely,

DONALD L. COOK
Deputy Administrator
for Defense Programs

Enclosure

cc: T. D'Agostino, NA-1
R. Lagdon, S-5
D. Nichols, Acting NA-SH-1
D Huizenga, EM-1
M. Campagnone, HS-1.1
J. McKamy, NA-162
A. Anderson, HS-1.1

FY 2011 Annual Report on Nuclear Criticality Safety Programs

A Defense Nuclear Facilities Safety Board (DNFSB) letter dated January 29, 2008, requested that the Department of Energy (DOE) address eight specific subject areas related to nuclear criticality safety in an Annual Report on Nuclear Criticality Safety (NCS) Programs. The closure plan for DNFSB Recommendation 97-2, *Continuation of Criticality Safety at Defense Nuclear Facilities in the Department of Energy,* required DOE (including the National Nuclear Security Administration (NNSA)) to report on these subject areas for their respective nuclear criticality safety programs. A January 13, 2009, letter from the DNFSB to the Acting Deputy Secretary of Energy requested that DOE provide supplemental information in its Annual Report. The subject areas of the 2009 letter have been addressed in the annual reports for 2008 through 2010. This report summarizes the detailed information provided in the NNSA and DOE reports, included as Appendices 1 and 2 to this Enclosure.

The NNSA and overall point of contact for this report is Jerry Hicks. He may be reached at 505-845-6287. The EM point of contact for this report is Robert Wilson, who can be reached at 303-236-3666.

Table of Contents:

The NNSA sites are presented by site office from west to east as follows:

Livermore Site Office (LSO)	Lawrence Livermore National Laboratory (LLNL)
Nevada Site Office (NSO)	Nevada National Security Site (NNSS)
Los Alamos Site Office (LASO)	Los Alamos National Laboratory (LANL)
Sandia Site Office (SSO)	Sandia National Laboratories (SNL)
Pantex Site Office (PXSO)	Pantex Plant (Pantex)
Y-12 Site Office (YSO)	Y-12 National Security Complex (Y-12)
Savannah River Site Office (SRSO) (includes the NNSA Office of Fissile Material Disposition (NA-26)	Savannah River Site (SRS), NNSA operations

The EM sites are presented by field office as follows:

Richland Operations Office (RL)	CH2M-HILL Plateau Remediation Company (CHPRC) Washington Closure Hanford (WCH)
Office of River Protection (ORP)	Bechtel National, Inc. for the Waste Treatment Plant (WTP) Washington River Protection Solutions (WRPS) for the Tank Farms (Tank Farms)
Portsmouth/Paducah Project Office (PPPO)	LATAKY-Paducah Fluor-B&W Portsmouth BWCS Paducah/Portsmouth
Idaho Operations Office (ID)	CH2M-WG Idaho (CWI) for the Idaho Cleanup Project (CWI) Bechtel BWXT Idaho (BBWI) for the Advanced Mixed Waste Treatment Project (AMWTP)
Oak Ridge Office (OR)	TWPC (WAI) UCOR Isotek Systems, LLC Safety & Ecology Corporation
Savannah River Operations Office (SR)	Savannah River Nuclear Solutions (SRNS) Savannah River Remediation (SRR) Parsons, SWPF

Below is a summary of the NNSA and EM detailed reports that address the eight specific subject areas referenced in the DNFSB letters of January 29, 2008. The additional topics requested in January 2009 have been addressed previously.

Specific Subjects Addressed in the DOE Annual Report on Nuclear Criticality Safety (per the DNFSB letter of 01/29/08)

1. Performance Metrics

A site-by-site evaluation of contractor nuclear criticality safety performance measured against established criticality safety performance metrics, including an evaluation of this performance and actions taken by DOE Field Element Line Management to improve nuclear criticality safety and address known nuclear criticality safety program deficiencies.

The performance metrics used in DOE defense-related criticality safety programs are listed below by broad general areas. The NNSA site offices and EM field offices select metrics tailored to the processes and operations at their respective sites. A summary discussion of the metrics used by each site and field office follows the list of metrics

Table 1: Leading and Lagging Indicators	
Leading	**Lagging**
1) Proportion of criticality safety nonconformances identified by workers, supervisors, criticality safety staff, DOE oversight, and external to DOE personnel, in decreasing order of desirability	3) Number of repeated or similar criticality safety non-conformances
2) Timely identification and resolution of non-conformances	4) Highest severity level of criticality safety non-conformances
13) NCS staff presence in the operations areas having significant quantities of fissionable material:	5) Number of spills of fissile solution greater than a specified threshold
14) Number of NCS non-managerial staff and Fissile Material Handlers (FMHs) serving on any American National Standard Institute /American Nuclear Society (ANSI/ ANS) - 8 Standard working groups	6) Number of fissile solution leaks of any size
15) Number of in-house technical seminars prepared and presented by NCS staff	7) Number of inadvertent transfers of fissile solution (e.g., transfer destination or route incorrect)
16) Percentage of the NCS engineering staff that is engaged in development activities (e.g., technical courses, conferences, graduate studies)	8) Fissile operations conducted without a process evaluation for criticality safety
17) Percentage of NCS staff qualified to DOE-STD-1135 or ANSI/ANS 8.26	12) Timely performance and documentation of required audits or assessments
18) Percentage of contractor personnel completing fissile material handler training when required	20) Number and type of DOE comments on contractor criticality safety evaluations (CSE) and the quality of CSEs
19) Number of small group training sessions conducted with fissile material operations crews	22) Systematic identification of, and action taken on, improvement issues
21) Progress toward program improvement milestones	23) Number of supplemental guidance documents issued to clarify or correct CSEs
Control charting and rate of change may allow extracting leading information from #24	24) Schedule and cost performance for producing high-quality CSEs
	25) Number of assessment findings.
Note: Merely counting the rate of nonconformances will only lead to under-reporting. This is the most common and most dangerous metric. That is why these are listed last. See the Y-12 discussion in section 6 for an example of methods for extracting leading information from the rate of nonconformances. Also, root causes of non-conformances are not a good metric, as recurrence control is a requirement of ANSI/ANS 8.1 § 4.1.5 and ANSI/ANS 8.19 § 7.7.	
Control charting and rate of change may allow extracting leading information from #9.	9) Number of nonconformances
10) Type of nonconformances	11) Root causes of nonconformances

Conduct of Operations and Formality of Operations Metrics:
While these metrics are not normally tracked as part of the criticality safety program, they are important to criticality safety. Several sites use conduct of operations metrics as an adjunct to criticality safety metrics.

National Nuclear Security Administration

The NNSA sites have developed a robust set of metrics for monitoring the health of the local criticality safety programs. The most complete are at LLNL and Y-12. The contractors and the site offices have collaborated in developing these metrics. The metrics have proved useful in monitoring program improvements found necessary by assessments. Where the metric set for the site is well established, the metrics are useful in preventing program degradation.

Lawrence Livermore National Laboratory: The contractor met or exceeded all of the negotiated criticality safety performance metrics for fiscal year (FY) 2011, earning a score of Excellent. The contractor significantly exceeded the minimum performance criteria in the areas of criticality safety self-assessments, continuing training for criticality safety engineers, support for DOE Nuclear Criticality Safety Program initiatives, participation in national consensus standards efforts, and criticality safety training for FMHs. Overall, the level of operational criticality safety infractions and deficiencies were minor during FY 2011. All operational deficiencies were self-identified and corrected. Implementation of criticality safety controls was excellent.

Metrics used: 1, 2, 3, 4, 8, 12, 13, 14, 15, 18

LSO also uses a subjective measure of the rigor of implementation of criticality controls into work control documents as part of their metrics set.

NNSA Headquarters (HQ) judges the LSO/LLNL criticality safety metric set to be the best in the complex for the site operation. The metrics used are weighted by importance, and can be objectively rated.

Nevada National Security Site: Nuclear criticality safety performance by the contractor has been minimally satisfactory this year. National Security Technologies, LLC (NSTec) demonstrated weaknesses in performance of CSEs and understanding and implementation of controls.

Metrics used: 9, 12, 13, 18, 20

The NNSS metric set used in FY 2011 assisted in identifying areas of substandard performance. NNSA HQ judges the criticality safety metrics process at NNSS to be functional.

Los Alamos National Laboratory: The focus of the LASO in 2011 was oversight of the Criticality Safety Improvement Plan (CSIP) including the quality of work produced. Particular emphasis was given to oversight of field implementation of the program in 2011. This emphasis will continue through 2012 for the plutonium facility (TA-55) and less than Hazard Category (HC) 2 facilities. Criticality safety was measured as part of the Nuclear and High Hazard Operations subjective space PBI in FY2011.

The LANL nuclear criticality safety program does not yet meet the expectations of national consensus standards and DOE Order 420.1B due to incomplete implementation. The revised

institutional criticality safety program at LANL is evaluated as compliant with DOE orders and national consensus standards. However, the major fissile facility (TA-55) has not yet completed implementation of the revised criticality safety program.

LANL performance on meeting the milestones defined in the CSPIP did not meet LASO expectations in terms of timeliness. The quality of work performed met expectations for evaluation upgrades and implementation at most facilities, with the exception being TA-55 program implementation. The quality of CSEs produced by the LANL engineering staff has continued to be high quality as assessed by the LASO criticality safety engineer.

Metrics used: 20, 21, 22

NNSA HQ judges that the metrics reported and the incentives in use place the emphasis where it is needed to bring the program to full compliance.

Sandia National Laboratories: All established metrics were reported as satisfactorily met. Sandia has little criticality safety risk other than in the experimental operations with nominal 7% enriched uranium. The disposition of legacy materials from former fissile operations is proceeding carefully with documented trivial criticality risk. The experimental operations are also monitored periodically by SSO criticality staff.

Metrics used: 9, 12, 13, 16, 17

NNSA HQ judges the Sandia criticality safety and critical experiments safety programs to be commensurate with the risk. Since the SSO only assigns one individual 10% of his time to do the site office criticality safety oversight, there is a constant chance that criticality safety oversight will be subsumed by other priorities.

Pantex Plant: Criticality safety metrics were met. The Pantex criticality safety program is judged acceptable. NA-17 staff assisted PXSO in an assessment of the contractor program in August 2011. The program remains acceptable. The Pantex contractor has reworked staff assignments to provide several people able to assist in criticality safety, while one person serves as the primary plant criticality safety engineer.
Metrics used: 9, 16, 17, 20

NNSA HQ judges the metrics used by the Pantex criticality program to be adequate to assure program health, given the nature of operations and the overall risk.

Y-12 National Security Complex: The performance as measured by the NCS metrics showed maintenance in the area of deficiencies for the year. Other areas showed improvements or maintenance of high performance. Metrics looking at closures of both minor non-compliances (MNCs) and deficiencies, showed steady performance over the year. At the beginning of FY 2010, there were 34 MNCs and deficiencies that were open over 45 days. By the end of the year, that number had been reduced to 10, and has increased to 12 at the end of FY-11. The self-reporting metric showed excellent performance for the year. The small group seminar metric showed very good performance.

Efforts to improve the quality of the process evaluations for criticality safety have continued, with the process evaluations written in FY-11 consistently being done well.

Metrics used: 1, 2, 3, 5, 6, 7, 9, 10, 11, 12, 13, 16, 17, 19, 20, 21, 23, 24

Y-12 has a complex set of metrics, suitable for a mature program at a complex site, that target most areas of the program. NNSA HQ judges that an adequate set of criticality safety metrics exist at Y-12. In addition, NNSA HQ agrees with YSO that the metrics both identify areas where improvement is needed, and target the areas that have been identified as needing extra emphasis. YSO and the Y-12 contractor staff continue to develop and apply metrics as needed for program maintenance and improvement.

Savannah River Site Office: No fissionable materials operations are currently underway. NNSA HQ concurs with SRSO that no criticality safety performance metrics are yet needed.

Environmental Management

All operational EM contractors are measured against established performance metrics. The performance compared to these metrics is generally adequate but requires some improvement. In addition, contractor performance in criticality safety is periodically assessed by internal and external organizations. These assessments typically result in corrective actions, which lead to improved criticality safety performance.

Fourteen of the 16 EM sites use counting of infractions as a principal criticality safety metric, contrary to known good practice. Two of the sites are not yet operational, and therefore have no established metrics. Five sites use infraction count as the only metric. Three of these five have very low criticality risk by the nature of the operation. (Waste Processing and DUF_6 conversion) One site uses several metrics including counting the number of infractions. Several of the sites have added continuing education of the NCS staff as a metric. Five sites list only the number of infractions and time to close as metrics. Two Idaho sites use an index type of metric that appears to be mostly based on the number of infractions.

Metrics Used: 1, 2, 9, 11, 12, 13, 16, and 25.

The HQ assessment is that EM sites, particularly Idaho, should improve on application and use of metrics for monitoring the health of criticality safety programs.

2. Contractor Staffing

The status of the contractor nuclear criticality safety engineer programs at each site, including staffing levels, plans to address vacancies, interim compensatory measures, and progress on training and qualification.

The NNSA and EM contractors in general have difficulty hiring and retaining qualified criticality safety staff. This includes the development path of hiring recent graduates and training them in criticality safety. LANL has lost several engineers in recent months. Some mission impact is likely.

Some sites have received assistance from other sites nearby or with similar expertise. Y-12 has solicited, and has agreement in principle, to receive help from ORNL criticality safety staff. Operations at NNSS have been assisted by both LANL and LLNL staff. LLNL assistance in CEF operations has helped cover work that the LANL home shop did not have available staff to do at the time.

The table below shows the contractor criticality safety staffing levels at each of the NNSA and EM sites, and the line management judgment of whether staffing is adequate. Mission work has been slowed or delayed in both Y-12 and LANL operations.

Table 2: Contractor Criticality Safety Staffing

Site	Contractor criticality safety staff, end of FY 2011	Status
LLNL	8	Adequate
NNSS	3	Adequate
LANL	8 (includes manager and senior advisor) plus 2 available consultants	Understaffed. Hiring has proven difficult over the last 2 years. Some mission delay has occurred for local operations. Some Nuclear Criticality Experiments Research Center (NCERC) staff are qualifying to the LANL program to deal with NCERC issues. Some staff loss has occurred to career change.
SNL	10 (only one near full-time, 2 full-time equivalents (FTEs) of work)	Adequate
Pantex	2. A third engineer in another division also maintains qualifications.	Adequate
Y-12	29 B&W, 21 Subcontractors	Marginal. Some mission delay may occur. The heavy reliance on contractor support is a concern.
Richland – CHPRC	16	Adequate
Richland – WCH	1 plus 1 part time in qualification	Adequate
River Protection – WTP (Bechtel)	3.5	Adequate;
River Protection – Tank Farms (WRPS)	4	Adequate
PPPO – Paducah-LATAKY	0.5	Adequate
PPPO – Portsmouth- Fluor B&W Portsmouth	7	Understaffed by 5; the site is recruiting and using overtime.
PPPO – BWCS	0.5	Adequate
Idaho – CWI	3	Adequate
Idaho – BWXT Idaho AMWTP	5	Adequate
Oak Ridge – Transuranic Waste Processing Center TWPC (WAI)	2 Part time plus available contract support	Adequate
Oak Ridge – UCOR	9	Adequate
Oak Ridge – Isotek	5 plus 1 part-time	Adequate

Table 2: Contractor Criticality Safety Staffing		
Site	**Contractor criticality safety staff, end of FY 2011**	**Status**
Oak Ridge – SEC	2 Part time plus available contract support	Adequate
Savannah River - SRNS	23 (10 fully qualified Senior Engineers; 7 fully qualified Engineers; 6 in training)	Adequate; recruiting in progress
Savannah River - SRR	4 (3 fully qualified , 1 working to become qualified)	Adequate
Savannah River- Parsons	1 Plus 1 part time	Adequate

3. Federal Staffing

The status of the Federal nuclear criticality safety engineer programs at each site, including staffing levels, plans to address vacancies, interim compensatory measures, and progress on training and qualification. This must include an analysis of the adequacy of each by DOE HQ Line Management.

NNSA HQ line management judges the Federal staffing at the NNSA sites adequate. The incumbent at NSO is still in qualification and supported by NNSA HQ. The site by site status of federal staffing is given in Table 2.

EM staffing shortages are being addressed by contracted support at Portsmouth Paducah Project Office and Oak Ridge. Shortages at Savannah River are being addressed by hiring. EM shortfalls are being addressed in the interim by support from EM HQ staff.

Table 3: Federal Criticality Safety Staffing		
Site or Field Office	**Federal Criticality Safety Staff (Full Time Equivalent)**	**Status**
Livermore	1	Adequate
Nevada	1. In qualification	Understaffed
Los Alamos	1	Adequate
Sandia	0.1; support available from NNSA HQ	Adequate
Pantex	0.25	Adequate
Y-12	1, 1 subcontract, 1 future leader.	Adequate
NNSA NA-SH	1.25	Marginal
Savannah River Site Office (no operations, design only)	0.5	Adequate
Richland	1 in qualification	Adequate; Support is provided from ORP
River Protection	3, plus 1 in qualification	Adequate
Idaho	3	Adequate
PPPO	2.5 FTEs (including subcontract)	Understaffed
Oak Ridge	1.5 FTEs (including subcontract)	Adequate
Savannah River (EM)	2 plus part time support from two others; One new hire expected	Understaffed

4. Lessons Learned from Assessments

A summary of the results and any lessons learned from federal assessments of criticality safety conducted throughout the year and the steps taken by the contractor and DOE in response to these assessments. This summary should highlight such factors as the quality of contractor self-assessments, the adequacy of criticality safety evaluations, and the consistency of sites' nuclear criticality safety programs.

In most cases, contractor self-assessments are adequate. Contractor response to self-assessment varies across the spectrum. Federal assessments of CSEs vary widely in sampling extent, from a small sample to all of the evaluations at a complex site. With one notable exception, evaluation quality is acceptable. The site with that exception (NNSS) is executing a corrective action plan at the direction of the field element. Another field element (LASO) found severe criticality program implementation issues as a result of two infractions and operational awareness activities by the field element criticality safety staff. This resulted in direction letters to the site contractor, and may result in enforcement actions. The fundamental issues in this case were noted by a contractor self assessment that was not seriously addressed by operations management.

Most federal assessments identify small errors in execution or items which are used for continuous improvement.

A significant lesson learned from oversight this year is that federal criticality safety staff and other federal engineering division staff personnel should be actively involved with the contractor engineering staff to understand planned process conditions and how they affect criticality safety. Also, coordination and collaboration between federal and contractor NCS staff is necessary in order properly review and assess process changes that potentially affect criticality safety. Federal and contractor criticality safety staffs need to understand the effects of chemical and metallurgical engineering phenomena that may cause changes in process conditions.

A lesson learned last year is that several part-time staff can combine to make an effective program. This is a very positive lesson for sites with small programs; however, there could be considerable risk if the program is not properly managed. SNL and Pantex have previously used this model. Several other sites have now applied this model.

5. Lessons Learned from Design Reviews

A summary of the results and lessons learned from contractor, federal, or independent reviews of proposed nuclear criticality safety controls and design requirements for new facility designs. Included with this is a description of how this information was used by the contractor and DOE Line Management Elements to improve facility designs and the design process.

Design experience in the last year has exemplified the necessity of configuration control in the design and safety basis documents throughout the useful life of the project. In one instance, a safety basis was written late during construction that was not consistent with the code of record for the design. The safety basis asserted design compliance with later requirements that the design documentation did not support. The hardware may be adequate to support the later

requirements, but the fact that it met the code of record and not the current safety basis expectations was not documented in the safety basis.

A recurring lesson learned from the reviews of design projects has been that the earlier the safety disciplines are involved, the more probable the operational success of the project, and the lower the cost for engineered safety. This lesson seems to be fairly well implemented across the complex. Given the aging infrastructure and the size of ongoing projects, it is likely to stay effective for several years.

The Uranium Processing Facility and the Chemistry and Metallurgy Research Replacement projects have now integrated criticality safety features into the design in accordance with site criticality safety guidance. Both projects have criticality safety guidance documentation similar to process evaluations for criticality safety, but at a detail level commensurate with leading the design.

Line management elements have conducted reviews in accordance with DOE-STD 1189, and in some cases more frequently, to verify that the design work is correctly incorporating nuclear and criticality safety work.

6. Trending of Infractions

A summary of the results of trending and analysis of each site's reportable and non-reportable occurrences related to criticality.

NNSA HQ comments:

The infraction rate at LANL has decreased in the last year. One infraction included violation of multiple controls, and then recovery without guidance from the criticality safety group. This resulted in direction letters from the field element to the contractor, as discussed in section 4 above. The infraction rate at Y-12 has stabilized, and may be near the minimum rate reasonable for operations where human error rates are a factor.

Lawrence Livermore National Laboratory

In FY 2011, LLNL had two criticality safety infractions. No trends are identified.

Nevada National Security Site

There were no criticality safety occurrences at NNSS in FY 2011.

Los Alamos National Laboratory

There were sixteen criticality safety infractions at LANL in 2011. Of these, 5 were reported in the ORPS system. This represents a decrease in the number of infractions from 2010.

- Correlating the infraction rate and the casual factors with assessment and operational awareness information results in the following conclusions:
- Formality of operations implementation at TA-55 is not yet mature.
- Criticality safety program implementation at TA-55 is incomplete.
- Awareness of criticality safety limits and requirements by operations staff is improving at the facility.

In addition to the criticality safety infractions, there was a reportable occurrence related to criticality safety. This Occurrence was a Potentially Inadequate Safety Analysis (PISA) leading to an Unreviewed Safety Question (USQ). The PF-4 operating group documented a calculation showing that up to 27 liters of lean solution and 5 to 10 liters of rich solution could backflow into the bulk nitric acid tank. There were administrative controls in place to address the backflow potential, and none of these controls was violated. This is documented in the criticality safety evaluation which is why this is not classified as a criticality safety infraction. This still represents a significant lapse in nuclear criticality safety control at the facility as an engineered feature should have been used to preclude this upset.

LANL is taking proactive steps to correct the identified issues, as directed by the site office.

Sandia National Laboratory

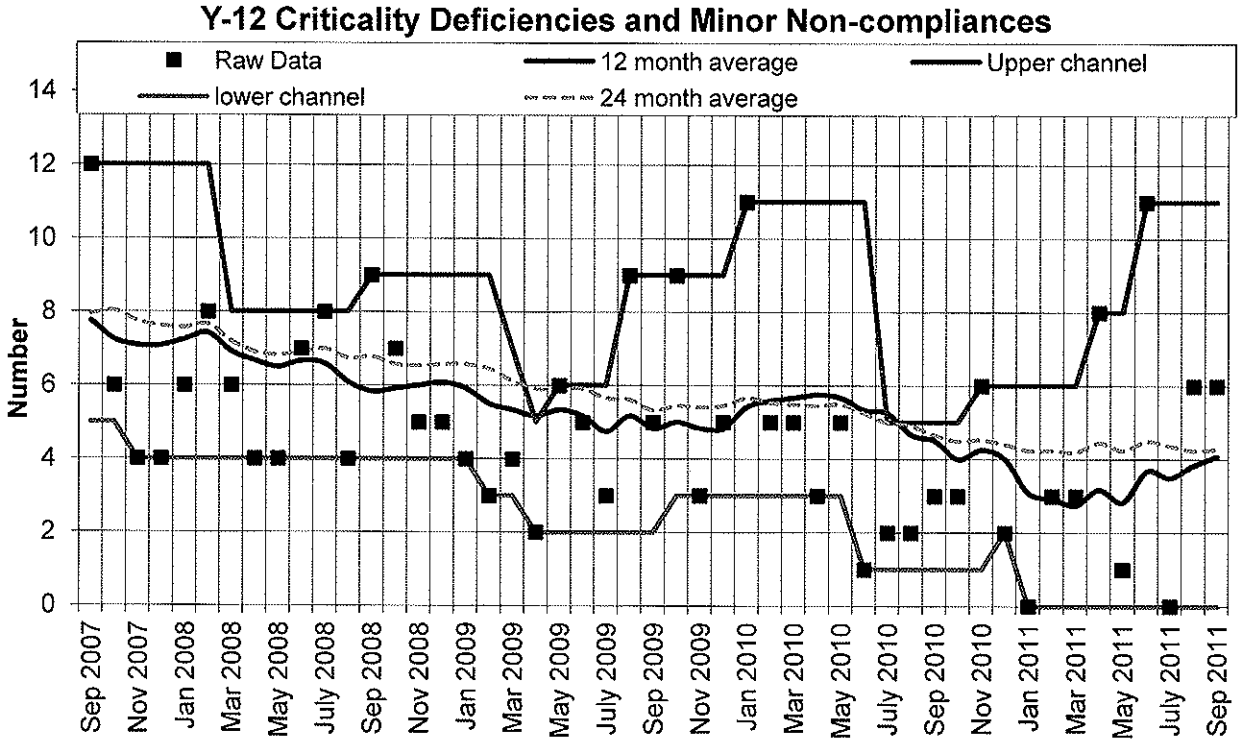
There were no criticality safety occurrences at SNL in FY 2011.

Pantex Plant

There were no criticality safety occurrences at Pantex in FY 2011.

Y-12 National Security Complex

Y-12 continues to have enough deficiencies and minor non-compliances to provide sufficient data for statistical analysis. . The chart below illustrates the use of leading and lagging indicators. The predictive ability of these indicators is not absolute; however, the combination of indicators predicts that the infraction rate will continue to decrease. When the upper and lower channels form a pinch point, as in about April 2009, a change should be expected. The difference or relative movement between the long-term and short-term averages indicates the direction of the change. This has been observed since about 2005 at Y-12. The rate fell from about six per month in 2006 to about three per month in 2010. It increased in FY-11, but has since fallen.



Savannah River Site Office (NNSA)

No fissionable materials operations are currently underway.

Environmental Management

EM HQ comments:

The trending of occurrences at EM sites identified several causal factors, some of which were common to several sites. These include:

- Legacy issues,
- Inadequate knowledge of previous plant conditions,
- Failure to address known existing plant conditions in the process evaluation for criticality safety
- At one site, there appears to be tendency to attribute program weakness to personnel error. EM-HQ has an assessment of this program planned for the 2nd quarter of FY-12.

Richland RL - CHPRC

The CHPRC has experienced 12 nonconformance events in the past year, down from 20 in the previous year. Three nonconformance events were reported at the K West Basin, one nonconformance event was recorded at the Waste and Fuels, and eight nonconformance events were reported at the Plutonium Finishing Plant (PFP). One nonconformance at PFP arose when Non-Destructive Assay measurements preparatory to Decontamination and Decommissioning activities identified over 1 kg of legacy plutonium.

Richland RL – WCH

There were no criticality safety occurrences at Richland –WCH in FY 2011.

Richland ORP – Waste Treatment Plant

This facility is not yet operational.

Richland ORP – Tank Farms Operations

WRPS tracks criticality safety issues through the PER system. Nineteen PERs in criticality safety were identified in 2010, and ten for 2011. One of the PERs in 2011 involved a potential change in process conditions. A sample analysis report indicated that a double-shell tank potentially contained larger and denser PuO_2 particles than were allowed for in the Tank Farms Process Evaluation for Criticality Safety. This discovery led to a USQ.

PPPO-Paducah

Based on the trend analysis, management problems related to prior operations at the site are the leading cause of anomalous conditions. Most Anomalous Condition Reports involve the discovery of conditions that differ from prior accepted knowledge. These conditions have generally been assigned to "Management Problems." There was one Non-conformance in 2010, and two in 2011.

PPPO-Fluor-B&W Portsmouth (FBP)

A review of the ACRs and associated problem reports indicate that the principle weakness in the NCS Program is personnel error. FBP is providing additional NCS training and providing additional oversight for fissile material movements to reduce the number of personnel errors. This is in contrast to last year's conclusion that the principal weakness was planning for legacy issues that arise. HQ-EM has planned an assessment of the site NCS program for the 2nd quarter of FY 2012, partially because of the mentioned weakness.

CH2M Hill – Idaho Cleanup Project

Two infractions occurred, both due to revised process evaluations for criticality safety not addressing existing conditions in the field.

Bechtel BWXT Idaho Advanced Mixed Waste Treatment Project (AMWTP)

Three infractions occurred, one dealing with misapplication of assay data, one dealing with a data entry error, and one due to unexpected holdup.

OR-WAI TWPC

Two infractions occurred. Only one involved fissile material, and involved and incorrect container.

OR - UCOR

Trending for FY 2010 revealed a few common issues that have resulted in a request for a specific management assessment of the BJC NCS control implementation process conducted during the 1st quarter FY2011. Corrective actions from the management assessment included a briefing for personnel involved in work package development, and revision of the checklist for implementation of controls identified in the process evaluations for criticality safety.

OR - Isotek

There have been an insufficient number of NCS-related issues identified during the reporting period to establish trends or indications. Fissile material operations are limited to storage only.

SRS - Savannah River Nuclear Solutions

The number of minor events (less than procedure limit violation or less than loss of a control) in FY 2011 was 40 versus 50 in FY 2010. There were three events involving a procedure limit violation or loss of a control in FY 2011 versus 2 in FY 2010. It continues to appear that minor deficiencies are being identified and corrected before more significant problems arise. No significant negative trends were identified.

SRS - Savannah River Remediation

No violations of the controls required by the process evaluations for criticality safety were reported.

SRS – Salt Waste Processing Facility

This facility is not yet operational.

7. Follow up Reviews

The results of follow-up reviews undertaken by DOE to assess and validate the effectiveness of corrective actions and improvements from the above activities for the previous year

At NNSS, the Criticality Experiments Facility Operational Readiness Review had identified several pre-start findings associated with criticality safety in FY 2010. Contractor corrective action plans were developed and approved by NSO. Closure of the corrective actions was validated by NNSA staff.

At LANL, the results of follow-up reviews have not met expectations, as discussed in previous sections 1 and 4. LASO and NNSA HQ criticality staff are monitoring operational implementation of the LANL criticality safety program.

In previous years, several issues have been identified in assessments of the Y-12 criticality safety program. B&W Y-12 developed a program improvement plan to address these issues. YSO continues to meet weekly with the contractor to review progress on implementing their NCS Improvement Program. The execution of this program is considered key for Y-12 in achieving effective corrective action and needed improvements for the site NCS Program. An effectiveness review and this regular monitoring confirms the program's adequacy in addressing

needed corrective action elements. The majority of these NCS Improvement Program milestones were achieved in FY 2011, and in time are expected to greatly improve program effectiveness and efficiency. FY 2012 will offer the first opportunity to assess the effectiveness of some of these improvement initiatives accomplished in FY 2011. Y-12 has several metrics focusing on the improvement areas, and current indications are favorable. The plant Nuclear Criticality Safety Committee and YSO are monitoring the improvement progress.

In EM facilities and operations, NCS assessments by EM HQ, field offices, and contractors identified criticality safety issues and opportunities for improvement that resulted in corrective actions. Those actions are tracked to closure. Follow-up assessments are conducted as necessary to verify completion of corrective actions and evaluate the improvement in the criticality safety program.

SRS - Savannah River Nuclear Solutions

Follow-up of the DOE 2007 Assessment of DOE-STD-1158 criteria in H-Canyon and HB-Line was accomplished during the 2011 Assessment of Operating Procedures in H-Canyon. The conclusion was that the one finding from that 2007 assessment that applied to Operating Procedures had been resolved.

8. The status of open issues identified in the previous year's annual report.

8.1 Metrics Development

Only incidental effort has occurred in metrics development. One metric (#25) was added. Two NNSA sites (Livermore and Y-12) have a mature criticality safety metrics program, and revise metrics as needed. Further metrics development will be addressed in section 1 as it occurs.

More detailed descriptions of site-specific issues for NNSA and EM sites are provided in Appendices 1 and 2 to this report.

8.1. Status of NNSA open issues from FY 2010

LANL NCS Program Implementation
The LANL NCS Program does not yet fully meet the requirements in the ANS-8 standards. The issues are with legacy evaluations, operations ownership of safety, and formality of operations. Although schedules for correcting the legacy evaluations have slipped, significant progress continues with completion of evaluations that are highly dependent on conduct of operations expected in December 2011. The CSPIP is being revised to include criticality safety program implementation at all less than HC 2 facilities and formalize the schedule for completion of Risk Category I (Inherent Drift Resistant) evaluation upgrades.

Contractor Staffing Shortages

These will persist for some time. The only viable way to increase staff is to develop staff from outside the discipline. The identified shortages are listed below. Shortages overall appear to be worsening.

Y-12 – Marginal
LANL – Still short
Portsmouth – Short by 40%

Federal staffing shortages:

The status of federal staffing is unlikely to change in the FY-12 budget climate.

NNSA HQ line management judges the federal staffing to be adequate, but there is no surge capacity. Enterprise level program improvement actions may be delayed. Since NSO has filled their NCS position, all field elements are at full strength.

EM staffing shortages were addressed by training personnel from outside the discipline at Richland, and River Protection, and by contracted support at Portsmouth Paducah Project Office and Oak Ridge. Shortages at Savannah River were being addressed by hiring. The remaining EM shortfalls are being addressed in the interim by support from EM HQ staff.

UPF Design review results:

The most significant finding related to NCS expressed was a concern that the gap between Criticality Safety Process Studies and the preliminary design could widen because of the schedule for updating the process studies. This appears to have been closed. Since this is a large multi-year project, criticality safety issues will arise from time to time. It appears that the contractor and field element are in control of the criticality safety aspects of the design.

8.2. Status of Open issues from EM from FY 2010

No open issues from EM for FY 2010 were identified.

8.3. Open issues for the FY 2012 Report

- Criticality safety related directives
  - Revision to Standard 3009 to properly address integration of criticality safety into Documented Safety Analysis is being considered. The revision number on the drafts is above 70.
  - DOE O 420.1 is in the revision process.
  - Potential revision of DOE-STD-3007-2007, *Guidelines for Preparing Criticality Safety Evaluations at Department of Energy Non-Reactor Nuclear Facilities.* This will be held until ANSI/ANS 8.1 is revised. Sufficient guidance exists to produce adequate process evaluations for criticality safety.

FY 2011 Annual Report on Nuclear Criticality Safety Programs
National Nuclear Security Administration

In January 2009, the Defense Nuclear Facilities Safety Board requested an annual report on the status of criticality safety in defense related DOE facilities. This enclosure is a compilation of the NNSA site office input for the report. The outline of the report is given in the table of contents below.

NNSA Site Inputs to Annual Report on Nuclear Criticality Safety Programs

1. Livermore Site Office (LSO)

1.1. Performance, Metrics, and Deficiencies

LSO's assessment of the Lawrence Livermore National Laboratory (LLNL) criticality safety (CS) program was based on a set of established performance metrics (see Table 1) and an extensive series of operational awareness activities in LLNL nuclear facilities.

- The contractor met or exceeded all of the negotiated criticality safety performance metrics for Fiscal Year (FY) 2010 with a score of Excellent.

- The contractor significantly exceeded the minimum performance criteria in the areas of criticality safety self-assessments, continuing training of criticality safety engineers, support for DOE Nuclear Criticality Safety Program initiatives, participation in national consensus standards efforts and criticality safety training for fissile material handlers.

- Overall, the level of operational criticality safety infractions and deficiencies were minor during FY 2011. All operational deficiencies were self-identified and corrected. Implementation of criticality safety controls was excellent.

There are no major issues or concerns with the contractor's criticality safety program.

Table 1. FY 11 LLNL Criticality Safety Performance Metrics
Metric:
Highest severity level of criticality safety infractions: *Criteria: 3 points for level 4 (or no infraction); 2 points for level 3; no points for level 2.*
Number of similar infractions that occurred in a 12-month period. *Criteria: 2 points for no similar infractions; no points for repeat infractions.*
Criticality safety infraction identified by workers. *Criteria: 0 points for fissile material handlers* (FMHs), Nuclear Criticality Safety Division *(NCSD) and facility staff, -2 points for NNSA/LSO, and -3 points for other governmental organizations (DOE Headquarters (HQ), Defense Nuclear Facilities Safety Board (DNFSB), etc...). Points to be averaged over the total number of infractions for the FY.*
All Criticality Safety Evaluation derived controls are fully implemented in facility procedures. *Subjective rating (maximum of 4 points). Items for consideration: Use of a deliberate and documented process for implementing CSE derived controls in facility procedures; personnel trained in the implementation of controls; controls are clearly implementable by handlers; and DOE STD-1158.*
Training compliance (% of LLNL personnel completing HS3100 or equivalent when required by job assignment): *Criteria: 3 points for 95-100%; 2 points for 90-94%; 1 point for 85-89% compliance.*
Number of NCSD non-managerial staff and FMHs actively serving on an American National Standards Institute/ American Nuclear Society (ANSI/ANS) - 8 standard working group. *Criteria: 3 points for 3 participants; 2 points for 2 participants; 1 point for 1 participant.*

Table 1. FY 11 LLNL Criticality Safety Performance Metrics
Metric:
NCSD conducts documented walk-through inspections of rooms with operations having significant quantity of fissionable material: *Criteria: 3 points for inspecting 95% quarterly; 2 points for inspecting 95% biannually; 1 point for inspecting 95% annually.*
Number of NCSD technical seminars: *Criteria: 3 points for 6 seminars; 2 points for 4 seminars; 1 point for 2 seminars.*
Quality of Criticality Safety Evaluations as evaluated by LSO. *Subjective rating (maximum of 4 points). Items for consideration: Compliance with standards, technical errors, conflicting control sets, failure to demonstrate criticality accident is not a credible event where required by Technical Safety Requirement (TSR), and DOE Standard (STD)-1158.*
Operation Conducted without a Criticality Safety Evaluation: *Criteria: -4 points for an operation being conducted without a criticality safety evaluation.*
Scoring criteria: Excellent: 25 – 23 Very Good: 22 – 20 Good: 16 – 19 Satisfactory: 15 - 12 Unsatisfactory: less than 12

LSO and LLNL will be using the same FY 2011 performance metrics for FY 2012.

1.2. Contractor Nuclear Criticality Safety Engineer Programs

LSO has assessed the staffing of the LLNL NCSD as stable and adequate. There were no changes in staffing during the year. The current core staff is comprised of eight engineers (including the division leader), a full time computer scientist, and two administrative staff. Additionally, three retired computer scientists provide numerical methods support for the LLNL Monte-Carlo code, COG. All LLNL CS engineers are qualified per the LLNL CS qualification program which satisfies *DOE-STD-1135-99, Guidance for Nuclear Criticality Safety Engineer Training and Qualification.*

Because of the scheduled de-inventory of Building (B)332 by FY 2012, there is some concern that LLNL will be unable to retain adequate personnel resources. In an effort to provide adequate funding to maintain his staff, the LLNL NCSD leader has successfully sought additional computational work (non-CS) for his engineers from other directorates as well as providing significant support for the DOE Nuclear Criticality Safety Program (NCSP) mission.

LSO continues to closely monitor LLNL criticality safety staffing levels to ensure adequate support of fissile material operations.

1.3. Federal Nuclear Criticality Safety Engineer Programs

The NNSA/LSO has one fully qualified criticality safety engineer. LSO has no plans at present to increase the staffing level for criticality safety oversight.

1.4. Results and Any Lessons Learned From Federal Assessments of Criticality Safety

The LSO Criticality Safety Engineer and LSO Facility Representatives have conducted numerous criticality safety focused walkthroughs and surveillances in LLNL facilities with operations involving significant quantities of fissionable materials. Additionally, two more detailed functional area reviews were done focusing on Materials Control and Criticality Safety Evaluations. No significant issues or deficiencies were identified in these reviews.

LLNL is required to conduct an annual audit of criticality safety in B332, the Plutonium Facility. Typically, this self-assessment is conducted by the LLNL NCSD. On a triennial basis the Laboratory's Assessment and Oversight Division conduct an assessment of the overall LLNL criticality safety program using Department of Energy (DOE)-STD-1158. This assessment addresses both the institutional LLNL criticality safety program as well as criticality safety in B332. LLNL's last formal audit was conducted in August 2010. The next triennial review was scheduled for FY 2011. LSO and LLNL criticality safety program managers assessed the self-assessment requirements and decided to delay the triennial audit into FY 2012 when the de-inventory activities should be almost complete. This will allow the assessment to look at the LLNL criticality safety program in light of the new facility inventory.

Additionally, LLNL NCSD staff continues to perform quarterly walkthroughs of all operations involving significant quantities of fissile material to ascertain that criticality safety controls are being correctly implemented and that process conditions have not been altered from those analyzed in the applicable criticality safety evaluations.

1.5. Results and Lessons Learned from Reviews of Proposed Nuclear Criticality Safety Controls and Design Requirements for New Facility Designs

LLNL has no such lessons learned to share for FY 2011.

1.6. Results of Trending and Analysis of Reportable and Non-Reportable Occurrences Related to Criticality

There were two criticality safety infractions in FY 2011 and two infractions the prior year. A review of FY 2011 infractions compared to FY 2011 infractions did not identify any trends in type or severity of LLNL criticality safety infractions.

Overall, the level of operational criticality safety infractions and deficiencies at LLNL were relatively minor during FY 2011. All operational deficiencies were self-identified. Implementation of criticality safety controls in LLNL facilities is judged by LSO to be excellent.

1.7. Results of Follow-Up Reviews Undertaken by DOE to Assess Effectiveness of Corrective Actions and Improvements

LSO did not conduct any follow-up reviews during FY 2011.

1.8. Open Issues from Last Year's Annual Report

There are no open issues from prior years.

2. Nevada Site Office (NSO)

2.1. Performance, Metrics, and Deficiencies

Nuclear criticality safety performance by Nevada Security Technologies (NSTec) Criticality Safety Program overall was minimally satisfactory for this year. NSTec failed to meet schedule and deliverables identified in the implementation plan for DOE-STD-3007-2007. In addition, NSO conducted an assessment of NSTec level of compliance, effectiveness, and performance associated with implementation of DOE-STD-3007-2007. The focus of the assessment was to verify proper execution of process evaluations for CS and implementation of the Criticality Control Review (CCR) process. The results of the assessment identified concerns with NSTec's ability to produce and internally review Nuclear Criticality Safety Evaluations (NCSEs). NSO required NSTec to develop and submit for approval compensatory measures and a corrective action plan to address the issues identified in the assessment report. Prior to the assessment, NSTEC had not completed CCR reviews for the active processes. As part of the corrective actions for the assessment, NSTec completed the CCR reviews of all NCSEs supporting active operations and submitted documentation to NSO on September 30. NSO is currently reviewing the documentation. NSO will closely monitor implementation of the compensatory measures and closure of the corrective actions during FY 2012.

Metrics used during FY 2011 included:

- Personnel Training
- Facility NCS Evaluations
- Facility Inspections
- NCSP Infractions
- Contact Time

2.2. Contractor Nuclear Criticality Safety Engineer Programs

Staffing Levels remain adequate to support the Nevada National Security Site (NNSS). NSTec currently has 3 full time CS Engineers and has recent hired a Criticality Safety Manager. The three CS engineers are fully qualified per the NSTec program.
NSO is closely monitoring the task performance of NSTec CS staff to assure that staffing levels are correct.

2.3. Federal Nuclear Criticality Safety Engineer Programs

A CS engineer was hired and is in the process of attaining qualification. NSO is utilizing support from NNSA HQ CS staff as a compensatory measure while the NSO CS engineer completes qualification.

2.4. Results and Any Lessons Learned From Federal Assessments of Criticality Safety

In FY 2011, NSO conducted an assessment of 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 is unsatisfactory. NSO required NSTec to develop and submit for approval compensatory measures and a corrective action plan to address the issues identified in the assessment report. NSO will closely monitor implementation of the compensatory measures and closure of the corrective actions during FY 2012. NSO also conducted assessments on the implementation of the Nevada National Security Site CS program by Los Alamos National Laboratory (LANL) (e.g. at NCERC/DAF) and LLNL (DAF). While several

findings were identified, the results of the assessments were that both LANL and LLNL are meeting expectations of the NNSS program by supporting the NCERC and the HQ DOE Nuclear Criticality Safety Program.

2.5. Results and Lessons Learned from Reviews of Proposed Nuclear Criticality Safety Controls and Design Requirements for New Facility Designs

No new designs are proposed or underway.

2.6. Results of Trending and Analysis of Reportable and Non-Reportable Occurrences Related to Criticality

No infractions were reported in FY 2011.

2.7. Results of Follow-Up Reviews Undertaken by DOE to Assess Effectiveness of Corrective Actions and Improvements

The FY 2010 report stated that the Criticality Experiments Facility Operational Readiness Review had identified several pre-start findings associated with CS. Contractor corrective action plans were developed and approved by NSO. NSTec and LANL implemented the corrective actions and submitted closure packages for each finding. Closure of the corrective actions was validated by NSO and NNSA Service Center staff and an independent CS expert from NNSA HQ. Based on these validations, NSO approved the closure of the pre-start findings. Documentation of the closures and validations was provided to NNSA HQ to support startup authorization for the National Criticality Experiments Research Center (NCERC). NA-10 authorized the startup of NCERC (formerly the Criticality Experiments Facility CEF) on May 11, 2011.

2.8. Open Issues from Last Year's Annual Report

The following issue from last year's annual report was closed this year: "The CSP Policy excludes criticality experiments from oversight, and no methodology or expertise has been identified to cover the area."

NSTec has assigned the DAF Facility Operations Review Committee (FORC) this oversight role. To assist in this, a member of the FORC is also a member of the LANL Critical Experiments Review Committee, and a member of the LANL Critical Experiments Review Committee is assigned as a member of the FORC.

3. Los Alamos Site Office

3.1. Performance, Metrics, and Deficiencies

3.1.1. Field Element Line Management actions

The focus of the LASO in 2011 was oversight of the Criticality Safety Program Improvement Plan (CSPIP) including the quality of work produced. Particular emphasis was given to oversight of field implementation of the program in 2011. This emphasis will continue through 2012 for the plutonium facility (TA-55) and less than hazard category (HC) 2 facilities.

- CS was measured as part of the Nuclear and High Hazard Operations subjective space Performance Based Incentive PBI in FY2011.
- The LASO criticality safety engineer met with LANL staff weekly on CSPIP status.

- The weekly meetings included review of comments on the LANL produced Criticality Safety Evaluations (CSEs). LASO performed a 100% review of CSEs produced in 2010.
- LASO CS staff and facility representatives performed field oversight activities to review implementation of the new program.

The CSPIP remains divided into two sub plans. Plan 1 focused on program and implementation improvements and Plan 2 focused on CSE upgrades.

Plan 1
LANL completed full implementation of the criticality safety program at all HC 2 nuclear facilities except TA-55. Implementation was independently verified by the LANL Nuclear Criticality Safety Committee (NCSC). The independent verification assessment was shadowed by LASO.

TA-55 declared implementation of the criticality safety program in FY 2011, but the independent verification review performed by the NCSC concluded that implementation was incomplete.

Plan 2
Completion of CSE upgrades for all Risk Category C (High Conduct of Operations dependent) operations is expected to be complete by the end of CY 2011. As of December 1, 2011 all remaining evaluations in this group were in peer review.

The CSPIP is being revised to include criticality safety program implementation at all less than (HC) 2 facilities and formalize the schedule for completion of Risk Category I (Inherently Drift Resistant) evaluation upgrades.

3.1.2. Evaluation

The LANL nuclear criticality safety program does not yet meet the expectations of national consensus standards and DOE Order 420.1B in some cases. Compliance status, on a facility by facility basis is as follows:

- The revised institutional criticality safety program at LANL is evaluated as compliant with DOE orders and national consensus standards.
- TA-55 has not yet completed implementation of the revised criticality safety program. The facility declared implementation of the criticality safety program in FY 2011, but the independent verification review performed by the NCSC concluded that implementation was incomplete. Identified weaknesses in Conduct of Operations, coupled with incomplete facility implementation of the criticality safety program have resulted in significant actions taken by LASO to drive safety improvements at the facility. Two letters were sent to LANS to address short and long term issues. The first letter, SO: 99CK-378801 Plutonium Facility (PF-4) Criticality Safety Program, Keilers to Beard, provided direction to address deficiencies in a select set of operations that are highly reliant on administrative controls. LANS screened operations at the facility, suspended a number of operations, and is developing additional controls to ensure the safety margin is maintained until the underlying conduct of operations issues can be corrected. The second letter, SO:32CK-374635 Los Alamos National Laboratory – Improving Nuclear Safety and Operations, Smith to McMillan, directs LANS to develop and implement a longer term strategy to correct a number of nuclear safety issues, including criticality safety program implementation at TA-55. LASO has also developed a FY 2012 Mandatory Award Term Metric to drive integrated safety improvements at TA-55. In this metric criticality safety program implementation is specifically identified. CSE upgrades continue at TA-55. Risk Category C evaluations are

complete, or in peer review as identified above. There are 165 Risk Category I evaluations requiring update at TA-55.

- Chemistry and Metallurgy Research (CMR) has fully implemented the revised criticality safety program and is evaluated as compliant with DOE orders and national consensus standards with the exception of process evaluation. There are twenty-five Risk Category I evaluations requiring update at CMR.
- Waste Disposition Project (WDP) has fully implemented the revised criticality safety program and is evaluated as compliant with DOE orders and national consensus standards with the exception of process evaluation. There are four Risk Category I evaluations requiring update at WDP facilities.

LANL performance on meeting the milestones defined in the CSPIP did not meet LASO expectations in terms of timeliness. The quality of work performed met expectations for evaluation upgrades and implementation at most facilities, the exception being TA-55 program implementation. The quality of CSEs produced by the LANL engineering staff has continued to be high quality as assessed by the LASO criticality safety engineer.

3.2. Contractor Nuclear Criticality Safety Engineer Programs

There are currently eight technical staff and one management staff in Safety Basis and Criticality Safety SB-CS. The ninth technical staff maintains the SB-CS database and maintains the computational resources. Two consultants currently work for the group – one will provide computational support for CMRR preliminary evaluation upgrades and the other will assist SB-CS with teaching the DOE NCSP Training and Education Project and developing training materials. One level 3\4 position is to be filled and a level 1 and two level 2 positions are currently posted on the LANL jobs website. These will be filled as soon as possible. Two additional level 1\2 positions will be advertised to replace a staff termination and a staff transfer to N-division. The NCERC/DAF position posted last year was posted unsuccessfully and instead of filling this position, the N-2 and SB-CS group leaders will collaborate and three N-2 staff will become qualified as criticality safety analysts to assist with NCERC/DAF criticality safety work. SB-CS will either supply the analyst or peer reviewer for all tasks. All eight technical staff are fully qualified as is the executive advisor. Retention of existing SB-CS staff, especially with the level 4 analysts, will be crucial to meeting the PIP milestones. A junior level student was hired in FY 2011 as well but is not qualified to perform evaluations.

LASO assesses the program as currently understaffed to address the emergent issues facing the site. LASO believes that a long term staffing plan is needed to increase numbers of qualified engineers at the site and provide sustainable staffing into the future. A total of 16 staff members are currently approved by the laboratory (four new positions were approved in FY 2011).

3.3. Federal Nuclear Criticality Safety Engineer Programs

The LASO nuclear criticality safety engineering program consists of one NNSA fully qualified Criticality Safety Engineer. There are no vacancies in criticality safety and LASO is fully staffed for this position. LASO continues to receive support from NNSA headquarters criticality safety staff on an as needed basis.

3.4. Results and Any Lessons Learned From Federal Assessments of Criticality Safety

LASO did not conduct an independent assessment of the LANS Criticality Safety Program in 2011. An independent assessment was requested by the Criticality Safety Support Group (CSSG) for the fourth quarter of FY 2011. This assessment was shifted to second quarter FY

2012 due to emergent issues at the site. The assessment is expected to take place in or around February 2012.

The LANS NCSC conducted an assessment of WDP operations in February 2011. The assessment concluded that the criticality safety program was not implemented and made a number of recommendations regarding program implementation. The facility response is addressed below. This assessment was not shadowed by LASO.

LANS conducted a Facility Centered Assessment (FCA) of Science and Technology Operations (STO) in 2011. The report concluded that the criticality safety program was not adequately implemented at three radiological facilities on site. LANS is finalizing the plan and schedule to address this noncompliance. This is being incorporated into the CSPIP as identified in Section 1 above. No safety issues were identified. LASO shadowed this assessment and concluded that the assessment was of high quality.

LANS conducted a FCA of WDP in 2011. The report concluded that the criticality safety program was not adequately implemented at WDP facilities. The facility response is addressed below. LASO shadowed this assessment and concluded that the assessment was of high quality.

The LANS NCSC conducted an Independent Verification Review of TA-55 Criticality Safety Program Implementation in 2011. The assessment concluded that the criticality safety program was not fully implemented. The facility has chartered a team to complete implementation to meet current site standards. This effort is being coordinated with corrective actions detailed in Section 1 above. LASO shadowed this assessment and concluded that the assessment was of high quality.

The LANS NCSC conducted an Independent Verification Review of WDP in 2011. The project had executed substantive corrective actions in response to the previous NCSC assessment and the FCA. These improvements resulted in a conclusion by the NCSC that the criticality safety program was fully implemented at WDP. There were a small number of issues identified related to criticality safety staff involvement at these facilities and net staffing levels for the criticality safety group as well as some minor issues related to WDP implementation. WDP is actively addressing the identified issues. LASO shadowed this assessment and concluded that the assessment was of high quality.

3.5. Results and Lessons Learned from Reviews of Proposed Nuclear Criticality Safety Controls and Design Requirements for New Facility Designs

The criticality safety group was actively engaged in line item projects in 2011. Project support of note included: CMRR, TA-55 Reinvestment, and the TRU waste facility (TWF). LASO reviews design documents at critical decision points to assure that design features are captured. Safety related controls, both specific administrative controls and engineered features, have been modified or added as a result of the group's involvement. The criticality safety group's engagement in non-line item projects has also improved and support is of high quality. Facility management engagement of the group in facility modifications is not always timely. The trend is improving over the previous year, but does not yet meet LASO expectations.

CMRR – Preliminary criticality safety evaluations have been completed for all aspects of the CMRR project. These PCSEs have been reviewed and commented on by the LASO SME. The evaluations were determined to be sufficient to support entrance into final design. Comments will be resolved by a revision to the evaluations during final design; this effort is currently in

progress. LASO has reviewed the Preliminary Documented Safety Analysis (PDSA) and System Design Descriptions (SDD) for the project. Comment resolution has been completed and a path forward is being executed to incorporate all criticality safety controls into the PDSA and SDDs. This process should conclude with adequate control definition incorporated in the PDSA and SDDs. The criticality safety basis is assessed as improved since the 2010 annual report as a result of LANS efforts.

The PCSE has been completed for the TWF. This has been reviewed by LASO and comments made. The PDSA has also been reviewed by LASO and comments submitted. Comment resolution is in progress. As a result of these efforts and criticality safety engineer engagement in the project, the resultant facility design should support criticality safety control implementation that is largely transparent to the operations staff.

3.6. Results of Trending and Analysis of Reportable and Non-Reportable Occurrences Related to Criticality

There were sixteen criticality safety infractions at LANL in 2011. Of these, five were reported in the Occurrence Reporting and Processing System (ORPS). This represents a decrease in the number of infractions when compared to 2010.

- The infractions were grouped to evaluate trends in causal factors, the following was determined: eleven of the sixteen infractions were identified by facility operations.
- Four of the 16 infractions where discovered during an assessment of WDP operations. These four infractions were identified by the assessment team
- The remaining infraction was identified by the LANS criticality safety group.
- The four infractions at WDP included two level 1 non-compliances and two Level 5 implementation issues. These are all directly correlated with incomplete criticality safety program implementation at those facilities.
- The single Level 1 noncompliance at TA-55 was of low safety significance and is directly related to process drift for the operation.
- The remaining Level 4 and Level 5 infractions had minimal impact on the criticality safety margin of the facility and were valuable from the standpoint of improving formality of operations. These are analyzed as approaching the nominal level for infractions at the facility.
- The Level 3 infraction is assessed as significant in that the operator violated multiple controls and, after the infraction was noted, recovered from the situation without guidance from the criticality safety group.

In addition to the criticality safety infractions, there was a reportable occurrence related to criticality safety. This Occurrence was a Potential Inadequacy in the Safety Analysis (PISA) leading to an Unreviewed Safety Question. The PF-4 operating group documented a calculation showing that up to 27 liters of lean solution and 5 to 10 liters of rich solution could backflow into the bulk nitric acid tank. There were administrative controls in place to address the backflow potential, and none of these controls was violated. This is documented in the criticality safety evaluation which is why this is not classified as a criticality safety infraction. This still represents a significant lapse in nuclear criticality safety control at the facility as an engineered feature should have been used to preclude this upset.

- Correlating the infraction rate and the casual factors with assessment and operational awareness information results in the following conclusions: Formality of operations implementation at TA-55 is not yet mature.
- Criticality safety program implementation at TA-55 is incomplete.
- Awareness of criticality safety limits and requirements by operations staff is improving at the facility.

LANS is taking proactive steps to correct the identified issues as detailed in section 3.1 above.

3.7. Results of Follow-Up Reviews Undertaken by DOE to Assess Effectiveness of Corrective Actions and Improvements

These were addressed in sections 3.1 through 3.6 above.

3.8. Open Issues from Last Year's Annual Report

These were addressed in sections 3.1 through 3.6 above.

4. Sandia Site Office (SSO)

4.1. Performance, Metrics, and Deficiencies

NCS performance measures to meet DOE O 226.1 Attachment 3 Section 1.b (4) were established in a letter to Sandia National Laboratory (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. These performance measures have been incorporated in the SNL document, GN470072 *Nuclear Criticality Safety*, which SSO approved as the Criticality Safety Program Document. A brief status is as follows:

1) Nonconformances

For NCS ORPS reportable, there was one in 2006 for the Manzano Nuclear Facility (MNF), one in 2007 for the Nuclear Material Storage Facility, and one in 2009 for the MNF. There were no NCS ORPS reportable in 2010 or 2011. The three earlier reportable events were discussed in last year's report.

2) Self-Assessments and Committees

DOE-STD-1158-2002 has been used extensively to meet ANSI/ANS - 8.19 requirements for self-assessments through 2009. SNL started an initiative in 2007 to complete self-assessments of their program per DOE-STD-1158-2002. The self-assessments have transitioned from subjective walkthroughs to DOE-STD-1158-2002 self-assessments for nuclear facilities and radiological facilities where criticality controls are implemented. All nuclear facilities are reviewed annually with the reports issued within two to three months of the review. In 2011, SNL planned nine DOE-STD-1158-2010 self-assessments of facilities representing all the facilities where fissile mass is greater than threshold quantities. Through November of 2011, three of the nine 2011 NCS self assessments have been completed and the remaining six will be completed in December 2011. This is the fourth year where SNL has performed self-assessments on facilities. The nine self-assessments in 2011 represent 100% of the facilities where fissile mass is greater than threshold quantities. SSO 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/compliance importance. Information from Self-Assessments, the CSSG review, and walkthroughs in 2011 were included in a local action tracking system.

Through November of 2011, the Radiological and Criticality Safety Committee met 10 times to review criticality safety for facilities within TA-V and the Sandia NCSC met 4 times to review criticality safety for facilities outside TA-V. One or sometimes two qualified SNL criticality safety engineers were present at all meetings. The Annular Core Research Reactor (ACRR) and Sandia Pulse Reactor (SPR) review committees also met to review procedures that implemented criticality safety. SSO personnel have been included in the notices with an agenda for the NCS committee meetings and have attended several meetings. Meeting minutes were developed, reviewed, approved, and distributed usually within three months of the meeting date. Many members of the safety committees are members of other safety committees including the minute taker. This supports consistency between the SNL facilities. The action items are generally documented as being completed in a future set of minutes following the development of the action item. These are committee action items and are tracked and closed in the minutes. The minutes are reviewed by members and signed off by the Chair of the committee.

3) Staff Responsibilities

The NCS training program is based on DOE-STD-1135-99 and ANSI/ANS - 8.26. SNL has ten qualified CS Engineers with one being a new trainee that qualified in May 2011. One qualified NCS engineer has allowed his training to expire to pursue other opportunities. Of the ten qualified CS engineers, six are members of safety committees that require criticality expertise. So far, seven of the ten CS Engineers have participated or observed the critical experiments at Sandia Pulse Reactor / Critical Experiments Facility SPR/CX. One of the CS Engineers is the lead designer and nuclear engineer for the SPR/CX experiments although several CS Engineers were involved in preparing or providing the training. SNL CS Engineers have supported the following:

Five CS Engineers attended ANS conferences and three attended ICNC.
NCS engineers participate in all of the NCS safety committee DOE Standard 1158 based self-assessments and walk-through activities.
Four CS Engineers are members of the ANS/ANSI Standards working groups and/or oversight committees.
One NCSE attended the Nuclear Criticality Safety Program (NCSP)/ CSSG Annual Review Meeting.
One NCSE attended the NCSP FY 2011 Program Execution Meeting at DOE/NV.
The University of New Mexico NCS short course included sections taught by two CS Engineers. In the last three years six CS Engineers attended the Lawrence Livermore National Laboratory (LLNL) short course for hands-on training. Two CS Engineers are planning on attending the LLNL class in the spring of 2011.
The Sandia Critical Experiments course was developed and taught by four SNL CS Engineers.

4) Criticality Safety Assessments

Prior to operations, the NCSEs are developed, reviewed, and approved. There are twelve active NCSEs for SNL. With the completion of Phase 1 of the SNM de-inventory, six NCSEs have been archived. New NCSEs are developed to DOE-STD-3007-2007, and if not, are

submitted to SSO for approval. To date, no NCSEs have required SSO approval. Currently SNL has several facilities and activities which were developed prior to DOE-STD-3007-93. SNL is working on a gap analysis of the NCSEs not meeting DOE-STD-3007-2007 and maintains a schedule for updating the remaining three in 2012. There were two new NCSEs completed in 2011 for the *Criticality Safety Assessment for the Annular Core Research Reactor Floor Storage Holes and 18 Element Storage Racks within the High Bay and Floor Storage Holes* and *Container C00210010 – SNM Deinventory*. In addition several criticality safety index calculations were completed for shipment of materials from SNL as described previously.

The current SNL verification and validation (V&V) process is being evaluated to ANSI/ANS- 8.24 to ensure software quality assurance requirements are addressed. The current program follows 414.1C. There are more than twelve computers used to perform criticality safety calculations. Prior to using the data from the computer for a NCSE, the V&V packages are completed. The ANSI/ANS-8.24 *Validation of Neutron Transport Methods for Nuclear Criticality Safety Calculation* has not been completed. The ANSI/ANS-8.26 *Criticality Safety Engineer Training and Qualification Program* has been completed and an update to the NCSE training program is completed.

4.2. Contractor Nuclear Criticality Safety Engineer Programs

Ten engineers are qualified to DOE-STD-1135-99 as CS Engineers. The program has been updated to address ANSI/ANS - 8.26 requirements.NCS program work is ~ 2 full-time-equivalents (FTEs) in 2011. NCS projects work is anticipated to remain at 2 FTEs for 2012. 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.

4.3. Federal Nuclear Criticality Safety Engineer Programs

One engineer has completed the Technical Qualification Program (TQP) standard for DOE-STD-1173-2003 in December 2007 and re-qualified in 2011. The requirement to re-qualify is an SSO requirement for every three years and is not a requirement by TQP. Criticality safety oversight is not a full time responsibility for the engineer, approximately 10% of his time. 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 operations will require oversight in the next few years. However, due to other commitments for the one engineer, SSO may require additional assistance as needed as observed in the last NNSA HQ Biennial Review.

4.4. Results and Any Lessons Learned From Federal Assessments of Criticality Safety

The only federal assessments performed in 2011 were the three facility walkthroughs. For the three assessments, there were minor observations identified. SSO performed one assessment of the CAS for the SNL criticality safety program. There were no observations identified during the CAS assessment. Since there were no deficiencies, no corrective action plans (CAPs) were required.

4.5. Results and Lessons Learned from Reviews of Proposed Nuclear Criticality Safety Controls and Design Requirements for New Facility Designs

For four of the last seven years, SNL has participated in LANL/LLNL assessment at Device Assembly Facility (DAF) at NTS but did not participate in 2011. SNL participates in DOE Complex End-User activities and meets with counterparts from other sites.

The Sandia NCS Triennial occurred in 2011 using two CS Engineers from LANL and LLNL. There was one finding, three observations, and one noteworthy practice identified during this review of the nuclear criticality safety program. The one finding was for "the process in the SNL criticality site procedure was not rigorously followed after a past noncompliance event" and this finding is being addressed. The report concluded with "In general, the NCS program at SNL appears to be robust and does a good job of implementing applicable DOE Orders and Standards. All personnel interviewed were appropriately knowledgeable of NCS requirements and policies. The interface between the NNSA/SSO criticality safety subject matter expert and the Criticality Safety Officer is well established. There is an extensive assessment schedule for the NCS program, both from internal and external entities."

In October 2010, SNL Independent Audit and Advisory Services completed a review of the criticality safety program. The report states "SNL criticality safety program has made significant improvements from the 2006 audit of this program, which found the program needed improvement. Based on observations 1 and 2, the auditor suggests reexamining programmatic guidance regarding timely responses to self-assessment results." There were nine observations identified. Action has been completed on two observations, three observations required no action, and the remaining four observations will be closed when the Sandia NCS procedure is updated (anticipated within the next two months).

4.6. Results of Trending and Analysis of Reportable and Non-Reportable Occurrences Related to Criticality

One reportable occurrence occurred in 2009 concerning the difference in the amount of fissile material in containers at the MNF as described previously. The occurrence report was issued as a PISA by the facility management and required an update to the MNF NCSE which was completed in 2010. No NCS related occurrence reports were required in 2010 and 2011.

4.7. Results of Follow-Up Reviews Undertaken by DOE to Assess Effectiveness of Corrective Actions and Improvements

No items were identified in the previous year and so no follow-up reviews were required.

4.8. Open Issues from Last Year's Annual Report

There are no open issues from prior years.

5. Pantex Site Office (PXSO)

5.1. Performance, Metrics, and Deficiencies

The FY 2010 Programmatic Assessment of the B&W NCS Program only identified one observation; the failure of the NCS Program Description Document to adequately address line management responsibility for safety. The same assessment identified a noteworthy practice: the B&W Pantex NCS Staff routinely coordinates with NCS Staffs at other Complex Sites. The Contractor continued to focus on the issue of NCS Engineer staffing. B&W Pantex currently has three qualified NCS engineers. The Pantex Plant continues with its established performance metric of no criticality safety infractions. There were no NCS-related infractions at Pantex in FY 2011; no NCS infractions have been recorded in at least the last twenty years. The PXSO CS Engineer, who is also a qualified Safety Basis Analyst, remains involved in reviewing all NCS-related work products. The PXSO CS Engineer monitors the qualified NCS Engineer Staffing, the status of the conduct of planned facility/operations walkdowns, and he shadows all

Contractor management self-assessments involving the B&W NCS Program. The PXSO CS Engineer also performs an annual programmatic assessment of the Contractor NCS Program.

5.2. Contractor Nuclear Criticality Safety Engineer Programs

The B&W Pantex Criticality Safety Program is staffed with two qualified criticality safety engineers and a third NCS engineer, in the Special Nuclear Materials Division, maintains her qualifications. Three Criticality Safety Engineers are sufficient to maintain the NCS technical basis and provide criticality safety support for Pantex operations. All three B&W criticality safety engineers have PhDs; two in nuclear engineering and one in Chemistry. All three NCS engineers have completed the B&W Pantex Nuclear Criticality Safety Engineer Qualification Card (which meets the requirements of DOE-STD-1135-99, *Guidance for Nuclear Criticality Safety Engineer Training and Qualification)* and all three NCS Engineers have completed the necessary criticality safety courses. The Pantex Site Office has determined that the B&W Pantex Criticality Safety Program is effective and adequately staffed for Pantex operations.

5.3. Federal Nuclear Criticality Safety Engineer Programs

PXSO has one primary criticality safety point of contact (referred to as the PXSO CS Engineer). Because of the form of the fissile material and the nature of the operations at Pantex, one PXSO CS Engineer is sufficient to oversee the Contractor's Criticality Safety Program. The PXSO CS Engineer has completed his qualification for *Criticality Safety Functional Area Qualification Standard,* DOE-STD-1173-2009. NNSA Headquarters conducted a Biennial Review of Site Nuclear Safety Performance in FY2011. In the functional area of CS, the CDNS team identified one weakness and one opportunity for improvement. Overall, the CS Program was graded as meeting expectations. The review indicated that since the last CDNS assessment "the contractor program has demonstrated significant improvement as a direct result of PXSO oversight." The weakness, which has since been corrected, cited a failure of the Contractor CS Program crosswalk to identify ANS/ANSI - 8.15 as an applicable requirement for Pantex. ANS/ANSI - 8.15 provides limits for Pu-238 which is encapsulated in RTGs staged at Pantex. The opportunity for improvement, which also has been corrected, fixed an inconsistency in the PXSO CS Procedure.

5.4. Results and Any Lessons Learned From Federal Assessments of Criticality Safety

In FY 2011 the PXSO CS Engineer, with support from the NNSA headquarters criticality safety staff, conducted a programmatic assessment of the B&W Pantex Nuclear Criticality Safety Program. The NCS Programmatic Assessment identified no findings/deficiencies, weaknesses, or observations. The B&W NCS Program demonstrated improvement over what was observed in the FY 2010 NNSA Programmatic Assessment. The Pantex Site Office typically assigns Performance Measures, as necessary, to provide a focus for the Contractor's NCS Program. In FY 2011, the NCS Program Description Document (PDD) was revised; the Contractor began the process of revising the NCS safety management program in the Sitewide Safety Analysis Report (SAR), and is in the process of re-evaluating all NCS-related technical safety requirements. The third Contractor CS engineer became qualified in FY 2011 and B&W Pantex continued their "no CS infraction" record. PXSO also conducted a shadow assessment of the B&W Pantex management self-assessment of the flowdown of ANSI/ANS - 8.24-2007, *Validation of Neutron Transport Methods for Nuclear Criticality Safety Calculations* requirements. No issues were identified. The Contractor has a robust Contractor Assurance System (CAS) and conducts a thorough self-assessment of one or more areas of the Criticality Safety Program on an annual basis. The B&W Criticality Safety Program remains a very stable and effective program in the Contractor's Integrated Safety Management System.

5.5. Results and Lessons Learned from Reviews of Proposed Nuclear Criticality Safety Controls and Design Requirements for New Facility Designs

In 2011 there were no new nuclear facilities designed or built at the Pantex Plant. Consequently, the current suite of criticality safety controls remained the same. Existing criticality safety controls are sufficient for fissile material operations currently authorized at the Pantex Plant. As was described in section 5.4 above, the Contractor is in the process of re-evaluating its suite of CS controls to ensure they are properly categorized and based on the latest criticality safety evaluation. That activity is projected to be completed in FY 2012. When applicable, the Contractor uses the criticality safety staff to review new facility designs, tooling, and processes.

5.6. Results of Trending and Analysis of Reportable and Non-Reportable Occurrences Related to Criticality

There are no known reportable or non-reportable occurrences related to criticality in at least the last 20 or more years at Pantex. Therefore, there is no trending or analysis of such events.

5.7. Results of Follow-Up Reviews Undertaken by DOE to Assess Effectiveness of Corrective Actions and Improvements

No follow up reviews were necessary in FY2011.

5.8. Open Issues from Last Year's Annual Report

There are no open issues from prior years.

6. Y-12 Site Office

6.1. Performance, Metrics, and Deficiencies

Y-12 has a comprehensive set of metrics that measure performance in the areas of noncompliance with NCS requirements, NCS support for Operations personnel, development of the NCS Engineering staff, and performance of the NCS Engineering staff carrying out their duties. Y-12 reviews these metrics in monthly NCS Advisory Council meetings, plant NCS Committee meetings, and at periodic plant Nuclear Criticality Safety Committee meetings. Additionally, some of the metrics are uploaded into the Contractor Assurance System (CAS). The extensive reporting of sub-threshold (i.e., nonreportable per DOE O 231.1A) NCS issues at Y-12 forms the basis for many of these Y-12 NCS metrics. Nonreportable NCS issues are categorized as either an NCS deficiency, a minor nonconformance, or a field correctable situation. The current set of Y-12 metrics reported on a monthly basis (unless indicated otherwise) includes:

- Closure timeliness of NCS deficiencies and minor noncompliances, focusing on the total number open longer than 45 days. This is a CAS metric.
- Overall Field Issues, focusing on the three-month average number of deficiencies, minor noncompliances, and field correctable situations. This is considered to be a leading indicator.
    - Overall Field Issues (Category) – This metric tracks the number of NCS field issues occurring per month (Deficiencies, Minor Noncompliances, and Field Corrected Issues) binned by category. The top six categories are displayed. The Average Issues per month are based upon the past year's performance. It is a breakdown of the Overall Field Issues metric by category of issue. This is considered to be a leading indicator.
    - Overall Field Issues (Operating Area) – This metric tracks the number of NCS field issues occurring per month (Deficiencies, Minor Noncompliances, and Field

Corrected Issues) binned by operating area. Data is provided for the past year. It is a breakdown of the Overall Field Issues metric by location of issue. This is considered to be a leading indicator.

  - Overall Field Issues (Cause) – This metric tracks the number of NCS field issues occurring per month (Deficiencies, Minor Noncompliances, and Field Corrected Issues) binned by cause. The average per month data is based upon the past year's performance. It is a breakdown of the Overall Field Issues metric by cause of issue. This is considered to be a leading indicator.

- Self-Reporting of NCS Issues – Reports the percentage of issues self-reported by the contractor's production and line oversight organizations (i.e., NCS engineering). This is a CAS metric and is considered to be a leading indicator.
- NCS Small Group Seminars – Reports the cumulative number of small group training sessions conducted with fissile material operations crews.
- NCS Repeat Deficiencies – Reports the number of NCS deficiencies that are deemed to be "repeat deficiencies" by the Nuclear Criticality Safety Advisory Committee. This is a CAS metric and is considered to be a leading indicator.
- NCS Professional Development Performance – Reports the percentage of the NCS engineering population that is engaged in credited development activities (e.g., technical courses, conferences, graduate studies, etc.).
- NCS Unplanned Activities – This item has two components:
  - Number of spills of fissile solution >4 L. A spill is an unplanned discharge of solution from its containment vessel. Leaks collected in approved containers are not considered to be spills unless the collecting container overflows. This is an indication of the physical state of the facility.
  - Number of inadvertent transfers of fissile solution. An inadvertent transfer is a transfer where the solution was transferred to an unintended location, or by an unintended route. It does not include simple spills. This is an indication that the facility systems are operating as designed/intended. This is a Continued Safe Operability Oversight Team (CSOOT) metric and is considered to be a leading indicator.
- NCS 9212 Leak Indications – This is a CSOOT metric maintained by Production.
- NCS Issue Trends – This metric provides two years worth of data on NCS deficiencies and minor non-compliances. This is an interactive metric that allows one to choose among four categories of issues: implementation, infrastructure, legacy, and performance. The time horizon for the display of data is adjustable so that long term or short term trends can be evaluated. This new metric links directly to the NCS database and, with the exception of the category binning assignment, is fully automated. This is a CAS metric and is considered to be a leading indicator.
- NCS Issue Age – This metric tracks the number of nuclear criticality safety issues that are open in several age bins. Issues include Deficiencies and Minor Noncompliances.
- CSE Quality – This metric tracks NCSE Quality as measured by completing a checklist and generating an overall score for the NCSE under review. On a quarterly basis, average score for all CSEs graded will be used to generate the metric. Both 3007-2007 upgrades and CSE revisions not upgraded are reviewed and graded. This is a CAS metric and is considered to be a leading indicator.
  - CSE Quality by Section – This metric tracks the results of the NCSE Quality Review by NCSE section. For the NCSEs reviewed during the quarter, the average percentage of total score in each major NCSE section is reported. It is a breakdown of the NCSE Quality metric by section of the NCSE.

- NCS Engineer Task Qualification – This metric tracks the percentage of NCS staff (B&W Y-12 and subcontractors) qualified in various NCS tasks. This is a CAS metric and is considered to be a leading indicator.
- Material Access Area (MAA) Time Index – The metric tracks "MAA time," which is defined as time spent in MAAs for any purpose. This is a measure of NCS engineers' field support to the facilities and is considered to be a leading indicator.
- Annual Review Performance – This metric tracks the number of days into the grace period that an annual review is performed. This metric is being discontinued in FY 2012.
- CSE Cost Performance Index – This metric may provide an early warning that there is a mismatch between the budgeting process and performance on developing/revising CSEs. This is a new metric for FY 2011 and the data that comprises this metric is still being populated.
- CSE Schedule Performance Index - This metric may provide an early warning that there is a mismatch between the budgeting process and performance on developing/revising CSEs. This is a new metric for FY 2011 and the data that comprises this metric is still being populated.

The performance as measured by the NCS metrics continues to show improvement in the areas of non-reportable issues (deficiencies, minor noncompliances, and field correctible issues). Issues in each of the three categories were down in comparison to the levels in FY 2010 and the total number of issues in FY 2011 is down slightly over 30% in comparison to FY 2010. Breakdown of the issues by operating area shows that the majority are occurring in Building 9212 with an average of just over five per month followed by Building 9204-2E with an average of just over two per month. Issues are binned by category and more issues are in the category of fissile storage than any other categories. Issues are also binned by cause and the most frequent cause is personnel error followed by equipment issues.

Metrics looking at closures of NCS items, both minor noncompliances (MNCs) and deficiencies, reveal that the improved levels achieved in FY 2010 are being maintained. At the beginning of FY 2010, there were 34 MNCs and deficiencies on the books open over 45 days. That number dropped to 10 by the end of FY 2010 and was only 12 at the end of FY 2011. In regards to issues identified as repeat deficiencies, only three deficiencies were identified as being a repeat of past events. The self-reporting metric showed excellent performance for the year with the vast majority of issues being identified by B&W personnel. The small group seminars metric showed very good performance with over 150 small group seminars performed throughout the year.

As of the end of FY 2011, there are only 2 open issues greater than one year old. In previous years, the trend for unplanned activities has been downward and in FY 2011, there were no unplanned activities.

Professional development of the NCS Engineering staff is being maintained at a level rated as excellent. Efforts have progressed on improving the quality of the CSEs written. CSEs evaluated for quality in FY 2011 scored consistently in a range rated as very good.

For FY 2011 the NNSA YSO has focused on review and refinement of the Y-12 NCS metrics set. YSO NCS oversight provides monthly contractor ratings (i.e., PAM reports) which include the Y-12 NCS Program CAS metrics as about a third of the performance rating. The current set of NCS CAS metrics for FY 2011 indicates continued improvement from the last reporting period. A couple of federal assessments of the Y-12 NCS CAS metrics were completed in FY

2011 and while generally positive did indicate the need for certain revisions and developments of new data measures for NCS process evaluation efficiency.

6.2. Contractor Nuclear Criticality Safety Engineer Programs

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 2011, there were twenty nine B&W Y-12 and twenty one subcontractor engineers practicing the NCS discipline including the Chief NCS Engineer. B&W Y-12 continues to pursue filling fulltime NCS engineer positions to reduce the current reliance on subcontractor engineers.

In FY 2011, Y-12 increased the number of CSEs that were revised as part of the CSE Upgrade Program, approving a total of ten upgraded CSEs in FY 2011. Y-12 plans to continue this effort and upgrade about as many CSEs in FY 2012.

The qualification status of the CS engineers is shown on the table below:

	B&W	Subs
Staff level, (Persons, not FTE):	29	21
Qualified Engineers in Training	97%	100%
Qualified CS Engineers	48%	52%
Qualified Senior CS Engineers	10%	Note 1
Process Reviews	76%	67%
NCS Evaluation and Documentation	19	81%
Implementing Documentation Approval	76%	67%
Computations	76%	95%
Computation Review	24%	43%
NCS Evaluation Review	28%	48%
Criticality Accident Alarm System Support	10%	Note 2

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

Y-12 will begin making changes to the NCS Training and Qualification Program in FY 2012 in order to strengthen the training for new engineers and make the structure of the program less rigid so that personnel can work on certain tasks for which they are qualified without having to become qualified in other tasks or facilities to which they are not assigned.

YSO reviews several NCS Program indicators relative to staffing adequacy from a perspective of staff maturity, stability, and adequacy to accomplish mission goals including field presence and response to off normal events. While in general considered adequate, it is clear that NCS engineering was pushed to the limit to accomplish FY 2011 evaluation upgrades and UPF support and so will require continued focus. Additionally the extensive use of sub-contracted resources continues to be of concern relative to building and retaining core expertise in the highly technical NCS engineering discipline.

6.3. Federal Nuclear Criticality Safety Engineer Programs

The federal NNSA Y-12 Site Office NCS staffing remains stable with one Sr. NCS Engineer augmented with one Future Leader Program (FLP) intern, 1.5 FTE on-site subcontracted NCS engineering support, and the assistance from the NNSA headquarters criticality safety staff. The 3.5 FTE on-site NCS FTEs for NNSA YSO are:

- YSO, Senior NCS Engineer: BSEE, BSNE, and MSNE, with twenty-nine years professional experience (with 14 years at Y-12).
- YSO, FLP intern: BSNE is scheduled to graduate from the DOE FLP program in 2014. He is currently training in the NCS and QA functional areas with YSO, and is scheduled to finish his last semester of the MSNE program at University of TN in Knoxville in the spring of 2012 and has passed his NE PhD qualifying exam.
- YSO, Support Service Subcontractor Resources: YSO retains the services of one Senior NCS Engineer reporting to the Sr. NCS Engineer, and 0.5 FTE dedicated NCS engineering support from a Nuclear Safety specialist reporting to the UPF project (Note: while this individual is full time at UPF, the other 0.5 FTE is focused on AB engineering support).

- NNSA headquarters continues to support YSO and is available for assist reviews and reactive technical assistance on an as needed basis.

This current level of specific YSO NCS engineering staffing, which is also augmented with YSO Facility Representative engineering support through dedicated NCS Field Observation assessments, is considered adequate for Y-12 given the site's CAS maturity and the current phase of the UPF project design.

6.4. Results and Any Lessons Learned From Federal Assessments of Criticality Safety

Formal YSO federal assessments, as documented on the DOE PEGASUS system, conducted of the Y-12 NCS program in FY 2011 include:

- 11 NCS program assessments using DOE standard 1158-2010 criteria – mainly in the Management and Supervisory Responsibilities areas;
- 32 NCS Program management field shadow assessments;
- 29 field walkthrough, event, and reactive assessments;
- 11 NCS evaluation and technical document reviews;
- 13 assessments of NCS program CAS elements - 7 of which were focused on NCS process evaluation operational reviews;
- 29 Facility Representative field NCS Observation assessments; and
- 1 NCS oversight program self-assessment.

Other federal assessment activities conducted in FY 2011 included:

- Weekly oversight of contractor NCS Improvement Program progress;
- Observance of contractors monthly NCS Advisory Council meetings;
- NCS program metrics status of development efforts; and
- Routine interface with contractor NCS engineering staff and field observances.

Results of federal assessment activity, as also provided to the contractor in monthly performance feedback reports (i.e., "PAM" reports), are in general very favorable for FY 2011. The contractor has performed exceptionally well in developing needed improvements in accordance with a documented project management plan with set milestones that provide a vision and sense of direction for the NCS program to address challenging site legacy issues that complicate daily fissile material operations. This is reflected in positive performance feedback ratings in the Engineering & Nuclear Safety area for FY 2011. However, while the assessments are in general positive, they also point out that a number of challenges and legacy issues remain.

Key results or lessons learned include:

(1) The four 9212 wet chemistry FY 2010 NCS process evaluation upgrades were a significant improvement with the credited implementation of the Primary Extraction system raffinate monitor and the elimination of the outdated and problematic 9818 tank and tankers evaluation, but were of varied quality and significant comments by YSO are being addressed by the contractor. These CSE upgrades having been completed in FY 2010 are not considered indicative of the newly revised evaluation process performance implemented under the FY 2011 NCS Improvement Plan. It is anticipated that the quality and consistency of these CSE upgrades will continue to improve as the contractors NCS staff matures with the newly improved process as espoused in the revision 1 CSE Writer's Guide released in September of 2011 (YAREA-F-0073 000 01).

(2) The conduct of fissile material operations remains a significant and perhaps the most challenging aspect of NCS program success. Several significant events in FY 2011 include the failure to follow basic procedure requirements that regardless complicating factors - does not meet the contractors or DOE expectations as outlined in monthly PAM reports.

(3) Legacy container and material handling issues remain a challenge as identified in recent birdcage accessories non-conformance issues and YSO assessment of batch card value consistency with accepted database records. Container simplification efforts to implement UPF container design strategy early in current processing areas is desired, but not yet funded.

(4) Assessment results of process condensate overflow event at the very end of FY 2010, 9212 isolation strategy assessment results, as well as a noted lack of progress in addressing process condensate issues indicate facility conditions in 9212 remain a significant challenge to the Y-12 NCS program. The contractor understands the significance of the 9212 isolation strategy issues as elevated by YSO earlier in the FY and is funding a project begun in FY 2011 and continuing into FY 2012 to improve isolation of out of service components from active processes. Needed process condensate upgrades for 9212 are not funded.

(5) UPF process studies for NCS are in general very well considered in both design methodology and progress at this stage of the UPF design. Assessments indicate significant design data needs remain for NCS and although clearly identified these should not be underestimated in terms of the needed work effort that remains. One area for example is relative to the chip size production based on the control of a set of parameters that has been demonstrated as being feasible. This successful demonstration however, should not be confused with the needed level of reliability required for a credited NCS control (i.e., and NCS process evaluation as opposed to a process study). See section 6.5 below for discussion of the NNSA vertical slice review.

(6) Assessments of operational reviews, discussions in following NCS Improvement plan implementation and progress, and an assessment of the 9212 pickling process PISA concerns identified earlier in the FY indicate that opportunities for early problem detection and rectification are being missed. The CSE operational review process is resource intensive, especially given the nature of some of Y-12 large legacy evaluations – most significantly the generalized container and storage area evaluations.

(7) Contractor NCS Management self-assessments reviewed while perhaps understated in significance of results do provide a noteworthy level of self introspection that should serve the NCS program well if continued and acted upon.

(8) Independent reviews of the contractor NCS committee are generally very positive. The committee is constituted at a very high level with the Deputy General Manager serving as the chair and includes recognized NCS expertise, Vice Presidents for Production and Engineering, etc. on staff. The development of a "top ten list" that includes key nuclear criticality safety program challenges is considered noteworthy. The review was also generally positive of the contractor CAS metrics and provided additional considerations for further improvements.

6.5. Results and Lessons Learned from Reviews of Proposed Nuclear Criticality Safety Controls and Design Requirements for New Facility Designs

Y-12 is currently designing a major new processing facility that will replace Y-12's aging enriched uranium processing facilities – the Uranium Processing Facility project. This is a high-profile project that has been reviewed several times during the FY. The following discussions provide brief summaries of those reviews and their lessons learned.

A team comprised of NNSA local and service center staff conducted a review, referred to as a "vertical slice review," of the UPF safety basis control set development process during January of 2011. As an integral part of the review, the team reviewed the criticality safety process studies (preliminary criticality safety evaluations) and the processes that are intended to integrate the criticality safety analysis with the design. The results from this comprehensive analysis state that the criticality safety process studies were well done and at the appropriate level of detail for the current stage of design. Specific comments on criticality safety process studies were received by the review team and tracked to monitor incorporation into the process studies. The overall results of this review, although not specific deficiencies related to NCS, emphasize the importance of maintaining a high level of involvement by NCS personnel in the design process and revising the criticality safety process studies on a frequent basis to keep up with the changing design. The current plans are to increase the NCS staff by a couple of FTEs during the final design phase of the project.

An outflow of the NNSA vertical slice review was the performance of a similar comprehensive vertical slice review conducted by B&W personnel. The purpose of the review was two-fold. The primary purpose was to determine whether the UPF project has adequately identified UPF safety SSCs in its safety basis documentation and whether these identified safety controls have been incorporated into the UPF process and facility design. Another intent of the review was to evaluate the adequacy of the safety basis documentation prepared for the UPF project and its compliance with applicable DOE requirements. Since the time of the NNSA vertical slice review, a criticality control review (CCR) document was developed and therefore included within the scope of the B&W review.

The overall conclusions of the B&W vertical slice assessment in the area of NCS are that the criticality safety process studies do identify appropriate safety controls needed to maintain subcriticality and have been prepared in accordance with applicable requirements. The report also concludes that the CCR document identifies appropriate criticality safety controls for elevation to the Preliminary Safety Design Report (PSDR) and has been prepared in accordance with applicable requirements. Several positive observations related to NCS are discussed below:

- The development and use of the criticality safety process study methodology continues to be noteworthy and to provide significant support to the development of the UPF design and safety basis.
- Several databases and collections of information have been created to facilitate consistency between criticality safety process studies and communication with other disciplines. These databases are being consolidated into one Access database which will be maintained and will be available to all NCS analysts for use.
- With minor exceptions, the criticality safety process studies reviewed show marked improvement from previous reviews in consistency in several areas related to presentation of information and the technical content of the analysis.

- The institution of multi-disciplinary kick-off meetings at the start of criticality safety process study revisions is a valuable tool for obtaining and sharing information and facilitating communication.
- All controls from the process studies are included in the CCR document. The UPF CCR goes beyond Y-12 site procedural requirements and includes all controls and their justification for whether or not to elevate to the PSDR. This facilitates confirming that all controls are addressed and that controls are appropriately elevated.

Other observations related to NCS are discussed below.

- The effects of the design basis fire on process equipment and structures needed to maintain structural integrity during a design basis fire to maintain criticality safety need to be defined.
- Thirteen observations and three positive observations of NCS were made in a 2010 internal management assessment. The thirteen observations were tracked by the Y-12 Issues Management System and of the thirteen, ten have been resolved. One of the closed observations was closed on the basis of new CCR criteria being developed and approved, but the procedures that implement the new criteria and methodology have yet to be approved. (As of the end of October 2011, the procedures implementing the new criteria and methodology are approved.)
- Presentation of controls and their wording in the criticality safety process studies was not entirely consistent where there are similar controls imposed by different criticality safety process studies (though improving).
- Comments made on specific criticality safety process studies during the NNSA vertical slice review have been satisfactorily resolved except for some of the general classified comments.

As mentioned previously, those comments from the NNSA vertical slice review not yet resolved are being tracked by the UPF NCS team. Although the current state of the Preliminary Fire Hazard Analysis does not allow for detailed analysis of the effects of a fire on fissile material and related equipment, the PFHA continues to be developed with an understanding for the need of the NCS team to identify areas of sensitivity and the PFHA analysts to identify what may or may not be damaged by a fire. Calculations that help define the sensitivity NCS to equipment deformation and water introduction have begun in early FY 2012. And finally, the UPF NCS team in conjunction with Engineering and Production support personnel continues to evaluate common NCS controls in the various process studies for consistent language (a database of all NCS controls is being used to facilitate this process).

The DOE CSSG was directed to perform a review of the Y-12 UPF project in regards to several topic areas associated with consideration for design basis events and the appropriateness of the NCS preliminary analyses that consider such events, with particular attention to the interaction of seismic design with criticality safety, including cost-benefit considerations.

With regard to the analysis of the design basis seismic event, the CSSG had positive remarks related to the development and use of an event tree assessment for the design basis seismic event to draw out additional functional requirements for the prompt, safe evacuation of the facility, and to prevent fires, explosions, and criticality accidents. The CSSG noted that this approach is considered as going beyond the minimum requirements for seismic safety as promulgated by DOE O 420.1B, DOE-STD-1189, ANSI/ANS - 2.26, ASCE/ SEI 43-05 and other natural phenomena hazards (NPH) orders and standards and is believed to be a noteworthy process improvement in implementing the requirements of DOE-STD-1189. The CSSG also

noted that use of the event tree assessment will only be effective if its recommendations are carried out by the project team.

The CSSG noted that the Safety Design Strategy is comprehensive and appropriately discusses nuclear criticality safety requirements and goals. They also noted that the development and updating of the criticality safety process studies is a positive contribution toward meeting DOE-STD-1189. The CSSG noted that although there is no requirement or guidance for criticality safety process studies, Y-12 is to be commended for generating these documents in support of the design effort.

With regard to the strategy of evaluating the design basis seismic event, the CSSG noted that the cost-benefit considerations leading to this strategy are not well documented but seismic qualification of fissile bearing equipment will be expensive and it should be justified as best it can be, realizing that it will involve professional judgment. The CSSG urges in their report that Y-12 include cost-benefit considerations in the criticality safety related seismic design process. To this goal, the UPF NCS team has begun performing calculations to help characterize the sensitivity of equipment deformation and water introduction to nuclear criticality safety.

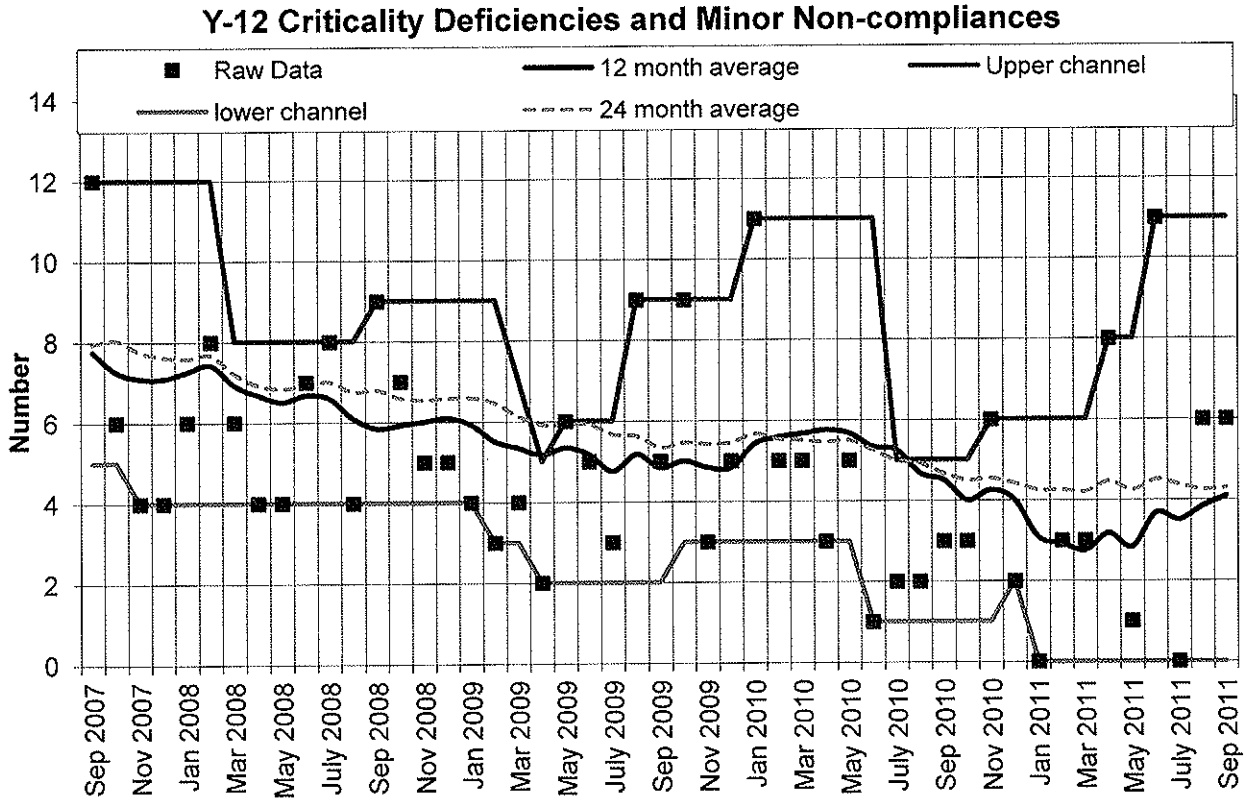
With regard to the consequence of a criticality accident, the CSSG notes that for purposes of determining the immediate evacuation zone, that use of a bounding accident of 10^{18} fissions within ten minutes is appropriate. The CSSG concludes that the criticality accident alarm system recommendations for the immediate evacuation zone and detector locations are appropriately conservative considering the maturity of the facility design and the criticality safety process studies. The CSSG concluded that the determination the CAAS does not require seismic qualification is appropriate given the supporting documentation and the strategy to evacuate after a seismic event.

YSO conducted several assessments of NCS process studies for UPF, and evaluated key UPF project documents such as the PSDR. The criticality safety process study (CSPS) reviews are discussed as item 5 in the section 6.4 above. The PSDR review in terms of the NCS program area included a criticality control review (CCR) methodology that pre-dated the development of a more consistent approach as is now approved in the Y-12 Criticality Safety Program document. Details of the NCS control strategy, although clearly evidenced in the CSPS documents reviewed and well summarized in section 5.1 of the same, was not acceptably included in the PSDR document. Several significant errors in the PSDR were also noted such as criticality accident characterization and double contingency principle discussions. It is believed these comments are understood and may be easily addressed as they do not represent cases where analyses or other intensive data needs to be developed.

6.6. Results of Trending and Analysis of Reportable and Non-Reportable Occurrences Related to Criticality

There were no reportable NCS (i.e., category 3C-1, 2) occurrences per DOE O 231.1A in 2011. There was one TSR violation occurrence in March of 2011 where a person entered a Criticality Accident Alarm System (CAAS) annunciation boundary during a CAAS outage without a required personal alarming dosimeter (category 3A-2). A management concern occurrence related to NCS was filed in July of 2011 when a CSE was made effective before the facility's operational safety board approved the change (category 10-2); no NCS requirements were violated.

The figure below shows the trending of NCS deficiencies and minor noncompliance infraction events over the past four FYs. The graphs show a continuing downward trend for infractions with a low reached in mid FY 2011. The trend for the last half of FY 2011 is being investigated by Y-12.



6.7. *Results of Follow-Up Reviews Undertaken by DOE to Assess Effectiveness of Corrective Actions and Improvements*

As reported last year, YSO meets weekly with the contractor to review progress made on implementing their NCS Improvement Program, and the execution of this program is considered key for Y-12 in achieving effective corrective action and needed improvements for the site NCS Program. An effectiveness review and this regular monitoring confirms the program's adequacy in addressing needed corrective action elements. The majority of these NCS Improvement Program milestones were achieved in FY 2011, and in time are expected to greatly improve program effectiveness and efficiency. FY 2012 will offer the first opportunity to assess some of these improvement initiatives accomplished in the FY 2011 period as staff and new management gain experience in working to the new NCS program methodologies. Lessons learned, which also include several Y-12 legacy conditions, are discussed in section 6.4 above.

6.8. *Open Issues from Last Year's Annual Report*

Key corrective action status items are as follows:

- The Y-12 Plant at the direction of Senior Management put together a Nuclear Criticality Safety Program Strategic Vision and Improvement Plan for Y-12 (Y/DD-1379) in response to identified weaknesses in the program. The plan has been communicated to the NNSA, both local and Washington, and the DNFSB Staff and has been very well received to this point.

The Plan details specific key goals, objectives, and tasks to move the program back to the level of operation expected by Plant Senior Management. Key goals defined in the plan;

1. Safe, Efficient, and Reliable Operations
2. Effective, Efficient, and Timely Deliverables and Services
3. Successful Learning Organization
4. Forward-Looking Organization
5. Organization Recognized for Excellence

As discussed previously, the Plan is being tracked to completion and is updated to Y-12 Site Office on a weekly basis. FY 2011 accomplished 63 of 67 specific program milestones with four items remaining for FY 2012: Development of retention strategy, Revision of criticality control review (CCR) process (accomplished as of the end of October 2011), Management assessment involving outside experts, and Refine CSE revision process based on previous milestone items. The plan is in the process of being evaluated by the new Safety Analysis Engineering Manager and will be revised to address improvement actions to accomplish in FY 2012.

- In last year's annual report, Y-12 reported that the raffinate monitor was in the final stages of testing and that results indicated that the monitor would reliably detect uranium concentrations that would present an immediate NCS concern downstream in unfavorable geometries. The testing of the monitor has been completed, the monitor is in operation, an active design feature requirement for the monitor is included in CSE-PX-069 Rev. 7 (an FY 2010 upgrade CSE), and the CSE is in effect.

- With regard to the action to destructively analyzing the floor in a solution processing are in 9212, all NCS evaluations and plans needed to perform the floor analysis have been completed. The project is on hold awaiting funding; funding approval is anticipated in FY 2012.

- With regard to the project to re-route the process condensate from the current basement storage safe tanks to other safe tanks in a large geometry exclusion control area, the design is nearly complete but funding for the project was not approved in FY 2011. The project remains on hold until funding for construction is identified.

7. Savannah River Site

7.1. Results and Lessons Learned from Reviews of Proposed Nuclear Criticality Safety Controls and Design Requirements for New Facility Designs

The Savannah River Site Office (SRSO) is not responsible for any operations involving fissionable materials. NA-26, Office of Fissile Materials Disposition is responsible for three nuclear facility projects at the Savannah River Site; the Mixed Oxide Fuel Fabrication Facility (MFFF), the Pit Disassembly & Conversion (PDC) Project, and the Waste Solidification Building (WSB). No detailed input for these NA-26 projects is provided based on the following logic:

1) MFFF - this facility is being licensed by the Nuclear Regulatory Commission and is not subject to 10 CFR 830 or DOE O 420.1B. Thus, though it possesses an inadvertent criticality hazard, it is inappropriate to include in this report.

2) PDC – FY 2011 activities for the project have focused on examining different programmatic alternatives to meet MFFF plutonium feed needs and on advancing associated pre-conceptual design alternatives. While criticality safety issues were considered during these activities, this has occurred at a very high and strategic level. Currently, the department is planning to make a preliminary alternative selection decision in the early part of FY 2012. Given the FY 2011 activities conducted and the uncertainty associated with the project, it seems there is little value for including any more detailed input for this project for the FY 2011 report.

3) WSB - This project is intended to handle waste streams from the previous two facilities. Based on the currently defined feed streams, an inadvertent criticality is not considered credible.

FY 2011 Annual Report on Nuclear Criticality Safety Programs Office of Environmental Management

A Defense Nuclear Facilities Safety Board (DNFSB) letter, dated January 29, 2008, (A. J. Eggenberger to J. C. Sell) requested that answers to specific subject areas related to Nuclear Criticality Safety (NCS) be included in the Department of Energy (DOE) Annual Report on NCS Programs. Information on these topics is provided below for Environmental Management (EM) sites. The Office of Environmental Management (EM) has 16 contractors at six field sites that required NCS programs. This is the fourth annual report.

The following is a brief summary on each requested topic for the EM complex. In Part I, II and III of the following table is the matrix summarizing the requested topic information with lines of inquiry at the various EM sites. Also attached are sixteen (16) detailed reports submitted by the EM site offices. Individual site reports are included as attachments.

Measure of Nuclear Criticality Safety Performance

All operational EM contractors are measured against established performance metrics. The performance compared to these metrics is generally adequate but requires some improvement. In addition, contractor performance in criticality safety is periodically assessed by internal and external organizations. These assessments typically result in corrective actions, which lead to improved criticality safety performance.

Contractor Criticality Safety Staffing

The EM contractor criticality safety staff level varies widely from 1 to 26, depending primarily on the scope and size of the nuclear operations. There are periodic shortages and the shortfall is typically made up by recruiting new hires or by technical support from subcontractors. Several of the contractors are now recruiting staff as a contingent action. With the exception of the Portsmouth office, the Federal oversight groups have assessed and affirmed that the current level of staffing is adequate for the current workload. The gaps in staffing at Portsmouth are being addressed via overtime and the contractor is actively recruiting additional resources.

Federal Criticality Safety Staffing

The Federal staffing levels are generally judged to be adequate. The Savannah River Operations Office, however, has two qualified staff solely assigned to criticality safety and one undergoing the qualification process rather than the four in their staffing plan, although they get occasional assistance from two qualified staffers currently in other positions and one new staff is anticipated in December, 2011. They also get periodic support from members of the Criticality Safety Coordinating Team. The Richland Operations Office RL has a Memorandum of Understanding with the Occurrence Reporting Process for NCS support until the RL SME is fully qualified. Additionally, the Office of River Protection (ORP) is increasing their staffing through having one individual currently in training, achieving qualification.

Federal Assessments of Sites' NCS Programs

EM Headquarters (HQ) assessments of the NCS programs have been conducted for EM sites. The Findings, Recommendations and most of the Opportunities for Improvements resulted in Corrective Action Plans. In addition, site led assessments of NCS programs are performed and these result in corrective actions. The results and common elements of these assessments are shared at meetings of the Federal Criticality Safety Coordinating Team and at the EM-sponsored NCS Workshops. The contractors' self-assessments evaluated were considered

adequate with some caveats. The criticality safety evaluations assessed in these activities are generally adequate. Although some HQ assessments recommended that the NCS safety basis needed updating. All the site programs evaluated were consistent with Federal and industry requirements.

New Facility Design

There are a number of new designs at the EM sites and each received a review by nuclear criticality safety staff. The general lesson learned is that the earlier the criticality safety input is received, the better.

Trending and Analysis of NCS Occurrences

Each of the sites has a process to identify, record, track, and trend NCS occurrences. The results of the information and analysis are used to focus management attention and resources on solving the identified issues. The issues are usually related to Conduct of Operations.

Follow-Up to Assessments

NCS assessments by HQ, field/site offices, or contractors identified criticality safety issues and opportunities for improvement that resulted in corrective actions. Those actions are tracked to closure. Follow-up assessments are conducted as necessary to verify completion of corrective actions and evaluate the improvement in the criticality safety program.

The EM point of contact for this report is Robert Wilson, (303) 236-3666.

Matrix of EM Site Response to DNFSB Special Topics (Part I)

Contractor	CH2M-Hill Plateau Remediation Company	Washington Closure Hanford	Bechtel National Inc. Waste Treatment Plant	Washington River Protection Solutions Tank Farms	LATAKY Paducah	FBP-B&W Portsmouth
Field Office	**Richland**	**Richland**	**River Protection**	**River Protection**	**PPPO**	**PPPO**
1. Measure of Contractor NCS Performance						
a. Have metrics been established to monitor contractor performance?	Yes	Yes	No, facility far from operational	Yes	Yes	Yes
b. If so, what are the metrics?	Nonconformances and closure of corrective action	Nonconformances and closure of corrective action	N/A	Nonconformances and closure of corrective action	See Att. 5	See Att. 6
c. If so, what is the contractor's record?	Acceptable, see Att. 1	Acceptable, see Att. 2	N/A	Acceptable	Acceptable	Acceptable
d. If no metrics have been established, what is the method of monitoring performance?	N/A	N/A	The Preliminary Criticality Safety Evaluation Report (CSER) receives RL approval	N/A	N/A	N/A
e. What is the conclusion on contractor performance and what is the basis?	Acceptable Oversight	Acceptable Oversight	Acceptable Oversight and CSER approval	Acceptable Oversight	Acceptable Oversight	Acceptable Oversight
f. What actions have been taken to improve contractor performance?	Surveillances and corrective actions	Surveillances and corrective actions	Corrective action from EM 09 assessment and Conditions of Approval (COAs) from SER	Surveillances and corrective actions	Meetings	Meetings and NCS document reviews
2. Contractor Criticality Safety Engineer Program						
a. How many NCS staff needed?	16	1	3.5	4	0.5	12
b. How many are there?	16	1 part time + 1 being qualified	3.5	4	0.5	7
c. Actions to address shortfall, if any?	N/A	N/A	N/A	N/A	N/A	Overtime, contracting and recruiting
d. Has DOE Field Management affirmed adequacy?	Yes	Yes	Yes	yes	Yes	See Att. 6

3. Status of Federal Criticality Safety Oversight Program						
a. How many NCS staff is needed?	1		3		0.1	3
b. How many are there?	One being qualified		3 fully qualified, 1 in training		0.1	3
c. Actions to address shortfall, if any?	Support from ORP		N/A		N/A	N/A
d. Has DOE Field Management affirmed adequacy?	Yes		Yes		Yes	Yes
4. Federal Assessments of Site NCS Programs						
a. What NCS assessments have been performed?	See Att. 1	See Att. 2	ORP & 09 Criticality Safety Support Group (CSSG) assessments	See Att. 4	See att. 5	See Att. 6
b. What corrective actions were taken as a result of these assessments?	See Att. 1	See Att. 2	See Att. 3	See Att. 4	N/A	See Att. 6
c. What lessons learned were developed?	Quality Assurance of CSERs	N/A	None	None	None	None
d. Were the contractor's self-assessments evaluated for adequacy? What was the conclusion?	Yes/adequate	Yes/adequate	N/A No operational facility	Yes/adequate	Yes/adequate	See Att. 6
e. Are criticality safety evaluations deemed adequate?	Yes	Yes	Yes	See Att. 4	Yes	Yes
f. Is the NCS program consistent with requirements?	Yes	Yes	Yes	Yes	Yes	Yes
5. New Facility Design						
a. Are any facilities being designated that will need a criticality safety program?	No; however new operations are planned	No	Yes	yes	No	No
b. Have these received a criticality safety design review by anyone?	N/A	N/A	Yes	yes	N/A	N/A
c. If so, what are the lessons learned? How were these lessons communicated?	N/A	N/A	N/A	none	N/A	N/A

6. Trending and Analysis of Reportable and Non-reportable Nuclear Criticality Occurrences						
a. How are NCS occurrences tracked and trended?	See Att. 1	See Att. 2	N/A	See Att. 4	See Att. 5	See Att. 6
b. Are leading and lagging indicators used to access the program?	No	No	No	No	No	No
c. What were the results?	See Att. 1	See Att. 2	N/A	See Att. 4	See Att. 5	See Att. 6
d. How were the results used to improve performance?	See Att. 1	N/A	N/A	N/A	See Att. 5	See Att. 6
7. Follow-Up to Assessments						
a. What prior assessments received a follow-up review?	See Att. 1	See Att. 2	See Att. 3	N/A	See Att. 5	See Att. 6
b. Were the corrective actions effective?	See Att. 1	See Att. 2	N/A	N/A	N/A	See Att. 6
c. Status of design projects	None	None			N/A	N/A
8. Open issues from past reports						
	None	None	See Att. 3	none	none	See Att. 6

Matrix of EM Site Response to DNFSB Special Topics (Part II)

Contractor	BWCP Paducah/ Portsmouth	Idaho Cleanup Project (CWI)	BBWI AMWTP	WAI	UCOR
Field Office	**PPPO**	**Idaho**	**Idaho**	**Oak Ridge**	**Oak Ridge**
1. Measure of Contractor NCS Performance					
a. Have metrics been established to monitor contractor performance?	See Att.7	Yes, see Att.8	Yes, see Att.9	Yes	Yes
b. If so, what are the metrics?	N/A	Severity and Adversity Indexes	A nuclear safety index number which includes criticality and nuclear safety violations	Anomalous condition Reports (ACR),	New ACRs, 12 month rolling average to close
c. If so, what is the contractor's record?	N/A	Acceptable	Acceptable	Acceptable	Acceptable
d. If no metrics have been established, what is the method of monitoring performance?	See Att. 7	N/A	N/A	N/A	N/A
e. What is the conclusion on contractor performance and what is the basis?	Acceptable	Acceptable/ Oversight	Acceptable/ Oversight	Acceptable/ Oversight	Acceptable/ Oversight
f. What actions have been taken to improve contractor performance?	N/A	Self-Assessments develop contractor identification of path for improvement	Self-Assessments develop contractor identification of path for improvement	N/A	N/A
2. Status of Contractor Criticality Safety Engineer Program					
a. How many NCS staff are needed?	0.5	3	5	3	9
b. How many are there?	0.5	3	5	2 Part Time Employees (PTE), 1 program mgr	9 Full Time Employees (FTEs)
c. Actions to address shortfall, if	N/A	N/A	N/A	N/A	N/A

any?					
d. Has DOE Field Management affirmed adequacy?	Yes	Yes	Yes	Yes	Yes
3. Status of Federal Criticality Safety Oversight Program					
a. How many NCS staff are needed?	0.1	3		2	
b. How many are there?	0.1	EM (1) and Quality Safety Division (QSD) (2)		1 FTE, 1 PTE	
c. Actions to address shortfall, if any?	N/A	N/A		N/A	
d. Has DOE affirmed adequacy?	Yes	Yes		Yes	
4. Federal assessment of Site NCS Program					
a. What NCS assessments have been performed?	See Att. 7	Quarterly surveillances	Quarterly surveillances	Biennial STD- 1158 assessments	Quarterly surveillances, ISMS Assessment
b. What corrective actions were taken as a result of these assessments?	See Att. 7	N/A	N/A	CA on accountability, Storage, chain of custody	None required
c. What lessons learned were developed?	N/A	None	none	None	None
d. Were the contractor's self-assessments evaluated for adequacy? What was the conclusion?	N/A	Yes/ Adequate	Yes/ Adequate	Yes/ Adequate	Yes/ Adequate
e. Are criticality safety evaluations deemed adequate?	Yes	Yes	Yes	Yes	Yes
f. Is the NCS program compliant?	See Att. 7	Yes	Yes	Yes	Yes
5. New facility Design					
a. Are any facilities being designed that will need a criticality safety program?	No	No, the Integrated Waste Treatment Unit will not need NCS program	No	Cask Process Enclosure	No

b. Have these received a criticality safety design review by anyone?	N/A	yes	N/A	No design feature effect NCS	N/A
c. If so, what are the lessons learned? How were these communicated?	N/A	N/A	N/A	N/A	N/A
6. Trending and Analysis of Reportable and Non-reportable Nuclear Criticality Occurrences					
a. How are NCS occurrences tracked and trended?	See Att. 7	NCS program tracks and trends non reportables	ORP system used	NCS Program (ACR) and ORPS system	NCS Program (ACR) and ORPS system
b. Are leading and lagging indicators used to assess the program? If so, what are they?	No	Yes, see Att. 8	Yes/ Nuclear safety Index (See Att. 9)	No data to trend	Yes/ New ACRs trended as leading indicators, time to close ACRs as lagging indicator.
c. What were the results?	N/A	The trends affirm current program	No trends identified	N/A	No new trends identified
d. How were the results used to improve performance?	N/A	N/A	None	N/A	N/a
7. Follow-up to Assessments					
a. What prior assessments received a follow up review?	N/A	No issues to track	No issues to track	none	None
b. Were the corrective actions effective?	N/A	N/A	N/A	N/A	N/A
c. Status of design projects.	Complete	N/A	N/A		
8. Status of Open Items					
	N/A	none	None	none	None

Matrix of EM Site Response to DNFSB Special Topics (Part III)

	ISOTEK	SEC	Savannah River Nuclear Solutions	Savannah River Remediation	Parsons
	Oak Ridge	**Oak Ridge**	**Savannah River**	**Savannah River**	**Savannah River**
1. Measure of contractor NCS Performance					
a. Are metrics established to monitor contractor NCS performance?	Yes	Yes	Yes	Yes	No, facility far from operational
b. If so, what are the metrics?	timely closure of Condition Reports; completion of NCS assessments	Number of ACRs	See Att. 14	See Att. 15	N/A
c. If so, what is the contractor record?	Acceptable	Acceptable	See Att. 14	See Att. 15	N/A
d. If no metrics have been established, what is the method of monitoring performance?	N/A	N/A	N/A	N/A	Design Reviews
e. What conclusion on contractors NCS program performance and what is the basis?	Acceptable based on oversight	Acceptable based on oversight	Adequate based on metrics and assessments	Adequate based on metrics and assessments	Adequate
f. Actions have been taken to improve contractor's NCS Performance?.	N/A	N/A	See Att. 14	See Att. 15	N/A
2. Status of Contractor Criticality Safety Engineer Program					
a. How many NCS staff are needed?	6	2	Current staff minimally adequate	4	2
b. How many are there?	4 FTE, 1 lead, 1PTE	2 PTE	11 senior CSEs, 7 CSEs, 6 in training	3 senior engineers and 1 in training	1 full time senior engineer and 1 part time
c. Actions to address shortfall, if any?	N/A	N/A	Recruitment and subcontractors	N/A	N/A

d. Has DOE management affirmed adequacy?	Current and planned staffing are adequate for Operations scheduled to begin in 12/2011	Yes	Yes	Yes	Yes
3. Status of Federal Criticality Safety Oversight Program					
a. How many NCS staff are needed?	2		4		
b. How many are there?	1 FTE, 1PTE		2 NCS qualified		
c. Actions to address shortfall, if any?	N/A		New hire to start 12/11. 2 other staff are backup.		
d. Has DOE Field Management affirmed adequacy?	Yes		No		
4. Federal Assessment of Site NCS Programs					
a. What NCS assessments have been performed?	Management Assessment of NCS Program using DOE-STD-1158 criteria	Management assessment of NCS at ORNL Bldg 3038	50 NCS assessment by SRO	4 NCS assessment by SRO	Review of NCS Program Descriptive document
b. What corrective actions were taken as a result of these assessments?	Procedure revisions and training to clarify process for implementation of CSEs.	None required	See Att. 14	See Att. 15	None
c. What lessons learned were developed?	None	None	See Att. 14	See Att. 15	None
d. Were the contractor's self-assessments evaluated for adequacy? What was the conclusion?	Yes/Adequate	Yes. Adequate	Yes. See Att. 14	Yes, See Att. 15	N/A
e. Are criticality safety evaluations deemed adequate?	Yes	Yes	Yes	Yes	Yes
f. Is the NCS program consistent with requirements?	Yes	Yes	Yes	Yes	Yes

5. New facility Design					
a. Are any facilities being designated that will need a criticality safety program?	Design completed for proposed Dissolution and Downblending Project but Design on hold.	No	Yes	Yes	Yes
b. Have these received a criticality safety design review by anyone?	Dissolution and Downblending design received NCS design review	N/A	See Att. 14	See Att. 15	See Att. 16
c. If so, what are the lessons learned? How were these lessons communicated?	N/A	N/A	See Att. 14	See Att. 15	See Att. 16
6. Trending and Analysis of Reportable and Non-reportable Nuclear Criticality Occurrences					
a. How are NCS occurrences tracked and trended?	The Contractor's Condition Reporting (CR) process is used to track and trend NCS-related issues.	ACRs and ORPS system	See Att. 14	See Att. 15	N/A
b. Are leading and lagging indicators used to access the program?	Insufficient data to trend	Insufficient data to trend	See Att. 14	See Att. 15	N/A
c. What were the results?	N/A	N/A	See Att. 14	See Att. 15	N/A
d. How were the results used to improve performance?	N/A	N/A	See Att. 14	See Att. 15	N/A
7. Follow-up to Assessments					
a. What prior assessments received a follow-up review?	None	New program	See Att. 14	None	None
b. Were the corrective actions effective?	N/A	N/A	Yes	N/A	N/A
c. Status of design projects	See Att. 12	N/A	Adequate	Adequate	Adequate
8. Status of Open Items					
	N/A	N/A	N/A	N/A	N/A

Attachment 1
CH2MHill Plateau Remediation Company (CHPRC)
Criticality Safety Program

Field/Site Manager: Matt McCormick NCS POC: Paul Macbeth

1. Measure of Contractor Nuclear Criticality Safety (NCS) Performance

The metrics utilized to monitor contractor NCS performance include:

1) Number and Type of Criticality Safety Non-conformances Reported. These range from internally managed "discrepancies" to loss of contingency events reportable through ORPS.
2) 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.
3) RL requires a review of the root causes of the nonconformance events and an assessment of trends whether negative or positive.

Effect on performance

The CHPRC has experienced 12 nonconformance events in the past year. Three nonconformance events were reported at the K West Basin, one nonconformance event was recorded at the Waste and Fuels, and eight nonconformance events were reported at the Plutonium Finishing Plant (PFP).

A significant nonconformance at PFP arose when NDA measurements were conducted as a prerequisite for planned Decontamination and Decommissioning (D&D) activities and identified over 1 kg of plutonium distributed in a six-inch diameter pipe within the 291-Z facility. The discovery of significant fissile material in the facility, previously thought to not contain any fissile material, led to a PISA declaration. A review of the as-found condition led to the determination that double contingency was still maintained. A criticality safety evaluation report was subsequently generated to document that a criticality accident was not credible within this facility.

The nonconformances identified this fiscal year have not had any significant impact on operations. While significant effort went into the recovery from the discovery of a significant quantity of fissile material in the 291-Z building at PFP, the impact on operations was not significant.

CHPRC instituted a number of corrective actions to improve CSER development in FY2010 and FY2011. No issues were identified with CSERs during this past fiscal year.

Field Office assessment of NCS program performance

The operational record has been good from the perspective of reportable nonconformance events in criticality safety, largely because of the reduction in work scope involving significant quantities of fissile materials. The decentralization of the criticality safety function reported last year has not adversely affected safety performance, and the contractor is currently re-centralizing the criticality safety program staff reporting. Operational performance in criticality safety is measured against the record of actual hours worked in handling fissile materials. Recent funding increases due to American Recovery and

Reinvestment Act work have resulted in a significant ramp-up in D&D activities in high-risk facilities - particularly at the Plutonium Finishing Plant. The work however, involves removal of equipment and gloveboxes that have been largely de-inventoried. As a result, the criticality safety controls are becoming less restrictive and provide operations with significantly more flexibility than they have had in the past. CHPRC continues to self-identify, report, and correct criticality safety issues at a relatively low level. This is an excellent practice as it tends to identify safety issues early and allows implementation of changes before the issues become larger problems.

It should be noted that the last work scope that potentially involves more significant quantities of fissile material holdup at the PFP (removing pencil tanks from the Plutonium Reclamation Facility) has begun but is not yet complete. RL expects that there could be a corresponding increase in nonconformance events due to the nature of the work and the complexity of the safety controls.

The RL criticality safety Subject Matter Expert (SME) provided oversight during the year to contractor activities, reviewed all potential nonconformance reports for adequacy and reviewed changes to the CHPRC criticality safety program documentation. Additionally, several oversight activities were conducted by the RL criticality safety SME and recorded in the Operational Oversight Database system. These included participation in contractor self assessments and responses to DNFSB concerns.

2. Status of Contractor Criticality Safety Engineer Staffing

The CHPRC criticality safety (CS) staff during most of FY-2011 included one Manager, nine qualified CS Engineers and one CS Engineer undergoing qualification, six qualified Criticality Safety Representatives (CSRs) (two are also qualified CSEs) and two CSRs undergoing qualification. At the end of the fiscal year the CHPRC criticality safety staff was reduced to six qualified CS Engineers, four qualified CSRs (two are also qualified CSEs) and one CSE undergoing CSR qualification. Given the planned reduction in fissile work for FY 2012, this is considered adequate but minimum staffing.

3. Status of Federal Criticality Safety Oversight Program

The Richland Operations Office presently is in the process of qualifying a Federal Criticality Safety Engineer. Additionally, through an MOA with the Office of River Protection, a qualified senior Federal CSE is available to support RL on an as-requested basis. A single qualified Federal CSE at RL has been the norm for approximately the past decade. It does not appear that additional support beyond that is necessary in the near future.

4. Federal Assessments of Site NCS Programs

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.

Four 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 criticality safety training and implementation of controls. Thirteen Work Site Assessments were also conducted to look at criticality safety related issues at K Basins, PFP, Waste and Fuels, other facilities

implementing the criticality safety program, and program documentation. A number of opportunities for improvement and no findings resulted from the four management assessments. These included updating procedures to reflect current criticality safety training and other programmatic requirements. These are currently being addressed.

DOE-RL participated in portions of these 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.

5. New Facility Design

There are no new facilities being designed within the CHPRC that will require a criticality safety program. There are however, new projects that fall under the established criticality safety program that will require criticality safety support for design. The Sludge Treatment Project (STP) required modification of K-West Basin to support planned sludge processing. This effort is in the final design phase. The STP project has been assigned contractor CSE support.

6. Trending and Analysis of Reportable and Non-reportable Nuclear Criticality Occurrences

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. With the implementation of Revision 19 of HNF-7098, Criticality Safety Manual, all potential nonconformances will be entered into CRRS (beginning in FY2011). Additionally, 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. Because the last posting/labeling nonconformance at PFP was in April, it appears that the corrective actions implemented by PFP have been effective.

As reported above, the CHPRC has experienced 12 total nonconformance events in the past year. (Attachment)

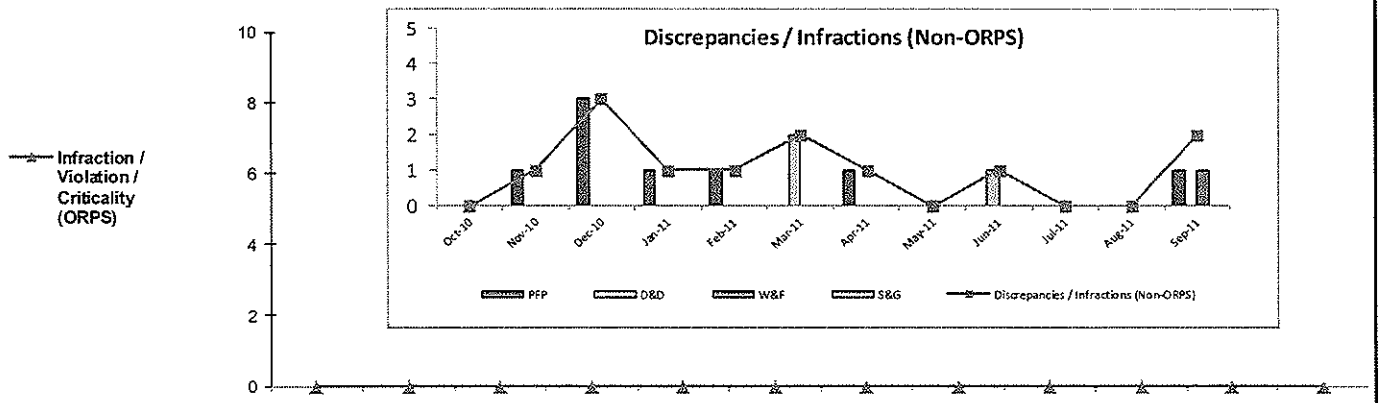
7. Follow Up to Assessments

At CHPRC, all actions arising from the previous year's management assessment are reviewed during the current year's management assessment. As there were no open action items in FY2010, no follow-up review was necessary during FY2011.

8. As applicable, provide status of any open issues identified in previous reports.

Presently there are no open issues.

CHPRC Criticality Safety



	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11
PFP	0	1	3	1	1	0	1	0	0	0	0	1
D&D	0	0	0	0	0	2	0	0	1	0	0	0
W&F	0	0	0	0	0	0	0	0	0	0	0	1
S&G	0	0	0	0	0	0	0	0	0	0	0	0
Discrepancies / Infractions (Non-ORPS)	**0**	**1**	3	**1**	**1**	**2**	**1**	**0**	**1**	**0**	**0**	**2**
Infraction / Violation / Criticality (ORPS)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
ORPS Fiscal Year Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Definition	**Analysis / Action**
Nonconforming criticality safety conditions identified, entered into the Potential Criticality Nonconformance Checklist in accordance with project specific procedures and tracked by program management (ORPS and Non-ORPS levels).	**Fiscal Year 2011 Summary**

Goal	**Zero Events**	Goal is based on number of ORPS events per Fiscal Year
Blue	0	
Green	1 - 2	
Yellow	3	
Red	≥ 4	

Attachment 2
Washington Closure Hanford (WCH)
2011 Criticality safety Program

Field/Site Manager: Matt McCormick NCS POC: Paul Macbeth

1. Measure of Contractor Nuclear Criticality Safety (NCS) Performance

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.

Effect on performance

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. Minor discrepancies have been identified in the past with regard to programmatic aspects. However, none were reported this fiscal year.

Field Office assessment of NCS program performance

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

2. Status of Contractor Criticality Safety Engineer Staffing

WCH retains a single dual-qualified CSR/CSE who provides support on a part-time basis. An additional criticality engineer is employed by WCH in the engineering department although he has responsibilities outside of the criticality safety discipline. WCH is in the process of completing the required documentation to qualify this additional criticality engineer as a CSR/CSE.

3. Status of Federal Criticality Safety Oversight Program

The Richland Operations Office presently is in the process of qualifying a Federal Criticality Safety Engineer. Additionally, through a Memorandum of Agreement (MOA) with the Office of River Protection, a qualified senior Federal CSE is available to support RL on an as-requested basis. A single qualified Federal CSE at RL has been the norm for approximately the past decade. It does not appear that additional support beyond that is necessary in the near future.

4. Federal Assessments of Site NCS Programs

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 conducted a programmatic management assessment covering their present and planned waste retrieval work in and near the 300 Area. The key element of this review was taken from the WCH Criticality Safety Program requirement that no activities are authorized or conducted in the 324 Facility that would result in increasing the fissile material in the facility above a minimum critical mass. During the year significant contamination was discovered under the floor of the 324 B Cell. The sample results are just becoming available, but the Unreviewed Safety Question review conservatively estimated that the increase in fissile mass was not significant. Once the inventory is evaluated, a revision to the criticality screening for the 324 Facility will be updated to reflect the increased inventory. No significant findings resulted from this assessment. The DOE-RL criticality safety engineer reviewed this management assessment report for completeness and adequacy of corrective actions.

5. **New Facility Design**

   There are no new facilities being designed within WCH that will require a criticality safety program.

6. **Trending and Analysis of Reportable and Non-reportable Nuclear Criticality Occurrences**

   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.

7. **Follow Up to Assessments**

   There were no open items from previous years requiring follow-up assessment activities at WCH.

8. **As applicable, provide status of any open issues identified in previous reports.**

   Presently there are no open issues.

Attachment 3
Bechtel National Inc.
Waste Treatment Plant

Field Office Manager: Scott Samuelson NSC POC: Tom Nirider

1. Measure of Contractor Nuclear Criticality Safety (NCS) Performance

As reported for FY 2010, the Waste Treatment Plant (WTP) project has not advanced to the point where performance metrics specific to operations have been implemented. The project is approximately at 60% completion. However, performance metrics specific to the production 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 should be implemented prior to project completion. The Office of River Protection, Nuclear Safety Division is presently developing a criticality safety program and is actively training nuclear safety staff as Federal Criticality Safety Engineers. As the project nears completion and the program develops it will incorporate the programmatic features necessary to conduct oversight of the operating WTP facility. Among those features are; development of appropriate performance metrics applicable to safety documentation, training, assessments, and problem resolution, as well as a Field Office Oversight and Assessment Plan addressing criticality safety.

ORP and CSSG assessments of the WTP criticality safety program were conducted in 2008 and 2009 (refer to section 4, below). The contractor has prepared and revised several times the, "Preliminary Criticality Safety Evaluation Report" (PCSER), but has not issued a revision that addresses the presence of PuO2 particle size distribution greater than 10 microns, preferential settling of PuO2 particles in process vessels, sampling nonrepresentativeness, and the COAs addressed in the 2009 safety evaluation report. DOE-ORP approval of this CSER has been documented in a Safety Evaluation Report (SER) written in 2009. This SER, however, contains nine conditions of acceptance (COAs). These COAs are currently being tracked to completion. Six of the COAs pertain to the Preliminary Documented Safety Analyses (PDSA), while the remaining three will require resolution by the time the DSA is finalized. There has not been significant progress in resolving these issues during the past year due largely to several significant technical issues and scheduling problems.

2. Status of Contractor Criticality Safety Engineer Program

Bechtel National, Inc. (BNI), the Contractor responsible for construction of the WTP, retains two qualified criticality safety engineers who have been with the WTP project for several years. One Bechtel criticality engineer is full-time, a second provides support part-time. In addition, two additional staff members are progressing through the criticality safety engineer qualification process. Progress toward qualifying these two additional engineers continues. Of significance is that BNI sponsored a one-week training program in MCNP during the month of October 2011. This class was well-attended both by contractor and DOE personnel.

A criticality safety assessment of WTP was completed by WTP ORP staff in January 2008. A final assessment report was issued to Bechtel National, Inc. in April 2008. It is anticipated that another assessment will be conducted in the next two years. Additionally, ORP will review and approve revisions to the Criticality Safety Evaluation Report for WTP.

Contractor staffing is presently adequate to support design and construction of the WTP. As mentioned above, BNI continues to work toward qualification of additional staff in criticality safety. The BNI radiation safety organization employs several engineers who conduct Monte Carlo N-Particle (MCNP) modeling. These resources will be utilized in addressing

problems specific to criticality safety in support of a major revision to the PCSER revision (estimated completion is June, 2012).

3. Status of Federal Criticality Safety Oversight Program

Criticality safety resides within the ORP nuclear safety division. All qualified Federal Criticality Safety Engineers (CSEs) 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. Two nuclear safety specialists have recently qualified as Federal CSEs. These two staff members have responsibility for oversight of the Tank Farms nuclear criticality safety program, but are available to assist with WTP criticality safety issues as needed. A second WTP nuclear safety specialist has begun working toward qualification as a Federal CSE. The ORP goal is to have a total of 4 federal staff qualified as CSEs to oversee ORP 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.

4. Federal Assessments of Site NCS Programs

There were no formal assessments of the contractor criticality safety programs conducted during FY 2011. ORP conducts assessments of the criticality safety programs on an as-needed basis because WTP is not an operating facility. The previous assessment conducted by ORP staff was completed April 2008. The report contained three findings. Corrective actions have subsequently been implemented.

In 2010, the WTP Contractor submitted the WTP Criticality Safety Program description document to ORP for approval as required by DOE O 420.1B. ORP evaluated the program description documented and approved it. This approval closed one of the nine COAs issued in the SER for the WTP CSER described in Item #1.

Additionally, as reported previously, in December 2008, the DOE Criticality Safety Support Group (CSSG) conducted a review and assessment of the WTP Criticality Safety Evaluation Report (CSER). The CSSG reported no major findings, but recommendations and areas for improvement were documented.

In 2009, the ORP federal CSE conducted a review of the WTP CSER and issued a Safety Evaluation Report (SER) conditionally approving the document with nine (9) conditions of acceptance (COA). The WTP contractor is currently in the process of resolving the COAs. The ORP criticality safety engineer is working closely with the contractor and is tracking the closure of these issues. Notably, the DOE CSSG assessment recommendations and areas for improvement were incorporated into the COAs written for the ORP SER. Progress on closure of the COAs has slowed due to several technical challenges (e.g., presence of PuO2 particles greater than 10 microns, preferential settling of heavy PuO2 particles in WTP process vessels, and pulse jet mixer design issues to ensure adequate vessel bottom clearing) which have caused the Criticality Safety Evaluation Report revision to be rescheduled until July, 2012.

5. New Facility Design

When it becomes operational, the Waste Treatment Plant Project will require Technical Safety Requirement level criticality safety controls, evaluations, and programs. Criticality safety considerations are being included in the facility design. Criticality safety evaluations addressing the process flow, process chemistry, and safety of operations have been developed, and continue to be updated with process design changes. Facility designs have

incorporated these basic control concepts. The contractor maintains and updates a Preliminary Criticality Safety Evaluation Report addressing the safety of operations and processes from a criticality safety perspective.

A significant lesson learned from ORP oversight to date is that federal criticality safety engineers and WTP federal engineering division staff personnel must be actively involved with the contractor design changes and how they affect the CSER. Also, closer coordination between ORP and WTP contractor NCS staff is necessary in order properly review and assess design changes that potentially affect criticality safety. Staff training plans at ORP are addressing these issues directly. ORP has recently added a qualified Federal criticality safety engineer, and two ORP nuclear safety specialists have recently qualified as CSEs. ORP has scheduled regular interface meetings with BNI criticality safety. These meetings have proven to help close the communication and coordination gaps.

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; sample non-representativeness, effect of co-precipitated plutonium and metal absorber agglomerations, the effects of gravity segregation and preferential settling of heavy particles such as PuO_2, solids accumulation in process vessels, and particle size distribution. These are being tracked through DNFSB commitments to Recommendation 2010-2, *Pulse Jet Mixing at the Waste Treatment and Immobilization Plant*, to closure.

In February, 2011, Washington River Protection Solutions (WRPS), the contractor operating the Tank Farms, WRPS, declared a PISA associated with the presence of large, dense Pu-oxide particles previously unidentified in tank wastes. The issue is summarized below:

- Mixing studies conducted by WTP indicated that large dense particles (>10 micron and >8 g/cc) will not remain suspended in certain process vessels.
- A study commissioned by the WTP and released in January concluded that there was a possibility for plutonium 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 farms wastes destined for processing within the WTP.
- WRPS determined that these finding affected their operations (mixing, waste transfer) a PISA was declared and certain operations 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 (Fe, Cr, and Ni) as assumed in previous criticality safety evaluations and preferential settling could occur during mixing or waste retrieval operations.
- A special team 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 Pu 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, 8 received greater than 750 grams, and 8 received less than 400 grams.
- The special 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 WTP Pretreatment Facility, resolution of the technical issues associated with the presence of large quantities of previously unanticipated forms of Pu will require significant changes to the criticality safety

strategy for WTP operations and a significant revision to the Preliminary Criticality Safety Evaluation Report.

6. **Trending and Analysis of Reportable and Non-reportable Nuclear Criticality Occurrences**

   The Waste Treatment Plant is not an operating facility. A nonconformance or occurrence reporting process for criticality safety is not yet in place.

7. **Follow Up to Assessments**

   ORP will conduct criticality safety assessments only on an as-needed basis. Closure of the open assessment finding and numerous open conditions of approval associated with the CSER are being tracked to closure by the Nuclear Safety Division. No formal assessments of the contractor criticality safety program have been conducted this fiscal year.

8. **As applicable, provide status of any open issues identified in previous reports.**

   There are no specific open issues from previous reports however there are outstanding COA from the SER approving the WTP Preliminary Criticality Safety Evaluation Report and some remaining actions to be closed from the 2009 CSSG Assessment of 2009. These will be addressed in the upcoming revision of the Preliminary Criticality Safety Evaluation Report which is scheduled for completion in June 2012.

Attachment 4
Washington River Protection Solutions
Tank Farms Operations
Criticality Safety Program

Field Office Manager: Scott Samuelson NSC POC: John Harris/Kevin Sandgren

1. Measure of Contractor Nuclear Criticality Safety (NCS) Performance

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. WRPS conducted a Management Assessment of the Criticality Safety Program in May 2011.
- Qualify Criticality Safety Engineers and Criticality Safety Representatives (using DOE STD 1135-99 as a guide). Presently all 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 May 2011.
- Frequent interaction of the Nuclear Criticality Safety Representatives with Operations staff in operating facilities. Facility criticality safety programs emphasize participation of the CSR in facility walkdowns, job planning, pre-job briefs, and interactions with operations.
- Frequent interaction of the Nuclear Criticality Safety Representatives with Process Engineering staff. Nuclear Criticality Safety Representatives 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.

2. Status of Contractor Criticality Safety Engineer Program

WRPS employs one Nuclear Safety Manager responsible for criticality safety, 2 qualified Criticality Safety Engineers (CSE) on a task-order contract basis (the CSE's are not full-time staff), and 1 qualified Criticality Safety Representative.

Staffing appears to be adequate based upon the current mission needs; however, frequent monitoring by DOE is required through periodic assessments to ensure that CSE support is available when needed.

3. Status of Federal Criticality Safety Oversight Program

Federal oversight staffing appears to be adequate; with three qualified NCS Federal Nuclear Safety Engineers (two assigned to Tank Farms and one assigned to the Waste Treatment Plant acting as backup for Tank Farms).

4. Federal Assessments of Site NCS Programs

DOE conducts a review of the WRPS Criticality Safety Management Self-Assessment and reviews the quarterly facility inspections.

Because of infrequent changes to the criticality safety evaluation report (CSER), DOE has raised concerns whether the existing technical bases developed many years ago for the CSER are considered adequate. As a result, DOE requested the DOE Criticality Safety Steering Group (CSSG) to assess the technical bases of the Tank Farms criticality safety program. The DOE 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, as listed below.

The CSSG was generally satisfied with the criticality safety approach taken at WRPS. There was a potential concern that the program and the technical basis have been stagnant for at least the last decade. With the potential for increased tank transfer and retrieval operations, ORP's concern was focused on whether the technical basis was adequate to current codes and standards and regulatory expectations. The current NCS strategy, while protecting criticality safety risks, has become somewhat confusing between the various Criticality Safety Evaluation Reports for new operations that build upon earlier CSERs for computations, analysis, and conclusions, Chapter 6 of the Documented Safety Analysis (DSA) and the Criticality Protection Specifications (CPS). The CSSG's opinion was that the WRPS criticality safety program should be aligned to ensure a clear, concise, and coherent criticality protection strategy that can be easily communicated to the operations staff and supervision. Special care should be taken to ensure that results of any new sample data is carefully considered and evaluated against the existing assumptions and technical bases for criticality safety.

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, and the Tank Farms CSP will be upgraded to meet current DOE expectations (e.g., DOE-3007-2007) beginning in October 2011, and completing by the end of 2013.

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 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.

5. New Facility Design

There are no new facilities undergoing design or construction in the Hanford Tank Farms requiring a criticality safety program. However, there are two new criticality safety evaluations for 2011. The first deals with a new retrieval technology for sludge from the single-shell tanks (high caustic soak and dissolution of hardened sludge heels in the tank), and the second involves a closure activity for the reportable occurrence (open Unreviewed Safety Question on PuO_2) discussed below.

6. Trending and Analysis of Reportable and Non-reportable Nuclear Criticality Occurrences

WRPS tracks criticality safety issues through the PER system. Nineteen PERs in criticality safety were identified in 2010, and ten for 2011. Most were low-level concerns or opportunities for improvement, and were closed through the PER process. However, review of new or modified retrieval operations within Tank Farms facilities has resulted in operational non-conformances with existing NCS limits and controls. The first such non-conformance dealt with a new retrieval technique for hardened sludge heels in single-shell tanks (to achieve the required waste retrieval prior to tank closure). This non-conformance

was trivial, though; in that it involved an overly restrictive term being used in the CSER for solids retrievals (the CSER discussed "saltcake" retrieval through dissolution, rather than "solids" retrieval, which would have covered both saltcake and sludge).

The second non-conformance, though, was more substantive, and came about as a result of a sample analysis report of a double-shell tank potentially containing larger and denser PuO_2 particles than were allowed for in the Tank Farms CSER. An independent task force team 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 PuO_2 or Pu metal fines (PuO_2 or Pu metal was not co-precipitated with the credited absorbers of the CSER, and, with sufficient mass, and if the particles are large and dense enough, could concentrate with mechanical agitation such as mixing or retrieval above CSER maximum localized concentration levels.) The USQ has resulted in 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). Analysis activities (a new CSER) are being conducted on the first of these tanks (a DST) to allow for planned retrieval of an SST into this tank.

In addition, periodic inspections, assessments, etc., have identified several areas for programmatic improvement that result in the generation of PERs. Identified PERs pertains to:

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

Trends are rolled up and reported to senior management semi-annually.

Of the 19 PERs identified in 2010, 15 were written to document the findings of the CSSG review discussed above. None of the PERs from 2010 involved other than documentation issues. Of the 10 PERs identified in 2011, one involves the PuO_2 issue described above, and one involves the potential of sending steam condensate from the 242-A Evaporator to the Tank Farms that's less than the allowable pH (i.e. more acidic) of the CSER which will be closed because it is bounded by a Documented Safety Analysis accident covering an inadvertent addition of a large volume (5,000 gallon) of nitric acid. Of the remainder of the 2011 PERs, one details the instance of a missing sign from a fissile storage area at the 222-S Laboratory (added the same day) and the remaining seven deal with procedural or training inconsistencies: e.g., activation of a procedure without CSR review, a delinquency of one individual on their biannual criticality safety training, out-of-date organizational charts in web-based training, and failure of the CSR to specify the degree of training required for individuals concerning the revision of administrative procedures. These documentation PERs have all been corrected and closed.

7. Follow Up to Assessments

ORP is planning to conduct an assessment of the WRPS CSP starting in June 2012.

8. Status of any open issues identified in previous reports

As discussed above, the PuO_2 USQ is being analyzed to determine whether the operational restrictions against mixing, waste addition, or retrieval can be lifted on any or all of these tanks.

Attachment 5
LATA Environmental Services of Kentucky, LLC (LATAKY)
Paducah Site
Criticality Safety Program

Office Manager William Murphie NCS POC Tom Hines

1. Measure of Contractor Nuclear Criticality Safety (NCS) Performance

A formal set of performance metrics is used to track the LATA Environmental Services of Kentucky, LLC (LATAKY) NCS program implementation at Paducah.

The number of Anomalous Condition Reports (ACRs), the amount of field time for NCS engineers, continuing education of NCS engineers, and number of surveillances, assessments, and lessons learned are included in these metrics.

LATAKY provides the information in quarterly NCS metrics reports. These reports included two ACRs that were generated in FY- 2011. The ACRs involved an assumed activity in an NCS determination not being performed as stated and the discovery of legacy fissile material.

The LATAKY Quality Assurance (QA) Program monitors and assesses the implementation and performance of the NCS Program. Two assessments of the NCS Program were performed in FY-2011, one by the Independent Review Committee and the other by the NCS Manager. No findings resulted from the Independent Review Committee assessment and one finding on an incomplete general NCS program module being used for computerized general NCS training noted in the NCS Manager's assessment. This finding was immediately corrected.

In addition, LATAKY and the DOE oversight staff perform Implementation Verification Review (IVRs) of the NCS Program implementation following updates to the safety basis documents. The last DOE assessment of the NCS Program implementation was performed as part of the annual Integrated Safety Management System (ISMS) assessment during June 2009. DOE oversight also includes routine monitoring of program implementation by the Facility Representatives.

PPPO meets with LATAKY NCS staff to coordinate the integration of NCS Program requirements with the safety basis. The significant reduction in fissile material inventory has resulted in limited NCS requirements.

The LATAKY NCS program meets DOE PPPO expectations. The LATAKY scope of work involves operations that do not pose a high risk of criticality. The ^{235}U enrichment of fissile material is typically less than 2.0 weight percent and most of the fissile waste has been shipped from the Paducah site. The NCS Program is well documented. The LATAKY NCS staff is qualified, knowledgeable, and experienced at the Paducah Site.

2. Status of Contractor Criticality Safety Engineer Program

During FY-2011, LATAKY had two senior NCS engineers who performed both NCS and nuclear safety basis work. Based on the current level of contractor activity, 0.5 NCS Staff Full Time Equivalent (FTE) is required to support the mission at the Paducah site in FY-2012. LATAKY has 0.5 NCS Staff FTE (one senior NCS engineer who also performs nuclear safety basis work); therefore, LATAKY has no staffing shortfalls.

Based on the performance of the LATAKY NCS Program and the minimal fissile material inventory, PPPO management has affirmed the current LATAKY staffing adequate.

3. Status of Federal Criticality Safety Oversight Program

Based on the current level of activity and minimal fissile material inventory at the Paducah site and the contractor's NCS Program, PPPO needs only limited NCS subject matter expert (SME) oversight.

PPPO has one Nuclear Safety Oversight Lead (NSOL). He provides oversight for the LATAKY NCS Program. However, he has multiple responsibilities and has limited time to provide oversight. In addition, PPPO utilizes three Facility Representatives at Paducah to provide oversight on safety management programs (including the NCS Program). PPPO also has a support contractor that assists in NCS oversight of the contractor as needed. The level of PPPO oversight for LATAKY NCS Program is deemed adequate.

4. Federal Assessments of Site NCS Programs

The last DOE assessment of the Paducah NCS program was performed in June 2009 while Paducah Remediation Services was the contractor.

The NCSEs have been evaluated as part in the safety basis document reviews and as part of the Implementation Verification Reviews (IVRs) conducted for updated safety basis documents. The evaluation concluded that the NCS Program is compliant with DOE requirements.

A DOE assessment of the LATAKY NCS Program is planned for February 2012.

5. New Facility Design

There are no plans to design and build a new Hazard Category 2 or 3 facilities at Paducah.

6. Trending and Analysis of Reportable and Non-reportable Nuclear Criticality Occurrences

The NCS Manager analyzes the ACRs and identifies the trend in causes. The corrective actions are tracked through the LATAKY Issues and Corrective Actions Tracking System.

Based on only one ACR in FY-2010 and two in FY-2011, there is no recent trend in anomalous conditions. In previous trend analyses, management problems related to prior operations at the site was the leading cause of anomalous conditions. The contract scope has been to disposition the radiological waste generated from the gaseous diffusion plant and ship to off-site waste disposal facilities. Most ACRs since 2003 involved the discovery of conditions that differ from prior accepted knowledge. These conditions have generally been assigned to "Management Problems".

LATAKY reviews any ACRs quarterly and any trend identified has a cause analysis performed that results in a Corrective Action Plan (CAP) for the Root Cause and any contributing items.

7. Follow up Assessments

PPPO has followed up on the effectiveness of corrective actions for prior assessments. A PPPO assessment of the previous contractor's NCS Program was performed in June 2009 with no new findings or observations. LATAKY adopted this program and implementing procedures.

PPPO also noted that previous corrective actions were completed and the results were determined to be effective. There are no outstanding issues.

8. As applicable, provide status of any open issues identified in previous reports.

Presently there are no open issues.

Attachment 6
Fluor-B&W Portsmouth (FBP).
Criticality Safety Program

Office Manager William Murphie NCS POC Tom Hines

1. Measure of Contractor Nuclear Criticality Safety (NCS) Performance

During FY-2011, the former uranium enrichment facilities (FUEF) have transitioned from NRC regulation to DOE regulation. In addition, there has been a transition in DOE contractors from LATA/Parallax Portsmouth, LLC (LPP), and the United States Enrichment Corporation (USEC) to Fluor-B&W Portsmouth (FBP).

A formal set of performance metrics were developed to track the LATA/Parallax Portsmouth (LPP) NCS program implementation (non-FUEF) at Portsmouth. These same metrics will also be tracked for both the FUEF and non-FUEF in FY-2012 as the two NCS programs are being consolidated into one FBP NCS Program.

FBP NCS maintains a schedule of walkdowns and surveillances and tracks open items. The number of Anomalous Condition Reports (ACRs) and NCS-related Problem Reports (PRs) are tracked and trended. Additionally, field support time, continuing education, assessments and reviews, and lessons learned are tracked.

ACRs and NCS-related Problem Reports were reported in FY-2011. There were five ACRs generated in FY- 2011 in the non-FUEF facilities. The five ACRs involved changing information on legacy fissile materials, personnel errors, and a training deficiency. Three of the five did not challenge the core criteria of two independent changes in process conditions. There was one ACR in the FUEF facilities under DOE regulation. The ACR involved a personnel error that did not challenge Double Contingency.

Although LPP and USEC did not perform any formal assessments of the NCS Program, FBP performed various reviews as a part of the transition process, developing action items and noting strengths and weaknesses in the Programs for consideration when the Programs will be consolidated in FY-2012.

NCS Staff performed approximately 81 walkdowns/surveillances of NCS approvals (NCSAs) and evaluations (NCSEs), for both FUEF and non-FUEF, during FY-2011. In addition, self-assessments of implementation of all FUEF NCSEs were conducted by the operating groups with NCS Engineering support.

PPPO continued its increased oversight of the LPP (non-FUEF) facilities and the transition activities from LPP and USEC to FBP during FY-2011. PPPO performed an NCS surveillance assessment for the FUEF under DOE purview while managed by USEC in second and third quarters FY-2011. PPPO is scheduled to perform an Independent Verification Review (IVR) in first quarter FY-2012 for all the FUEF. DOE oversight also includes routine monitoring of program implementation by two Facility Representatives.

2. Status of Contractor Criticality Safety Engineer Program

PORTS has gone through three transitions during FY-2011 and during this time, the NCS organization has been understaffed. Based on the current level of contractor activity, about twelve NCS Staff Full Time Equivalents (FTE's) are required to support the mission at the Portsmouth site. Currently FBP has seven NCS engineer FTEs including subcontractor staff. FBP currently has multiple postings for NCS Engineers and one for NCS Manager. The Nuclear Safety Manager is filling the NCS Manager position until it can be filled. There is also one Nuclear Criticality Safety Officer (CSO) and a posting for another; the CSOs will support both FUEF and non-FUEF facilities. While FBP recognizes that there is an

increased need for NCS support they are filling the gap by working overtime and pursuing additional contractor support.

FBP is meeting the minimum requirements by utilizing the present resources with scheduled overtime while actively recruiting additional resources and pursuing additional contractor support.

3. Status of Federal Criticality Safety Oversight Program

Based on the current level of activity at the Portsmouth site and the planning for Decontamination and Decommissioning (D&D), PPPO needs approximately 3.0 FTEs in addition to the Facility Representatives.

PPPO has one Nuclear Safety Oversight Lead (NSOL). He provides oversight for the DOE Contractor Nuclear Safety and NCS Programs at both Paducah and Portsmouth. Because of his multiple responsibilities, oversight capabilities must be augmented. PPPO has support contractor personnel that assist in oversight of the FBP NCS Program with 2.5 FTEs that report to the NSOL.

In addition, PPPO utilizes two Facility Representatives at PORTS to provide oversight on FBP safety management programs (including the NCS Program).

4. Federal Assessments of Site NCS Programs

A PPPO surveillance review of the USEC NCS program was completed in May 2011. The review concluded that the NCS Program is compliant with DOE requirements.

The surveillance review of the USEC NCS Program identified eleven observations and four proficiencies to be incorporated into and/or adequately addressed by the future consolidated FBP NCS Program Description Document to be submitted to DOE for approval. The most significant issues were: 1) a lack of NCS requirements to label items with fissile content so that operators know whether to apply spacing controls, and 2) a lack of documented performance standards for nondestructive assay measurements used for NCS.

All FUEF Nuclear Criticality Safety Analyses (NCSA) and associated Nuclear Criticality Safety Evaluations (NCSE) were reviewed for adequacy and results documented in a Nuclear Criticality Safety Report for each facility. The NCSA/NCSE sets were adequate and together meet DOE requirements.

A DOE IVR is planned for first quarter FY-2012 and the NCS Program is included in this review. The FBP IVR was completed in fourth quarter FY-2011 with no findings or observations related to the NCS Program.

A DOE EM HQ assessment of the FBP NCS program is planned following the completion of the DOE IVR in the second quarter FY-2012.

5. New Facility Design

There are no plans to design and build a new Hazard Category 2 or 3 facility at PORTS.

6. Trending and Analysis of Reportable and Non-reportable Nuclear Criticality Occurrences

FBP utilizes the ACR and Problem Reporting processes to track NCS occurrences. Trending is performed quarterly in the NCS Metrics Report, which is provided to PPPO.

A review of the ACRs and associated problem reports indicate that the principle weakness in the NCS Program is personnel error. FBP is providing additional NCS training and

providing additional oversight for fissile material movements to reduce the number of personnel errors.

7. Follow Up to Assessments

PPPO has been performing follow up on the corrective actions from the anomalous conditions and the PPPO surveillance review report performed in FY-2011. Many of the findings, observations, and corrective actions are being addressed as a part of the FBP NCS Program consolidation process, which will be complete in FY-2012.

PPPO also noted that previous corrective actions completed by LPP were not always effective. These are being addressed during the FBP NCS Program consolidation process as well.

8. As applicable, provide status of any open issues identified in previous reports.

Any open issues carried over from LPP are being resolved as a part of the FBP NCS Program consolidation process.

Attachment 7
BWCS Paducah/Portsmouth
Criticality Safety Program

Office Manager William Murphie NCS POC Tom Hines

1. Measure of Contractor Nuclear Criticality Safety (NCS) Performance

The Babcock & Wilcox Conversion Facilities (BWCS) started production at Paducah, KY and Portsmouth, OH, on September 30, 2011. The BWCS NCS Program for Paducah and Portsmouth is a limited scope program. At this time no metrics are established for tracking; however, an Anomaly Detection Process covered under the Hazardous Material Protection Program has been established under which Anomalous Conditions, NCS infractions, or NCS deficiencies will be identified and promptly corrected. The occurrence of such events will be tracked and trended in order to prevent reoccurrence and transmit lessons learned. BWCS did not have any ACRs in FY-2011.

2. Status of Contractor Criticality Safety Engineer Program

Upon contract initiation, BWCS had a part-time Sr. NCS Engineer who provided support to both Paducah and Portsmouth sites. Based on the current level of contractor activity, 0.5 NCS Staff Full Time Equivalent (FTE) is required to support the mission at both sites in FY-2012. BWCS has 0.5 NCS Staff FTE; therefore, there is no staffing shortfall.

Based on the performance of the BWCS NCS Program and the minimal fissile material inventory, PPPO management has affirmed the current BWCS staffing is adequate.

3. Status of Federal Criticality Safety Oversight Program

Based on the minimal fissile material inventory at the Paducah and Portsmouth BWCS facilities and the contractor's NCS Program, PPPO needs only limited NCS subject matter expert (SME) oversight.

PPPO has one Nuclear Safety Oversight Lead (NSOL). He provides oversight for the BWCS NCS Program. However, he has multiple responsibilities and has limited time to provide oversight. In addition, PPPO utilizes one Facility Representative at Paducah and one at Portsmouth to provide oversight on safety management programs (including the NCS Program). PPPO also has a support contractor that assists in NCS oversight of the contractor as needed. The level of PPPO oversight for the BWCS NCS Program is deemed adequate.

4. Federal Assessments of Site NCS Programs

BWCS have only been in production since September 2011. A due diligence walk-down was performed in January 2011 to identify potential issues. The corrective actions performed to resolve those issues included developing an NCS Program Description Document and an implementation matrix for applicable American National Standards/American National Standards Institute standards to demonstrate implementation.

Since BWCS did not go into production until September 30, 2011, there were no lessons learned or self-assessments in FY-2011.

The BWCS NCS Program identifies applicable standards and exceptions. The NCS Evaluations are written in accordance with the appropriate DOE guidance and requirements. The primary fissile operation of BWCS is the storage of fissile UF_6 cylinders which is a singly contingent operation that has been DOE-approved for previous contractors. DOE O 420.1B requires DOE approval for singly contingent operations and at the date of this report, DOE approval for BWCS storage of potentially fissile cylinders was being processed.

5. **New Facility Design**

   The BWCS facility is complete and has started production. There are no plans to design and build another Hazard Category 2 or 3 facilities at Paducah or Portsmouth.

6. **Trending and Analysis of Reportable and Non-reportable Nuclear Criticality Occurrences**

   The BWCS NCS Engineer will analyze the ACRs and identify the trend in causes. NCS occurrences will be entered into the Condition Reporting/Non-Compliance Reporting process governed by the Condition Reporting procedure.

   Since production did not start until September 30, 2011, there have been no anomalous conditions to track or trend.

7. **Follow up Assessments**

   PPPO has not performed an assessment since operation did not begin until September 30, 2011. There are no outstanding issues.

8. **As applicable, provide status of any open issues identified in previous reports.**

   Presently there are no open issues from previous reports.

Attachment 8
CH2M Hill – Washington Group Idaho, LLC
Idaho Cleanup Project
Criticality Safety Program

Field/Site Manager: Richard Provencher/James Cooper NSC POC: Kermit Bunde/Roger Harshbarger

1. **Measure of Contractor Nuclear Criticality Safety Performance**
   - CH2M Hill – Washington Group Idaho, LLC (CWI) is the contractor for the Idaho Cleanup Project. They provide two criticality safety-related metrics. The first metric is called the Nuclear Safety Severity Index (NNSI) and is reported monthly to DOE-ID as part of the Safety Performance Objectives, Measures, and Commitments (SPOMC) report. This is an index of severity of ORPS reports related to TSR violations, criticality safety events (i.e., loss of double contingency), or degradation of SSCs. The second metric is called the Criticality Safety Adversity Index (CSAI). This metric is a weighted index of criticality safety noncompliances. The 12 month average for both of these metrics exceeds the goals. See attachments.
   - No negative trends in nuclear criticality safety have been identified by DOE Line Management.
2. **Status of the contractor nuclear criticality safety engineer programs**
   - CWI has one full time criticality safety engineer, one full time sub contract 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.
   - DOE line management determined that the contractor had adequate staffing for FY 2011 activities.
3. **The status of the federal nuclear criticality safety engineer programs.**
   - EM programs have one qualified federal criticality safety engineer and the Quality and Safety Division (QSD) has two qualified federal criticality safety engineers.
   - DOE line management has determined that the office has adequate staffing for current activities.
4. **Federal assessments of criticality safety conducted throughout the year**
   - Quarterly surveillances of the contractor were conducted by the QSD and EM staff.
   - No issues were identified during the surveillances. The contractor Criticality Safety Program is functioning at a level that ensures facility safety.
   - As part of the above mentioned quarterly surveillances, the contractors' self-assessments were reviewed. Recent self-assessments have been found to be in-depth and accomplished with appropriate rigor.
   - New and revised criticality safety evaluations meet the expectations of DOE-STD-3007-2007.
5. **Lessons Learned from new facility design**

   There are no new facilities (in construction or planned) at Idaho that need criticality safety controls or design requirements.

6. Trending and analysis of reportable and non-reportable occurrences related to criticality.

Short descriptions of the two incidents that occurred in FY-11 are noted below.

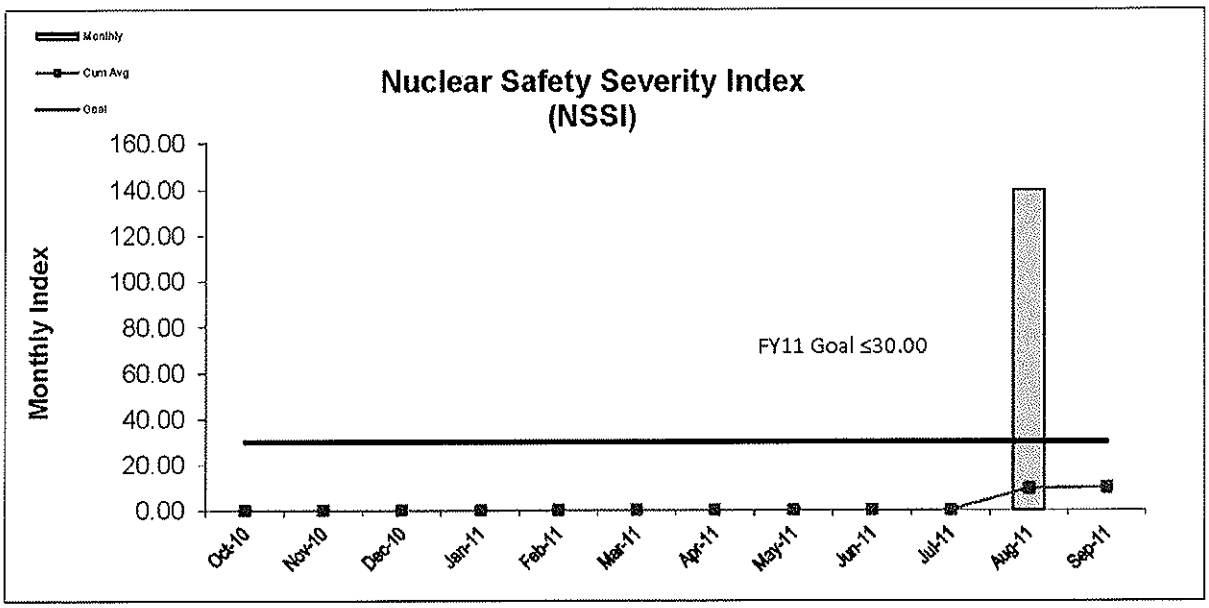
- ORPS EM-ID-CWI-FUELRCSTR-2011-0001. During a review of fuel storage records it was identified that a sealed failed fuel can containing TRIGA fuel was not stored in the fuel storage canister in compliance with the criticality safety evaluation. The fuel was stored in an incorrect position of a NAC-LWT basket. This configuration was previously cited as an assumption in the analysis, but was elevated to a credited control in August 2010. This fuel canister had been in storage since 2004 and was not verified to comply with the new control during implementation. Adequate safety margin per ANSI/ANS 8.1 was maintained.
- Non ORPS reportable. The criticality safety evaluation for casks Castor V/21, MC-10, TN-24P, TN-REG, and TN-BRP does not meet the documentation requirements of the CWI Criticality Safety Program or of ANSI/ANS 8.21. The Criticality Safety Program requires that where fixed poisons are necessary for the prevention of criticality, the design must provide for a means to verify their continued presence and effectiveness. Decisions not to follow the recommendations in ANSI/ANS 8.21 must be justified and documented in the applicable CSE. Although a previous evaluation justified why surveillances for poison effectiveness were not necessary, the current evaluation lacks this documentation. Double contingency was not lost in this event.
- See included charts for trends.

7. Follow-up reviews undertaken by DOE

As noted in item no. 4 above, no issues were identified during the DOE surveillances.

8. Status of open issues identified in the previous year's annual report

No open issues were identified in the 2011 fiscal year annual report



	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11
Goal	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Monthly	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	[redacted]	0.00
Cum Avg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.47	9.83

Definition

This is an index of severity of ORPS reports related to TSR violations, criticality safety events, or degradation of SSCs. NSSI = $10^6 \sum wf_i$/hours worked. The weighting factors are further described in the SPOMC submittal letter, CCN 310792 of September 27, 2010.

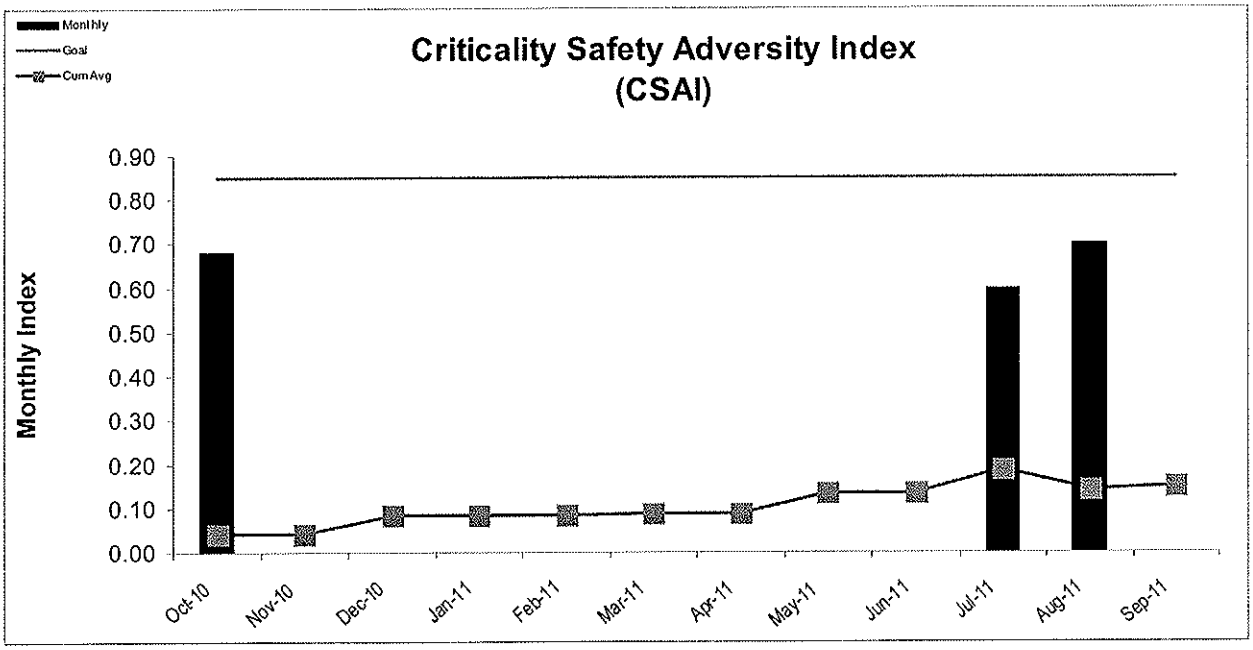
Analysis

There was one ORPS reportable event related to TSR violations, criticality safety, or degradation of SSCs during the reporting period. ORPS report CWI-FUELRCSTR-2011-0001, discovery date 8-8-2011. It was discovered that TRIGA fuel stored at INTEC, CPP-603, Irradiated Fuel Storage Facility was not stored in compliance with the current approved Technical Safety Requirement (TSR) -114 and therefore a TSR violation was reported.

Actions

A Cause Analysis of the event was performed and 11 corrective actions have been issued to ensure adequate protection of workers, the public, and the environment. Corrective actions include an extent of condition review, document revisions, and a lessons learned. Nuclear Safety will continue to integrate with operations to ensure proper implementation of documents is occurring so that Nuclear Safety events do not occur.

Goals	Points of Contact
Annual Performance Goal is ≤30.00. Monthly Grading Criteria: Blue ≤37.50, Green (37.51-45.00), Yellow (46.00-52.50), Red >52.50. Cum Avg: Blue ≤27.00, Green (28.00-30.00), Yellow (31.00-33.00), Red >33.00.	Responsible Manager: J. L. Harvey (3-0849) SME: R. G. Peatross (520-6662)



Data	Oct- 10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11
Goal	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Monthly	0.68	0.00	0.61	0.00	0.00	0.00	0.00	0.61	0.00	0.60	0.70	0.00
Cum Avg	0.04	0.04	0.08	0.08	0.09	0.09	0.09	0.13	0.13	0.19	0.24	0.25

Definition

The Criticality Safety Adversity Index (CSAI) is an index to measure criticality safety infractions and deficiencies. The CSAI calculation is ($\sum$ wf_i * 200,000)/hours worked. The weighting factors are defined as; Infraction = 4 and Deficiency = 1.

Analysis

July 2011 – Deficiency. The CSE(s) for Casks Castor V/21, MC-10, TN-24P, TN-REG, and TN-BRP do not meet the documentation requirements of PRD-112 and the requirements of ANSI/ANS 8.21. PRD-112 Section 4.4.1.2.6 requires where fixed poisons are used for the prevention of criticality, the design must provide for a means to verify their continued presence and effectiveness. Decisions not to follow the recommendations in ANSI/ANS 8.21 must be justified and documented in the applicable CSE.

August 2011 – Deficiency. During a review of fuel storage paperwork it was identified that a sealed failed fuel can containing TRIGA was not stored in the fuel storage canister in compliance with the CAFL or the CSE. The fuel was stored in position 4 of a NAC-LWT basket.

Actions

Criticality safety continues to support operations by writing criticality safety evaluations, answering safety bases questions, and performing assessments.

Goals	Points of Contact
Annual performance goal is ≤0.85 Monthly Grading Criteria: Blue ≤1.06, Green (1.07-1.28), Yellow (1.29-1.49), Red >1.49. Cum Avg: Blue ≤.77, Green (.78-.85), Yellow (.86-.94), Red >.94.	Responsible Manager: M. Thieme (520-0506)

Attachment 9
Bechtel BWXT Idaho
Advanced Mixed Waste Treatment Project (AMWTP)
Criticality Safety Program

Field/Site Manager: Richard Provencher/James Cooper NSC POC: Kermit Bunde/Roger Harshbarger

1. **Measure of contractor nuclear criticality safety performance**

   Bechtel BWXT Idaho, LLC (BBWI) was the contractor during the reporting period. Idaho Treatment Group, LLC (ITG) is the current Advanced Mixed Waste Treatment Project (AMWTP) contractor. Metrics are used to monitor the health of the program:

   - AMWTP continues to track and trend all events and deficiencies that impact or potentially impact NCS, regardless of severity. This tracking and trending utilizes AMWTP's formal issues tracking system, *Trackwise*, and is included in the AMWTP self-assessment of the NCS program.
   - In addition, AMWTP utilizes a leading indicator metric for NCS issues, which is included in the Safety Performance Objectives, Measures, and Commitments (SPOMC) report to DOE-ID. See attachment.
   - No negative trends in criticality safety have been identified by DOE line management.

2. **The status of the contractor nuclear criticality safety engineer programs.**

   - FY 2011: AMWTP NCS staffing was three full-time AMWTP employees (two criticality safety officers, one criticality safety engineer). In addition, AMWTP employs four criticality safety engineers on a subcontracted basis (sharing 80 hours per week).
   - DOE management determined the contractor had adequate staffing for FY 2011 activities.
   - FY 2012: Work force restructuring during transition to a new contractor eliminated one criticality safety engineer on October 1, 2011. AMWTP currently has no qualified criticality safety engineer on-site. The subcontract criticality safety engineers remain available off-site and DOE/EM-Idaho has determined this is adequate.

3. **Status of the federal nuclear criticality safety engineer programs.**

   - 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.

4. **Federal assessments of criticality safety programs**

   - Quarterly surveillances of the contractor are conducted by QSD and EM staff and this is supplemented by periodic surveillance of AMWTP Criticality Alarm System by EM. No corrective actions were deemed necessary as the contractor Criticality Safety Program is functioning currently at a level that will ensure facility safety.
   - As part of the above-mentioned quarterly surveillances, the contractors' self-assessments are reviewed. Recent self-assessments have been found to be in-depth and accomplished with appropriate rigor. Also, it was determined that new and revised criticality safety evaluations meet the expectations of DOE-STD-3007-2007.

5. **Lessons learned from new facility designs.**

   - The Analytical Chemistry Laboratory (ACL) was transitioned from CWI to AMWTP ownership in FY 2011. The ACL was determined to be a less than Hazard Category-3

Nuclear Facility, requiring no Criticality Safety Programmatic oversight. Regardless, as part of transition activities, AMWTP NCS staff evaluated the ACL processes to determine that the ACL was, indeed, exempt from criticality controls.

- Design and construction of a Retrieval Contamination Enclosure (RCE) and Inner Contamination Enclosure (ICE) for the resumption of Retrieval activities in WMF-636 were performed. In addition, Operating Instructions for new retrieval methods were generated. In accordance with ANSI/ANS-8.19, each phase of the design, construction, and documentation generation was reviewed and evaluated by NCS staff.
- Sludge processing in the Treatment Facility Box-line was conceived, designed, constructed, and implemented in FY-11. Each phase of the design, construction, and documentation generation were reviewed and evaluated by NCS staff.

6. Trending and analysis of reportable and non-reportable occurrences related to criticality.

a) A short description of each FY-11 infraction
   - A drum was compacted without a valid assay. The drum had been assayed 3 times. The final assay was not used as the assay of record.
     - Criticality Working Requirement (CWR) Violation
   - The Mass Controlled Area (MCA) Fissile Gram Equivalent (FGE) value for the supercompactor was inadvertently reset, when intending to reset the Box Line MCA value. This was done without an independent verification of the data before it was entered into Fissile Tracking System (FTS).
     - Technical Safety Requirements (TSR) Violation
     - CWR Violation
   - Untoward holdup material (dust and debris) was discovered in areas below the Treatment Facility Boxlines.
     - PISA
     - CWR Violation

b) NCS occurrences, like all AMWTP reportable occurrences, are tracked and trended through the ORPS system and the issues tracking system (*Trackwise)*. AMWTP implemented a leading indicator metric for NCS issues, which is included in the Safety Performance Objectives, Measures, and Commitments (SPOMC) report to DOE-ID.

c) Lagging indicators are used extensively at AMWTP across all disciplines. Examples of lagging indicators relative to Nuclear Criticality Safety are:
   - ORPS Reports
   - CWR Violations
   - Fact-finding minutes
   - Periodic assessments
   - Annual assessments

   Results have been used to initiate changes to the Criticality Safety Program and results shared and discussed with criticality safety staff.

See following graph for trend

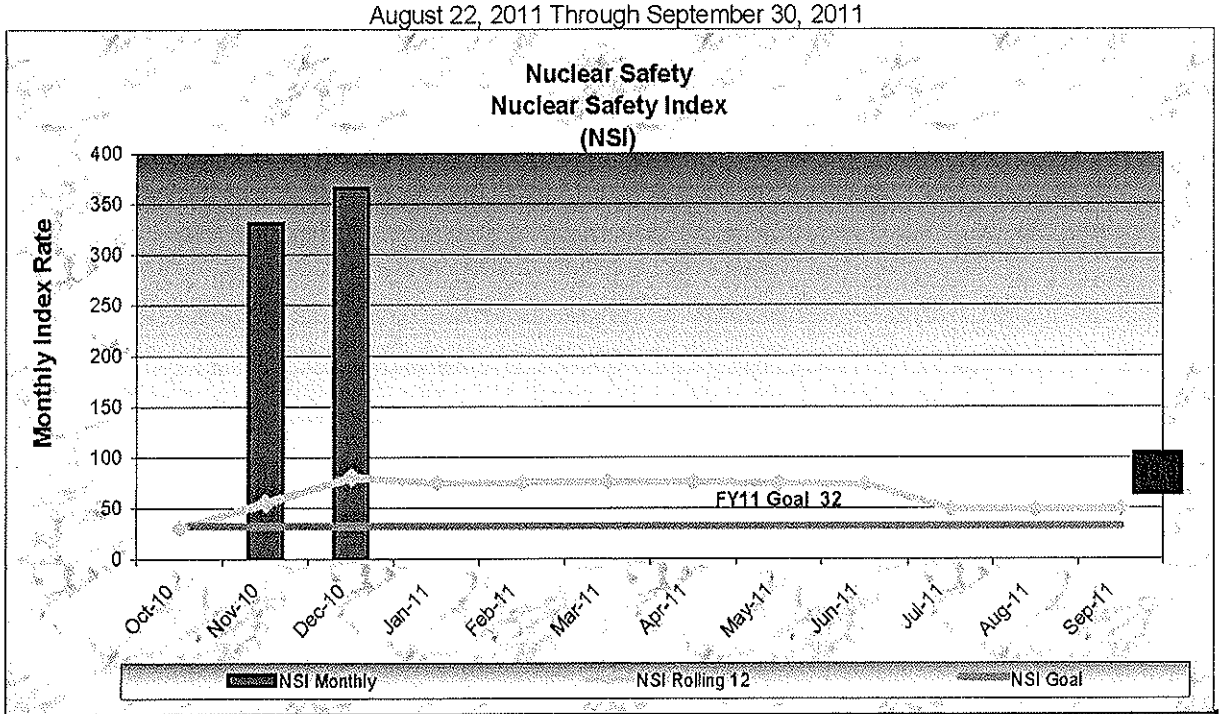
7. Follow-up reviews undertaken by DOE.

As noted in item no. 4 above, no issues were identified during the DOE surveillances.

8. Status of open issues identified in the previous year's annual report.

No open issues were identified in the FY 2011 annual report

AMWTP Detailed SPOMC Metrics
Measurement Period Covering:
August 22, 2011 Through September 30, 2011



Data	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11
NSI Monthly	0			0	0	0	0	0	0	0	0	0
NSI Rolling 12	30.1											
NSI Goal	32	32	32	32	32	32	32	32	32	32	32	32

Definition

The Nuclear Safety Index (NSI) is an index that measures TSR/LCO violations and criticality safety events in accordance with ORPS reportable criteria.

Analysis

There were no ORPS events related to the Nuclear Safety Index for the September reporting period.

The NSI ended FY-11 reflecting performance greater than the annual goal of ≤ 32.

Actions

Two Technical Safety Requirement (TSR) ORPS events that occurred earlier in the year had a sustained impact the NSI metric throughout the fiscal year. Corrective actions associated with the TSR events had an effective impact on the TSR metric with no addition events occurring for the remainder of the year.

Goals

FY 11 Performance Goal = ≤ 32

NSI Grading Criteria:		Monthly		Rolling 12
Positive	≤ 125%	(≤ 40)	≤ 90 %	(≤ 29)
Acceptable	>125 - 150%	(> 40 - 48)	> 90 - 100%	(> 29 - 32)
Marginal	> 150 - 175%	(> 48 - 56)	> 100 - 110%	(> 32 - 35)

Point of Contacts

Responsible Manager:	Rod Arbon
	(557-6303)
POC:	Rick Moore
	(557-7147)

Attachment 10
Wastren Advantage Inc.
TWPC Criticality Safety Program Annual Report

Field/Site Manager: John Eschenberg NCS POC: Brenda Hawks

1. **Measure of Contractor Nuclear Criticality Safety (NCS) Performance**

   Wastren Advantage Inc. (WAI) manages the TRU Waste Processing Center (TWPC) in Oak Ridge. Metrics established to monitor contractor NCS performance include the number of infractions.

   WAI has had two NCS ACRs during FY 2011. One ACR (July 2011) involved the transfer of a loaded waste container into the Box Breakdown Area (BBA) without first obtaining approval from the Inventory Coordinator. The container was previously determined to contain no fissile material and was considered "exempt" from NCS control. This was a process administrative error that no immediate impact on criticality risk but needed attention.

   The second NCS ACR (August 2011) was identified during a management assessment and involved the use of a 30-gallon drum to collect prohibited items from the re-drumming process in the Contact-Handled (CH) Glovebox. Although multiple 30-gallon drums were not being used, edge-to-edge storage of multiple 30-gallon drums is not approved. This ACR remains open at the present time. The associated NCSEs are being examined for possible approval of 30-gallon drum storage, or elimination of their use altogether in favor of the analyzed 55-gallon drum.

   Management attention to issues continues to be prompt and appropriate and ORO considers the performance acceptable. No corrections have been deemed necessary at this time.

2. **Status of Contractor Criticality Safety Engineer Program**

   TWPC (WAI) has two NCS Engineers supporting the criticality safety program on a part time basis. Additional senior qualified NCS Engineers are available/on call and the NCS Manager is also a Qualified Senior NCS Engineer.

   Additional resources are subcontracted and available. There is no shortfall at this time and a contracting mechanism is in place to prevent any shortfall in the future.

3. **Status of Federal Criticality Safety Oversight Program**

   Oak Ridge EM has one Federal NCS Engineer who is currently the Engineering Division Director. One additional full-time subcontract NCS Engineer is also on staff. Additional support is available on an as-needed basis from a qualified NCS Engineer and an engineer-in-training from the Oak Ridge Office of Science. The Oak Ridge NCS staffing level is adequate.

4. **Federal Assessments of Site NCS Programs**

   Periodic informal assessments (twice per year) are conducted by the Federal subcontract NCS Engineer. No issues of concern were identified as a result of these informal reviews.

   TWPC has conducted two management self-assessments associated with NCS during the year. One was a NCS Program assessment using criteria from DOE-STD-1158 (August 2011). This is part of a triennial assessment approach that is used to ensure that all DOE-STD-1158 criteria are examined as applicable to the TWPC operations over a 3-year period, with a selection of criteria examined each year. This assessment identified, as a finding, the

ACR involving use of a 30-gallon drum for Prohibited Items as discussed in Section 1 above. Three observations were identified: (1) Inadequate marking of empty containers; (2) The need to involve Facility Management more in the review of the NCS Program; and (3) The need for NCS concurrence with final design documentation.

The second Management Assessment was a focused examination on determining the adequacy of source control on site. The need was identified to provide better control on storage, inventory, and source control.

In addition to management assessments, the Contractor also has conducted the annual operations reviews of NCSEs as required by ANSI/ANS-8.1.

5. New Facility Design

Any potential change in facility design regarding longer-term sludge treatment is in the planning phase. NCS is involved in the current planning and design activities for sludge treatment at TWPC.

6. Trending and Analysis of Reportable and Non-reportable Nuclear Criticality Occurrences

NCS occurrences are tracked and trended by ACRs. When the Occurrence Reporting Criteria is met, they are tracked via the Occurrence Reporting and Processing System (ORPS) in addition to the ACR process. With only two ACRs documented in FY2011, there was insufficient data to indicate a trend.

7. Follow-Up to Assessments

None.

8. Status of Open Issues Identified in previous reports

There are no open issues.

Attachment 11
UCOR
Criticality Safety Program

Field/Site Manager: John Eschenberg NCS POC: Brenda Hawks

1. Measure of Contractor Nuclear Criticality Safety (NCS) Performance

Metrics established to monitor contractor NCS performance include the number of New ACRs, and the 12-month rolling average time to close ACRs (goal is < 30 days average time to close).

Less than two new ACRs occurred per month (19 ACRs during FY 2011). The average time to close ACRs has decreased and 70% of ACRs in FY2011 were closed within 10 days. Three were open longer than 30 days, with the longest being 93 days.

Contractor performance has been improving, as evidenced by the lower number of ACRs experienced and emphasis placed upon closing ACRs that have occurred.

2. Status of Contractor Criticality Safety Engineer Program

The Bechtel-Jacobs (BJC) NCS program currently has nine FTEs. 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 Project. The DOE NCS oversight will continue to observe the CSO staffing levels for adequacy, as well.

3. Status of Federal Criticality Safety Oversight Program

Oak Ridge EM has one Federal NCS Engineer who is currently the Engineering Division Director. One additional full-time subcontract NCS Engineer is also on staff. Additional support is available on an as-needed basis from a qualified NCS Engineer and an engineer-in-training from the Oak Ridge Office of Science. The Oak Ridge NCS staffing level is adequate.

4. Federal Assessments of Site NCS Programs

Criticality Safety was included as a functional area in quarterly surveillances of the contractor.

NCS was part of the scope of the DOE Integrated Safety Management System Phase I and II Re-Verification Assessment performed in December 2010. NCS objectives were reviewed during the assessment included:

a) The contractor NCS Program description is in accordance with DOE Order 420.1B, *Facility Safety*, and approved by DOE.
b) The contractor has developed appropriate procedures to implement the NCS Program.
c) The contractor NCS Program description has been adequately implemented.
d) The assessor will validate closure of the corrective actions from the DOE verification and validation of the SCALE 5.1 code.

The assessment verified procedures ensure that adequate NCS controls are identified to mitigate the identified hazards and that the controls are effectively implemented during preparation for the initiation of work at each level. Contractor NCS procedures provide assurance that the controls will remain in effect as long as the hazards are present. The contractor demonstrates ownership and participation in the NCS Program.

Monthly informal assessments were performed by the Oak Ridge Operations Office (ORO) subcontract NCS Engineer. The monthly assessments used selected portions of DOE-STD-1158 as lines of inquiry.

The contractor NCS Program Description document was recently revised and approved by DOE ORO.

Criticality safety evaluations and the NCS program are consistent with DOE Order 420.1B and applicable ANSI/ANS standards.

5. New Facility Design

There are no new facilities being designed. However, there are design aspects associated with existing facilities undergoing either cleanup/decommissioning/decontamination, or modification to which the existing BJC NCS Program will be applied.

There were no formal lessons learned.

6. Trending and Analysis of Reportable and Non-reportable Nuclear Criticality Occurrences

All ACRs are tracked and trended internally by the BJC corrective action tracking system (I/CATS or 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. The NCS Review Board evaluates the ACR tracking and trending when they meet.

Trending of FY2010 ACRs revealed a few common issues that resulted in a specific management assessment of the NCS control implementation process during the first quarter of FY2011. The assessment identified that there were five ACRS in FY2010 that involved errors in the implementation of NCSEs. Causes and corrective actions for the individual ACRs were identified and tracked as part of the ACR resolution process defined in the NCS Program procedures. Two observations were identified in the management assessment.

a) Four ACRs with errors in implementation involved the incorporation of NCSE requirements into work packages. Neither the implementation checklist performed by Criticality Safety, nor the work package review by numerous organizations, identified the errors.
b) Lack of adequate communications on the status of implementation of the NCSE contributed to two of the errors.

Corrective actions for these observations were the following:

a) A briefing was conducted for K-25 personnel involved in work package development to share good practices relative to comprehensive incorporation of NCSE requirements into work packages.
b) The NCSE implementation checklist was revised to identify and track the status of all work packages affected by an NCSE revision.

7. Follow-Up to Assessments

None.

8. As Applicable, Provide Status of any Open Issues Identified in Previous Reports

There are no open issues.

Attachment 12
Isotek
Criticality Safety Program

Field/Site Manager: John Eschenberg NCS POC: Brenda Hawks

1. Measure of Contractor Nuclear Criticality Safety (NCS) Performance

Metrics established to monitor contractor NCS performance on a quarterly basis include:

- Number and Severity Level of Condition Reports (CRs)
- Timely Closure of CRs
- Self-Reporting of CRs by Operations
- Completion of NCSE Annual Assessments
- New Condition Reports with NCS Implications
- Open/Unresolved Condition Reports with NCS Implications
- Completed NCS Surveillances
- Number of UNSAT Surveillance Conditions
- Completed NCS Assessments
- Number of UNSAT Assessment Conditions
- NCS Engineer Professional Development Activities

There have been no infractions since Isotek took over operations in February 2007. Isotek is only authorized to perform storage operations for fissile material. The primary NCS activities engaged in by the Isotek NCS staff have been to support completion of the design for the Dissolution and Downblending Project and to prepare evaluations for the transfer of fissile material to the Nevada National Security Site (NNSS) Device Assembly Facility (DAF). As a result, there have been few measurable activities at this stage of the project.

2. Status of Contractor Criticality Safety Engineer Program

The Isotek NCS program currently has a stable workforce consisting of a Lead NCS Engineer, four full-time NCS Engineers, and one part-time NCS Engineer. All personnel are qualified in the development of NCS evaluations, and all but two full-time personnel 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.

3. Status of Federal Criticality Safety Oversight Program

Oak Ridge EM has one Federal NCS Engineer who is currently the Engineering Division Director. One additional full-time subcontract NCS Engineer is also on staff. Additional support is available on an as-needed basis from a qualified NCS Engineer and an engineer-in-training from the Oak Ridge Office of Science. The Oak Ridge NCS staffing level is adequate.

4. Federal Assessments of Site NCS Programs

Monthly informal assessments were performed by the ORO subcontract NCS Engineer. One assessment each month used a selected portion of DOE-STD-1158 as lines of inquiry. An additional assessment each month was used to monitor the status of NCSE development, program procedure revisions, implementation status for NCS controls, and other related NCS activities

The Federal NCS Staff also has frequent (at least bi-weekly) meetings with the Isotek Lead NCS Engineer to monitor contractor CS progress and issues, which enables timely identification and resolution of concerns.

No findings or observations have been identified with respect to these reviews and no open items presently exist.

5. **New Facility Design**

   New facility design has been completed for the Dissolution and Downblending Project. Only minor equipment changes are necessary to address the shipment of fissile material to NNSS. These equipment changes have not necessitated any additional NCS limits or controls.

6. **Trending and Analysis of Reportable and Non-reportable Nuclear Criticality Occurrences**

   There have been an insufficient number of NCS-related issues identified during the reporting period to establish trends or indications. Fissile material operations are limited to storage only.

7. **Follow-Up to Assessments**

   The contractor has performed an annual management assessment of the NCS Program using DOE-STD-1158 criteria. The contractor has implemented a self-assessment process where the NCS Program is examined using all applicable DOE-STD-1158 criteria over a three-year period. In the annual review conducted in July 2011, one finding and five observations were identified. The finding involved improper execution of the Nuclear Criticality Safety Assessment implementation process. The finding has been closed and positive actions have been taken to make program improvements for all five observations. NCS-related concerns are being given timely and appropriate consideration.

8. **Status of Open Issues Identified in previous reports**

   There are no open issues for this reporting period.

Attachment 13
Safety & Ecology Corporation
SEC Criticality Safety Program

Field/Site Manager: John Eschenberg NCS POC: Brenda Hawks

1. **Measure of Contractor Nuclear Criticality Safety (NCS) Performance**

   The Safety and Ecology Corporation (SEC) Nuclear Criticality Safety Program is newly implemented. Metrics monitoring the contractor's NCS performance include the number of infractions.

   SEC did not have any infractions during FY 2011.

   The performance of the contractor is exceptional. Management attention to issues continues to be prompt and appropriate. No improvement has been deemed necessary at this time.

2. **Status of Contractor Criticality Safety Engineer Program**

   SEC has two NCS Engineers supporting the criticality safety program on a part time basis. Additional senior qualified NCS Engineers are available/on call.

   Resources are subcontracted and additional resources are available. There is no shortfall at this time and a contracting mechanism is in place to prevent any shortfall in the future.

3. **Status of Federal Criticality Safety Oversight Program**

   Oak Ridge EM has one Federal NCS Engineer who is currently the Engineering Division Director. One additional full-time subcontract NCS Engineer is also on staff. Additional support is available on an as-needed basis from a qualified NCS Engineer and an engineer-in-training from the Oak Ridge Office of Science. The Oak Ridge NCS staffing level is adequate.

4. **Federal Assessments of Site NCS Programs**

   The SEC NCS Program Description Document was approved by the DOE ORO EM NCS Staff in FY 2011. No other assessments were conducted during the year due to the limited scope of operations that have occurred.

   SEC has conducted a management self-assessment associated with the implementation of the NCS Program for the 3038 Hot Cell.

5. **New Facility Design**

   No new facility design occurred in FY 2011. Operations at SEC Hot Cells at ORNL are D&D activities. Any potential change in facility design will require NCS involvement.

6. **Trending and Analysis of Reportable and Non-reportable Nuclear Criticality Occurrences**

   NCS occurrences are tracked and trended by ACRs. When the Occurrence Reporting Criteria is met, they are tracked via the Occurrence Reporting and Processing System (ORPS) in addition to the ACR process. At present there is insufficient data to indicate a trend.

7. **Follow-Up to Assessments**

   None.

8. **Status of Open Issues Identified in previous reports**

   There are no open issues.

Attachment 14
Savannah River Nuclear Solutions
Criticality Safety Program

Field/Site Manager: Dr. David Moody NSC POC: Norman Shepard

1. Measure of Contractor Nuclear Criticality Safety (NCS) Performance

Savannah River Nuclear Solutions (SRNS), the Management and Operations (M&O) Contractor has an established criticality safety metric. SRNS has a central criticality safety oversight committee, the Nuclear Criticality Safety Review Committee (NCSRC). The NCSRC maintains a criticality safety indicator based on reportable and non-reportable deficiencies that are submitted into a site database from the M&O and Liquid Waste facilities. A rating scale is used to score each reportable and non-reportable deficiency. On a quarterly and annual basis with an annual roll-up, the cumulative score, and the number of reportable and non-reportable deficiencies in each rating bin, are presented to and reviewed by the NCSRC. Cause codes for each deficiency are also compiled and tracked to determine the major causes of the deficiencies.

For Fiscal Year (FY) 2010, there were a total of 58 deficiencies (6 criticality alarm system/evacuation route issues, 50 minor events less than a procedure limit violation or less than a control failure, and 2 procedure limit violations). There were no violations of the highest level Criticality Safety Limits upon which the procedure limits are based. The minor deficiencies are typically identified during facility self-assessments, readiness assessments, and criticality engineer walkdowns. The number of these assessments increased during 2010 due to preparation for new missions and new facility operations. The use of Human Performance Improvement (HPI) tools to prevent human factors-related deficiencies helps to reduce the number of these deficiencies.

For FY 2011, there were a total of 53 deficiencies (10 criticality alarm system/evacuation route issues, 40 minor deficiencies less than a procedure limit violation or less than a control failure, and 3 procedure limit violations). There were no violations of the highest level Criticality Safety Limits upon which the procedure limits are based. The minor deficiencies are typically being identified during facility self-assessments, readiness assessments, and criticality engineer walkdowns. Emphasis on the use HPI tools continues.

The SRNS Criticality Safety Program organization also prepares a quarterly criticality safety Performance Assessment (PA) using the same data. However, the PA examines the data more closely on a facility-by-facility basis. If a facility is experiencing an unusually high number of reportable or non-reportable deficiencies, or a higher than expected number of the same type of deficiency, or unusually special or severe problems, the facility is placed on the "watch list" or a recurring event is declared in ORPS. During 2010 and 2011, no "watch list" items or recurring events were identified. In addition to the metric discussed above, SRNS has a rigorous and active self-assessment process. Performance is reviewed using the lines of inquiry established in DOE-STD-1158. A trained SRNS criticality safety technician and several criticality safety engineers, working together with facility engineers, perform criticality safety facility self-assessments.

During FY 2011, a Design Review was performed for the new 85-ton single-failure proof crane in L-Area, and Readiness Assessments were performed for the L-Area Phase II Spent Fuel Shipments to H-Canyon, the HB-Line WIPP Pipe Overpack Container Repackaging and Vacuum Salt Distillation projects, and F-Canyon Waste Box Remediation Phase III.

SRNS receives feedback on its criticality safety program from Federal assessments. These assessments include DOE-STD-1158 based assessment activities performed by DOE-SR Field Office personnel alone or with assistance of DOE-EM HQ personnel. An assessment of H-Canyon Operating Procedures was completed in August 2011 with assistance of DOE-EM HQ staff. There were no Findings as a result of the assessment, but several Opportunities for Improvement (OFIs) were identified. The OFIs suggested potential improvements for policies, procedures, reviews, and assessments. DOE-SR Field Office personnel also reviewed and commented on the criticality safety related sections of several DSAs and associated NCSEs. DOE-SR Field Office assessments have concluded that the M&O and Liquid Waste contractors have a mature and healthy criticality safety program. More information is provided in Item 4 below.

Corrective actions and programmatic improvements are developed, tracked, and implemented in response to identified deficiencies, observations, or OFIs. Some examples (additional examples provided in Item 4 below):

- SRNS has worked with DOE-SR and site DNFSB staff to prepare a revision to the Criticality Safety Program Description Document (CSPDD). This revision was approved by DOE-SR in June 2011. As part of the CSPDD, additional improvements to the functional classification methodology have been developed.
- Preparation of a revision to the SRNS criticality safety engineer qualification program to better document criticality engineer qualifications.
- Monthly criticality safety DOE-SR/SRNS/SRR interface meetings continue to review performance and identify ongoing/upcoming issues.

2. Status of Contractor Criticality Safety Engineer Program

SRNS has created a criticality safety (CS) engineer qualification program in compliance with ANS-8.26 and DOE-STD-1135. This program has been reviewed by DOE-SR and determined to be compliant with DOE-STD-1135. SRR, the Liquid Waste contractor, utilizes the SRNS criticality safety engineer qualification program. SRNS manages the majority of DOE-EM activities at SRS. SRNS currently has ten fully qualified Senior CS Engineers, seven fully qualified CS Engineers, and six working to complete the CS Engineer qualification. Fifteen of the qualified Senior CS and CS engineers are also qualified as Criticality Safety Officers in various facilities. Three people are qualified as Criticality Safety Officers, but not as a CS engineer. SRNS currently utilizes the services of a subcontractor to provide an additional qualified senior CS engineer. Ongoing effort is being directed to assist all staff in achieving increased levels of qualification.

DOE-SR agrees with the contractors that the current level of support is adequate; however, there is very little capacity to accommodate additional work at a level beyond that which currently exists. While adequate criticality safety engineer resources exist, SRNS continues to explore the possibility of hiring of additional Nuclear Criticality Safety staff. SRNS has established a program to incentivize the staff to achieve the appropriate qualifications. As a compensatory measure, SRNS continues to use a qualified subcontractor senior CS engineer to provide staff augmentation for H-Canyon/HB-Line.

During FY 2010, a DOE review based on DOE-STD-1158 Management Responsibilities Lines of Inquiry confirmed the adequacy of the contractor's criticality safety staffing for one of the M&O facilities (HB-Line). This staffing is typical for the M&O facilities. DOE reviews of criticality safety basis documents that support facility Documented Safety Analysis and Technical Safety

Requirement changes for the M&O contractor facilities and activities indicate that the contactor level of criticality safety support is adequate.

3. Status of Federal Criticality Safety Oversight Program

During most of FY 2011, Federal staffing was two full time engineers. One was a qualified criticality safety engineer and the other was working to complete the Federal Technical Qualification Program in Criticality Safety and did so in August 2011. Additionally, one qualified criticality safety engineer working as a facility engineer provided some part time support and another qualified criticality safety engineer working for NNSA provided assistance. DOE-SR has been successful in hiring another full time engineer to work in criticality safety. He started in December 2011. With the addition of this third full time engineer for criticality safety and the availability of two part time engineers, DOE-SR is close to the staff of four needed to support criticality safety as identified in the January 2008 Five Year Work Force Management Plan for Fiscal Years 2008 - 2013.

4. Federal Assessments of Site NCS Programs

In FY 2011 DOE-SR conducted over fifty reviews relating to criticality safety. The distribution of these reviews was as follows: four contractor Criticality Safety Program Assessments, one DOE-SR Criticality Safety Program self-assessment, eight reviews dealing with Documented Safety Analyses/Technical Safety Requirements, twenty field observations, and eighteen criticality safety evaluation reviews. The criticality safety evaluation reviews were summarized in an overall assessment that concluded that the contractor provided adequate evaluations of operations for criticality safety. The evaluations were performed and reviewed by adequately trained and qualified criticality safety engineers and met the requirements of DOE-STD 3007. Individual reviews identified some specific issues. The following are some examples:

a) There are inconsistencies in identifying the need for Criticality Accident Alarm Systems (CAAS). Nuclear Criticality Safety Evaluations (NCSEs) are sometimes done for a specific process, whereas multiple processes can occur in the same areas. The individual NCSEs conclude that a CAAS is or is not needed for the process. However the evaluation of the need for the CAAS should consider all the processes for a given area. It was determined that no additional CAASs were needed but it was determined that the documentation for how and where to consistently address the need for CAASs in an area with many operations is excessively informal and the contractor was directed to formalize the process.
b) A Criticality Safety Evaluation incorrectly identified a scenario as being controlled with controls on multiple parameters when in fact only one parameter was controlled. This was identified to the contractor as a comment on the criticality safety evaluation. The criticality safety evaluation was revised and the single parameter scenario was identified and justified. The Documented Safety Analysis was revised to identify the scenario as a single parameter deviation from the Double Contingency Principle and it was approved by DOE as required. Three anomalies in data resulting from Monte Carlo criticality safety calculations were identified to the contractor as comments on a criticality safety evaluation.

Two of the anomalies were a result of errors in the code input. The input was corrected and the anomalies disappeared. The third anomaly was that adding Plutonium to a Uranium solution in the dissolver resulted in the reactivity of the solution going down. The Plutonium contained some Pu-240 which absorbed significant numbers of neutrons at energies above the energy where most of the U-235 fissions occur. Therefore there were fewer neutrons available to

cause U235 fissions and K_{eff} went down even though some ^{239}Pu fissions also resulted. Additional discussion was added to the NCSE to demonstrate that the anomaly was understood.

With the assistance of DOE-EM HQ, DOE-SR conducted an assessment of Operating Procedures in H-Canyon using applicable DOE-STD-1158 criteria. The assessment resulted in no Findings and seven Opportunities for Improvement. Of particular interest, the HQ assessment recommended that the Contractor develop improved methods of marking criticality safety controls in procedures, review double contingency analyses periodically to ensure consistency with procedures, and provide clarification to an existing TSR.

SRNS has a rigorous and active facility self-assessment process. Performance is primarily reviewed using the lines of inquiry established in DOE-STD-1158. A trained SRNS criticality safety technician and several criticality safety engineers, working together with facility engineers, perform criticality safety facility self-assessments. Assessments reports are transmitted to DOE-SR for information.

5. Lessons Learned from New Facility Design

No new facility design activities began in FY 2011.

6. Trending and Analysis of Reportable and Non-reportable Nuclear Criticality Occurrences

As indicated in section 1, the SRNS NCSRC maintains a criticality safety indicator based on reportable and non-reportable occurrences. A rating scale is used to score each reportable and non-reportable occurrence. On a quarterly and annual basis, the cumulative score, and the number of reportable and non-reportable occurrences in each rating bin, are presented to and reviewed by the NCSRC. The DOE-SR NCS staff participates in the NCSRC review and discussion of the criticality safety indicator results. Cause codes derived from INPO information are identified for each occurrence and compiled and tracked to determine the major causes of the occurrences. A goal and suggested actions are established by the NCSRC on an annual basis to reduce the number of occurrences in the groupings having the highest number of occurrences.

The SRNS Criticality Safety Program organization also prepares a quarterly criticality safety Performance Assessment (PA) using the same data. However, the PA examines the data more closely on a facility-by-facility basis. If a facility is experiencing an unusually high number of reportable or non-reportable occurrences, a higher than expected number of the same type of problem, or unusually special or severe problems, the facility is placed on the "watch list" or a recurring event is declared. This information is provided to and reviewed by the DOE-SR. No facilities are currently on the watch list.

The criticality safety indicator is a lagging indicator. The data indicates that the majority of reportable and non-reportable occurrences over the past several years are low consequence events (i.e., less severe than violation of a procedural limit). There were some cases in which a procedural limit was violated, but the actual higher level Criticality Safety Limit (CSL) was not challenged. In a few cases, a control credited in protecting the double contingency principle was violated, but other controls remained in place such that actual violation of the double contingency principle was never an issue.

The number of minor events (less than procedure limit violation or less than loss of a control) in FY 2011 was 40 versus 50 in FY 2010. The number of events involving a procedure limit violation or loss of a control was 3 in FY 2011 versus 2 in FY 2010. These events are reported

at SRS as ORPS Non-reportable (3C3). It continues to appear that minor deficiencies are being identified and corrected before more significant problems arise. There were no 3C2 or 3C1 non-reportable ORPS items during FY 2011. No significant negative trends were identified. A summary of the three 3C3 events follows:

The 3C3 event in H-canyon on 5/31/11 - During a rain shower, an instrument air supply line valve that was closed (should have been open) to the enriched U storage tank sump level indicator prevented the level indicator from functioning. All other criticality controls remained in place and there was no leak from the enriched storage tank. One credited control was lost. A criticality cannot occur in the sump unless a leak from the U storage tank is followed by an extended period of evaporation.

The 3C3 event in H-Canyon on 8/31/11 - During the performance of a maintenance procedure involving 2nd Uranium 1DS, 1DX and 1EX stream temperature interlock functional tests, it was identified that the Distributed Control System (DCS) temperature set points and the maintenance procedure set points did not match. It was later determined that the permanent DCS set point changes were not correctly installed in the configuration database. This resulted in a failure of a Double Contingency Analysis defense which requires the 1DS, 1DX and 1EX temperature interlocks to be functional with a correct set point to protect the DCA limits. Several other parameters are monitored during mixer-settler operation and all other criticality controls associated with these other parameters remained in place. The DCS was operational, but the set points were incorrect. Correction to the set points was made.

The 3C3 event in L-Area on 9/20 - While making fuel bucket moves in the area of the Horizontal Tube Storage racks in preparation for removal of those racks, a nuclear criticality block (a device that prevents a chain fall from carrying fuel into a given storage row) was placed on an incorrect row (i.e., not the position required by the applicable NCSE). Other controls remained in place and fuel was not moved into the incorrect row. However, a credited control was lost.

A criticality accident was never approached in any of these events because of the presence of multiple additional controls.

Due to periodic changes in the number of facilities operating, the planned and unplanned number of facility outages that occur, mission changes and changes in the type of fissile or fissionable material involved, and management and facility staff changes, it is not possible to normalize indicator results from year to year. Nevertheless, due to the substantial number of activities performed each year across the site and the large number of personnel involved, the indicator results provide a meaningful data set that can be used to determine if the Criticality Safety Program is functioning effectively and to identify areas of improvement.

7. Follow-Up to Assessments

Follow-up of the DOE 2007 Assessment of DOE-STD 1158 criteria in H-Canyon and HB-Line was accomplished during the 2011 Assessment of Operating Procedures in H-Canyon. The conclusion was that the one finding from that 2007 assessment that applied to Operating Procedures had been resolved.

8. List of Leading and Lagging Indicators for monitoring the effectiveness of NCS program implementation

See Items 1 and 6 for discussions of Indicators and their use at SR.

9. The status of any on-going design projects, how criticality safety is being integrated into design, and any design changes that were made because of criticality safety input

The Waste Solidification Building (WSB) project continues. The WSB is intended to process high and low activity waste from the Mixed-Oxide Fuel Fabrication Facility MFFF), and may process similar waste from the Pit Disassembly Project.

An NCSE and DSA Chapter have been prepared for the WSB and are in the review process. An MFFF NCSE demonstrates that under normal and credible abnormal conditions, the concentrations of fissile materials in the waste stream sent to the WSB from the MFFF are so low that criticality safety is not an issue in the WSB. Any changes to the MFFF and WSB flowsheets will be evaluated.

10. Status of any Open Issues Identified in Previous Reports

There are no open items from the FY 2010 report.

Attachment 15
Savannah River Remediation
Criticality Safety Program

Field/Site Manager: Dr. David Moody NSC POC: Norman Shepard

1. Measure of Contractor Nuclear Criticality Safety Performance

Savannah River Remediation (SRR), the Liquid Waste (LW) Contractor and Savannah River Nuclear Solutions (SRNS), the Management and Operations (M&O) Contractor have jointly established metrics. SRNS and SRR have a central criticality safety oversight committee, the Nuclear Criticality Safety Review Committee (NCSRC). The NCSRC maintains a criticality safety indicator based on reportable and non-reportable occurrences that are submitted into a site database. The database includes items from M&O facilities as well as LW facilities. A rating scale is used to score each reportable and non-reportable occurrence. On a quarterly and annual basis, the cumulative score, and the number of reportable and non-reportable occurrences in each rating bin, are presented to and reviewed by the NCSRC. Cause codes for each occurrence are also compiled and tracked to determine the major causes of the occurrences. A goal is established by the NCSRC on an annual basis to reduce the number of occurrences in the groupings having the highest number of occurrences.

In FY 2010, LW had one minor deficiency. In FY 2011, LW had no deficiencies.

In addition, SRR performs an Annual Functional Area Program Performance Analysis, the previous covering the time period 6/1/2010 through 5/31/2011. The Program Performance Analysis documented reviews of Occurrence Reporting and Processing System (ORPS) reports categorized under criterion 3C (criticality safety), plus ORPS reports categorized under other areas such as TSR violations, instrumentation/equipment problems, surveillance problems, procedure problems, safety significant control problems, and management concerns related to criticality safety.

Similarly, the Site Tracking, Analysis, and Reporting System (STAR) reports categorized under FA 15 (criticality safety) were reviewed, plus STAR reports categorized under other areas such as TSR violations, instrumentation/equipment problems, surveillance problems, and management concerns that were related to criticality safety. The SRSOC critique database and New Information (NI) databases were reviewed as well.

There were no criticality safety related ORPS events in the reporting period and only one (1) implementation issue in STAR.

In addition to the PIs above, the M&O/LW Contractors have a rigorous and active self-assessment process. Performance is reviewed using the lines of inquiry established in DOE STD-1158.

2. Status of the Contractor Nuclear Criticality Safety Engineer Program

SRR currently has three senior criticality engineers available plus one engineer working to complete CS Engineer qualification. DOE-SR agrees that this staffing level is appropriate for the SRR activities.

3. Status of the Federal Nuclear Criticality Safety Engineer Programs

During most of FY 2011, Federal staffing was two full time engineers. One was a qualified criticality safety engineer and the other was working to complete the Federal Technical Qualification Program in Criticality Safety and did so in August 2011. Additionally one qualified criticality safety engineer working as a facility engineer provided some part time support and another qualified criticality safety engineer working for NNSA provided assistance for facilities of

concern for NNSA. DOE-SR has been successful in hiring another full time engineer to work in criticality safety. He will start in December 2011. With the addition of this third full time engineer for criticality safety and the availability of two part time engineers, DOE-SR is close to the staff of four needed to support criticality safety as identified in the January 2008 Five Year Work Force Management Plan for Fiscal Years 2008 - 2013.

4. Federal Assessments of Site NCS Programs

In FY 2011 DOE-SR conducted four reviews relating to the SRR criticality safety program. One review was of a criticality safety evaluation, one observation of the SRR Criticality Safety Committee Meeting (overview of the SRR CSP), one observation of the Nuclear Criticality Safety Review Committee Meeting (Overview of both the SRR and SRNS CSPs), and one review of criticality safety for safety basis documents. The criticality safety evaluation review concluded that the evaluation was performed and reviewed by qualified criticality safety engineers and met the requirements of DOE-STD3007.

Monthly criticality safety DOE-SR/SRNS/SRR interface meetings review performance and identify ongoing/upcoming issues.

5. Lessons Learned from New Facility Design

Facilities being designed for SRR that will need a criticality safety program include the Small Column Ion Exchange Program, for which an NCSE was written. DOE-SR is currently reviewing this NCSE.

6. Trending and Analysis of Reportable and Non-reportable Nuclear Criticality Occurrences

SRR had no criticality safety related ORPS events and only one implementation issue in its issue management system.

The deficiency was noted over the performance period in which the amount of monosodium titanate added to a strike tank exceeded that in the procedure. A Nuclear Criticality Safety Assessment (NCSA) was written to show that it was still within the constraints of the Nuclear Criticality Safety Evaluation (NCSE).

7. Follow-up to Reviews Undertaken by DOE

No DOE follow-up reviews were undertaken.

8. A list of leading and lagging indicators for monitoring the effectiveness of NCS program implementation

See Item 1 for discussions of Indicators and their use at SR.

9. The status of any on-going design projects, how criticality safety is being integrated into design, and any design changes that were made because of criticality safety input

An on-going design project is Chemical Cleaning of Type I and II H-Area Tanks. An NCSE was written. A Consolidated Hazard Analysis Process, utilizing a multi-discipline team, was used to determine scenarios. Frequent meetings between the project and the criticality engineers were held to ensure both the project and criticality personnel were in agreement on the criticality barriers.

10. Status of open issues identified in the previous year's annual report

There are no open items from the FY 2010 report.

Attachment 16
Parsons
Salt Waste Processing Facility
Criticality Safety Program

Field/Site Manager: Dr. David Moody NSC POC: Norman Shepard

1. Measure of Contractor Nuclear Criticality Safety Performance

The Salt Waste Processing Facility (SWPF) project is currently scheduled for early startup in 2014. Therefore the project has not progressed to the stage for metrics for criticality safety performance

2. Status of the Contractor Nuclear Criticality Safety Engineer Program

The SWPF project has one full time engineer and one part time engineer for criticality safety staff. Both were qualified as Senior Criticality Safety Engineers in accordance with DOE-STD-1135. DOE-SR agrees that this staffing for a relatively small liquid waste processing facility is adequate.

3. Status of the Federal Nuclear Criticality Safety Engineer Programs

During most of FY 2011, Federal staffing was two full time engineers. One was a qualified criticality safety engineer and the other was working to complete the Federal Technical Qualification Program in Criticality Safety and did so in August 2011. Additionally one qualified criticality safety engineer working as a facility engineer provided some part time support and another qualified criticality safety engineer working for NNSA provided assistance for facilities of concern for NNSA. DOE-SR has been successful in hiring another full time engineer to work in criticality safety. He will start in December 2011. With the addition of this third full time engineer for criticality safety and the availability of two part time engineers, DOE-SR is close to the staff of four needed to support criticality safety as identified in the January 2008 Five Year Work Force Management Plan for Fiscal Years 2008 - 2013.

4. Federal Assessments of Site NCS Programs

The SWPF Criticality Safety Program Description Document (CSPDD) has been reviewed and was approved by DOE-SR in late 2009. Additionally a review of a preliminary Nuclear Criticality Safety Evaluation (NCSE) has been performed. Comments provided on the CSPDD document were resolved prior to approval. The review of the NCSE concluded that it was done in accordance with DOE-STD-3007-2007. Criticality safety evaluations are deemed adequate based on the NCSE review. No additional DOE-SR reviews have been performed in FY 2011.

5. Lessons Learned from New Facility Design

The SWPF project is a new facility design and requires a criticality safety program. The CSPDD which describes the Criticality Safety Program for the SWPF project has been reviewed and approved by DOE-SR. In 2008, a 90% design review was performed by DOE that included review of the Preliminary Documented Safety Analysis (PDSA). Revisions to the Nuclear Criticality Safety Evaluations are in the comment/review cycle and focus on incorporating considerations from Operations. Future new or revised NCSEs will be performed as appropriate as the project matures. DOE comments were incorporated in Chapter 6 of the PDSA, which summarized the preliminary analysis (NCSE) results, important limits, and controls.

Some of the lessons learned from reviews and assessments of this new project work include: 1) importance of getting criticality safety engineers involved early in the project, importance of

determining credibility/noncredibility of a criticality accident, 2) identification of a control strategy early in the project, and 3) importance of evaluating the functional classification of controls.

6. Trending and Analysis of Reportable and Non-reportable Nuclear Criticality Occurrences

The facility is not operational. There are no reportable or non-reportable nuclear criticality safety occurrences.

7. Follow-up to Reviews Undertaken by DOE

No DOE follow-up reviews were undertaken.

8. Status of open issues identified in the previous year's annual report

See Item 5.

There are no open items from the FY 2010 report.