Office of Enterprise Assessments Targeted Review of the Safety-Significant Systems at the Pacific Northwest National Laboratory Radiochemical Processing Laboratory

July 2015

Office of Nuclear Safety and Environmental Assessments
Office of Environment, Safety and Health Assessments
Office of Enterprise Assessments
U.S. Department of Energy

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Acronyms

BM	Building Manager
CAS	Criticality Alarm System
CONOPS	Conduct of Operations
CRAD	Criteria, Review and Approach Document
CSE	Cognizant System Engineer
DOE	U.S. Department of Energy
DSA	Documented Safety Analysis
EA	Office of Enterprise Assessments
ESR	Electronic Service Request
F&O	Facilities and Operations
FR	Facility Representative
FSS	Fire Suppression System
JPP	Job Planning Package
M&TE	Measurement and Test Equipment
MOU	Memorandum of Understanding
NMMP	Nuclear Maintenance Management Program
OA	Operator Aid
OFI	Opportunity for Improvement
ORPS	Occurrence Reporting and Processing System
PAR	Performance Assessment Report
PM	Preventive Maintenance
PNNL	Pacific Northwest National Laboratory
PNSO	Pacific Northwest Site Office
PO	Power Operator
POD	Plan of the Day
RPL	Radiochemical Processing Laboratory
SAT	Systematic Approach to Training
SE	System Engineer
SME	Subject Matter Expert
SOP	Standard Operating Procedure
SS	Safety Significant
SSC	Structures, Systems, and Components
TSR	Technical Safety Requirement
USQ	Unresolved Safety Question

Executive Summary

The U.S. Department of Energy (DOE) Office of Environment, Safety and Health Assessments, within the Office of Enterprise Assessments (EA), conducted an independent review of certain aspects of management and oversight of the safety-significant Criticality Alarm System and Fire Suppression System at the Pacific Northwest National Laboratory (PNNL) Radiochemical Processing Laboratory (RPL), Building 325, a nuclear facility operated by Battelle Memorial Institute (hereafter referred to as Battelle). The principal focus was on technical procedure development, use and adherence; training; maintenance and calibration of equipment. EA also evaluated the effectiveness of Federal safety system oversight by reviewing the performance of the DOE Office of Science Pacific Northwest Site Office (PNSO) oversight at PNNL. This independent review, conducted during March 2015, was part of a larger targeted assessment of safety-class and safety-significant (SS) structures, systems, and components across the DOE complex.

Overall, the selected safety systems are acceptably operated and well maintained. Battelle's process for development and implementation of procedures is sound and procedures are technically adequate to achieve the required level of system performance. With important exceptions noted below, facility personnel generally use procedures in a manner that ensures the availability of the selected safety systems to perform their intended safety functions when required.

RPL training programs ensure that operations personnel are trained on procedure use, proper system response, and required actions involved in credible accident scenarios in which systems are required to function. Battelle has established a system engineer program to ensure safety systems meet their safety functional requirements and performance criteria. EA found the experienced incumbent system engineers to be very knowledgeable of their systems and associated performance. However, regardless of assigned systems, they are qualified to the same general requirements and rely on experience gained in the job after completion of the qualification requirements to reach an adequate level of knowledge and ability to perform independently.

The selected safety significant systems are well maintained and are acceptably reliable to perform intended functions. Surveillance and testing activities for the selected safety systems are generally performed in accordance with technical safety requirements.

PNSO oversight of PNNL is satisfactory with one best practice related to identification and communication of PNSO oversight issues throughout the organization. The Performance Assessment Report is an electronic system used to report and track issues and effectively provides information throughout the organization in real time.

EA identified a few deficient areas. Battelle incorrectly determined that the "Control of Interrelated Processes" requirements were not applicable to RPL, and PNSO approved this determination. For example, the safety significant fire suppression system uses water provided by Mission Support Alliance under a Memorandum of Understanding (MOU) to Battelle. By not fully evaluating all applicable systems against Conduct of Operations requirements for Control of Interrelated Processes, Battelle cannot ensure these systems and facilities will respond adequately to abnormal events involving interrelated processes relied upon for facility operations despite the fact MOUs exist for these systems. In addition, operators were observed using out of date and uncontrolled copies of alarm response procedures in the operator work area where the alarm panel is located.

EA also identified a significant number of completed surveillance test packages with procedure non-compliances. Although EA considers the sheer number of procedure non-compliances identified during

this assessment to represent a breakdown in the process used to execute procedures at RPL, no instances were observed that call into question the operability of SS structures, systems, and components.

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1.0 PURPOSE

The U.S. Department of Energy (DOE) Office of Environment, Safety and Health Assessments, within the Office of Enterprise Assessments (EA), conducted an independent review of the safety-significant (SS) Criticality Alarm System (CAS) and the Fire Suppression System (FSS) at the Pacific Northwest National Laboratory's (PNNL) Radiochemical Processing Facility (RPL), Building 325. Battelle Memorial Institute (hereafter referred to as Battelle), operates this facility under contract to the DOE Office of Science, Pacific Northwest Site Office (PNSO). EA also evaluated the effectiveness of Federal safety system oversight by reviewing the performance of DOE oversight at PNNL. EA performed offsite planning during February 2015 and the onsite data collection portion of the review March 2-5, 2015.

2.0 SCOPE

This targeted review evaluated the effectiveness of processes for operating, maintaining, and overseeing the performance of selected safety systems at RPL. Specifically, EA selected the CAS and FSS SS systems. EA's review consisted of an evaluation of the procedures and processes used to demonstrate the ongoing operability and reliability of the system, and evaluation of the implementation of those procedures and processes for a sample of components within that system.

Specifically, this assessment evaluated processes for developing and implementing procedures, and conducting maintenance, training, and calibration of safety system equipment to ensure continued reliable capability to perform intended safety functions at PNNL nuclear facilities. The assessment evaluated a sample of the site's on-going management of selected safety significant structures, systems and components including associated DOE site office oversight as evidenced by procedure development, use and adherence, the conduct of training, implementation of maintenance requirements, and the calibration of selected safety system equipment. EA also evaluated the effectiveness of site office programs in managing and maintaining safety system performance using criteria from Criteria, Review and Approach Document (CRAD) 45-21, Revision 1, Feedback and Continuous Improvement Inspection Criteria and Approach – DOE Field Element. Key observations and results from this review are presented in Section 5.0.

Selected objectives and criteria from the following sections of the CRAD 45-11, Revision 3, *Safety Systems Inspection Criteria, Approach, and Lines of Inquiry*, were used to define the scope of this targeted review:

IV. Maintenance
V. Surveillance and Testing (procedures)
VI. Operations (operations procedures and training)
VII. Cognizant System Engineer (maintenance support and training)

3.0 BACKGROUND

EA's oversight program is designed to enhance DOE safety and security programs by providing DOE and contractor managers, Congress, and other stakeholders with an independent evaluation of the adequacy of DOE policy and requirements, and the effectiveness of DOE and contractor line management performance in safety and security and other critical functions as directed by the Secretary of Energy.

The EA oversight program is described in and governed by DOE Order 227.1, *Independent Oversight Program*, and a comprehensive set of internal protocols, operating practices, inspectors' guides, and process guides.

In a memorandum to DOE senior line management dated November 6, 2012, "Safety Class or Safety Significant Structures, Systems and Components" was identified as a targeted review area, with a series of reviews starting in 2013. The memorandum also stated that these areas would be further defined in associated review plans and that the performance of DOE oversight would be evaluated during targeted reviews to provide input to the overall evaluation of DOE's Federal assurance capability. The reviews of safety systems covered several DOE sites to ensure that EA has sufficient information to provide insights into DOE-wide performance. When all selected DOE sites have been reviewed, EA will prepare a report summarizing the conclusions of the assessments regarding the overall status of safety system management throughout the DOE complex, common issues, and lessons learned.

PNSO oversees Battelle and is responsible for administering the contract, executing assigned DOE and Office of Science programs, and conducting oversight of work performed at PNNL in support of DOE and Office of Science requirements and priorities. The PNNL mission includes basic and applied research and development to strengthen U.S. scientific foundations for fundamental research and innovation; prevent and counter acts of terrorism through applied research in information analysis, cyber security, and the nonproliferation of weapons of mass destruction; increase the U.S. energy capacity and reduce dependence on imported oil; and reduce the effects of human activity on the environment. RPL, also known as Building 325, is a Category 2 nuclear hot cell facility that was designed and constructed to create and implement innovative processes in support of the national mission areas. Some of the work taking place at the RPL involves advancements in the cleanup of radiological and hazardous wastes, the processing and disposal of nuclear fuels, detection and forensics of nuclear material, and the production and delivery of medical isotopes.

The CAS and FSS SS systems selected for this review are the only active SS systems in the facility. CAS provides immediate detection of a nuclear criticality and simultaneously sounds facility evacuation horns located throughout the facility. The FSS provides fire suppression capability to reduce the amount of radioactive material released during a postulated fire event. Various structures, systems, and components (SSCs) support these functions for these systems. These SSCs are identified as SS within the Documented Safety Analysis (DSA) and technical safety requirements (TSRs).

Although the review focused primarily on the selected systems, EA considered additional systems during field observations, as necessary, to obtain a clearer perspective for evaluating implementation of some CRADs.

4.0 METHODOLOGY

EA completed the targeted review through detailed document reviews and an onsite review of contractor safety system engineering, operations, and maintenance; system material condition; and field office oversight of the selected safety significant systems. The review included observation of contractor and field office personnel during facility walkthroughs, safety system walkdowns, actual and simulated maintenance work package execution, surveillance tests, and contractor assessments. The EA team also performed detailed reviews of documentation associated with procurement packages and procurement records management, completed surveillance tests, assessed safety system performance, and reviewed the maintenance history for the selected safety systems. EA also conducted interviews with operations, maintenance, engineering and management staff in the areas selected for review.

EA divided the targeted review process into several stages, including offsite planning, onsite data gathering activities, report writing, validation, and review. Planning included discussions with responsible site and Office of Science personnel, determination of the details of safety systems to be reviewed, scheduling of the review, collection of applicable site procedures and documents, and document reviews. After the onsite data collection period, EA prepared a draft independent review report identifying overall perspectives, deficiencies, and opportunities for improvement (OFIs) and made it available to line management for review and feedback.

5.0 RESULTS

5.1 Technical Procedure Implementation and Performance

- ***Inspection Criterion:*** *Procedures are technically accurate to achieve required system performance for normal, abnormal, remote shutdown, and emergency conditions.*

- ***Inspection Criterion:*** *Formal processes have been established to control safety system equipment and system status to ensure proper operational configuration control is maintained in accordance with DOE Order 422.1, Conduct of Operations.*

- ***Inspection Criterion:*** *Surveillance and test procedures confirm that key operating parameters for the overall system and its major components remain within safety basis and operating limits.*

- ***Inspection Criterion:*** *The acceptance criteria from the surveillance tests used to confirm system operability are consistent with the safety basis.*

EA relied upon the attributes of Section 2.p, *Technical Procedures*, of DOE Order 422.1, *Conduct of Operations*, to assess the adequacy of RPL technical procedures. This section of the report covers procedure development, use, and adherence. In addition, this section addresses the adequacy of surveillance testing procedures to support continued system operability. EA reviewed selected elements of the RPL procedures program as it relates to the selected systems. EA observed walkthroughs with operators and System Engineers and several simulated procedure performances for CAS and FSS. EA reviewed Occurrence Reporting and Processing System (ORPS) reports and completed TSR surveillance procedures for the last three years. EA also observed Plan-of-the-Day meetings and routine operator procedure performance activities.

Procedure Development

Generally, reviewed procedures were technically accurate and capable of being performed as written. The procedures achieved required objectives for continued system operability and met most of the detailed attributes of DOE Order 422.1, *Conduct of Operations*, Section 2.p, *Technical Procedures*. Processes are in place to develop, revise, approve and implement technical procedures. However, three of the Order 422.1 attributes have not been implemented as follows **(See OFI-PNNL-Procedures-01):**

- RPL management polices do not designate procedures to be developed for all normal, abnormal and emergency conditions.
- RPL management polices do not address the development of alarm response procedures.
- RPL directives do not designate a senior manager responsible for procedure development.

It is important to note that EA did not identify missing or unacceptable procedures as a result of these compliance omissions. EA did, however, identify that a procedure(s) and associated training had not been

developed for implementation of Section 2.m, *Control of Interrelated Processes*, of DOE Order 422.1 at RPL. The RPL conduct of operations matrix (RPL-PLN-1106) dated 6/1/2014 states that Section 2.m is not applicable. This section of the Order contains three required attributes for systems or processes that are deemed interrelated processes. Interrelated processes are those provided to the nuclear facility (in this case RPL) but are under the control of organizations outside of RPL. Discussions between EA and laboratory management determined that there are three interrelated processes at RPL. The first is steam provided by Johnson Controls; the second is electrical power supplied by the City of Richland; and the third is potable water provided to RPL by Mission Support Alliance. For each of these interrelated processes, the Order requires operator responsibilities and training to be defined for both RPL operators and operators of the interrelated process. In addition, lines of communications must be established between operating personnel at RPL and other interrelated process operators for the coordination of activities. RPL procedures do not identify the roles and responsibilities for operators related to interrelated processes, associated training has not been developed or implemented and lines of communication between RPL operators and interrelated process operators have not been implemented in accordance with the Order requirements. In addition, RPL memorandums of understanding (MOU) with each of the three interrelated process providers have not been modified to address DOE conduct of operations requirements for interrelated processes discussed above. **(See Finding: PNNL-Procedures-01)**

Procedure Use

RPL procedure ADM-NOD-802, *Document Development and Control*, defines the process used to develop and control facility documents including procedures. Two procedure use categories defined in Section 3.0 of this procedure (Mandatory Use and Reference Use). The use categories are defined as follows:

> Mandatory Use Procedure: Category designated for procedures that require a high degree of rigor. They may or may not be conducted on a regular basis. For this category, the procedure is open at the work station. Unless otherwise indicated, all steps are to be performed in sequence. If there are initialed steps, Radiological Control hold points or completion signoffs, the procedure shall be placed in this category.
>
> Reference Use Procedure: Category designated for simple operations that are typically conducted regularly. For this category, the procedure can be performed from memory, but the procedure is available to the worker and may be referred to periodically as needed during the performance of the procedure to confirm that all required steps have been completed.

EA reviewed approximately 50 technical procedures during this assessment and found numerous procedures categorized as Reference Use that were not categorized correctly. **(See OFI: Battelle-Procedures-02)** Below are some examples of Reference Use procedures that do not fit the definition above:

- ADM-RPL-702, *325 Building Criticality Alarm System Outage Procedure*, contains detailed actions steps to properly and safely enter into and exit from planned and unplanned outages of the CAS. This procedure is infrequently used.
- RPL-SA-005, *325 Building Fire Suppression System Outage Procedure*, contains detailed actions necessary when any portion of the RPL FSS is not operable. The procedure also includes steps to return the system to operable status. The procedure is critical to continued operability of this SS system and many portions of the procedure are not performed frequently.

- SOP-325-19, *RPL Alarm Response*, contains detailed operator actions for various alarms and in one case directs the operator to make a specific 4-sentence immediate announcement. The procedure is infrequently performed. The operators have not committed these actions to memory nor are they drilled upon them.
- SOP-325-HVAC-01, *Operation of the RPL Main Ventilation Supply and Exhaust Fans*, contains dozens of detailed action steps to start-up the system, rotate the operating exhaust and supply fans, shutdown individual supply and exhaust fans and verification of system alignment. Certain portions are performed infrequently.
- PM 44274, *325 Building Fire Suppression System Floor-Level Inspection*, is categorized as Reference Use but contains numerous steps and blanks spaces for performer initials. This procedure is performed annually and fulfills TSR requirements for the FSS.

SOP-PO-Tour-2000, *Power Operator Tour Procedure*, introduces a different procedure use category (Information Use) that is not recognized as a use category in any of the contractor procedures on the development and use of RPL procedures (i.e., ADM-NOD-802, *Document Development and Control Procedure*, and ADM-001, *Document Production and Distribution*). **(See OFI-Battelle-Procedures-02)**

ADM-NOD-802 recommends the use of ADM-004, *Writer's Style Guide*, when developing technical procedures. Contrary to the guidance in ADM-004, EA found several procedures with more than one action in a procedure step to ensure that procedures are accurately performed and required procedure actions are not overlooked. **(See OFI-Battelle-Procedures-03)** For example:

- PM-44806, Rev.5, *325 Building Fire Suppression System Riser 6 Inspection and Testing*, Step 3.2.2.12 states two actions, "CLOSE FP-121-VLV and OPEN FP-122-VLV to drain excess water from the fill port." Another example is step 3.4.2.4, "Open FP-126-VLV Main Drain valve to flush the feed main; then close FP-126-VLV. "(Two separate actions, opening and closing the valve). This procedure contained five additional steps containing multiple actions per step.
- SOP-325-ELEC-2, rev 9, *Loss of Power*, Step 7.1.1, "At the power operator office,…verify that one exhaust fan is running in manual mode. IF no exhaust fans are running, THEN start any exhaust fan in manual mode."
- SOP-325-HVAC, rev 1, Operation of the RPL Main Ventilation Supply and Exhaust Fans, Step 7.3.2.1, "At the Metasys workstation, select STOP for the exhaust fan that is running in AUTO RUN, place the control switch on the exhaust fan control panel to MANUAL and back to AUTO."

Two observed simulated alarm responses involved Power Operators (PO) in the PO office. The simulations were conducted on different days with different POs. EA selected three alarms for simulation. Each time an alarm was simulated as occurring; the PO instinctively reached for a binder in the PO office labeled "Annunciators" and began executing the required operator actions. However, the version of the RPL alarm procedure in the binder was revision 4 dated 7/15/2009. This revision of the procedure was superseded by revision 5 on 6/30/2011. The current revision is revision 7 (4/15/2014) and the operator actions are different from the 2009 version. The bottom of the procedure cover page for every RPL procedure states, "Unless stamped and numbered as a Controlled Copy, the online version is the official version of this procedure. Before using a printed copy verify that it is the most current version by checking the revision number against an official copy." In addition, this procedure non-compliance had been overlooked by Battelle management for more than three and one-half years. **(See Finding-Battelle-Procedures-02)**

In order to be prepared to respond at a moment's notice to a particular alarm, RPL management stated that a controlled copy of SOP-325-19, *RPL Alarm Response*, and other Standard Operating Procedures

(SOPs) is located in the PO office. In addition, ADM-RPL-611, Technical Surveillance Requirement Administration requires that a controlled copy of SOPs be maintained in the Building Manager's (BM) Office. Neither the PO office nor BM office copies were stamped or numbered as a controlled copy as required. **(See Finding-Battelle-Procedures-02)**

Procedure Compliance/Adherence

In many cases, EA found procedure implementation and execution at RPL to be acceptable. RPL staff are knowledgeable of proper procedure use and adherence and generally perform procedures effectively. However, EA observed several examples of procedure non-compliances during the assessment. **(See OFI-Battelle-Procedures-04)**

- RPL staff incorrectly executed some procedure steps. For example, the Feb 2015 performance of the semiannual CAS PM (PM-13070, rev 21) step 3.2.6 states, "Record the serial number and CALIBRATION EXPIRES date on the replacement detector and verify it will remain in calibration through at least June of the next year." The steps were initialed as completed. However, the actual calibration of the detectors expires at the end May of the next year.
- Inconsistencies also exist in documented completion of some procedure steps; some steps are initialed off, some blanks are documented with a check mark, and some steps are checked with other steps blank where neither a check or initial was used (calling into question whether the step was properly completed before proceeding to the next step which was checked).
- 2014 records show several sets of operator rounds do not document out of range indications.
- RPL HVAC exhaust systems are governed by SOP-325-HVAC, *Operation of the RPL Main Ventilation Supply and Exhaust Fans.* The procedure contains detailed steps on start-up of the HVAC system from a non-operating condition, shutdown of the system, as well as how to swap fans to ensure that they have equivalent run times. However, the run hours are not tracked and the fans are not rotated on a periodic basis as stated in the procedure. According to the RPL staff, this practice was discontinued about two years ago.
- Requirements for PO shift turnover are contained in SOP-PO-TOUR-2000, *Power Operator Tour Procedure,* and are conducted using a turnover check list. However, one item on the checklist is out of date and has been for over a year. It is filled out electronically and the turnover cannot be electronically completed unless the operator checks all of the boxes. One box is no longer applicable; however, the operators have to check the box attesting that the turnover item is complete. Also, during one observed turnover, the operator who had been out for several days completed the turnover process assuming PO duties without reviewing the logs back to the last day that the individual was on shift. This resulted in missing key alarms and trips that occurred during the days between being on shift.
- ADM-CM-064, *Equipment Identification and Labeling Requirements,* contains acronyms that are not properly reflected on CAS howler (audible alarm device) equipment tags in the field and most of the equipment tags for CAS howlers are not in accordance with the specified color convention described in the CM procedure. For example, the procedure requires that specific acronyms be used on the tags with white letters on a blue background. Contrary to the specified labeling, yellow tags with black lettering were observed with the incorrect equipment acronyms on the tags.
- ADM-RPL-712, *Signs and Operator Aids,* describes the process for managing Operator Aids (OA) in accordance with DOE Order 422.1 requirements. However, EA identified three unapproved operator aids including instructions on how to swap ventilation fans and how to interpret alarm codes for a system that had already been removed.

ADM-RPL-712 also requires semiannual review of approved OA. The RPL facility specialist performs this review. The specialist stated that the review is accomplished by verbal discussion with the persons

using the aids and asking them if their OAs are still valid, needed, or are any new ones needed versus direct verification that the aid remains valid. Contrary to DOE Order 422.1 Section 2.q, *Operator Aids*, the OA process does not include the revision number in the OA master list for the OA source document nor does it periodically verify agreement between the master list and actual postings. **(See OFI-Battelle-Procedures-05)**

Surveillance Test Procedures

Based on EA review of the procedures and a sample of their execution, surveillance test procedures for the CAS and FSS are technically accurate and capable of being performed as written. All of the surveillance test procedures confirm that key operating parameters for the overall system and its major components remain within safety basis and operating limits. Each test procedure contains clear and appropriate acceptance criteria to confirm system operability is consistent with the safety basis. However, as noted below, in many cases the documented completion of TSR surveillances was not in compliance with RPL procedures.

ADM-RPL-611, *Technical Safety Requirement Administration*, specifies certain criteria for completion of surveillance activities. These include:

- If a correction is necessary, a single line shall be drawn through each incorrect entry and it shall be initialed and dated.
- Procedure steps shall be performed sequentially unless otherwise denoted in the procedure or cover sheet.
- Initialing a signoff space signifies that:
    1. The person who placed initials in the space either performed or personally witnessed the verbatim performance of the step.
    2. The results of the step are satisfactory or the discrepancy is noted by circling in red and recording the discrepancy on the cover sheet.

Additionally, ADM-RPL-611 specifies requirements for review of completed surveillance activities. Specifically, "The System Engineer or Fire Protection Engineer reviews the surveillance procedure or inventory documentation and certifies on the coversheet that all data is correct and within limits; procedure steps are filled out as required; all acceptance criteria are met; and all discrepancies are identified on the cover sheet and reviewed by the RPL Building Manager."

EA reviewed 110 safety system surveillances completed during the last three years for compliance with ADM-RPL-611 requirements. Approximately half (57 out of 110) contained non-compliances. The most frequent non-compliances were improper procedure correction (missing initials, date, or both – 56 instances), failure to circle discrepancies in red (32 instances), and failure of the System Engineer (SE) to identify and correct non-compliances (86 instances). Other errors noted were less frequent, but potentially more significant. These included steps not initialed or checked, some steps completed out of order; incomplete or wrong data entered; required steps not completed properly; and unauthorized pen-and-ink changes. These errors are significant because all the surveillance test procedures are Mandatory Use, which require steps to be performed sequentially unless otherwise noted. The failure to complete the procedure, as written, has the potential to leave the system in an inoperable condition. ADM-001 *Document Production and Distribution* has a defined process for making "In field Procedure Changes." The process ensures that changes are approved by the procedure approvers (or delegates), and that an Unresolved Safety Question (USQ) review is performed. By not completing the procedures as written, the USQ process and review of changes by procedure approvers is entirely bypassed. This increases the potential to compromise safety system operability and TSR compliance. The sheer number of these non-

compliances indicates a larger, **s**ystemic procedure adherence problem. Several examples are noted below: **(See Finding-Battelle-Procedures-03)**

- PM 44806, completed 2/12/12. Unapproved pen-and-ink changes.
- PM 44806, completed 5/22/12. Unapproved pen-and-ink change.
- PM 13070, completed 2/25/15 contained several procedure errors.
  - As previously noted, failure to correctly complete procedure step 3.2.6. This step ensures the detectors to be installed will have valid calibrations until June of the following year. The step was initialed as completed; however, the actual calibration of the detectors expires in May, not June. Note that the step is associated with a TSR Surveillance Requirement. The relevant requirement reads, "Each neutron criticality detector shall be exchanged with a calibrated detector. The calibration period for a neutron criticality detector shall not exceed 2 years." It has an annual frequency associated with it.
  - Initials missing in step 3.3.5, although the step is checked off as being completed, and the serial number of the detector is recorded.
  - Step 1 of 3.4.3 not marked as completed, although all detector keylock switches were verified to be in the OFF position.
  - Step 1 of Section 4.2 not marked as completed, although steps before and after are marked as completed.
- PM 44277 completed 8/19/14. Incorrect data entered. In step 3.4.1.2 the number of turns to close a valve is recorded as 13. The next step records the number of turns to open the same valve as 2. This is an obvious error that was also not caught on review by the SE and the Building Manager.

DOE Order 422.1, Section 2.a and DOE Order 226.1B, *Implementation of the Department of Energy Oversight Policy* require monitoring and self-assessment of operations. PNNL does not require the periodic self-assessment of conduct of operations (CONOPS) attributes which would cover Section 2.p, *Technical Procedures* of the CONOPS matrix. **(OFI-Battelle-Procedures-06)**

In summary, RPL procedures are developed using a thorough review and approval process. Procedure use categories have been identified and procedure execution is consistent with the use category. Based on a limited sample of observations and thorough review of procedure performance records, RPL staff use of and adherence to procedures is in need of improvement. In addition, management attention is needed to properly implement procedures and processes to comply with DOE Order 422.1 Section 2.m, *Control of Interrelated Processes*, to determine causal factors and extent of condition associated with the failure to properly control and use important operating procedures, and to improve the compliance with TSR administration procedure.

5.2 Training

- ***Inspection Criterion:*** *Operations personnel are trained on procedure use, proper system response, failure modes, and required actions involved in credible accident scenarios in which the system is required to function.*

- ***Inspection Criterion:*** *Operations personnel are knowledgeable of system design and performance requirements in accordance with the facilities safety basis.*

- ***Inspection Criterion:*** *The DOE contractor has established an effective system engineer training and qualification program as defined in DOE Order 420.1C to ensure continued operational readiness of identified systems to meet their safety functional requirements and performance criteria.*

EA reviewed three areas of RPL personnel training against the requirements of DOE Order 426.2, *Personnel Selection, Training, Qualification and Certification Requirements for DOE Nuclear Facilities* and the criterion listed above. The training programs were Power Operator, System Engineering and Maintenance Personnel training.

ADM-RPL-905, *RPL Training Plan,* uses a graded approach based on potential for impact to the safety basis by personnel performing assigned duties at RPL. For example, Operators are ranked at a Medium-Low level while System Engineers (SE) are ranked at the highest level (Medium). The training level defines the rigor, based upon risk, and the level of effort and formality used to develop the individual training programs. This process is in accordance with the Systematic Approach to Training (SAT) described in DOE Order 426.2.

The RPL Power Operator Training Package (SAT Course 1491) acceptably implements the requirements of the RPL training plan. EA interviews and walkdowns with POs indicate they are knowledgeable of the facility systems, operations and safety basis. The training program generally covers procedure use, system response, failure modes, and required actions for alarm response. However, as discussed in the Procedures Section above, EA observed an area of weakness in documenting out of range parameters on documents such as operator round sheets. A review of a sample of completed round sheets for 2014 identified numerous operator round readings that were out of the defined range but not marked and others that were marked in different ways. For example, some out of range conditions were asterisked, others were checked and still others were not marked at all. Some out of range readings were discussed in the remarks section of the round sheet while others were not. No procedure guidance is provided to operators on how to document out of range conditions and the PO training program does not train POs on the expected method of documenting out range conditions. **(See OFI-Battelle-Training-01)**

SE training is defined in SAT Course 1915, *RPL Systems Engineer Training Package*. DOE Order 420.1C, Chapter V defines training and qualifications requirements for Cognizant System Engineers. Battelle has prepared a training and qualification process for SEs, which is generally consistent with the RPL training plan for a Medium risk level position. Although the SE training program meets the broad training requirements of DOE Order 426.2 and the DOE Order 420.1C, all of the SEs are qualified to the same general qualification course regardless of assigned system. The RPL SE training and qualification program does not qualify a candidate to perform the cognizant system engineer function, described in DOE Order 420.1C for a specific safety system. After completion of RPL SE qualification, SEs gain the additional system-specific knowledge necessary to be fully cognizant of assigned safety systems through experience on the job. **(See OFI-Battelle-Training-02)**

Although the SEs are qualified to the same general SE qualification, each of the SS systems has been assigned a SE who is responsible to be cognizant of all aspects of system performance. Currently assigned SEs are acceptably knowledgeable of their systems, associated safety basis and system performance issues. The incumbents have extensive experience on their systems. This experience prevented knowledge gaps between the completion of SE qualification and full cognizance of their assigned system. Approximately four years ago, RPL management assigned engineers to be back-up SEs to the primary assigned systems. Although this is a good management practice, little or no progress has been made in cross-qualification of assigned backup SEs.

Maintenance personnel are hired at the journeyman level and are trained on RPL specific tasks such as Lockout/Tagout, Rad Worker, and Suspect Counterfeit Items. EA reviewed the training records for maintenance personnel assigned to RPL and found no issues. Based on interaction with maintenance personnel during simulated PM performances, the craft were knowledgeable of RPL safety systems and the associated procedures that they support.

In summary, the RPL process for the development of Operator, System Engineer and Maintenance personnel training, meets the requirements of DOE Order 426.2. In addition, the SE training program generally meets the requirements of DOE Order 420.1C, *Facility Safety*, Chapter V, *Cognizant System Engineering (CSE).* However, EA noted weaknesses in PO training related to documentation of unexpected system indications, and the SE training program does not qualify the SE to perform the CSE function for an assigned system.

5.3 Maintenance and Calibration of Equipment

- ***Inspection Criterion:*** *The safety system is included in the nuclear facility maintenance management program and the DOE approved Nuclear Maintenance Management Plan required by DOE Order 433.1B, and is maintained in a condition that ensures its integrity, operability, and reliability.*

- ***Inspection Criterion:*** *The system(s) are maintained in a condition that ensures the safety functions can be reliably performed when required.*

- ***Inspection Criterion:*** *Maintenance processes for the system are in place for corrective, preventive, and predictive maintenance and to manage the maintenance backlog; and the processes are consistent with the system's safety classification.*

- ***Inspection Criterion:*** *The system is periodically inspected in accordance with maintenance requirements.*

- ***Inspection Criterion:*** *Maintenance activities associated with the system, including work control, post-maintenance testing, material procurement and handling, and control and calibration of test equipment, are formally controlled to ensure that changes are not inadvertently introduced, the system fulfills its requirements, and that system performance is not compromised.*

- ***Inspection Criterion:*** *Requirements are established for procurement and verification of items and services. Processes are established and implemented that ensure that approved suppliers continue to provide acceptable items and services.*

The RPL-PLN-1104, Nuclear Maintenance Management Program (NMMP) is included in the RPL DSA as a safety management system. The NMMP with its referenced procedures is compliant with DOE Order 433.1B, Maintenance Management Program for DOE Facilities, except in adequately addressing integration with DOE Order 430.1B, Real Property Asset Management. The NMMP introduction states it does not address the requirements of DOE Order 430.1B. However, NMMP Section 3.13, Aging Degradation and Technical Obsolescence, indicates "The life-cycle of high value RPL SSCs are managed through ADM-360, Risk Based Life Cycle Asset Management Program Description process," which incorporates DOE Order 430.1B requirements. **(See OFI-Battelle-Maint-01)**

The reviewed RPL CAS and FSS are included in the NMMP as evidenced by the reviewed Master Equipment List, preventive maintenance (PM) procedures and computer based MAXIMO PM scheduling process, standing maintenance procedures, and MAXIMO maintenance histories. In addition, Battelle was properly maintaining reviewed SS systems and modifying them as necessary to ensure continued integrity, operability and reliability.

ADM-016, Work Control Procedure, defines appropriate processes for control of operations, construction, and maintenance work activities conducted by the Facilities & Operations (F&O) staff. These processes include processing electronic service requests (ESRs), work planning (including development of Job Planning Packages (JPP) when needed), JPP review and approval, Risk Assessment meeting and Plan of

the Day (POD) processes, work performance, pre- and post-job reviews, and closing service requests. EA also verified the availability of routine CAS and FSS PM and Standard Maintenance Packages. ADM-NOD-802, Document Development & Control Procedure, appropriately requires Safety Evaluation Screens/Un-reviewed Safety Question Determinations be conducted after JPPs, and Preventive, Predictive or Corrective Maintenance packages are approved. However, as noted previously in Section 5.1 above, the use of unapproved pen-and-ink changes at the time of PM performance can bypass the USQ process. **(See Finding-Battelle-Procedures-03)**

The observed POD meetings provided an appropriate mechanism to evaluate, plan, and authorize the day's activities, including preventive maintenance, routine maintenance, dispatch work, planned work, and contracted maintenance and construction activities. The observed Plan of the Week meeting facilitated coordination between planned maintenance and research activities. The observed Risk Assessment meeting for a JPP to modify Hot Cell lighting clearly enhanced the JPP by identifying additional hazards and needed controls; however, the RPL Job Planning Package Hazard Risk Assessment prepared for the meeting was not documented "…using either the JPP Risk Assessment form or in accordance with F&O Procedure ADM-028, F&O Assessment Process…", as required by ADM-016. **(See OFI-Battelle-Maint-02)**

SEs appropriately supported maintenance activities in work planning and parts procurement, specifying Functional Test Procedures (post-maintenance and modification testing), performing safety evaluation screens, work package reviews and approvals, supervising work as the Person in Charge, and reviewing the completed work packages for adequacy. EA reviewed multiple electronic service requests, JPPs, completed PMs and SOPs records, and post-job meeting records. EA also observed a JPP planning meeting, several pre-job meetings and simulated performance of PM-13070, Criticality Alarm System Semiannual Test Procedure, SOP-325-18, 325 Building Fire Suppression System Monthly Inspections, and PM-44806, 325 Building Fire Suppression System Riser 6 Inspection and Testing. Although EA identified no significant concerns, the transitions between the simulated CAS or FSS Outage Administrative procedures to and from the simulated CAS or FSS PMs included redundant steps, and lacked clear definition or placeholders indicating where one procedure should be paused and the other procedure begun. **(See OFI-Battelle-Maint-03)**

ADM-083, Preventive Maintenance Deferral & Grace Periods, establishes the grace periods for various preventive maintenance activities and an appropriate process for obtaining approval and deferral of preventive maintenance activities into or beyond the established grace period. There was no backlog of deferred CAS or FSS PMs or surveillances at the time of this review.

ADM-RPL-607, Periodic System Assessments, requires periodic, performance driven and as directed reviews of system operability, reliability, and material condition. The eight reviewed 2013 and 2014 periodic and performance-focused assessment reports for the CAS and FSS adequately documented the results, implication and corrective action taken for experienced failures, tests and inspections, and the basis for concluding the systems continued to be operable and generally reliable despite some evidence of age related degradation. For example, the assessments discussed planned or taken corrective actions for FSS piping internal corrosion, a FSS lead-in pipe failure, and multiple instances of obsolescence (i.e., FSS dry pipe alarm check valve and CAS components). EA verified through discussion with the CAS and FSS SEs and review of planned or implemented testing, corrective maintenance and modifications that RPL was addressing these latter conditions and a recent failure of a CAS howler, including procurement of addition materials and components and enhanced condition monitoring.

Battelle has established appropriate RPL administrative procedures for procurement, use of evaluated suppliers, receipt inspection, identification and response to suspect or counterfeit items, commercial grade dedication, disposition of non-conformances, material and component storage, shelf life, preventive

maintenance while in storage, and handling of materials and components necessary to support CAS and FSS maintenance and modifications. EA interviewed the CAS and FSS System Engineers and the RPL Building Technician regarding their roles and responsibilities for materials procurement and handling. EA also reviewed the procurement packages, commercial grade dedication plans and receipt inspection documentation for FSS seismic restraint modifications (required to comply with NFPA 13) and CAS Howler timer relays (required as critical spare parts). Job planning packages for testing (qualification as SS components) the procured spare CAS Howler time relays and spare CAS Howlers salvaged from another building were also reviewed. Finally, EA inspected the Controlled Storage Area and verified the CAS and FSS SS materials and components were appropriately stored, inventoried and controlled. With the exception of finding a single non-SS gasket in the Controlled Storage area (which was subsequently removed), EA identified no concerns with procurement, verification of quality and handling of CAS and FSS materials and components.

ADM-RPL-812, Control of Measuring and Test Equipment, establishes appropriate requirements and responsibilities for procurement of Measuring and Test Equipment (M&TE) and calibration services, control, storage and use of M&TE, and response to suspect calibration issues. EA interviewed the M&TE Custodian and inspected the M&TE Controlled Storage Area, inventory listing and equipment calibration stickers. EA identified no M&TE concerns.

The RPL TSR requires that each CAS neutron criticality detector be exchanged annually with a calibrated detector, and that the calibration period for a neutron criticality detector shall not exceed 2 years. The records of 2014 implementation of PM-13070, Criticality Alarm System Semiannual Test Procedure, documented that each installed criticality detector was replaced in 2014 with a detector that was verified to remain in calibration until at least 3 months after the next scheduled annual replacement. However, as noted above (See Section 5.1 of this report), the performance of the PM in February of 2015 does not provide this assurance. The removed criticality detectors were returned to PNNL's Instrumentation Calibration and Evaluation Section for calibration using *NCD Calibration Procedure, Radiological Calibration Procedure*, Manual MA-563, Procedure 2.3.3. The circuitry within each criticality detector includes both primary and backup trip circuits that are calibrated to trip at different count rate levels. Although two trip circuits capable of detecting a criticality event enhances the reliability of evacuation alarm initiation, the basis or need for different trip set points was not adequately explained by the Nuclear Criticality Safety Basis Memo 09-01or understood by the RPL staff. **(See OFI-Battelle-Maint-04)**

RPL-FSS-SDD, 325 Building Fire Suppression System Design Description, indicates that all FSS pressure gauges are calibrated by PNNL Calibration Services prior to installation to assure gauges used for TSR surveillance are within tolerance. NFPA 25-2008 requires FSS gauges to be recalibrated or replaced with calibrated gauges at least every five years. Gauges not accurate to within 3% of the full scale are required to be recalibrated or replaced. Based on reviews of related assessments and surveillance records, Battelle adequately met these requirements.

Overall, the RPL NMMP, work control processes, work packages, PM scheduling, performance assessments, and records management are well implemented and compliant with DOE Order 433.1B, *Maintenance Management Program for DOE Facilities*. RPL has documented and taken or planned corrective action for age related FSS degradation, recent examples of CAS and FSS component failures, and multiple examples of CAS and FSS component obsolescence. However, based on inherent designed redundancies, system walkdowns, reviewed PM and surveillances records, reviewed plans for modification and enhanced system condition monitoring, and proactive procurement of replacements for obsolete critical spares, Battelle is appropriately maintaining and modifying the CAS and FSS systems to ensure continued integrity, operability and reliability.

5.4 PNSO Safety Oversight Program

This portion of the review was to determine whether the following inspection criteria from Criteria Review and Approach Document (CRAD) HSS 45-21, Rev. 1, Feedback and Continuous Improvement were satisfied:

- ***Inspection Criterion:*** *DOE field element line management has established and implemented oversight processes that evaluate contractor and DOE programs and management systems, including site assurance systems, for effectiveness of performance (including compliance with requirements). Such evaluations are based on the results of operational awareness activities; assessments of facilities, operations, and programs; and assessments of the contractor's assurance system. The level and/or mix (i.e., rigor or frequency in a particular area) of oversight may be tailored based on considerations of hazards, the maturity and operational performance of the contractor's programs and management systems. (DOE 0 226.1B 4b(1))*

- ***Inspection Criterion:*** *DOE field element line oversight program includes written plans and schedules for planned assessments, focus areas for operational oversight, and reviews of the contractor's self-assessment of processes and systems. (DOE 0 226.1B 4b(2))*

- ***Inspection Criterion:*** *Oversight processes are tailored according to the effectiveness of contractor assurance systems, the hazards at the site/activity, and the degree of risk, giving additional emphasis to potentially high consequence activities. (DOE 0 226.1B 4b(5))*

- ***Inspection Criterion:*** *DOE line management has in place effective processes for communicating oversight results and other issues in a timely manner up the line management chain, and to the contractor as appropriate, sufficient to allow senior managers to make informed decisions. (DOE 0 226.1B 4d)*

- ***Inspection Criterion:*** *As part of self-assessments conducted to evaluate organizational performance in Integrated Safety Management (ISM), include an assessment of the effectiveness of the organization's operating experience program. (DOE 0 210.2A)*

- ***Inspection Criterion:*** *There is adequate Facility Representative coverage for DOE facilities. (DOE-STD-1063- 2011 sec. 5.1)*

- ***Inspection Criterion:*** *Facility Representatives provide effective oversight to determine that the contractor is operating DOE facilities in a safe manner. (DOE-STD-1063-2011 sec.4.1)*

- ***Inspection Criterion:*** *Is the Facility Representative staffing analysis performed in accordance with DOE-STD- 1151? Are Facility Representatives staffed to the indicated level? [DOE-STD-1063-20II section 5.1 and Appendix C, Process to Determine Facility Representative Staffing]*

- ***Inspection Criterion:*** *Based on a sample of occurrence reports, are Facility Representative reviews of the occurrence reports accomplished in a timely manner while insuring that the root cause has been determined and effective action proposed? [DOE 0 232.2]*

- ***Inspection Criterion:*** *Do Facility Representatives accomplish facility assessments, surveillances, and audits as scheduled and are the findings meaningful and consistent with facility performance? [DOE-STD-1063-2011 sections 4.1 and 5.2]*

PNSO has established an oversight and assessment program that is consistent with the Office of Science model. Within this framework, there is substantial reliance on the contractor assurance system and contractor self-assessments. Accordingly, PNSO utilizes a risk-based system to apply their resources to nuclear, high hazard facilities, and higher risk programs, including a combination of assessments, surveillances, and operational awareness activities. PNSO PNSO-PCDR-02, *Performance Assurance Program Procedure*, requires these to be formally scheduled and promulgated to facility representatives (FRs) and subject matter experts (SMEs). While the PNSO FRs documented over 250 oversight activities in 2014, the facility representatives did not perform formally scheduled operational or safety surveillances. The facility representatives are performing formally scheduled surveillances in 2015. **(See OFI-PNSO-01)**

Although PNSO's self-assessment program contains most of the relevant order requirements, it does not address DOE Order 210.2A, DOE Corporate Operating Experience Program, which requires Heads of DOE Field Elements to include an assessment of the effectiveness of the organization's operating experience program as part of the self-assessment program. **(See OFI-PNSO-02)**

PNSO uses an effective tool to track oversight activities. The Performance Assessment Report (PAR) is an electronic system which allows PNSO personnel to input and view real time all oversight activities, including issues, trends, and other planned activities. The transparency and currency of information on the PAR provides an advantage over systems seen at some other sites such as weekly reports and periodic trending analysis. EA considers this tool to be a best practice.

PNSO has established an effective FR program. Facility Representatives are thoroughly trained, understand their assignments, interact with their counterparts, and have free access to their facilities and all levels of contract management. PNSO FRs and managers are thoroughly involved in ORPS. They review corrective actions, provide feedback, and track actions to completion. However, facility representatives do not regularly walk through each other's facilities. This can lead to FRs becoming complacent and developing a routine where they walk through the same areas and review the same items, potentially missing out-of-compliance issues. As an example, in the RPL, Room 900, EA observed unapproved operator aids posted in the room as well as out of date and uncontrolled copies of procedures utilized by operators. One of the out of date procedures (RPL Alarm Response) was three revisions behind. If other facility representatives periodically walked through RPL, this may have been discovered and corrected. **(See OFI-PNSO-03)**

In 2014, PNSO FRs took an extended amount of time to review and approve ORPS reports. Approximately half of the level two and three ORPS reports took nine months or more to finalize, well beyond the recommended 45 days. This extended closure time has been allowed more than warranted by PNSO and can lead to delays in implementation of effective corrective actions, and thus extend improper operating practices. **(See OFI-PNSO-04)**

In summary, PNSO oversight of PNNL is satisfactory with one best practice observed. PNSO has a few opportunities to improve their contractor oversight such as Facility Representatives walking through each other's facilities to provide a fresh perspective, formally scheduling and executing surveillances for Facility Representatives, and overseeing the contractor in improving the ORPS corrective action and finalization process. When addressed, these items will improve an already satisfactory and effective oversight process.

6.0 CONCLUSIONS

Overall, technical procedures associated with RPL are adequate to ensure operability and reliability of the CAS and FSS SS systems. Except as noted below, RPL procedure compliance is acceptable. Although EA identified needed enhancements for the SE qualification to ensure that the SEs are qualified to perform their roles and responsibilities independently, Battelle has established a credible training program and process for qualifying RPL staff using a Systematic Approach to Training in accordance with DOE Order 426.2 using a graded approach. The RPL incumbent POs, SEs, and maintenance staff are appropriately knowledgeable through training and experience to carry out the duties of their positions. CAS and FSS systems are well maintained and capable of performing their SS functions to protect on-site and co-located workers. Maintenance procedures, work documents, and records associated with the systems provide evidence of an acceptable maintenance program.

Although Battelle's RPL programs and processes for ensuring safety system capability are, for the most part, adequately implemented, EA identified several areas of weakness that warrant increased management attention:

- Battelle has not rolled down DOE Order 422.1, Conduct of Operations, requirements addressing control of interrelated processes into RPL requirements or implementing procedures and associated MOUs with interrelated process operators. During implementation of this requirement, Battelle erroneously assumed that the section did not apply to its nuclear facilities even though RPL relies on multiple processes that are not under the control of facility operators or management (i.e., electrical power distribution, steam, and potable water). If left uncorrected, this area of non-compliance could result in delays in abnormal condition response by the operators of both the facility and the interrelated process.

- Contrary to DOE Order 422.1, Section 2.p and PPNL procedures controlling the use of official versions of procedures, RPL staff repeatedly used (from June 2011 to March 2015) the incorrect version of an important procedure (SOP-325-19, RPL Alarm Response) and did not maintain PO office copies of SOP-325-19 and other SOPs as official copies or verify them prior to use. Because this problem existed for several years, the causal factors associated with overlooking this problem must be addressed.

- Based on the high percentage (greater than 50 percent) of reviewed surveillance test packages that contain non-compliance problems, a systemic failure to comply with ADM-RPL-611, Technical Safety Requirement Administration, exists which could lead to future TSR violations if uncorrected.

PNSO has established and implemented a functioning oversight program in conformance with DOE requirements; the PNSO FRs provide continuous, routine operational awareness and surveillance feedback to the contractor and DOE management. However EA noted some recommended enhancements in the scheduling and completion of PNSO FR assessments.

7.0 FINDINGS

As defined in DOE Order 227.1, *Independent Oversight Program*, findings are significant deficiencies or safety issues that warrant a high level of attention from management. If left uncorrected, findings could adversely affect the DOE mission, the environment, the safety or health of workers and the public, or national security. Findings may identify aspects of a program that do not meet the intent of DOE policy or Federal regulation. Corrective action plans must be developed and implemented for EA appraisal findings. Cognizant DOE managers must use site- and program-specific issues management processes

and systems developed in accordance with DOE Order 227.1 to manage these corrective action plans and track them to completion.

Battelle

Finding-Battelle-Procedure-01: Battelle has not rolled down DOE Order 422.1, *Conduct of Operations*, requirements addressing control of interrelated processes into RPL requirements and implementing procedures and associated MOUs with interrelated process operators.

Finding-Battelle-Procedures-02: Contrary to DOE Order 422.1, Section 2.p, *Technical Procedures* and PNNL procedures controlling the use of official versions of procedures, RPL staff used (from June 2011 to March 2015) the incorrect version of an important procedure (SOP-325-19, *RPL Alarm Response*) and Battelle management did not identify the problem through its management observation and self-assessment processes. In addition, Battelle did not maintain BM Office and PO office copies of SOP-325-19 and other SOPs as official copies or verify them prior to use.

Finding-Battelle-Procedures-03: A systemic problem in complying with ADM-RPL-611, *Technical Safety Requirement Administration*, exists. Specifically, requirements in ADM-RPL-611 to properly document the conduct of surveillance tests were not followed in over 50 percent of the surveillance test packages reviewed. For example, unauthorized surveillance test procedure field corrections were made, documentation of the completion of steps were not properly done, and the process established to identify problems with the conduct of surveillance tests was ineffective.

8.0 OPPORTUNITIES FOR IMPROVEMENT

This EA independent oversight review identified 16 OFIs. These potential enhancements are not intended to be prescriptive or mandatory. Rather, they are suggestions offered by EA that may assist site management in implementing best practices, or provide potential solutions to minor issues identified during the review. In some cases, OFIs address areas where program or process improvements can be achieved through minimal effort. It is expected that the responsible line management organizations will evaluate these OFIs and accept, reject, or modify them as appropriate, in accordance with site-specific program objectives and priorities.

PNNL Site Office

OFI-PNSO-01: Ensure all Facility Representatives are scheduled to and perform operational and safety surveillances for 2015 and out years with clear objectives and these are performed within the fiscal year.

OFI-PNSO-02: Ensure a self-assessment of the PNSO Operating Experience program is scheduled and performed in fiscal year 2015 and periodically thereafter.

OFI-PNSO-03: Consider establishing a process where the FRs periodically walkthrough each other's facilities to improve knowledge of site facilities, improve backup capabilities, change walkthrough routines, and provide a second set of eyes to catch potential noncompliances.

OFI-PNSO-04: Improve the ORPS corrective action development and finalization process so corrective actions are implemented in a timely manner and ORPS reports are not regularly finalized well past the recommended 45 day period.

Battelle

OFI-Battelle-Procedures-01: RPL directives and the associated Conduct of Operations Matrix should be revised to fully comply with DOE Order 422.1, Section 2.p, Technical Procedures.

OFI-Battelle-Procedures-02: RPL procedures should be reviewed against the use definitions in ADM-NOD-802, Document Development and Control Procedure to correct improperly categorized procedures to ensure procedures are effectively utilized and executed.

OFI-Battelle-Procedures-03: Consider adding a requirement to ADM-NOD-802 to compare procedures to the writer's guide as part of periodic reviews of procedures.

OFI-Battelle-Procedures-04: Consider periodic self-assessments of RPL procedure use and adherence to identify procedure performance issues and trends.
OFI-Battelle-Procedures-05: Consider revising the process for periodic review of posted OAs to include direct verification of the OA as remaining valid, needed, and up to date.

OFI-Battelle-Procedures-06: Consider implementing periodic assessments of CONOPS attributes such as 2.p, *Technical Procedures,* at RPL to ensure the continued health of the CONOPS program.

OFI-Battelle-Training-01: Consider revising the PO training and qualification program to include expected methods to document unexpected RPL conditions (i.e. Operator Round Sheets) to ensure that they are consistently identified and documented for SE and management attention.

OFI-Battele-Training-02: Consider revising the SE training and qualification process to include a system specific component to ensure that the SEs can perform the CSE function independently upon completion of qualification requirements and reducing the potential for knowledge gaps created by SE attrition.

OFI-Battelle-Maintenance-01: Consider revising the RPL NMMP before the next three year DOE review and approval submittal to remove the disclaimer and specifically address the integration of the NMMP with DOE Order 430.1B, *Real Property Asset Management.*

OFI-Battelle-Maintenance-02: Consider revising the ADM-016, JPP Risk Assessment form, ADM-028, F&O Assessment Report, or the RPL Job Planning Package Hazard Risk Assessment form to establish consistency in requirements and format of implementation.

OFI-Battelle-Maintenance-03: Consider revising the CAS and FSS PM and interfacing Outage Administrative procedures by integration or by improving the interface between the procedures using place-holders and removing redundancy and potential conflicting requirements to facilitate smooth execution transition.

OFI-Battelle-Maintenance-04: Consider determining, documenting and providing staff training on the basis for the CAS nuclear criticality detector backup trip circuit setpoints. Also, consider whether it is more appropriate to make the primary and backup setpoints consistent.

9.0 ITEMS FOR FOLLOW-UP

EA will assess compliance with ADM-RPL-611, *Technical Safety Requirement Administration during subsequent reviews.*

Appendix A
Supplemental Information

Dates of Review

Onsite Review: March 2-5, 2015

Office of Enterprise Assessments Management

Glenn S. Podonsky, Director, Office of Enterprise Assessments
William A. Eckroade, Deputy Director, Office of Enterprise Assessments
Thomas R. Staker, Director, Office of Environment, Safety and Health Assessments
William E. Miller, Director, Office of Nuclear Safety and Environmental Assessments
Patricia Williams, Director, Office of Worker Safety and Health Assessments

Quality Review Board

William A. Eckroade
Thomas R. Staker
William E. Miller
T. Clay Messer
Karen L. Boardman
Michael A. Kilpatrick

EA Site Lead

Jeff Snook

EA Reviewers

Jeff Snook – Lead
Tim Martin
Glenn Morris
Greg Teese

Appendix B
Key Documents Reviewed, Interviews, and Observations

Documents Reviewed

13-PNSO-0260, *Operational Agreement Between PNSO and RL,* July 13, 2013
2014-TMB-01, *Programmatic Review of the Radiochemical Processing Laboratory Fire Suppression System Repair,* June 10, 2014
300A-TECH-PM-001, *300 Area Utility Systems Roles and Responsibilities Agreement between Washington Closure Hanford, LLC and Pacific Northwest National Laboratory,* Rev. 3
2012 – 2014 Assessments Performed By PNSO
2014 RPL Facility Representative Weekly Reports
ADM-001, *Document Production & Distribution,* Rev. 16
ADM-004, *Writers Style Guide,* Rev 5
ADM-008, *Preventive/Predictive Maintenance Program, Rev. 6*
ADM-012, *Timely Orders/Standing Orders,* Rev. 6
ADM-016, *Work Control Procedure,* Rev. 19a
ADM-017, *PNNL Freeze Protection Program,* Rev. 7
ADM-020, *Pre-Job Briefing and Post-Job Review,* Rev. 8
ADM-028, *F&O Assessment Process,* Rev. 8
ADM-081, *Equipment Out-of-Service Guidance,* Rev. 2
ADM-083, *Preventive Maintenance Deferral & Grace Periods,* Rev. 5
ADM-120, *Impairment of Fire Protection Systems and Passive Fire Protection Features,* Rev. 2
ADM-360, *Risk Based Life Cycle Asset Management Program Description,* Rev. 5
ADM-435, *Power Operator Training Procedure,* Rev. 4
ADM-CM-026, *Systems Performance Monitoring and Analysis,* Rev. 3
ADM-CM-051, *Configuration Management Program Requirements,* Rev. 6
ADM-CM-052, *Configuration Management Program Standards Document,* Rev. 5
ADM-CM-058, *Facility Modification Manual,* Rev. 9
ADM-CM-059, *F&O Document Center,* Rev. 6
ADM-CM-064, *Equipment Identification and Labeling Requirements,* Rev. 14
ADM-CM-069, *Graded Approach and Risk Assessment,* Rev. 6
ADM-NOD-802, *Document Development & Control Procedure,* Rev. 8
ADM-RPL-607, *Periodic System Assessments,* Rev. 4
ADM-RPL-611, *Technical Safety Requirement Administration,* Rev. 14
ADM-RPL-702, *325 Building Criticality Alarm System Outage Procedure,* Rev. 1
ADM-RPL-710, *Logs and Turnovers,* Rev. 1
ADM-RPL-712, *Signs and Operator Aids,* Rev. 4
ADM-RPL-807, *Control of Purchased Items and Services,* Rev. 5
ADM-RPL-808, *Identification and Control of Items/Materials,* Rev. 5
ADM-RPL-812, *Control of Measuring and Test Equipment,* Rev. 3
ADM-RPL-815, *Control of Nonconforming Items,* Rev. 6
ADM-RPL-817, *Radiochemical Processing Laboratory Records Management Program,* Rev. 1
ADM-RPL-818, *RPL Surveillance Process,* Rev. 2
ADM-RPL-822, *Commercial Grade Dedication,* Rev. 1
ADM-RPL-901, *System Engineer Program Description,* Rev. 6
ADM-RPL-902, *RPL Systematic Approach to Training,* Rev. 3
ADM-RPL-905, *RPL Training Plan,* Rev. 3
ADM-RPL-1101, *Control of RPL Temporary Modifications,* Rev. 3
ADM-RPL-1109, *RPL Master Equipment List,* Rev. 3
Assessment of the Pacific Northwest National Laboratory Nuclear Maintenance Management Program,

September 2013, Rev. 0
Audit Report, *Nuclear Criticality Safety Program Training Audit,* December 3, 2014
BEP-325/RPL, *Building Emergency Procedure for Radiochemical Processing Laboratory,* Rev. 13
Cause Analysis Report for Weaknesses in the PNNL Chronic Beryllium Disease Prevention Program, SC--PNSO-PNNL-PNNLBOPER-2014-0007
City of Richland 300 Area Electrical Services Interfaces and Responsibilities Agreement, June 2014
Contractor Training Assessment Report for the Pacific Northwest National Laboratory Radiochemical Processing Laboratory, Sonalysts, Inc. 2014
Contract No. DE-AC05-76Rl01830 Notification of FY 2012 Oversight Review of Various Safety Systems at the Radiochemical Processing Laboratory and Nuclear Safety Programs at PNNL, November 17, 2011
Contract No. DE-AC05-76Rl01830 Transmittal of Report Independent Oversight Review of the DOE
Contract No. DE-AC05-76Rl01830 -Notification of the FY 2013 Oversight Review of Various Safety Systems at the Radiochemical Processing Laboratory and Nuclear Safety Programs at PNNL, November 29, 2012
Contract No. DE-AC05-76Rl01830 -Notification of FY 2014 Oversight Review of Various Safety Systems at the Radiochemical Processing Laboratory and Nuclear Safety Programs at PNNL, December 9, 2013
Contract No. DE-AC05-76Rl01830 Notification of the FY 2015 Oversight Review of Various Safety Systems at the Radiochemical Processing Laboratory and Nuclear Safety Programs at PNNL, October 14, 2014
Corrective Action Plan for 14-PNSO-0234, SSO Assessment of RPL Fire Protection Systems
Course 554, Suspect/Counterfeit Items Overview
CRL-TECH-ESH-009, *Hazards Analysis for the 325 Building Extended Mission Documented Safety Analysis,* Rev. 2
CRL-TECH-ESH-010, *Control Allocation for the 325 Building Extended Mission Documented Safety Analysis,* Rev. 2
DOE PNSO PNNL Facility-Specific Facility Representative Qualification Card, Thomas Davies, June 5, 2008
Drawing H-3-29015, *Elec Neutron Sens Criticality Alm Sys Wiring & Intcon Diag,* Rev. 10
Drawing H-3-52813, *Elec Neutron Sensitive Criticality Alm System Basement Plan,* Rev. 6
Drawing H-3-52814, *Elec Neutron Sensitive Criticality Alarm Sys First Fl Plan,* Rev. 5
Drawing H-3-52825, *Elec Neutron Sensitive Criticality Alarm Sys Second Fl Plan,* Rev. 5
Drawing H-3-308415, *Fire Suppression Piping Drawing Directory,* Rev. 1
Drawing H-3-308421, *Fire Suppression Piping Basement Area 16,* Rev. 5
Drawing H-3-308422, *Fire Suppression Piping Basement Area 17,* Rev. 4
Drawing H-3-308423, *Fire Suppression Piping Basement Area 18,* Rev. 4
Drawing H-3-308427, *Fire Suppression Piping 1st Floor Area 3, 4,* Rev. 5
Drawing H-3-308430, *Fire Suppression Piping 1st Floor Area 9E, 9W,* Rev. 8
Drawing H-3-308433, *Fire Suppression Piping 1st Floor Area 325A,* Rev. 7
Drawing H-3-308434, *Fire Suppression Piping 1st Floor Area 325B,* Rev. 5
Drawing H-3-310181, *Fire Suppression Piping Risers P&ID,* Rev. 6
FY14 Deferred Maintenance Source Documentation Summary, 325 Building
FY14 Deferred Maintenance Source Documentation Summary, North Storage Pad
HDI - Basic Laboratory and Ops Practices
HDI - Conduct Internal Assessment or Audit
HDI - Develop Corrective or Preventative Actions
HDI - Integrated Safety Management (ISM) Program Description

HDI - Issues Tracking System
HDI - Lockout and Tagout
HDI Receive and Inspect Item or Service
HDI-Complete Corrective Actions and Evaluate Effectiveness
JPP S721224A, *Add seismic restraints to FSS piping*, dated 1/8/2015MSA-1401740 R3, *RL Approval – Operations and Maintenance Transfer of 300 Area Water and Sewer Follow-On Proposal*, July 30, 2014
MSA-1404028A R1, *Submittal of the Truth in Negotiation Act Sweep for the Operations and Maintenance Transfer of 300 Area Water and Sewer Follow-On Proposal*, October 30, 2014
NCD Calibration Procedure Radiological Calibration Procedure, Manual MA-563 Procedure 2.2.3, Rev. 11
NCR RPL-F-NCR-09-052, *Criticality Howlers, Criticality Alarm System (CAS)*
NOD-PMP15, *Nuclear Operations Division Performance Management Plan (2015),* Rev. 0
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Office of Science (SC) Assessment of the Criticality Alarm System for Building 325 at PNNL, November 20, 2012
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Interviews
CAS System Engineer
Criticality Safety Expert
F&O Training Lead
FSS System Engineer
HVAC System Engineer
M&TE Custodian and RPL Building Technician
Nuclear Maintenance Plan Supervisor
RPL BM & NM Manager
RPL Ops Manager
RPL Power Operators (6)
RPL Training Specialist

Observations
Daily PODs
Wednesday Plan Of Week
SOP-325-18, *325 Building Fire Suppression System Monthly Inspections*, simulation
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FSS system walkdown/tour with SE
JPP Risk Assessment Meeting, S723697, *MEC 2 Hot Cell LED Lighting Install*
JPP Planning Meeting, S698153
Several Pre-Job Meetings
RPL Operator Rounds