Independent Oversight Targeted Review of Activity-Level Implementation of Radiological Controls at Sandia National Laboratories

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Office of Safety and Emergency Management Evaluations
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Acronyms

ACRR	Annular Core Research Reactor
AHCF	Auxiliary Hot Cell Facility
ALARA	As Low As Reasonably Achievable
CFR	Code of Federal Regulations
CRAD	Criteria, Review, and Approach Document
DOE	U.S. Department of Energy
DSA	Documented Safety Analysis
ES&H	Environment, Safety, and Health
FMOC	Facilities Management and Operations Center
GIF	Gamma Irradiation Facility
HSS	Office of Health, Safety and Security
IH	Industrial Hygiene
JSHE	Job Site Hazard Evaluation
OFI	Opportunity for Improvement
POD	Plan of the Day
RCA	Radiological Control Area
RCT	Radiation Control Technician
RP	Radiation Protection
RPP	Radiological Protection Program
RPSA	Radiation Programmatic Self-Assessment
RPPM	Radiation Protection Program Manual
RTWD	Radiological Technical Work Document
SFO	Sandia Field Office
SME	Subject Matter Expert
SMP	Safety Management Program
SNL	Sandia National Laboratories
SPRF	Sandia Pulsed Reactor Facility
SSO	Safety System Oversight
TA	Technical Area
TSA	Triennial Self-Assessment
TSR	Technical Safety Requirement

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1.0 PURPOSE

The U.S. Department of Energy (DOE) Office of Enforcement and Oversight (Independent Oversight), within the Office of Health, Safety and Security (HSS), conducted an independent review of radiological protection program (RPP) activity-level implementation for Sandia National Laboratories (SNL), Technical Area (TA) V (TA-V) facilities. SNL is managed by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, under contract to DOE and is overseen by the National Nuclear Security Administration and its Sandia Field Office (SFO). Independent Oversight performed the review within the broader context of an ongoing program of targeted assessments of radiological control programs, including RPPs, with an emphasis on the implementation of radiological work planning and control across DOE sites that have hazard category 1, 2, and 3 nuclear facilities. The purpose of this set of facility-specific Independent Oversight targeted reviews is to evaluate the flowdown of occupational radiation protection (RP) requirements, as expressed in facility RPPs, to work planning, control, and execution processes, such as radiological work authorizations, including radiological technical work documents (RTWDs). To meet the goals of the targeted review, Independent Oversight performs assessments that are primarily driven by activity-level observations. Once each facility-specific review is completed, Independent Oversight will develop a report on performance throughout the DOE complex.

This targeted review was performed at SNL September 23-27, 2013. This report discusses the background, scope, methodology, results, and conclusions of the review, as well as findings, opportunities for improvement (OFIs), and items for further follow-up by Independent Oversight.

2.0 SCOPE

The scope of this review encompassed activity-level implementation of radiological control activities at the following facilities associated with operations conducted under the SNL RPP for the TA-V facilities:

- Gamma Irradiation Facility (GIF)
- Annular Core Research Reactor (ACRR) facility
- Facilities Management and Operations Center (FMOC) work at the Sandia Pulsed Reactor Facility (SPRF)
- Nuclear Material Movement for TA-V.

TA-V also includes the Auxiliary Hot Cell Facility (AHCF). Independent Oversight did not evaluate the AHCF during the onsite portion of the review because a scheduled electrical outage and a pause between waste repackaging campaigns limited radiological work activities.

The GIF and ACRR are national facilities for defense and civilian research in gamma irradiation, nuclear and material sciences; they host scientists from national laboratories, universities, industry, and international research facilities. Other facilities at TA-V support research and experimentation in materials science, engineering, physics, chemistry, and microelectronics. During the review, Independent Oversight observed work in TA-V that included receipt and shipment of radioactive materials, nuclear material transfers, cask unloading, source inspection and storage rack loading, hoisting and rigging,

storage pool movements, facility maintenance, radiological surveys, reactor operations, materials testing, and conduct of research and experimentation.

3.0 BACKGROUND

TA-V is located on Kirtland Air Force Base in Albuquerque, New Mexico. SNL's primary mission is to develop, engineer, and test the non-nuclear components of nuclear weapons, as well as maintaining the reliability and surety of nuclear weapon systems, conducting research and development in arms control and nonproliferation technologies, and investigating methods for disposal of the U.S. nuclear weapons program's hazardous waste. Other missions include research and development in energy and environmental programs, and the surety of critical national infrastructures.

Title 10 CFR Part 835, *Occupational Radiation Protection*, defines the requirements for developing, implementing, and maintaining an RPP. Title 10 CFR 835.101(a), *Radiation protection programs*, states that "A DOE activity shall be conducted in compliance with a documented radiation protection program (RPP) as approved by the DOE." Each DOE site that works with radiological material has developed an RPP and supporting implementing procedures for radiological control.

The SNL RPP is documented in *10 CFR 835 Radiation Protection Program* and MN471016, *Radiation Protection Program Manual* (RPPM). SNL defines the scope of applicability for the RPP as all SNL radiological activities, including those reviewed during this assessment, that are not specifically excluded in §835.1(b).

4.0 METHODOLOGY

This review was guided by HSS Criteria, Review, and Approach Document (CRAD) 45-35, Rev. 1, *Occupational Radiation Protection Program Inspection Criteria, Approach, and Lines of Inquiry*. Independent Oversight observed the conduct of radiological activity-level work activities and practices involving radiological hazards and reviewed them against site radiological control implementing procedures, the RPP, and 10 CFR 835, as indicated in HSS CRAD 45-35, Rev 1.

During this review, Independent Oversight reviewed the effectiveness of the flowdown of occupational RP requirements to work planning, control, and execution processes at SNL for TA-V. Results of this review are based on a sampling of data and observations of work that was ongoing at the time of the review. This Independent Oversight activity was not intended to represent a full programmatic review of site RPP.

5.0 RESULTS

The results of this targeted review are organized in three areas: RP organization and administration; radiological work planning, exposure, and contamination control; and radiological surveys and monitoring.

5.1 Radiation Protection Organization and Administration

The SNL RP organization is a well-established, longstanding entity that is responsible for centralized capabilities in RP, occupational safety and health, dosimetry, bioassay, radiological equipment maintenance and calibration, and radiological sample analysis. The RP organization is led by a

department manager, who is supported by three team leads and eight project leads who cover RP across all laboratory facilities (TAs). Most RP project leads are deployed to the line organizations to provide program support. The major TAs at SNL each have a deployed RP project lead who manages RP support services, supported by a radiological engineer, a lead radiation control technician (RCT), and a cadre of field RCTs.

The RP organization is staffed by qualified and experienced RP personnel. A number of managers and staff have professional certifications and/or advanced degrees in health physics or related disciplines, as well as years of applied RP experience. At TA-V, overall responsibility for radiation safety is the responsibility of the respective RP project lead and radiological engineer, who are both trained and qualified for their positions. These individuals report to their respective team lead. The team lead at TA-V and the GIF technical support manager at TA-V are both certified health physicists.

Title 10 CFR 830.204(b)(5) and 830.204(b)(6) require that the documented safety analysis (DSA) of a nuclear facility define the characteristics of the safety management programs (SMPs) necessary to ensure its safe operation. DOE-STD-3009, *Criteria and Guidance for Preparation of U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analysis*, provides guidance on grading the SMPs (including the RPP) that a facility must comply with in order to establish an adequate safety basis. Program commitments encompass a large number of details that are more appropriately covered in specific program documents (i.e., plans and procedures) external to the DSA. The safety basis includes only the top-level summary of program elements, not the details of the program or its governing documents. Technical safety requirements (TSRs) must also provide information on the commitments to the SMPs identified in the DSA as necessary components of the safety basis for the facility.

In reviewing the SNL nuclear facilities' safety bases regarding the RPP as an SMP, Independent Oversight identified several minor discrepancies. The ACRR DSA (Section 12.1), the SPRF Safety Analysis Report (Section 12.1), and the SPRF/Critical Experiments TSR 5.4.1 all reference the RPPM, which is the implementing mechanism used to communicate the requirements of 10 CFR 835 – not a program document. The ACRR TSR 5.6.2 and the AHCF Basis for Interim Operation (Section 6.2.1) and its TSR 5.4.1 all reference the RPP indirectly as "described and implemented through the SNL Corporate Policy System and, specifically, through the ES&H [Environment, Safety, and Health] Policy Area which includes procedures for radiation protection." (See **OFI-1**.)

The RPP at SNL is actually described in two different documents both entitled *Radiation Protection Program*, which is confusing. The SNL RPP, updated on April 29, 2011, describes comprehensive program plan commitments as required by 10 CFR 835.101; Independent Oversight determined that this document provides for adequate and effective implementation and control of all RP activities. RPP-01, *Radiation Protection Department Radiation Protection Program*, updated on August 1, 2013, briefly describes the SNL occupational RPP; this document seems redundant and unnecessary. Ideally, there should be a single top-level RPP document that identifies the RPP as an SMP as required by 10 CFR 830.204 for the nuclear facilities at SNL. (See **OFI-1**.)

SNL has developed appropriate programmatic RP documentation, including management policy statements, implementing procedures, and technical basis documents. SNL uses a matrix to link the RPPM and the DOE-approved RPP to demonstrate compliance with 10 CFR 835; however, the matrix itself references many RPPM subject area sections without directly indicating all of the mechanisms that implement each of the RPP or RPPM compliance commitments. (See **OFI-2**.) DOE Guide 441.1-1C, *Radiation Protection Programs Guide*, Section 3.1, provides one means for demonstrating compliance with 10 CFR 835:

The approved RPP details how a DOE activity shall be in compliance with 10 CFR 835 and should identify the functional elements appropriate for that activity. Additional documentation should be developed and maintained to supplement the approved RPP to demonstrate that an RPP can be effectively managed and administered to achieve compliance with 10 CFR 835. This documentation typically includes a site radiological control manual developed to the guidance contained in the RCS [Radiological Control Standard, DOE-STD-1098-99], *as well as detailed implementing procedures, appropriate management policy statements, and technical basis documentation. While this documentation need not be part of the RPP, it should be clearly linked to the compliance commitments contained in the RPP*.

Independent Oversight reviewed the contractor's ongoing RP oversight as described in RPA-08-01, *Assessments*, which describes the assessment activities for the RP department and provides guidance for performing programmatic self-assessments, independent assessments/audits, and management surveillances. Chapter 13, *Feedback and Improvement*, of the RPPM provides additional guidance for performing radiation protection programmatic self-assessments (RPSAs), quarterly triennial self-assessments (TSAs) for partial fulfillment of the requirements of 10 CFR 835.102, and independent assessments of the RPP. Independent Oversight's review of several RPSAs and TSAs completed in the past three years determined that the RP department's assessment activities are robust and effective in identifying and resolving issues. Additionally, the SNL corporate auditing organization completed an audit of the RPP in May 2013 and found that the program is mature, appropriately resourced, effective, and in compliance with requirements. Independent Oversight reviewed AIS ID 2190 (2013-ES-0027), *Independent Audit & Advisory Services Audit Report – Radiation Protection Program*, and concurs with the remarks and noteworthy practices cited in the report. Independent Oversight also reviewed the RP department's response to the corporate audit, completed in August 2013 (i.e., memo, Brennan to Miltenberger, *Completion of Resolution Notice for Evaluating Opportunities for Improvement Based on Recommendations Provided in AIS ID 2190 Independent Audit Report*), which indicated that all identified audit suggestions were considered and potential improvement actions were developed by all affected individuals. Independent Oversight found this response to be appropriate to the observations contained in the corporate review.

5.2 Radiological Work Planning, Exposure, and Contamination Control

At both ACRR and GIF, engineered safety controls for operations are robust and are used effectively to prevent inadvertent access to radiological control areas (RCAs) during operations. These controls include interlocked access locations at areas posted as "Very-High Radiation Areas" during source operations that are controlled by control room operators in conjunction with routine coverage provided by RP personnel.

RTWDs serve as the primary work control documents governing radiological controls for operational and experimental research activities at both GIF and ACRR. It is noteworthy that, in accordance with the RPPM, RTWDs are now prepared and owned by the line organizations and not the RP department; seven years ago, SNL made the line organizations responsible for their work planning and control. During development of RTWDs, the RP department conducts a formal radiological engineering and occupational radiation safety review to aid in the development of RTWDs by the line organizations, and this practice appears to be working well. In general, these documents adequately bounded the scope of observed work activities and identified applicable radiological hazards and appropriate controls. For example, facility and training requirements for users are well-defined and were discussed and verified at observed pre-job briefs. Independent Oversight observed a TA-V RP staff meeting and found it to be an effective planning and response mechanism that provides appropriate coverage for radiological work activities within TA-V.

Separate Plan of the Day (POD) meetings are held each day for GIF and ACRR to provide status updates and to allocate work and resources for the upcoming day. The POD meetings cover all facilities, including both proposed experiments and operational activities. Independent Oversight found the POD meetings to be formal, informative, and effective.

Within TA-V, Independent Oversight observed several activity-level work evolutions in which hazard controls were effectively implemented. These work evolutions included the receipt, inspection, and shipment of radioactive materials; shielded cask movement (including associated critical lifts); GIF storage pool activities, including source unloading and source rack loading; ACRR operations, including experiment package removal/transfer to shielded storage; and RCT coverage of work in RCAs. Administrative and computer-based access controls, electronic dosimetry, and RTWD issuance are all used for confirmation of training status and for ensuring that individuals are made aware of and acknowledge RTWD requirements before conducting radiological work. Additionally, training and qualification was confirmed by supervision and during pre-job briefings.

Independent Oversight identified a few examples where institutional requirements were not specifically followed during work planning, resulting in a potential for unnecessary exposure or a conflict with the principle of "As Low As Reasonably Achievable" (ALARA) and/or good conduct of radiological operations practices. For example:

- FMOC and "Facility Express" work conducted at SPRF included shot blasting of painted concrete floors to prepare the surface for application of epoxy coatings. For this activity, an initial request by the TA-V facility supervisor – service request no. 472299, service order no. 173420, and job site hazard evaluation (JSHE) no. 5513 – indicated that the floors to be resurfaced were located in a "Controlled Area/Radioactive Materials Area" and that the work was to be performed in a Nuclear facility was indicated on the work request and JSHE checklist. However, the FMOC JSHE request only identified a need for industrial hygiene (IH) subject matter expert (SME) evaluation, and failed to also identify RP as a needed SME evaluation. Samples of concrete debris (collected by the RCT assigned to cover the SPRF) from waste generated during floor surface removal indicated Co-60 and Cs-137 activity above minimum detectable activity levels. The RCT collected these samples only to determine the proper waste disposal path and did not specifically provide radiological work coverage (since no RTWD was used or assigned to this work activity). These results were discussed at the weekly TA-V RP staff meeting (RCTs in attendance routinely discuss tasks being conducted at their facilities). Following questions by Independent Oversight and RP management, the work on additional floor surfaces at SPRF was paused pending evaluation.

  Since the samples were collected from the bulk contents of vacuums after the shot blasting, the exact location, extent, or magnitude of any prior contamination cannot be determined. The JSHE evaluation by IH identified potential hazards associated with silica and stated that those hazards must be addressed by the contractor. However, the JSHE process did not address any radiological hazards or their requisite controls because a separate RP JSHE was not requested by Facility Express. The contractor's Pre-Task Plan Worksheet Task/Hazard also failed to include potential radiological hazards, addressing only noise, dust, and ergonomic hazards and controls. Subsequent interviews with RP staff indicated that the facility dates back to the 1960s, and, although current activities and routine surveys have provided no indication of contamination beneath the painted floor surface, RCTs would have performed some additional characterization (possibly including pre-job collection and analysis of concrete samples) to address potential legacy contamination if the RP JSHE had been completed. Additionally, while the RP staff was aware this type of work was contemplated, interviews indicated that some staff members believed only application of paint was going to be requested; nonetheless, no formal RP JSHE was completed. Interviews with the FMOC requestor for the JSHE indicated that the SMEs are responsible for the completeness of the JSHE process; this

statement conflicts with the requirements of SNL FMOC, Radiological Control Administrative Procedure No. AP-036, Revision 2, which assigns that responsibility to the FMOC as part of their work control process. Furthermore, the SPRF facility supervisor did not recognize the absence of an RP SME review on the completed FMOC JSHE as a potential missed review, before allowing the work to proceed without an RTWD or RCT coverage. (See **Finding-1** and associated **OFI-3**.)

- GIF pin receipt activities are conducted in accordance with GIF-RTWD-003 Rev. 0, which states that Co-60 particulate is not expected during the job. Each pin is a sealed source (double encapsulated), and the external surfaces of the pins are not contaminated. The cask is flushed during source receipt as a precaution against pin damage during shipment. Although the RTWD contains contamination limits and requisite controls/surveys, the potential for residual contamination on internal cask surfaces (resulting from the vendor or the vendor's other clients immersing the cask into their storage pools, some with acknowledged leaking sources) has not been considered as a potential contributor to contamination, largely because SNL personnel were aware that past surveys did not indicate contamination and because of their knowledge of prior processes and practices. Nonetheless, during the initial unfiltered venting (prior to filter placement) of steam and/or argon purge gas from the cask and into the work area (i.e., the breathing zone of the individual removing the plug), Independent Oversight noted that the RTWD and work practices made no use of engineering controls, such as local ventilation or respiratory personal protective equipment, to protect against potential contaminants until RCTs could verify safe conditions and before filter placement and filter analysis by gamma spectroscopy. (See **OFI-4**.)

- During GIF re-racking of Co-60 pins and container movements with long-handled tools over the open pool surface, a worker was observed with dangling lanyards and unsecured dosimetry. Neither the Operations related TWDs nor RTWD assigned to this task, GIF-RTWD-003 Rev. 0, discuss any foreign material exclusion controls to prevent introduction of foreign objects into undesired locations. Independent Oversight also noted a potential for dropping materials into the reactor pool during ACRR experiment package handling. (See **OFI-5**.)

- The ACRR RTWD (ACRR-RTWD-001 Rev. 2) allows irradiated experiment package dose rates up to 30 R/hr on contact. Time, distance, and shielding are important factors in minimizing exposure when moving material from the experiment station to the shielded storage area. The individual traverses the area as quickly as possible, thereby minimizing time. However, even though shielding is discussed in the RTWD, it is not used (e.g., leaded vinyl sheets or sheeting made into bags). Individuals conducting these activities at ACRR have among the highest accumulated doses at SNL and have required the issuance of ALARA goal extensions as recently as last quarter. Although only a few individuals (three or four) are involved, methods for significantly decreasing the doses to these individuals should be considered. Additionally, at the package assembly area where activated components may contribute to high exposures, the use of a leaded acrylic shield for both whole body and lens of the eye protection should be considered. (See **OFI-6**.)

- At ACRR, removal of an irradiated experiment package creates some potential for cross contamination. ACRR-RTWD-001 Rev. 2 requires RCT coverage when experimenters handle potentially contaminated experimental packages; however, Independent Oversight noted that even though RCTs conduct surveys of workers' gloved hands and work surfaces with hand-held instrumentation, workers routinely handle experiment packages and then touch tools and rigging (below the hook apparatus, some with irregular surfaces, which cannot readily be assessed effectively by taking swipes for sampling of removable contamination) before doffing their outer gloves. Specifying that workers change their gloves before handling additional equipment could

reduce the potential for spreading contamination and place less demand and reliance on RCTs. (See **OFI-6**.)

- Some RPPM references to the implementing procedures used by SNL line organizations need revision, either because they refer to items that no longer exist by that name (e.g., radiation work permits vs. RTWDs), or because the referenced function has changed. This deficiency was self-identified during a recent corporate assessment and through observations to determine the currency of documents contained on the Radiation Protection Program Committee and Radiation Protection Safety Committee websites.

5.3 Radiological Surveys and Monitoring

Potential external radiation exposures to gamma and beta-gamma radiation are appropriately monitored through use of both thermoluminescent and electronic dosimeters. Dose rates that might be present during facility operations in GIF and ACRR areas with the potential for significant dose rates are also monitored by a network of fixed radiation detectors that have local and remote readouts.

ACRR experimental areas do not typically meet regulatory thresholds for contamination areas that would require self-survey, but exit monitoring is performed via hand and foot monitors that personnel are required to use before exiting the RCA. The ACRR also has a personnel contamination monitor for use by personnel who have performed hands-on work under the RTWD.

Radiological survey and monitoring systems in use at TA-V are comprehensive and take advantage of state-of-the-art technology, allowing for quick and effective evaluation of dose rates and surface contamination levels.

The possible presence of alpha and beta-gamma contamination on surfaces and dose rate are evaluated in accordance with RTWD and facility-specific pre-job survey requirements, as well as during RCT job coverage. Smear samples are taken in representative locations and evaluated by low background gas flow proportional counters maintained and operated by the department 4121 analytical section. Direct surface measurements for alpha and beta-gamma are taken with hand-held survey instruments with scintillation and pancake type Geiger-Mueller survey meters. Independent Oversight noted that RCTs provide effective job coverage and documentation for work that has a potential for changing radiological conditions. Radiological survey records associated with RCT job coverage and routine surveys were found to be legible and complete.

Independent Oversight identified some weaknesses previously in Section 5.2 which also had some ramifications in the implementation of survey and monitoring controls at GIF. These concerns with implementation of survey and monitoring controls could be indicative of weaknesses in training programs and/or procedure compliance:

- The overall RTWD governing the GIF pin receipt, GIF-RTWD-003 Rev. 0, along with operational procedures, requires the GIF RCT to take surveys (smears) of the cask internal cavity before releasing the shipping cask as empty. However, before the survey and sample analysis, individuals were observed touching the interior surfaces of the shielded cask cavity with bare hands; one individual was feeling the surfaces and assessing the heat of decay effects, and another (the vendor representative) was collecting his own samples. (See **OFI-4**.)

- During GIF pin receipt, the initial unfiltered venting (prior to filter placement) sent steam and/or argon purge gas from the cask into the work area (breathing zone of the individual removing the

plug). The RTWD and work practices made no use of personal air sampling or monitoring of the ambient work environment for potential contaminants to ensure an appropriate monitoring determination in case a pin had been damaged in transit. (See **OFI-4**.)

6.0 CONCLUSIONS

SNL has a sound RP infrastructure and has developed appropriate programmatic RP documentation, including management policy statements, implementing procedures, and technical basis documents. The RPP is well-established and staffed by qualified and experienced RP personnel. A number of managers and staff have professional certifications and/or advanced degrees in health physics or related disciplines, as well as years of applied RP experience.

Both GIF and ACRR make effective use of engineering controls to mitigate hazards associated with radiological operations. They also apply appropriate levels of external and internal radiological exposure control measures, including external dosimetry and radiological surveys and monitoring, based on the specific radiological hazards at each facility.

While Independent Oversight noted a number of positive attributes during observation of TA-V work, there were also examples of weaknesses in applying institutional and facility-level radiological requirements in the areas of radiological work control processes (including the FMOC interface), radiological conduct of operations, contamination control, and monitoring practices. Additional effort in these areas would improve effectiveness in meeting all radiological control program objectives.

7.0 FINDINGS

Findings are significant deficiencies or safety issues that warrant a high level of management attention and that, if uncorrected, could adversely affect the DOE mission, the environment, the safety or health of workers or the public, or national security. Findings may also identify aspects of a program that do not meet the intent of DOE policy.

Finding-1: SNL did not ensure that before FMOC work began in an RCA (in a nuclear facility); an appropriate RP SME review was conducted in accordance with the JSHE process.

8.0 OPPORTUNITIES FOR IMPROVEMENT

Independent Oversight identified the following OFIs. These recommendations are not intended to be mandatory. Rather, they are to be reviewed and evaluated by the responsible line management organization and accepted, rejected, or modified as appropriate, in accordance with site-specific program objectives and priorities.

OFI-1: SNL should ensure that all DSA documents are consistent in defining the characteristics of the RP SMP as required by 10 CFR 830.204 and should directly reference the top-level RPP, not the RPPM. Furthermore, SNL should consider defining the RPP in a single document that specifically identifies the RPP as an SMP as required by 10 CFR 830.204 for nuclear facilities at SNL.

OFI-2: SNL should enhance documentation of the formal linkage between the RPP document hierarchy and the RPP, RPPM, and compliance matrix. Specifically, enhance the existing

RPP/RPPM compliance matrix to indicate the linkage and flowdown of each compliance commitment to specific implementing mechanisms (procedures, RTWDs, etc.) and technical basis documents. (Note: This OFI applies to both the SNL RPP managers and the SFO management reviewers/approvers.)

OFI-3: SNL should improve radiological work planning and control associated with the FMOC JSHE and RTWD interface. Specific actions to consider include:

- Conduct an extent-of-condition review to ensure that FMOC and Facility Express work at SNL radiological facilities is conducted in accordance with established radiological controls.
- Develop interim compensatory measures to ensure RP SME review of FMOC work planning before hands-on work begins.
- Review facility manager roles and responsibilities and revise as needed to ensure that "gatekeeper" responsibilities are assigned so that these managers not only coordinate work in their facilities, but also are cognizant of work package and SME reviews and established controls.
- Reinforce RCT stop-work authority when questions arise related to hands-on work performance within radiological facilities.

OFI-4: SNL should reinforce training provided to both RCTs and operations personnel on proper conduct of radiological operations and surveys, and on establishing and following controls that are consider potential radiological conditions as well as process knowledge. Specific actions to consider include:

- Establish or reinforce hold points for survey conduct and assign operator actions as part of these hold points.
- Review existing RTWDs for TA-V and revise as needed to ensure that requisite RCT coverage, surveys, and/or monitoring activities (e.g., air sampling) are appropriately assigned.

OFI-5: SNL should consider establishing a foreign material exclusion program under its Conduct of Operations program or other controls for preventing introduction of foreign objects into undesired locations, or revising existing TWDs and/or procedures to establish similar controls.

OFI-6: SNL should review TA-V RTWDs for ALARA engineering improvement opportunities. Specific actions to consider include:

- Conduct extent-of-condition reviews to ensure that the ALARA measures required by existing RTWDs are appropriately implemented.
- Use leaded vinyl sheets or sheeting material made into experiment package transfer bags as shielding at ACRR.
- Require (as appropriate) the use of eye protection (Safety Glasses ANSI Z87) to provide beta dose protection to the lens of the eye.
- Use a leaded acrylic shield for both whole body and lens of the eye protection in the ACRR package assembly area where activated components may contribute to exposures.

9.0 ITEMS FOR FOLLOW-UP

Independent Oversight will follow up on actions and satisfactory closure of the finding identified in this report.

APPENDIX A
Supplemental Information

Review Dates

September 23-27, 2013

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APPENDIX B
Documents Reviewed

- SNL, 4128, Radiological Protection (RP) Organization Chart
- SNL, *10 CFR 835 Radiation Protection Program,* Issue G, August 29, 2011
- SNL, RPP-01, *Radiation Protection Department Radiation Protection Program,* Issue No. 5, August 01, 2013
- SNL-MN471016 , *Radiation Protection Department Radiation Protection Program Manual*, Issue T, August 01, 2012
- SNL-RPA-01-02, *Radiation Protection Department Roles and Responsibilities,* Rev. 6, October 11, 2012
- SNL-RPA-02, *Radiation Protection Department Personnel Training and Qualification,* Rev. 5, November 30, 2009
- SNL-RPA-05-01, *Radiation Protection Department Work Processes,* Rev. 1, August 31, 2009
- SNL-RPA-05-02, *Radiation Protection Department Management of Work,* Rev. 1, August 31, 2009
- SNL-RPA-06, *Radiation Protection Department ALARA Review,* Rev. 2, August 1, 2013
- SNL-RPA-08-01, *Radiation Protection Department Assessments,* Rev. 1, December 14, 2011
- SNL-RPA-08-02, *Radiation Protection Department Event Reporting and Root Cause analysis,* Rev. 1, December 14, 2011
- Selected SNL-RPOs, *Radiation Protection Department Procedures,* Including; *Radiological Surveys, Clearance of Property and Materials, Surveillance, Facility Decommissioning Support, Surveillance Scheduling, Posting, Dosimetry, Air Monitoring, Worker Evaluations, Radioactive Material Handling, Incident Response, Technician Coverage, JSHE, Temporary Containment*
- Selected SNL-TBs, *Radiation Protection Department Technical Basis Documents,* Including; *Unrestricted Release, Soil Contamination, Instrumentation Selection, Correction Factors, Source Control, Air Sampling and Monitoring, Counting Systems, Source Screening*
- TA-V-ACRR-MP-007, *Material Handling and Storage,* Rev. 2, July 14, 2011
- TA-V-ACRR-MP-020, *Experiment Safety,* Rev. 2, July 14, 2011
- TA-V-ACRR-MP-006, *Preventative Maintenance & Surveillance,* Rev. 2, January 3, 2013
- TA-V-ACRR-MP-002, *Power Determination by Pool Heat Up,* Rev. 1, May 16, 2013
- TA-V-ACRR-OP-002, *Pulse Operation,* Rev. 4, May 1, 2013
- TA-V-ACRR-OP-003, *TRW Operation,* Rev. 3, January 24, 2012
- TA-V-ACRR-OP-004, *Steady-State Operation,* Rev. 4, May 1, 2013
- TA-V-ACRR-OP-005, *Facility Startup and Shutdown,* Rev. 1, May 1, 2011
- TA-V-ACRR-OP-008, *Operations Response,* Rev. 4, April 29, 2013
- TA-V-ACRR-RTWD-001, *ACRR Operations and Experiments,* Rev. 2, September 12, 2013
- TA-V-ACRR-OP-010, *Pulse Operation-Transient Rod Full Stroke,* Rev. 2, February 23, 2011
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