UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
1600 E. LAMAR BLVD.
ARLINGTON, TX 76011-4511

October 28, 2016

Mr. M.E. Reddemann
Chief Executive Officer
Energy Northwest
P.O. Box 968, Mail Drop 1023
Richland, WA 99352-0968

SUBJECT: COLUMBIA GENERATING STATION – NRC INTEGRATED INSPECTION REPORT AND INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI) INSPECTION REPORT 05000397/2016003 AND 07200035/2016001

Dear Mr. Reddemann:

On September 30, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Columbia Generating Station. On October 13, 2016, the NRC inspectors discussed the results of this inspection with you and other members of your staff. Inspectors documented the results of this inspection in the enclosed inspection report.

NRC inspectors documented one finding of very low safety significance (Green) in this report. This finding did not involve a violation of NRC requirements.

Further, inspectors documented a licensee-identified violation which was determined to be of very low safety significance in this report. The NRC is treating this violation as non-cited violation (NCV) consistent with Section 2.3.2.a of the NRC Enforcement Policy.

If you contest the violation or significance of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region IV; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC resident inspector at the Columbia Generating Station.

If you disagree with a cross-cutting aspect assignment in this report or a finding not associated with a regulatory requirement, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region IV; and the NRC resident inspector at the Columbia Generating Station.

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 2.390, “Public Inspections, Exemptions, Requests for Withholding,” a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC’s Public

Document Room or from the Publicly Available Records (PARS) component of the NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA Ryan Alexander for/

Jeremy R. Groom, Chief
Project Branch A
Division of Reactor Projects

Docket Nos. 05000397, 07200035
License No. NPF-21

Enclosure:
Inspection Report 05000397/2016003
and 07200035/2016001
w/ Attachment 1: Supplemental Information
Attachment 2: Request for information

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Letter to M.E. Reddemann from J. Groom dated October 28, 2016

SUBJECT: COLUMBIA GENERATING STATION – NRC INTEGRATED INSPECTION REPORT AND INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI) INSPECTION REPORT 05000397/2016003 AND 07200035/2016001

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U.S. NUCLEAR REGULATORY COMMISSION

REGION IV

Docket:	05000397 and 07200035
License:	NPF-21
Report:	05000397/2016003 and 07200035/2016001
Licensee:	Energy Northwest
Facility:	Columbia Generating Station
Location:	North Power Plant Loop Richland, WA 99354
Dates:	July 1 through September 30, 2016
Inspectors:	R. Alexander, Senior Project Engineer D. Bradley, Resident Inspector J. Braisted, Ph.D., Reactor Inspector L. Brookhart, Senior ISFSI Inspector L. Carson II, Sr. Health Physicist P. Elkmann, Senior Emergency Preparedness Inspector G. Kolcum, Senior Resident Inspector J. O'Donnell, CHP, Health Physicist R. Womack, Fuel Facility Inspector, Accompaniment
Approved By:	Jeremy Groom, Chief Project Branch A Division of Reactor Projects

Enclosure

SUMMARY

IR 05000397/2016003 and 07200035/2016001; 07/01/2016 – 09/30/2016; Columbia Generating Station and Independent Spent Fuel Storage Installation; Problem Identification and Resolution.

The inspection activities described in this report were performed between July 1 and September 30, 2016, by the resident inspectors at Columbia Generating Station and inspectors from the NRC's Region IV office. One finding of very low safety significance (Green) is documented in this report. The significance of inspection findings is indicated by their color (Green, White, Yellow, or Red), which is determined using Inspection Manual Chapter 0609, "Significance Determination Process." Their cross-cutting aspects are determined using Inspection Manual Chapter 0310, "Aspects within the Cross-Cutting Areas." Violations of NRC requirements are dispositioned in accordance with the NRC Enforcement Policy. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process."

Cornerstone: Initiating Events

- Green. The inspectors reviewed a self-revealing finding for the licensee's failure to follow plant procedure SYS-4-31, "System and Equipment Performance Monitoring and Trending Program," revision 11, that ensures system and component performance to permit early detection and predict equipment problems, and confirm the effectiveness of predictive, preventive, proactive, and corrective maintenance. The actions taken for piping supplied by plant service water were not effective in managing corrosion control. Specifically, the loss of the 2C condensate booster pump was due to a system performance monitoring program that did not permit early detection and predict fouling of internal surfaces of piping that cooled the lube oil coolers. Consequently, on August 5, 2016, the licensee reduced reactor power to approximately 60 percent power due to an inability to control lube oil temperature on the 2C condensate booster pump oil coolers which are cooled by plant service water. The licensee entered this issue into their corrective action program as Action Request 353210.

  The failure to follow plant procedure SYS-4-31, "System and Equipment Performance Monitoring and Trending Program," that ensures that a system performance monitoring program will permit early detection of equipment problems, predict equipment problems, and help confirm the effectiveness of predictive, preventive, proactive, and corrective maintenance was a performance deficiency. Specifically, the loss of the 2C condensate booster pump was due to ineffective corrective actions and a system performance monitoring program that did not permit early detection related to fouling of internal surfaces of piping that supplied cooling water to the lube oil coolers. The performance deficiency was more than minor because it affected the equipment performance attribute of the Initiating Event Cornerstone and adversely affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the inability to adequately cool the lube oil coolers for the condensate booster pump 2C upset plant stability by causing an unplanned plant transient. The inspector performed the initial significance determination using NRC Inspection Manual Chapter 0609, Appendix A, Exhibit 1, "Initiating Events Screening Questions." The inspectors determined that the finding was of very low safety significance because the finding did not cause a reactor trip and the loss of mitigation equipment relied upon to transition the plant from the onset of the trip to a stable shutdown condition.

Specifically, the licensee maintained other feed and condensate pumps for mitigation since they were powered from diverse sources.

This finding had a cross-cutting aspect in the area of human performance, challenge the unknown, in that the licensee failed to challenge uncertain conditions. Specifically, since 1999 and as recent as 2012, despite a plant service water corrosion control program, piping supplied by plant service water has continued to corrode internally and challenge loads supported by plant service water [H.11]. (4OA2.2)

Licensee-Identified Violations

A violation of very low safety significance that was identified by the licensee has been reviewed by the inspectors. Corrective actions taken or planned by the licensee have been entered into the licensee's corrective action program. This violation and associated corrective action tracking numbers are listed in Section 4OA7 of this report.

PLANT STATUS

The plant began the inspection period at 100 percent power. On July 16, 2016, the plant reduced power to approximately 90 percent power for control rod maintenance and steam valve testing. The plant returned to 100 percent power on July 17, 2016. On July 20, 2016, the plant reduced power to approximately 70 percent power due to a loss of electrical power to non-safety-related condensate and feedwater components. The plant returned to 100 percent power on July 22, 2016.

On August 5, 2016, the plant reduced power to approximately 60 percent power to remove a non-safety-related condensate booster pump from service for repair. The plant returned to 100 percent power on August 7, 2016. On August 13, 2016, the plant reduced power to approximately 92 percent power for control rod drive and steam valve testing. The plant returned to 100 percent power on August 14, 2016. On August 21, 2016, the plant reduced power to approximately 70 percent power for control rod configuration change and steam valve testing. The plant returned to 100 percent power on August 22, 2016.

On September 9, 2016, the plant reduced power to approximately 65 percent power for power suppression testing. The plant returned to 100 percent power on September 11, 2016. On September 17, 2016, the plant reduced power to approximately 92 percent power for control rod drive and steam valve testing. The plant returned to 100 percent power on September 18, 2016, and remained there for the remainder of the inspection period.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01)

.1 Readiness for Impending Adverse Weather Conditions

a. Inspection Scope

On August 3, 2016, the inspectors completed an inspection of the station's readiness for impending adverse weather conditions due to a range fire. On September 30, 2016, the inspectors completed an inspection of the station's readiness for impending adverse weather conditions due to thunderstorms and lightning. The inspectors reviewed plant design features, the licensee's procedures to respond to adverse weather, and the licensee's planned implementation of these procedures. The inspectors evaluated operator staffing and accessibility of controls and indications for those systems required to control the plant.

These activities constituted two sample of readiness for impending adverse weather conditions, as defined in Inspection Procedure 71111.01.

b. Findings

No findings were identified.

1R04 Equipment Alignment (71111.04)

.1 Partial Walk-Down

a. Inspection Scope

The inspectors performed partial system walk-downs of the following risk-significant systems:

- July 1, 2016, post-accident monitoring instrumentation
- July 14, 2016, emergency diesel generator jacket water systems (for all three generators)
- August 12, 2016, emergency diesel generator fuel oil systems (for all three generators)

The inspectors reviewed the licensee's procedures and system design information to determine the correct lineup for the systems. They visually verified that critical portions of the systems were correctly aligned for the existing plant configuration. These activities constituted three partial system walk-down samples as defined in Inspection Procedure 71111.04.

b. Findings

No findings were identified.

.2 Complete Walk-Down

a. Inspection Scope

On September 13, 2016, the inspectors performed a complete system walk-down inspection of the emergency diesel generator 480V and 4160V electrical systems. The inspectors reviewed the licensee's procedures and system design information to determine the correct lineup for the existing plant configuration. The inspectors also reviewed outstanding work orders, open condition reports, in-process design changes, temporary modifications, and other open items tracked by the licensee's operations and engineering departments. The inspectors then visually verified that the system was correctly aligned for the existing plant configuration.

These activities constituted one complete system walk-down sample, as defined in Inspection Procedure 71111.04.

b. Findings

No findings were identified.

1R05 Fire Protection (71111.05)

.1 Quarterly Inspection

a. Inspection Scope

The inspectors evaluated the licensee's fire protection program for operational status and material condition. The inspectors focused their inspection on four plant areas important to safety:

- July 13, 2016, fire areas R-11 and R-15, high pressure core spray and reactor core isolation cooling pump rooms
- August 5, 2016, fire areas R-6, R-7, and R-14, residual heat removal A, B, and C pump rooms
- September 28, 2016, fire areas DG-3/2 and DG-9/2, emergency diesel generator B room and day tank
- September 29, 2016, fire areas RC-4, RC-5, RC-6, RC-7, RC-8, RC-9, RC-14, and RC-19, radwaste building 467' vital island and remote shutdown room

For each area, the inspectors evaluated the fire plan against defined hazards and defense-in-depth features in the licensee's fire protection program. The inspectors evaluated control of transient combustibles and ignition sources, fire detection and suppression systems, manual firefighting equipment and capability, passive fire protection features, and compensatory measures for degraded conditions.

These activities constituted four quarterly inspection samples, as defined in Inspection Procedure 71111.05.

b. Findings

No findings were identified.

.2 Annual Inspection

a. Inspection Scope

This evaluation included observation of an announced fire drill for training on August 18, 2016. On August 22, 2016, the inspectors completed their annual evaluation of the licensee's fire brigade performance.

During this drill, the inspectors evaluated the capability of the fire brigade members, the leadership ability of the brigade leader, the brigade's use of turnout gear and fire-fighting equipment, and the effectiveness of the fire brigade's team operation. The inspectors also reviewed whether the licensee's fire brigade met NRC requirements for training, dedicated size and membership, and equipment.

These activities constituted one annual inspection sample, as defined in Inspection Procedure 71111.05.

b. Findings

No findings were identified.

1R06 Flood Protection Measures (71111.06)

a. Inspection Scope

On July 25, 2016, the inspectors completed an inspection of the station's ability to mitigate flooding due to internal causes. After reviewing the licensee's flooding analysis, the inspectors chose two plant areas containing risk-significant structures, systems, and components that were susceptible to flooding:

- Reactor building 522' elevation, general area
- Reactor building 501' elevation, steam tunnel

The inspectors reviewed plant design features and licensee procedures for coping with internal flooding. The inspectors walked down the selected areas to inspect the design features, including the material condition of seals, drains, and flood barriers. The inspectors evaluated whether operator actions credited for flood mitigation could be successfully accomplished.

These activities constituted completion of one flood protection measures sample, as defined in Inspection Procedure 71111.06.

b. Findings

No findings were identified.

1R07 Heat Sink Performance (71111.07)

a. Inspection Scope

The inspectors reviewed licensee programs to verify heat exchanger performance and operability for the following heat exchangers:

- standby service water system spray pond B
- residual heat removal system heat exchanger RHR-HX-1B
- motor control center room cooling coil RRA-CC-10

The inspectors verified whether testing, inspection, maintenance, and chemistry control programs are adequate to ensure proper heat transfer. The inspectors verified that the periodic testing and monitoring methods, as outlined in commitments to NRC Generic Letter 89-13, utilized proper industry heat exchanger guidance. Additionally, the inspectors verified that the licensee's chemistry program ensured that biological fouling was properly controlled between tests. The inspectors reviewed previous maintenance records of the heat exchangers to verify that the licensee's heat exchanger inspections adequately addressed structural integrity and cleanliness of their tubes. Specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of 3 triennial heat sink inspection samples as defined in Inspection Procedure 71111.07-05.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program and Licensed Operator Performance (71111.11)

.1 Review of Licensed Operator Requalification

a. Inspection Scope

On July 27, 2016, the inspectors observed an evaluated simulator scenario performed by an operating crew. The inspectors assessed the performance of the operators and the evaluators' critique of their performance. The inspectors also assessed the modeling and performance of the simulator during the requalification activities.

These activities constituted completion of one quarterly licensed operator requalification program sample, as defined in Inspection Procedure 71111.11.

b. Findings

No findings were identified.

.2 Review of Licensed Operator Performance

a. Inspection Scope

The inspectors observed the performance of on-shift licensed operators in the plant's main control room. At the time of the observations, the plant was in a period of heightened risk due to maintenance activities. The inspectors observed the operators' performance of the following activities:

- July 20, 2016, loss of condensate and feedwater pumps
- July 21, 2016, restoration of condensate pumps
- July 22, 2016, increasing reactor power
- September 23, 2016, reactor core isolation cooling system testing

In addition, the inspectors assessed the operators' adherence to plant procedures, including conduct of operations procedure and other operations department policies.

These activities constituted completion of one quarterly licensed operator performance sample, as defined in Inspection Procedure 71111.11.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12)

a. Inspection Scope

The inspectors reviewed one instance of degraded performance or condition of safety-related structures, systems, and components (SSCs):

- September 30, 2016, mechanism operated contacts for 4160V circuit breakers

The inspectors reviewed the extent of condition of possible common cause SSC failures and evaluated the adequacy of the licensee's corrective actions. The inspectors reviewed the licensee's work practices to evaluate whether these may have played a role in the degradation of the SSCs. The inspectors assessed the licensee's characterization of the degradation in accordance with 10 CFR 50.65 (the Maintenance Rule), and verified that the licensee was appropriately tracking degraded performance and conditions in accordance with the Maintenance Rule.

These activities constituted completion of one maintenance effectiveness sample, as defined in Inspection Procedure 71111.12.

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13)

a. Inspection Scope

The inspectors reviewed three risk assessments performed by the licensee prior to changes in plant configuration and the risk management actions taken by the licensee in response to elevated risk:

- July 5, 2016, Yellow risk for low pressure core spray work activities
- July 21, 2016, Green risk for recovery of loads on non-vital bus SM-3
- August 29, 2016, Yellow risk for turbine hydraulic pump replacement and control room emergency chiller work activities

The inspectors verified that these risk assessment were performed timely and in accordance with the requirements of 10 CFR 50.65 (the Maintenance Rule) and plant procedures. The inspectors reviewed the accuracy and completeness of the licensee's risk assessments and verified that the licensee implemented appropriate risk management actions based on the result of the assessments.

The inspectors also observed portions of two emergent work activities that had the potential to cause an initiating event or to affect the functional capability of mitigating systems:

- July 20, 2016, Loss of condensate and feed pumps

- July 25, 2016, Orange risk for recovery of standby service water flow to air handler WMA-AH-53B

The inspectors verified that the licensee appropriately developed and followed a work plan for these activities. The inspectors verified that the licensee took precautions to minimize the impact of the work activities on unaffected SSCs.

These activities constituted completion of five maintenance risk assessments and emergent work control inspection samples, as defined in Inspection Procedure 71111.13.

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15)

a. Inspection Scope

The inspectors reviewed three operability determinations that the licensee performed for degraded or nonconforming SSCs:

- July 17, 2016, operability determination of division 1 emergency diesel generator for diesel jacket cooling water heater loss under Action Request (AR) 350795

- July 21, 2016, operability determination of the startup transformer and offsite power for loss of loads on SM-3 under AR 352504

- August 18, 2016, operability determination of vital electrical equipment cooled by air handling unit WMA-AHU-53B for reduced cooling flow under ARs 352668 and 352835

The inspectors reviewed the timeliness and technical adequacy of the licensee's evaluations. Where the licensee determined the degraded SSC to be operable, the inspectors verified that the licensee's compensatory measures were appropriate to provide reasonable assurance of operability. The inspectors verified that the licensee had considered the effect of other degraded conditions on the operability of the degraded SSC.

These activities constituted completion of three operability and functionality review samples as defined in Inspection Procedure 71111.15.

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18)

.1 Temporary Modifications

a. Inspection Scope

On September 30, 2016, the inspectors reviewed a temporary modification to condensate booster pump 2C and associated oil cooler that affected risk-significant SSCs.

The inspectors verified that the licensee had installed this temporary modification in accordance with technically adequate design documents. The inspectors verified that this modification did not adversely impact the operability or availability of affected SSCs. The inspectors reviewed design documentation and plant procedures affected by the modification to verify the licensee maintained configuration control.

These activities constituted completion of one sample of temporary modifications, as defined in Inspection Procedure 71111.18.

b. Findings

No findings were identified.

.2 Permanent Modifications

a. Inspection Scope

On September 30, 2016, the inspectors reviewed a permanent plant modification to the mechanism operated contacts for 4160V circuit breakers that affected risk-significant SSCs.

The inspectors reviewed the design and implementation of the modification. The inspectors verified that work activities involved in implementing the modification did not adversely impact operator actions that may be required in response to an emergency or other unplanned event. The inspectors verified that post-modification testing was adequate to establish the operability of the SSCs as modified.

These activities constituted completion of one sample of permanent modifications, as defined in Inspection Procedure 71111.18.

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19)

a. Inspection Scope

The inspectors reviewed seven post-maintenance testing activities that affected risk-significant SSCs:

- July 6, 2016, post-maintenance testing of low pressure core spray under work order 02090713

- July 16, 2016, post-maintenance testing of emergency diesel generator 1A1 jacket water heater under work order 02092856

- July 22, 2016, post-maintenance testing of circuit breaker E-CB-S/3 under work order 02080222

- August 6, 2016, post-maintenance testing of condensate booster pump 2C under work order 02094810

- September 9, 2016, post-maintenance testing of emergency diesel generator exhaust fan DEA-FN-11 under work order 02100561

- September 14, 2016, post-maintenance testing of reactor core isolation cooling system under work order 02092776

- September 29, 2016, post-maintenance testing of standby gas treatment train B under work orders 02074191, 02088953, and 02093286

The inspectors reviewed licensing- and design-basis documents for the SSCs and the maintenance and post-maintenance test procedures. The inspectors observed the performance of the post-maintenance tests to verify that the licensee performed the tests in accordance with approved procedures, satisfied the established acceptance criteria, and restored the operability of the affected SSCs.

These activities constituted completion of seven post-maintenance testing inspection samples, as defined in Inspection Procedure 71111.19.

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22)

a. Inspection Scope

The inspectors observed five risk-significant surveillance tests and reviewed test results to verify that these tests adequately demonstrated that the SSCs were capable of performing their safety functions:

In-service tests:

- August 5, 2016, reactor core isolation cooling testing

Reactor coolant system leak detection tests:

- September 30, 2016, shift and daily instrument checks

Other surveillance tests:

- July 1, 2016, monthly emergency diesel generator 3 surveillance test

- August 5, 2016, residual heat removal heat exchanger testing
- August 13, 2016, turbine bypass valve testing

The inspectors verified that these tests met technical specification requirements, that the licensee performed the tests in accordance with their procedures, and that the results of the test satisfied appropriate acceptance criteria. The inspectors verified that the licensee restored the operability of the affected SSCs following testing.

These activities constituted completion of five surveillance testing inspection samples, as defined in Inspection Procedure 71111.22.

b. Findings

No findings were identified.

Cornerstone: Emergency Preparedness

1EP4 Emergency Action Level and Emergency Plan Changes (71114.04)

a. Inspection Scope

The inspector performed an in-office review of Columbia Emergency Plan, Revision 63. This revision made minor administrative changes, updates, and corrections.

This revision was compared to its previous revision, to the criteria of NUREG-0654, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," Revision 1, and to the standards in 10 CFR 50.47(b) to determine if the revision adequately implemented the requirements of 10 CFR 50.54(q)(3) and 50.54(q)(4). The inspector verified that the revision did not decrease the effectiveness of the emergency plan. This review was not documented in a safety evaluation report and did not constitute approval of licensee-generated changes; therefore, this revision is subject to future inspection.

These activities constitute completion of one emergency action level and emergency plan changes sample as defined in Inspection Procedure 71114.04.

b. Findings

No findings were identified.

1EP6 Drill Evaluation (71114.06)

a. Inspection Scope

On August 30, 2016, the inspectors observed simulator-based licensed operator requalification training that included implementation of the licensee's emergency plan. The inspectors verified that the licensee's emergency classifications, off-site notifications, and protective action recommendations were appropriate and timely. The inspectors verified that any emergency preparedness weaknesses were appropriately identified by the evaluators and entered into the corrective action program for resolution.

These activities constituted completion of one training observation sample, as defined in Inspection Procedure 71114.06.

b. Findings

No findings were identified.

2. RADIATION SAFETY

Cornerstones: Public Radiation Safety and Occupational Radiation Safety

2RS2 Occupational ALARA Planning and Controls (71124.02)

a. Inspection Scope

The inspectors assessed licensee performance with respect to maintaining individual and collective radiation exposures as low as is reasonably achievable (ALARA). The inspectors performed this portion of the attachment as a post-outage review. During the inspection the inspectors interviewed licensee personnel, reviewed licensee documents, and evaluated licensee performance in the following areas:

- Radiological work planning, including work activities of exposure significance, radiological work planning ALARA evaluations, initial and revised exposure estimates, and exposure mitigation requirements. The inspectors also verified that the licensee's planning identified appropriate dose reduction techniques, reviewed any inconsistencies between intended and actual work activity doses, and determined if post-job (work activity) reviews were conducted to identify lessons learned.

- Verification of dose estimates and exposure tracking systems, including the basis for exposure estimates, and measures to track, trend, and if necessary reduce occupational doses for ongoing work activities. The inspectors evaluated the licensee's method for adjusting exposure estimates and reviewed the licensee's evaluations of inconsistent or incongruent results from the licensee's intended radiological outcomes.

- Problem identification and resolution for ALARA planning. The inspectors reviewed audits, self-assessments, and corrective action program documents to verify problems were being identified and properly addressed for resolution.

These activities constitute completion of two of the five required samples of occupational ALARA planning and controls program, as defined in Inspection Procedure 71124.02.

b. Findings

No findings were identified.

2RS4 Occupational Dose Assessment (71124.04)

a. Inspection Scope

The inspectors evaluated the accuracy and operability of the licensee's personnel monitoring equipment, verified the accuracy and effectiveness of the licensee's methods for determining total effective dose equivalent, and verified that the licensee was appropriately monitoring occupational dose. The inspectors interviewed licensee personnel, walked down various portions of the plant, and reviewed licensee performance in the following areas:

- Source term characterization, including characterization of radiation types and energies, hard-to-detect isotopes, and scaling factors.

- External dosimetry including National Voluntary Laboratory Accreditation Program (NVLAP) accreditation, storage, issue, use, and processing of active and passive dosimeters.

- Internal dosimetry, including the licensee's use of whole body counting, use of in vitro bioassay methods, dose assessments based on airborne monitoring, and the adequacy of internal dose assessments.

- Special dosimetric situations, including declared pregnant workers, dosimeter placement and assessment of effective dose equivalent for external exposures (EDEX), shallow dose equivalent, and neutron dose assessment.

- Problem identification and resolution for occupational dose assessment. The inspectors reviewed audits, self-assessments, and corrective action program documents to verify problems were being identified and properly addressed for resolution.

These activities constitute completion of the five required samples of occupational dose assessment program, as defined in Inspection Procedure 71124.04.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity, Emergency Preparedness, Public Radiation Safety, Occupational Radiation Safety, and Security

4OA1 Performance Indicator Verification (71151)

.1 Mitigating Systems Performance Index: Emergency AC Power Systems (MS06)

a. Inspection Scope

The inspectors reviewed the licensee's mitigating system performance index data for the period of July 2015 through June 2016 to verify the accuracy and completeness of the reported data. The inspectors used definitions and guidance contained in Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, to determine the accuracy of the reported data.

These activities constituted verification of the mitigating system performance index for emergency ac power systems, as defined in Inspection Procedure 71151.

b. Findings

No findings were identified.

.2 Mitigating Systems Performance Index: High Pressure Injection Systems (MS07)

a. Inspection Scope

The inspectors reviewed the licensee's mitigating system performance index data for the period of July 2015 through June 2016 to verify the accuracy and completeness of the reported data. The inspectors used definitions and guidance contained in Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, to determine the accuracy of the reported data.

These activities constituted verification of the mitigating system performance index for high pressure injection systems, as defined in Inspection Procedure 71151.

b. Findings

No findings were identified.

.3 Mitigating Systems Performance Index: Heat Removal Systems (MS08)

a. Inspection Scope

The inspectors reviewed the licensee's mitigating system performance index data for the period of July 2015 through June 2016 to verify the accuracy and completeness of the reported data. The inspectors used definitions and guidance contained in Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, to determine the accuracy of the reported data.

These activities constituted verification of the mitigating system performance index for heat removal systems, as defined in Inspection Procedure 71151.

b. Findings

No findings were identified.

.4 Mitigating Systems Performance Index: Residual Heat Removal Systems (MS09)

a. Inspection Scope

The inspectors reviewed the licensee's mitigating system performance index data for the period of July 2015 through June 2016 to verify the accuracy and completeness of the reported data. The inspectors used definitions and guidance contained in Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, to determine the accuracy of the reported data.

These activities constituted verification of the mitigating system performance index for residual heat removal systems, as defined in Inspection Procedure 71151.

b. Findings

No findings were identified.

.5 Mitigating Systems Performance Index: Cooling Water Support Systems (MS10)

a. Inspection Scope

The inspectors reviewed the licensee's mitigating system performance index data for the period of July 2015 through June 2016 to verify the accuracy and completeness of the reported data. The inspectors used definitions and guidance contained in Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, to determine the accuracy of the reported data.

These activities constituted verification of the mitigating system performance index for cooling water support systems, as defined in Inspection Procedure 71151.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152)

.1 Routine Review

a. Inspection Scope

Throughout the inspection period, the inspectors performed daily reviews of items entered into the licensee's corrective action program and periodically attended the licensee's condition report screening meetings. The inspectors verified that licensee personnel were identifying problems at an appropriate threshold and entering these problems into the corrective action program for resolution. The inspectors verified that

the licensee developed and implemented corrective actions commensurate with the significance of the problems identified. The inspectors also reviewed the licensee's problem identification and resolution activities during the performance of the other inspection activities documented in this report.

b. Findings

No findings were identified.

.2 Annual Follow-up of Selected Issues

a. Inspection Scope

The inspectors selected two issues for an in-depth follow-up:

- On July 5, 2016, the inspectors reviewed Action Requests for ITT Barton indicating switches and color-banded instruments in the control room including regulatory commitments

- On August 5, 2016, the inspectors reviewed Action Requests for plant service water deficiencies including regulatory commitments after the emergent downpower

The inspectors assessed the licensee's cause analyses, extent of condition reviews, and compensatory actions. The inspectors verified that the licensee appropriately prioritized the planned corrective actions and that these actions were appropriate.

These activities constituted completion of two annual follow-up samples as defined in Inspection Procedure 71152.

b. Findings

Introduction. The inspectors reviewed a self-revealed, Green finding for the licensee's failure to follow plant procedure SYS-4-31, "System and Equipment Performance Monitoring and Trending Program," revision 11. Specifically, the licensee was not effective in detecting and managing internal corrosion of piping that supplied cooling water to the 2C condensate booster pump lube oil coolers resulting in an unplanned power reduction to secure that equipment on August 5, 2016.

Description. On August 5, 2016, the licensee reduced reactor power to approximately 60 percent power due to an inability to control lube oil temperature on the 2C condensate booster pump oil coolers which are cooled by plant service water. Operators responded appropriately to manage the changing plant conditions, including completion of a temporary modification to the system to restore plant service water to the 2C condensate booster pump oil coolers. The licensee's subsequent apparent cause evaluation in AR 353210 concluded that the internal surfaces of the plant service water piping were fouled due to corrosion which limited the heat transfer capacity and reduced cooling capability of the condensate booster pump lube oil coolers.

As discussed in the plant Final Safety Analysis Report, section 9.2.1, the plant service water system is designed to provide cooling water for removal of heat rejected from

auxiliary equipment. The cooling water comes from an 8-inch header that is reduced to a 2-inch line and then a 1.5-inch line. From the 1.5-inch header pipe the water is distributed through 1-inch lines to the booster pump coolers starting with the 2A pump, then the 2B pump, and finally the 2C pump. In addition to a biocide treatment system, the plant service water system is maintained with additional chemical treatment intended to minimize silt deposition, scale formation, corrosion, and consequential fouling of heat transfer surfaces.

The inspectors reviewed licensee procedure SWP-CAP-01, "Corrective Action Program," revision 36, which refers to SWP-CAP-07, "Trending Program," revision 9, which states that equipment trending is performed through SYS-4-31, "System and Equipment Performance Monitoring and Trending Program," revision 11. SYS-4-31, "System and Equipment Performance Monitoring and Trending Program," revision 11, ensures, in part, that a system performance monitoring program will "monitor system and component performance, permit early detection of equipment problems, predict equipment problems, and help confirm the effectiveness of predictive, preventive, proactive, and corrective maintenance."

The licensee's apparent cause evaluation stated, "Since 2012, the licensee has experienced multiple instances of COND-P-2C [the 2C condensate booster pump] outlet lube oil high temperatures due to clogging of the small bore piping." However, the inspectors' independent review of the licensee's corrective action system found that since 1999, as described in Condition Report 139350, the licensee was aware that the plant service water system was challenged by corrosion of the internal surfaces of carbon steel piping. The inspectors found that the corrosive environment led to multiple additional examples of plant service water pipe blockage issues, with notable examples documented from 2012 through 2015 (e.g., AR 268037, AR 269662, AR 310400, AR 311460, and AR 310551).

In 2008, the licensee developed a Long Range Improvement Plan (LRIP), a living document to evaluate and define the corrective actions required to effectively improve the performance and reliability of the system. However, despite the LRIP, the inspectors determined the licensee's actions were ineffective and failed to ensure the early detection of equipment problems, predict equipment problems, and help confirm the effectiveness of predictive, preventive, proactive, and corrective maintenance as required by plant procedures. Of note, the licensee's apparent cause evaluation ultimately concluded that the plant service water "subsystem piping and components should have been replaced prior to this event." The licensee's apparent cause evaluation (in AR 353210) included new long-term corrective actions to address the internal surface corrosion.

Analysis. The failure to follow plant procedure SYS-4-31, "System and Equipment Performance Monitoring and Trending Program," that ensures a system performance monitoring program will permit early detection of equipment problems, predict equipment problems, and help confirm the effectiveness of predictive, preventive, proactive, and corrective maintenance was a performance deficiency. Specifically, the loss of the 2C condensate booster pump was due to ineffective corrective actions and a system performance monitoring program that did not permit early detection related to fouling of internal surfaces of piping that cooled the lube oil coolers. Consequently, on August 5, 2016, the licensee reduced reactor power to approximately 60 percent power due to an inability to control lube oil temperature on the 2C condensate booster pump oil coolers

which are cooled by plant service water. The performance deficiency was more than minor because it affected the equipment performance attribute of the Initiating Event Cornerstone and adversely affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the inability to adequately cool the lube oil coolers for the condensate booster pump 2C upset plant stability resulting in an unplanned plant transient. The inspector performed the initial significance determination using NRC Inspection Manual Chapter 0609, Appendix A, Exhibit 1, "Initiating Events Screening Questions." The inspectors determined that the finding was of very low safety significance because the finding did not cause a reactor trip and the loss of mitigation equipment relied upon to transition the plant from the onset of the trip to a stable shutdown condition. Specifically, the licensee maintained available other feedwater and condensate pumps for mitigation of the unplanned plant transient.

This finding had a cross-cutting aspect in the area of human performance, challenge the unknown, in that the licensee failed to challenge uncertain conditions. Specifically, since 1999 and as recent as 2012, despite a plant service water corrosion control program, piping supplied by plant service water has continued to corrode internally and challenge the functionality of loads supported by plant service water [H.11].

Enforcement. This finding does not involve enforcement action because no violation of a regulatory requirement was identified. This issue was entered into the licensee's corrective action program as AR 353210. Because this finding does not involve a violation and is of very low safety significance, it is identified as FIN 05000397/2016003-01, "Ineffective System Performance Monitoring Program For Plant Service Water Piping Fouling."

4OA3 Follow-up of Events and Notices of Enforcement Discretion (71153)

.1 (Closed) Licensee Event Report (LER) 05000397/2016-001-01: Manual Reactor Scram Following Loss of Reactor Closed Cooling

On March 28, 2016, the licensee inserted a manual reactor scram due to a loss of the non-safety reactor closed cooling (RCC) system. The loss of RCC was due to inadequate mechanical isolation between RCC and the safety-related standby service water (SW) system during post-maintenance testing of a SW valve. The scram was uncomplicated and RCC was recovered without adverse impact to cooled components. This issue was dispositioned as a Green non-cited violation in Section 1R19 of NRC Integrated Inspection Report 05000397/2016002 (ML16202A082). This revision to the LER modified language for the root cause but did not significantly change the NRC's conclusion. This licensee event report is closed.

.2 Loss of main feed pump

On July 20, 2016, the licensee reduced reactor power to approximately 70 percent power due to a failure of non-safety circuit breaker E-CB-S/3 mechanism operated cell switches. Specifically, the switches failed to change state during routine electric lineup shift. As a result, non-safety components tripped including a condensate pump, a condensate booster pump, and a main feed pump. The inspectors reviewed personnel performance, including operator response to changing plant conditions, and computer

data. The inspectors determined the licensee's response was appropriate for the event and in accordance with procedures and training.

.3 Loss of condensate booster pump 2C

On August 5, 2016, the licensee reduced reactor power to approximately 60 percent power due to an inability to control lube oil temperature on the 2C condensate booster pump oil coolers which are cooled by plant service water. The loss of the 2C condensate booster pump was due to ineffective corrective actions related to fouling of internal surfaces of piping that cools the lube oil coolers. This issue was dispositioned as a Green finding in Section 4OA2 of this report.

These activities constituted completion of three event follow-up samples, as defined in Inspection Procedure 71153.

4OA5 OTHER ACTIVITIES

.1 Operation of an Independent Spent Fuel Storage Facility at Operating Plants (60855.1)

a. Inspection Scope

A routine Independent Spent Fuel Storage Inspection (ISFSI) inspection was conducted at Columbia Generating Station (CGS) on July 26-28, 2016, by Region IV, Division of Nuclear Material Safety inspectors. The inspectors reviewed and evaluated selected areas from the licensee's ISFSI program areas. The areas reviewed included radiation safety, operating procedures, cask thermal monitoring, quality assurance, corrective action, safety evaluations, fuel specifications of loaded assemblies, and compliance to conditions listed in the Holtec HI-STORM 100 Technical Specifications and Holtec Final Safety Analysis Report (FSAR). Also reviewed were changes made to the ISFSI program since the last routine ISFSI inspection which was conducted in March of 2014. CGS utilized a general Part 72 license in accordance with the Holtec HI-STORM 100 System, approved under Certificate of Compliance 1014, License Amendment 2 and FSAR, Revision 4. At the time of the inspection, CGS's ISFSI had 36 loaded Holtec HI-STORM 100S casks on its ISFSI pad.

Inspectors performed a review of the dry fuel storage records for the five canisters that had been loaded at the ISFSI since the last NRC ISFSI inspection. The canisters' contents were reviewed to verify that the licensee was loading fuel in accordance with the Technical Specifications for approved contents. Documents reviewed included multi-purpose canister (MPC) loading maps and fuel assembly specific information such as identification, decay heat, cooling time, average U-235 enrichment, burn-up values, and other information. All fuel documents reviewed documented that CGS had met the requirements listed in the Technical Specifications.

The inspectors requested documentation related to maintenance of the fuel building cask handling crane and the annual maintenance of the site's loaded HI-STORM casks and ISFSI pad. Documents were provided that demonstrated the fuel building cask handling crane was inspected on an annual basis in accordance with the American Society of Mechanical Engineers (ASME) B30.2 safety requirements. The licensee had completed annual inspections and maintenance on its casks and ISFSI pad in accordance with FSAR Table 9.2.1 for two calendar years that were reviewed, 2014 and 2015.

Inspectors reviewed the radiological conditions at the CGS ISFSI through a document review of the most recent radiological survey and three calendar years of thermoluminescent dosimeter (TLD) monitoring data from around the ISFSI. A dry cask loading supervisor, one radiation protection (RP) technician, and other members of the licensee staff accompanied the NRC inspectors during a walk-down of the ISFSI pad. A radiological survey was performed by the RP technician to record gamma exposure rates. The measurements taken by the RP technician were consistent with measurements recorded on the most recent ISFSI site survey. The radiological conditions in and around the ISFSI were as expected for the age and heat-load of the 36 currently loaded spent fuel storage casks. Annual Radiological Environmental Operating Reports for the CGS site were reviewed for the last two calendar years. The reports documented the dose equivalent to any real individual located beyond the site controlled area had been well below the 10 CFR 72.104(a)(2) requirement of less than 25 millirem per year.

A review of the Corrective Action Program (CAP) associated with the ISFSI was conducted by the NRC inspectors. A list of condition reports issued since the last NRC ISFSI inspection was provided by the licensee for the cask handling crane and ISFSI operations. When a problem was identified the licensee would document the issue as an Action Request (AR) in the licensee's CAP.

Of the list of ARs provided relating to the ISFSI and the cask handling crane, 30 were selected by the NRC inspectors for further review. The ARs were related to a variety of issues. The ARs reviewed were well documented and properly categorized based on the safety significance of the issue. The corrective actions taken were appropriate for the situations. Based on the comprehensiveness of the ARs, the licensee demonstrated a high attention to detail in regard to the maintenance and operation of the ISFSI program and the cask handling crane. No NRC safety concerns were identified related to the ARs reviewed.

The licensee's 10 CFR 72.48/10 CFR 50.59 screenings and evaluations for ISFSI program changes and changes to the cask handling crane were reviewed to determine compliance with regulatory requirements. The CGS had not performed any 10 CFR 72.48 or 10 CFR 50.59 full evaluations (on the cask handling crane) since the last NRC ISFSI inspection. The NRC inspectors selected twenty 10 CFR 72.48 screens and one 10 CFR 50.59 screen that was performed on the cask handling crane for additional review. All the screens reviewed were determined to be adequately evaluated by the licensee.

An on-site review of the Quality Assurance (QA) audits and QA surveillance reports related to dry cask storage activities at the CGS ISFSI was performed by the NRC inspectors. The QA audit reports and surveillances resulted in several ARs. The NRC inspectors reviewed the corrective actions resulting from the ARs to ensure that the identified deficiencies were properly categorized based on their significance and properly resolved. All identified deficiencies had been properly categorized and resolved by the licensee.

b. Findings

No findings were identified.

4OA6 Meetings, Including Exit

Exit Meeting Summary

On July 28, 2016, the inspectors debriefed Mr. William Hettel, Vice President of Operations, and other members of the licensee's staff of the results of the routine ISFSI inspection documented in Section 4OA5. Licensee personnel acknowledged the information presented. The inspectors asked the licensee whether any materials examined during the inspection should be considered propriety. No propriety information was identified.

On September 1, 2016, the inspectors presented the radiation safety inspection results to Mr. R. Schuetz, Plant General Manager, and other members of the licensee staff. The licensee acknowledged the issues presented. The licensee confirmed that any proprietary information reviewed by the inspectors had been returned or destroyed.

On September 15, 2016, the inspectors presented the triennial heat sink inspection results to M. R. Schuetz, Plant General Manager, and other members of the licensee staff. The licensee acknowledged the issues presented. The inspector asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

On September 16, 2016, the emergency preparedness inspector conducted a telephonic exit meeting to present the results of the in-office inspection of changes to the licensee's emergency plan to Mr. C. Forester, Acting Manager, Emergency Preparedness, and other members of the licensee staff. The licensee acknowledged the issues presented.

On October 13, 2016, the resident inspectors presented the complete quarterly inspection results to you, and other members of the licensee staff. The licensee acknowledged the issues presented. The licensee confirmed that any proprietary information reviewed by the inspectors had been returned or destroyed.

4OA7 Licensee-Identified Violations

The following licensee-identified violation of NRC requirements was determined to be of very low safety significance and meets the NRC Enforcement criteria for being dispositioned as a non-cited violation.

> License NPF-21, Condition 2.C(11), "Shield Wall Deferral (Section 12.3.2, SSER #4, License Amendment #7)" states that the licensee shall complete construction of the deferred shield walls and window as identified in Attachment 3. Attachment 3 of License NPF-21 states, in part, that shield walls and window identified in five areas will be installed if the associated radiation levels at these locations exceed 2.5 millirem per hour (mR/hr) as dictated by the ongoing ALARA reviews.
>
> Contrary to the above, one of these locations routinely exceeded 2.5 mR/hr since 2015 without the construction of a shield wall. Specifically, the Radwaste 467' Decontamination Facility A-Centrifuge Room routinely had general area dose rates measuring 4 -70 mR/hr. In addition, from 2009 through 2015, the licensee failed to establish a program to conduct

ALARA reviews routinely and monitor dose rates for three radiation zones containing all five areas.

The licensee initially identified this non-compliance with License Condition 2.C(11) during a quality assurance audit in 2010. In September 2015, during Quality Assurance Audit Report AU-OP/TS-15, the licensee identified this non-compliance again and that it was not corrected. This 2015 audit deficiency was entered in their corrective action program as Action Request AR 00339651.

During the inspection, inspectors toured the five areas called out in the license condition with the licensee's Principal Health Physicist and Heath Physics (HP) technician. Radiation surveys performed by the HP technician confirmed general area dose rates in the Radwaste 467' Decontamination Facility A-Centrifuge Room were in excess of 2.5 mR/hr.

The inspectors assessed the finding in accordance with Inspection Manual Chapter (IMC) 0609, "The Significance Determination Process," dated April 29, 2015. The inspectors determined the finding was of very low safety significance (Green). The inspectors determined that this violation resulted in no actual safety consequence. All five areas remained properly characterized and appropriate administrative radiation area controls remained in place. The licensee created two corrective action program entries, Action Requests AR 00354266, to create procedures for ongoing ALARA reviews, and AR 00354320, to take action to update their licensee condition to accurately reflect current operations. This violation is being treated as a licensee-identified, non-cited violation consistent with Section 2.3.2 of the "NRC Enforcement Policy."

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

P. Belsterling, Reactor Fuels Engineer
A. Black, Emergency Services General Manager
O. Brooks, Emergency Preparedness Coordinator
D. Brown, Manager, System Engineering
G. Burton, Principal Health Physicist, Radiation Protection
S. Cooper, Plant Fire Marshal
S. Clizbe, Manager, Emergency Preparedness
M. Davis, Manager, Chemistry/Radiation Safety
D. Gregoire, Manager, Regulatory Affairs and Performance Improvement
G. Hettel, Vice President, Operations
G. Higgs, Manager, Maintenance
M. Hummer, Licensing Engineer
A. Javorik, Vice President, Engineering
M. Kellett, Assistant to the Vice President, Operations
M. Kinmark, Health Physics Staff Advisor, Radiation Protection
E. Kuhn, Auditor, Quality
M. Laudisio, Manager, Radiation Protection
C. Moore, ISFSI Supervisor
C. Moon, Manager, Quality
T. Parmalee, Compliance Engineer, Licensing and Regulatory Affairs
B. Pease, Manager, Emergency Services
G. Pierce, Manager, Training
R. Prewett, Operations Manager
G. Rheaume, System Engineering Supervisor, NSSS
R. Sanker, Supervisor, Radiation Protection
B. Schuetz, Plant General Manager
D. Stevens, Assistant Manager, Operations
D. Suarez, Regulatory Compliance Engineer
L. Williams, Licensing Supervisor
D. Wolfgramm, Compliance Supervisor, Regulatory Affairs
G. Wyatt, Supervisor, Simulator and Examination Group

NRC Personnel
R. Deese, Senior Reactor Analyst

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000397/2016003-01	FIN	Ineffective System Performance Monitoring Program For Plant Service Water Piping Fouling (Section 4OA2)

Closed

05000397/2016-001-01	LER	Manual Reactor Scram Following Loss of Reactor Closed Cooling (Section 4OA3)

LIST OF DOCUMENTS REVIEWED

Section 1R01: Adverse Weather Protection

Procedures

Number	Title	Revision
13.1.1	Classifying the Emergency	47
13.1.1A	Classifying the Emergency – Technical Bases	31
ABN-ELEC-GRID	Degraded Off Site Power Grid	7
SOP-HOTWEATHER-OPS	Hot Weather Operations	6
SOP-WARMWEATHER-OPS	Warm Weather Operations	12

Action Requests (ARs)

352906	349679	349680	349751	350319
350457	350487	351501	352697	

Section 1R04: Equipment Alignment

Procedures

Number	Title	Revision
ISP-CMS-X302	Suppression Chamber Pressure Monitoring – CC	6
OSP-INST-H101	Shift and Daily Instrument Checks (Modes 1, 2, 3)	86
OSP-INST-M201	Accident Monitoring Instrumentation Channel Checks	12
SOP-DG1-LU	Emergency Diesel Generator (DIV 1) Valve and Power Supply Lineup	4

Procedures

Number	Title	Revision
ISP-CMS-X302	Suppression Chamber Pressure Monitoring – CC	6
SOP-DG2-LU	Emergency Diesel Generator (DIV 2) Valve and Power Supply Lineup	4
SOP-DG3-LU	High Pressure Core Spray Diesel Generator Valve and Power Supply Lineup	6

Calculations

Number	Title	Revision/Date
E/I-02-92-1082	Calculation for Indication Uncertainty Determination for CMS Pressure Recorder 3	April 2, 2008
ME-02-91-46	Sizing of Air Dryers for DG1A, DG1B, and HPCS Air Start Systems	0

Miscellaneous

Number	Title	Revision
	Instrument Master Data Sheet: CMS-PR-1	10
	Instrument Master Data Sheet: CMS-PR-2	10
	Instrument Master Data Sheet: CMS-PR-3	19
	Instrument Master Data Sheet: CMS-PR-4	18
707-00,1,2	Alphaline Absolute and Gage Pressure Transmitter Models 1151AP & 1151GP	3

Action Requests (ARs)

352962	352963	027831	228564	249537
259891	265736	270393	278948	288879
294084	301190	326504	353446	324184
334600	343979	334076	352430	353088
320823	342380	343901	346765	351145
351650	351666			

Section 1R05: Fire Protection

Procedures

Number	Title	Revision
1.3.57	Barrier Impairment	35
PFP-DG-Building	Pre-fire Plan: Diesel Generator Building	4
PFP-RW-467	Pre-fire Plan: Radwaste 467	5
SOP-DG2-START	Emergency Diesel Generator (Div 2) Start	28

Miscellaneous

Number	Title	Revision
NFPA-13	Standard for Installation of Sprinkler Systems	2016

Action Requests (ARs)

343349	343350	344142	346476	350025
350725	351070	351492	351594	353094
353780	322708	323676	329942	335241
338915	340980			

Section 1R06: Flood Protection Measures

Procedures

Number	Title	Revision
PFP-RB-522	Pre-fire plan: Reactor Building 522	5
PFP-RB-501	Pre-fire plan: Reactor Building 501	3

Calculations

Number	Title	Revision
ME-02-02-02	Calculation for Reactor Building Flooding Analysis	2

Miscellaneous

Number	Title	Date
	Fire tour log	July 25, 2016

Action Requests (ARs)

317818	319653	323450	323834	325982

Action Requests (ARs)

327634	327760	334625	334943	345128
348593	351269	351946	352863	

Section 1R07: Heat Sink Performance

Procedures

Number	Title	Revision
1.5.13	Preventive Maintenance Optimization Living Program	35
1.5.15	Equipment Reliability Process Description	7
4.820.B1	820.B1 Annunciator Panel Alarms	39
8.4.42	Thermal Performance Monitoring of RHR-HX-1A and RHR-HX-1B	12
8.4.81	SW System Performance with FPC HX Valved In	7
ABN-SW	Service Water Trouble	15
ISP-SW-X301	Remote Shutdown Monitoring Standby Service Water Pump B, Discharge Header Pressure – CC	3
ISP-SW-X302	Remote Shutdown Spray Pond B Temperature – CC	1
ISP-SW-X305B	Accident Monitoring Instrumentation Standby Service Water Spray Pond Water Temperature Monitoring DIV 2 Channel B – CC	2
OSP-INST-H102	Shift and Daily Instrument Checks (Mode 4)	43
OSP-INST-M101	Remote and Alt Remote Shutdown Panel Channel Check	12
OSP-SW/IST-Q701	Standby Service Water Loop A Operability	27
OSP-SW/IST-Q702	Standby Service Water Loop B Operability	29
OSP-SW-M101	Standby Service Water Loop A Valve Position Verification	37
OSP-SW-M102	Standby Service Water Loop B Valve Position Verification	34
OSP-SW-Q101	SW Spray Pond Average Sediment Depth Measurement	10
SOP-RHRB-INJECTION-QC	RHR Loop B RPV Injection - Quick Card	1
SOP-RHR-SPC-QC	RHR Loop A(B) in Suppression Pool Cooling - Quick Card	5

Procedures

Number	Title	Revision
SOP-SW-OPS	Standby Service Water	7
SWP-CAP-06	Condition Report Review	23
SWP-CHE-02	Chemical Process Management and Control	23, 25
SWP-CHE-05	Chemical Management Program	11, 12
TSP-SW/ISI-G802	SW Loop B System Leakage Test	3

Calculations

Number	Title	Revision
ME-02-08-15	Determination of Allowable Volumes of Air/Gas in the RCIC and ECCS Discharge Piping	2
ME-02-09-03	Test Data Evaluation and Uncertainty Analysis for the RHR Heat Exchangers	0
ME-02-15-09	Impact of Plugged Spray Nozzles on UHS Performance	0
ME-02-92-41	Calculation for Ultimate Heat Sink Analysis	7
ME-02-85-68	Drift Loss Calculation	0

Miscellaneous

Number	Title	Revision Date
	Service Water Reliability Program	2
	Eddy Current Test Data for RHR-HX-1B	May 2015
	Blocked Tube Map for RHR-HX-1B	May 2015
	Blocked Tube Map for FCP-HX-1B	February 16, 2011
1-72-06-31350	Fuel Pool Cooling Heat Exchanger Specification Sheet	July 10, 1972
C-21513	Regulatory (NRC) Commitment Change Form	January 8, 2014
GEK-90332A	RHR Heat Exchanger Data Sheet	
LDCN-13-021	Spray Pond Ashfall Impact	0
WPPSS-EN-81-01	1979 Ultimate Heat Sink Spray System Test Results	

Vendor Documents

Number	Title	Revision
02-67-00, 6	Reactor Building MCC Fan Coil Units	4
03-233-00	Oriented Spray Cooling System Instruction and Maintenance Manual	1

Drawings

Number	Title	Revision
M584	General Arrangement Plans and Sections Standby Service Water Pump Houses	10
E799	Standby Service Water Pump Houses Miscellaneous Sections and Details	32

Action Requests (ARs) (Issued)

354935	355139	355203	355282		

Action Requests (ARs) (Reviewed)

326322	314617	291250	326339	322256	335204
257827	216938	353496	352353	352071	351505
351421	340152	339296	338580	337123	336209
335216	335204	329949	329800	329785	329783
329639	329638	329545	328299	328046	324943
324701	322256	320695	319654	319271	318321
318074	316238	313136	311052	306676	304792
286643					

Work Orders (WOs)

02063625	02091925	02046668	02067567	02022945	02036353
02045235	02045236	02047821	02056546	02066890	02066891
02081812	02084013	02085032	02085320	02084013	02085320
02085716	02086157	02086157	02086501	02066834	01178001
02047409	02039821	01021412	02008989	01196579	01022197
02054228	02054229	02039920	02021790	02062198	

Section 1R11: Licensed Operator Requalification Program and Licensed Operator Performance

Procedures

Number	Title	Revision
OI-9	Operations Standards and Expectation	64
1.3.1	Operating Policy, Programs, and Practices	120
13.1.1	Classifying the Emergency	47
5.1.1	RPV Control	21
5.2.1	Primary Containment Control	23
5.3.1	Secondary Containment Control	20
SOP-COND-START	Main Condensate System Pump Start	16
SOP-RCIC-START	RCIC Start in Test Return Mode	6
SOP-RHR-SPC	Suppression Pool Cooling/Spray/Discharge/Mixing	8

Miscellaneous

Number	Title	Revision
LR002320	Evaluated Scenario – Crew F	July 26, 2016

Action Requests (ARs)

349277	349736	351176	352549	352573
352591	353076	353597		

Section 1R12: Maintenance Effectiveness

Procedures

Number	Title	Revision
1.5.11	Maintenance Rule Program	15
CDM-01	Cause Determination Program	16
DES-2-15	Engineering Change Revisions	10
SWP-CAP-01	Corrective Action Program	36

Action Requests (ARs)

294219	331377	331548	333584	352504

Section 1R13: Maintenance Risk Assessments and Emergent Work Control

Procedures

Number	Title	Revision
1.5.11	Maintenance Rule Program	15
1.5.14	Risk Assessment and Management/Surveillance Activities	38
WCI-4	Online Work Control Process	48
1.3.76	Integrated Risk Management	47
1.3.83	Protected Equipment Program	21
1.5.14	Risk Assessment and Management for Maintenance/Surveillance Activities	38

Work Orders (WOs)

02070691 02059769 02090713

Action Requests (ARs)

350833 350764 350594 350060 352668

352790 352835

Section 1R15: Operability Determinations and Functionality Assessments

Procedures

Number	Title	Revision
1.3.66	Operability and Functionality Evaluation	33
OI-9	Operations Standards and Expectation	64
OI-14	Columbia Generating Station Operational Challenges and Risk Program	13

Calculations

Number	Title	Revision
ME-02-95-25	Calculation for Evaluation of Standby Service Water Capability	2

Action Requests (ARs)

352504 352668 352835 350795

Section 1R18: Plant Modifications

Procedures

Number	Title	Revision
CDM-01	Cause Determination Manual	16
DES-2-8	Document Only Change Process	11
SWP-CAP-01	Corrective Action Program	36

Miscellaneous

Number	Title	Revision
EC 11437	MOC switch PM/Inspect	0
EC 15016	E-CB-S/3	0
WO 02080222	MOC switch work order	n/a

Action Requests (ARs)

294219	333584	284521	331377	333548
352504	336145	284521		

Section 1R19: Post-Maintenance Testing

Procedures

Number	Title	Revision
OI-41	Operations Work Control Expectations	59
SOP-DG-1-STBY	Emergency Diesel Generator (DIV 1) Standby Lineup	20
SOP-LPCS-SP	LPCS Suppression Pool Mixing	4
OSP-ELEC-M701	Diesel Generator 1 – Monthly Operability Test	55
OSP-LPCS/IST-Q702	LPCS System Operability Test	39
OSP-RCIC/IST-Q702	RCIC Valve Operability Test	41
OSP-SGT-M702	Standby Gas Treatment System B Operability	13

Work Orders (WOs)

02088437	02074267	02070602	02090713	02040036
02046307	02059769			

Action Requests (ARs)

351851	351923	350972	351128	351923
352353	353549	354341	354448	354545
355084				

Section 1R22: Surveillance Testing

Procedures

Number	Title	Revision
OSP-ELEC-M703	HPCS Diesel Generator Monthly Operability Test	61
OSP-INST-H101	Shift and Daily Instrument Checks (Mode 1,2,3)	86
SOP-RCIC-START	RCIC Start in Test Return Mode	6
SOP-RHR-SPC	Suppression Pool Cooling/Spray/Discharge/Mixing	8
SOP-SW-FILL	Standby Service Water System Fill	7

Action Requests (ARs)

337030	339506	347344	347495	348315
350093	353970			

Section 1EP4: Emergency Action Level and Emergency Plan Changes (71114.04)

No additional documents were reviewed.

Section 1EP6: Drill Evaluation

Procedures

Number	Title	Revision
5.1.1	RPV Control	21
5.2.1	Primary Containment Control	23
5.3.1	Secondary Containment Control	20
13.1.1	Classifying the Emergency	47
13.1.1A	Classifying the Emergency – Technical Bases	31

Section 2RS2: Occupational ALARA Planning and Controls

Procedures

Number	Title	Revision
GEN-RPP-01	ALARA Program Description	8
GEN-RPP-02	ALARA Planning and Radiation Work Permits	34
GEN-RPP-13	ALARA Committee	13
RPI-2.0	Preparation of Amendments to the Columbia Final Safety Analysis Report	7
11.2.2.1	Exposure Evaluations for Maintaining TEDE ALARA	7

Audits and Self-Assessments

Number	Title	Date
337262	Snapshot Self-Assessment on Occupational ALARA Planning and Controls: NRC Inspection Module 71124.02	April 16, 2016
AU-RP-RW-15	Quality Services Audit Report: Radiation Protection and Process Controls Program	November 5, 2015
AU-OP/TS-15	Quality Services Audit Report: Operations, Technical Specifications and Applicable License Conditions Program Audit	June 9, 2015

Action Requests (AR)

331414	335127	339486	339633	339651
343639	345608	340456	340405	343470
343863	343858	347760	347761	350048

Radiation Work Permits

Number	Title	Revision
30003685	RX 548 RWCU Chem-Decon Connections LHRA	2
30003686	RX 548 RWCU HTX 1A Pipe Repair LHRA	0
30003687	RX 548 RWCU HTX 1A Pipe Repair LHRA-Multi Packs	0
30003694	RX 548 RWCU HTX 1A Pipe Repair LHRA	0
30003695	RX 548 RWCU HTX 1A Pipe Repair LHRA	0

ALARA Planning, In-Progress Reviews, and Post-Job Reviews

Number	Title	Revision
30003685	RX 548 RWCU Chem-Decon Connections LHRA	2
30003686	RX 548 RWCU HTX 1A Pipe Repair LHRA	0
30003687	RX 548 RWCU HTX 1A Pipe Repair LHRA-Multi Packs	0
30003694	RX 548 RWCU HTX 1A Pipe Repair LHRA	0
30003695	RX 548 RWCU HTX 1A Pipe Repair LHRA	0
30003786	RX 606 SFPCU Cask Handling	1
30003788	RX 606 SFPCU Dry Cask Loading	0
30003790	RX 606 SFPCU Project	0
30003791	RX 606 SFPCU Underwater High Risk	0

Miscellaneous Documents

Number	Title	Date
15-05	Assessment & Calculation of Aggregated Category 1 & Category 2 Quantities of RAM Subject to 10 CFR Part 37 Physical Protection Requirements	November 19, 2015
R22	2015 CGS Refueling Outage CRE Report:	May 9, 2015 – June 28, 2016
	Columbia Generating Station Scaling Factors: Revision 1 to Current (2014) Scaling Factors	May 5, 2015
	Offgas Pretreatment: Trend Radiation Monitor Data	January 2015 – August 2016
7607	Monthly Routine Survey: Radwaste 437’	August 14, 2016
6006	Monthly Routine Survey: Radwaste 487’	January 2, 2016
5686	Monthly Routine Survey: Radwaste 487’	November 28, 2015
2246913	Monthly Routine Survey: Radwaste 437’	August 17, 2013
2241213	Monthly Routine Survey: Radwaste 467’	August 11, 2013
6598	Monthly Routine Survey: Radwaste 467’	March 26, 2016
6385	Radiation Survey: Radwaste 467’ Decon Facility A-Centrifuge Room	March 26, 2016

Miscellaneous Documents

Number	Title	Date
5518	Radiation Survey: Radwaste 467' Decon Facility A-Centrifuge Room	November 10, 2015
6939	Radiation Survey: Radwaste 467' Decon Facility A-Centrifuge Room	May 7, 2016

Section 2RS4: Occupational Dose Assessment

Procedures

Number	Title	Revision
11.2.4.5	Whole Body Counts and Daily Checks Using the Renaissance FastScan	16
11.2.6.4	Damaged, Lost, or Off-Scale Dosimetry Devices	13
11.2.6.7	Special Dosimetry	17
GEN-RPP-06	Dosimetry Program Description	12
HPI-2.2	Skin Dose Evaluation	13
HPI-5.9	Evaluation of In-Vivo Bioassay Results Following a Potential Intake	13
HPI-6.4	Administering an Occupational Radiation Exposure History File	24
PAT-01	Plant Access Training	2
SWP-RPP-01	Radiation Protection Program	14

Audits and Self-Assessments

Number	Title	Date
316790	Snapshot Self-Assessment: 71124.04 Occupational Dose Assessment	February 19, 2016
AU-RP-RW-15	Quality Services Audit Report: Radiation Protection and Process Controls Program	November 5, 2015

Action Requests (AR)

309932	310230	321147	325306	328584
329788	330639	347761	347767	349415

Exposure Assessments

Number	Title	Date
1804	Exposure Investigation / Evaluation	August 28, 2016
1805	Exposure Investigation / Evaluation	August 28, 2016
1806	Exposure Investigation / Evaluation	August 28, 2016
347761-01	Evaluation of ISFSI Expansion Project Dose	August 28, 2016

Miscellaneous Documents

Number	Title	Date
	Visitor Entry/Exit Log	July 9, 2015 – July 20, 2016
	Columbia Generating Station Scaling Factors: Revision 1 to Current (2014) Scaling Factors	May 5, 2015
100518-0	National Voluntary Laboratory Accreditation Program (NVLAP) Certificate of Accreditation for Landauer, Inc.	January 1, 2016
4404	Quarterly Routine Survey: ISFSI Pad	July 23, 2015
5467	Quarterly Routine Survey: ISFSI Pad	November 5, 2015
6134	Quarterly Routine Survey: ISFSI Pad	January 26, 2016
6857	Quarterly Routine Survey: ISFSI Pad	April 26, 2016

Section 4OA1: Performance Indicator Verification

Procedures

Number	Title	Revision
PPM 1.5.13	Preventive Maintenance Optimization Living Program	35
SWP-CAP-01	Emergency Preparedness Performance Indicators, January 7, 2015	36
1.5.11	Maintenance Rule Program	15
NEI 99-02	Regulatory Assessment Performance Indicator Guidelines	7

Miscellaneous

Number	Title	Date
	MSPI Derivation Reports	July-September 2016

Section 4OA2: Problem Identification and Resolution

Procedures

Number	Title	Revision
OI-45	Color Banding of Control Room Instrumentation	7

Miscellaneous Documents

Number	Title	Revision
PER 296-0490	Condition Report	
PER 299-0745	Condition Report	

Action Requests (ARs)

354988	351352	353597	354970	355027
354870	313504	332078		

Section 4OA3: Follow-up of Events and Notices of Enforcement Discretion

Procedures

Number	Title	Revision
SD000199	Plant Service Water (TSW)	14
OI-41	Operations Work Control Expectations	59

Section 4OA5.1: Other Activities

Procedures

Number	Title	Revision
PPM-6.6.7	MPC Processing	24
PPM-9.6.1	Spent Fuel Selection for Cask Storage	7
PPM-6.3.40	Determination of Fuel Assembly Condition of ISFSI	5
NE-02-14-01	Minimum Required MPC Backfill Helium Mass	0
SWP-CAP-01	Corrective Action Program	35
SWP-CAP-06	Condition Report Review	23
SWP-LIC-02	Licensing Basis Impact Determination	14
AU-DC-14	ISFSI Audit Report	0
AU-DC-16	ISFSI Audit Report	0
NUPIC-23509	Holtec NUPIC Audit Report	0

Procedures

OSP-SFS-D101	Spent Fuel Storage Cask Heat Removal System Checks	12
PPM 10.4.5	Reactor (MT-CRA-2) Overhead Crane Inspection	23

Condition Reports

AR 341304	AR 347711	AR 349747	AR 348000	AR 345608	AR 341857
AR 340204	AR 335571	AR 334815	AR 335207	AR 333550	AR 322504
AR 322265	AR 318381	AR 317239	AR 315837	AR 314198	AR 314194
AR 310747	AR 307631	AR 307630	AR 307629	AR 307624	AR 307616
AR 307615	AR 307612	AR 300522	AR 307317	AR 306366	AR 300522

10 CFR 72.48 Screens/Evaluations

Screen-14-0005	Screen-15-0002	Screen-14-0008	Screen-15-0001	Screen-16-0002
Screen-08-0005	Screen-08-0006	Screen-08-0011	Screen-09-0009	Screen-10-0004
Screen-10-0005	Screen-10-0006	Screen-10-0007	Screen-12-0005	Screen-14-0003
Screen-12-0007	Screen-12-0008	Screen-13-0001	Screen-13-0003	Screen-14-0006
Screen-14-0007	Screen-16-0002	LDCN-13-049	LDCN-14-041	LDCN-16-006
50.59-Screen-14-0144				

Other Documents

Number	Title	Revision/Date
	Quality Assurance Survey Report #23509	January 3, 2014
	CGS ISFSI TLD Results 2014 to 2016	July 26, 2016
	10 CFR 72.212 Evaluation Report	8
	Holtec HI-STORM 100 FSAR	4
	Certificate of Compliance 1014 Holtec HI-STORM 100	Amendment 2
	Annual Radiological Environmental Operating Report	May 10, 2016
	Annual Radiological Environmental Operating Report	May 14, 2015
NE-02-00-08	Calculation for Fuel History Data	August 27, 2015
	SFS-MPC-032 Cask Loading Plan	April 7, 2014
	SFS-MPC-033 Cask Loading Plan	April 14, 2014
	SFS-MPC-034 Cask Loading Plan	April 21, 2014
	SFS-MPC-035 Cask Loading Plan	April 28, 2014
	SFS-MPC-036 Cask Loading Plan	May 5, 2014

Work Order

01143963	02049205	02069221	02055162	02069288	00383534

The following items are requested for the
Occupational Radiation Safety Inspection
Integrated Report 2016-003
at
Columbia Generating Nuclear Station
(August 29-September 1, 2016)

Inspection areas are listed in the attachments below.

Please provide the requested information on or before August 19**, 2016**

Please submit this information using the same lettering system as below. For example, all contacts and phone numbers for Inspection Procedure 71124.0**1** should be in a file/folder titled "**1**- A," applicable organization charts in file/folder "**1**- B," etc.

If information is placed on *ims.certrec.com*, please ensure the inspection exit date entered is at least 30 days later than the onsite inspection dates, so the inspectors will have access to the information while writing the report.

In addition to the corrective action document lists provided for each inspection procedure listed below, please provide updated lists of corrective action documents at the entrance meeting. The dates for these lists should range from the end dates of the original lists to the day of the entrance meeting.

If more than one inspection procedure is to be conducted and the information requests appear to be redundant, there is no need to provide duplicate copies. Enter a note explaining in which file the information can be found.

If you have any questions or comments, please contact Louis Carson at (817) 200-1221, Louis.Carson@nrc.gov or John O'Donnell at (817) 200-1441, John.O'Donnell@nrc.gov.

PAPERWORK REDUCTION ACT STATEMENT

This letter does not contain new or amended information collection requirements subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). Existing information collection requirements were approved by the Office of Management and Budget, control number 3150-0011.

Attachment

2. Occupational ALARA Planning and Controls (71124.02)
Date of Last Inspection: May 18, 2015

A. List of contacts and telephone numbers for ALARA program personnel

B. Applicable organization charts

C. Copies of audits, self-assessments, and LERs, written since date of last inspection, focusing on ALARA

D. Procedure index for ALARA Program

E. Please provide specific procedures related to the following areas noted below. Additional Specific Procedures may be requested by number after the inspector reviews the procedure indexes.
1. ALARA Program
2. ALARA Committee
3. Radiation Work Permit Preparation

F. A summary list of corrective action documents (including corporate and sub-tiered systems) written since date of last inspection, related to the ALARA program. In addition to ALARA, the summary should also address Radiation Work Permit violations, Electronic Dosimeter Alarms, and RWP Dose Estimates

NOTE: The lists should indicate the significance level of each issue and the search criteria used. Please provide in document formats which are "searchable" so that the inspector can perform word searches.

G. List of work activities greater than 1 rem, since date of last inspection
Include original dose estimate and actual dose.

H. Site dose totals and 3-year rolling averages for the past 3 years (based on dose of record)

I. Outline of source term reduction strategy

J. If available, provide a copy of the ALARA outage report for the *most recently* completed outages for each unit

K. Please provide your most recent Annual ALARA Report.

4. Occupational Dose Assessment (Inspection Procedure 71124.04)
Date of Last Inspection: June 18, 2014

A. List of contacts and telephone numbers for the following areas:
1. Dose Assessment personnel

B. Applicable organization charts

C. Audits, self-assessments, vendor or NUPIC audits of contractor support, and LERs written since date of last inspection, related to:
1. Occupational Dose Assessment

D. Procedure indexes for the following areas
1. Occupational Dose Assessment

E. Please provide specific procedures related to the following areas noted below. Additional Specific Procedures will be requested by number after the inspector reviews the procedure indexes.
   1. Radiation Protection Program
   2. Radiation Protection Conduct of Operations
   3. Personnel Dosimetry Program
   4. Radiological Posting and Warning Devices
   5. Air Sample Analysis
   6. Performance of High Exposure Work
   7. Declared Pregnant Worker
   8. Bioassay Program

F. List of corrective action documents (including corporate and sub-tiered systems) written since date of last inspection, associated with:
   1. National Voluntary Laboratory Accreditation Program (NVLAP)
   2. Dosimetry (TLD/OSL, etc.) problems
   3. Electronic alarming dosimeters
   4. Bioassays or internally deposited radionuclides or internal dose
   5. Neutron dose

   NOTE: The lists should indicate the significance level of each issue and the search criteria used. Please provide in document formats which are "searchable" so that the inspector can perform word searches.

G. List of positive whole body counts since date of last inspection, names redacted if desired

H. Part 61 analyses/scaling factors

I. The most recent National Voluntary Laboratory Accreditation Program (NVLAP) accreditation report or, if dosimetry is provided by a vendor, the vendor's most recent results