UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
2100 RENAISSANCE BOULEVARD, SUITE 100
KING OF PRUSSIA, PENNSYLVANIA 19406-2713

February 14, 2014

EA-13-247

Mr. Joseph E. Pacher
Site Vice President
R.E. Ginna Nuclear Power Plant, LLC
Constellation Energy Nuclear Group, LLC
1503 Lake Road
Ontario, New York 14519

SUBJECT: R.E. GINNA NUCLEAR POWER PLANT, LLC - NRC INTEGRATED INSPECTION REPORT 05000244/2013005 WITH PRELIMINARY WHITE FINDING

Dear Mr. Pacher:

On December 31, 2013, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your R.E. Ginna Nuclear Power Plant, LLC (Ginna). The enclosed inspection report documents the results, which were discussed on January 29, 2014, with you and other members of your staff.

The enclosed inspection report discusses a finding that has preliminarily been determined to be a White finding with low to moderate safety significance that may require additional inspections, regulatory actions, and oversight. As described in Section 1R01 of the enclosed report, the finding is associated with an apparent violation of Title 10 of the *Code of Federal Regulations* (10 CFR) 50, Appendix B, Criterion XVI, "Corrective Action," for Constellation Energy Nuclear Group's (CENG's) failure to assure that conditions adverse to quality were promptly identified and corrected. Specifically, CENG failed to identify the need to hydrostatically seal two cable penetrations between manhole 1 and battery room 'B' after the site's design basis flood height was changed during the NRC Systematic Evaluation Program (SEP) in 1983; promptly correct the significant adverse condition in May 2013 when the condition was identified and take timely action in early September 2013 when CENG was presented with evidence challenging it's May 2013 evaluation related to manhole 1 and the improperly sealed penetrations. As a result, various Deer Creek flooding scenarios could have resulted in flooding of both battery rooms.

This finding, which the inspectors determined no longer presents an immediate safety concern since the penetrations were hydrostatically sealed on October 4, 2013, was assessed based on the best available information, using the NRC's Significance Determination Process (SDP). The basis for the NRC's preliminary significance determination is described in the enclosed report. Because the finding is also an apparent violation of NRC requirements, it is being considered for escalated enforcement action in accordance with the Enforcement Policy, which appears on the NRC's Web site at http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html.

The NRC will inform you in writing when the final significance has been determined. We intend to complete and issue our final safety significance determination within 90 days from the date of this letter. The NRC's SDP is designed to encourage an open dialogue between your staff and the NRC; however, the dialogue should not affect the timeliness of our final determination.

We believe that we have sufficient information to make a final significance determination. However, before we make a final decision, we are providing you an opportunity to provide your perspective on this matter, including the significance, causes, and corrective actions, as well as any other information that you believe the NRC should take into consideration. Accordingly, you may notify us of your decision within 10 days to: (1) request a regulatory conference to meet with the NRC and provide your views in person; (2) submit your position on the finding in writing; or, (3) accept the finding as characterized in the enclosed inspection report.

If you choose to request a regulatory conference, the meeting should be held in the NRC Region I office within 30 days of the date of this letter, and will be open for public observation. The NRC will issue a public meeting notice and a press release to announce the date and time of the conference. We encourage you to submit supporting documentation at least 1 week prior to the conference in an effort to make the conference more efficient and effective. If you choose to provide a written response, it should be sent to the NRC within 30 days of the date of this letter. You should clearly mark the response as a "Response to Preliminary White Finding in Inspection Report No. 05000244/2013005; EA-13-247," and send it to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Regional Administrator, Region I, and a copy to the NRC Senior Resident Inspector at Ginna.

You may also elect to accept the finding as characterized in this letter and the inspection report, in which case the NRC will proceed with its regulatory decision. However, if you choose not to request a regulatory conference or to submit a written response, you will not be allowed to appeal the NRC's final significance determination.

Please contact Daniel Schroeder at (610) 337-5262 within 10 days from the issue date of this letter to notify the NRC of your intentions. If we have not heard from you within 10 days, we will continue with our significance determination and enforcement decision. Because the NRC has not made a final determination in this matter, no notice of violation is being issued for this inspection finding at this time. In addition, please be advised that the number and characterization of the apparent violation may change based on further NRC review.

In addition, the enclosed inspection report documents two findings of very low safety significance (Green). One of these findings involved a violation of NRC requirements. If you contest the violation or significance of the non-cited violation, 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 I; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC resident inspector at Ginna.

If you disagree with a cross-cutting aspect assignment or a finding not associated with a regulatory requirement in this report, 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 I; and the NRC resident inspector at Ginna.

In accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice," 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 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/

Michael L. Scott
Acting Director
Division of Reactor Projects

Docket No: 50-244
License No: DPR-18

Enclosure: Inspection Report No. 05000244/2013005
w/Attachments: Quantitative and Qualitative Evaluations (Attachment 1)
Supplementary Information (Attachment 2)

cc w/encl: Distribution via ListServ

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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket No:	50-244
License No:	DPR-18
Report No:	05000244/2013005
Licensee:	Constellation Energy Nuclear Group, LLC
Facility:	R.E. Ginna Nuclear Power Plant, LLC
Location:	Ontario, NY
Dates:	October 1, 2013, through December 31, 2013
Inspectors:	N. Perry, Senior Resident Inspector D. Dodson, Resident Inspector A. Bolger, Project Engineer C. Cahill, Senior Reactor Analyst T. Hedigan, Operations Engineer T. Moslak, Health Physicist M. Patel, Operations Engineer
Approved by:	Michael L. Scott Acting Director Division of Reactor Projects

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SUMMARY

IR 05000244/2013005; 10/01/2013 – 12/31/2013; R.E. Ginna Nuclear Power Plant, LLC (Ginna); Adverse Weather Protection and Maintenance Effectiveness.

This report covered a 3-month period of inspection by resident inspectors and announced inspections performed by regional inspectors. The inspectors identified a preliminary White finding associated with an apparent violation. Additionally, the inspectors identified one non-cited violation (NCV) and one self-revealing finding of very low safety significance (Green). The significance of most findings is indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process (SDP)," dated June 2, 2011. Cross-cutting aspects are determined using IMC 0310, "Components Within the Cross-Cutting Areas," dated October 28, 2011. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy, dated July 9, 2013. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4.

Cornerstone: Mitigating Systems

- Preliminary White. The inspectors identified a finding associated with an apparent violation of Title 10 of the *Code of Federal Regulations* (10 CFR) 50, Appendix B, Criterion XVI, "Corrective Action," for Constellation Energy Nuclear Group, LLC (CENG) staff's failure to assure that conditions adverse to quality were promptly identified and corrected. Specifically, CENG failed to identify the need to hydrostatically seal two cable penetrations between manhole 1 and battery room 'B' after the site's design basis flood height was changed during the NRC Systematic Evaluation Program (SEP) in 1983; promptly correct the significant adverse condition in May 2013 when the condition was identified and take timely action in early September 2013 when CENG was presented with evidence challenging it's May 2013 evaluation related to manhole 1 and the improperly sealed penetrations. As a result, various Deer Creek flooding scenarios could have resulted in flooding of both battery rooms. Immediate corrective actions included placing this issue in the corrective action program (CAP) as condition report (CR)-2013-003407, CR-2013-005262, and CR-2013-005643; and hydrostatically sealing the penetrations on October 4, 2013.

  This finding is more than minor because it is associated with the protection against external factors attribute of the Mitigating Systems cornerstone and affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, propagating flood water could damage mitigating equipment needed to prevent core damage with a flood below the design basis level of 273.8 feet because of the unsealed penetrations in manhole 1. In accordance with IMC 0609.04, "Initial Characterization of Findings," and Exhibit 2 of IMC 0609, Appendix A, "The Significance Determination Process For Findings At-Power," the inspectors utilized Section B, "External Event Mitigation Systems (Seismic/Fire/Flood/Severe Weather Protection Degraded)," of Appendix A and determined the finding involved the loss or degradation of equipment or function specifically designed to mitigate a flooding initiating event, which requires the inspector to go to Exhibit 4, "External Events Screening Questions." The inspectors determined that a detailed risk evaluation (DRE) was needed because the loss of equipment and function would degrade two or more trains of a multi-train system or function, and the loss of equipment and function would degrade one or more trains of a system that supports a risk-significant system or

function. The staff determined that, currently, there is not an existing SDP risk tool that is suitable to assess the significance of this finding with high confidence, mainly because of the uncertainties associated with extreme flood frequency extrapolations based on limited available historical data. Therefore, the risk evaluation was performed using IMC 0609, Appendix M, "Significance Determination Process Using Qualitative Criteria." The change in core damage frequency (CDF) estimates ranged from Green, a finding of very low safety significance, to Yellow, a finding of substantial safety significance. A significance and enforcement review panel (SERP) held on January 28, 2014, made a preliminary determination that the finding was of low to moderate safety significance (White) based on quantitative and qualitative evaluations. This finding has a cross-cutting aspect in the area of Problem Identification and Resolution, Corrective Action Program, because CENG personnel did not thoroughly evaluate problems such that the resolutions addressed causes. Such evaluations should include properly classifying, prioritizing, and evaluating operability and reportability of conditions adverse to quality. Specifically, CENG personnel had an opportunity to thoroughly evaluate and assess impacts to the plant such that resolutions addressed causes, when two unsealed penetrations into battery room 'B' were identified in May 2013; CENG's evaluation associated with CR-2013-003407 was not thorough and did not consider all flow paths for flooding through manhole 1. Additionally, the condition adverse to quality was not properly evaluated for operability. CENG personnel had an additional opportunity to thoroughly evaluate and assess impacts to the plant such that resolutions addressed causes and properly evaluate for operability when inspectors presented evidence of degraded manhole 1 conditions, e.g., clogged manhole drains, to CENG management on September 5, 2013 [P.1(c)]. (Section 1R01)

- Green. The inspectors identified an NCV of 10 CFR 50.65(b), because CENG staff did not include safety-related and non-safety-related structures, systems, and components (SSCs) within the scope of the maintenance rule monitoring program. Specifically, CENG staff failed to appropriately include an estimated 90 safety-related and non-safety-related SSCs within the scope of the maintenance rule monitoring program, which could have resulted in a failure to detect SSC degradation and to provide reasonable assurance that these SSCs are capable of fulfilling their intended functions. Immediate corrective actions included placing these issues into the CAP as CR-2013-002083, CR-2013-004444, CR-2013-004993, CR-2013-006139, CR-2013-006628, and CR-2013-006674.

  The finding is more than minor because if left uncorrected, the finding could become a more significant safety concern. Specifically, the failure to monitor SSC performance and condition could have resulted in a failure to detect SSC degradation and to provide reasonable assurance that these SSCs are capable of fulfilling their intended functions. The failure to adequately scope an estimated 90 or more components could have resulted in the failure to detect degradation within multiple systems and to provide reasonable assurance that these SSCs are capable of fulfilling their intended functions. Additionally, this issue is similar to Example 3j described in IMC 0612, Appendix E, "Examples of Minor Issues," which states that issues are not minor if significant programmatic deficiencies were identified with the issue that could lead to worse errors if uncorrected. The inspectors evaluated the finding using IMC 0612, Attachment 0609.04, "Initial Characterization of Findings." The attachment instructs inspectors to utilize IMC 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power." Using Exhibit 2, "Mitigating Systems Screening Questions," of IMC 0609, Appendix A, the inspectors determined that the finding did not represent an actual loss of function of one or more non-technical specification trains of equipment. Therefore, the inspectors determined the finding was of very low safety significance (Green). This finding has a cross-cutting aspect in the area of Problem

Identification and Resolution, Corrective Action Program, because CENG personnel did not thoroughly evaluate problems such that the resolutions addressed causes and extent of conditions. Specifically, CENG had multiple opportunities following the inspectors identification of maintenance rule scoping issues on March 27, 2013, and prior to November 7, 2013, to thoroughly evaluate recent maintenance rule scoping problems such that the resolutions addressed causes and extent of conditions [P.1(c)]. (Section 1R12)

- Green. A self-revealing finding was identified for failure to modify or establish a preventive maintenance (PM) schedule for the turbine-driven auxiliary feedwater (TDAFW) direct current (DC) lube oil pump control switch. On November 18, 2013, plant personnel found the main control room switch for the TDAFW DC lube oil pump failed due to switch contact oxidation. This resulted in the DC oil pump failing to automatically start when demanded during a surveillance test and the continued inoperability of the TDAFW pump. As immediate corrective actions for the November 18, 2013, TDAFW DC lube oil switch failure, CENG staff initiated CR-2013-006727, replaced the switch, verified continuity of the other two switches that were not modified in 1980, and established a compensatory action to verify continuity of the other two switches following manipulation of the switch until they are replaced. Additionally, an appropriate PM will be established for the three switches unless they are modified such that the main control board green light indicates continuity of the circuit.

  This finding is more than minor because it is associated with the equipment performance attribute of the Mitigating Systems cornerstone and affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, due to the failure of the main control board switch for the TDAFW DC lube oil pump, the pump failed to start during testing resulting in the continued inoperability of the TDAFW pump. The inspectors evaluated the finding using Attachment 0609.4, "Initial Characterization of Findings," worksheet to IMC 0609, “Significance Determination Process.” The attachment instructs the inspectors to utilize IMC 0609, Appendix A, “Significance Determination Process for Findings At-Power.” The inspectors determined this finding was not a deficiency affecting the design or qualification of a mitigating SSC, did not represent a loss of system and/or function, and did not represent an actual loss of function of at least a single train. Therefore, the inspectors determined this finding to be of very low safety significance (Green). In accordance with IMC 0612, the finding does not have a cross-cutting aspect because the performance deficiency occurred in 1980 and is not reflective of present plant performance. (Section 1R12)

REPORT DETAILS

Summary of Plant Status

R.E. Ginna Nuclear Power Plant, LLC (Ginna) began the inspection period operating at full power and operated at full power for the entire period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01 – 1 sample)

.1 Readiness for Seasonal Extreme Weather Conditions

a. Inspection Scope

The inspectors performed a review of CENG's readiness for the onset of seasonal cold temperatures. The review focused on the following SSCs: screen house, auxiliary building (including heat tracing), intermediate building, control building, turbine building, and emergency diesel generator (EDG) rooms. The inspectors reviewed the Updated Final Safety Analysis Report (UFSAR), technical specifications (TSs), control room logs, and the CAP to determine what temperatures or other seasonal weather could challenge these systems and to ensure CENG personnel had adequately prepared for these challenges. The inspectors reviewed station procedures, including CENG's seasonal weather preparation procedures and applicable operating procedures. The inspectors performed walkdowns of the selected SSCs to ensure station personnel identified issues that could challenge the operability of systems during cold weather conditions. Documents reviewed for each section of this inspection report are listed in Attachment 2.

b. Findings

No findings were identified.

.2 (Closed) Unresolved Item 05000244/2013004-01, Design Basis External Flooding and Unsealed Penetrations in the 'B' Battery Room

a. Inspection Scope

This unresolved item (URI) was identified because CENG staff did not adequately assess plant conditions or take appropriate actions to ensure equipment in battery room 'B' would not be challenged by a design basis flood following identification of unsealed penetrations between manhole 1 and battery room 'B' and identification of clogged manhole drains. Specifically, no analysis existed to determine whether a design basis flood could have potentially impacted equipment in battery rooms 'A' and 'B' via unsealed penetrations between manhole 1 and battery room 'B'. Additional information was required to review and evaluate CENG's new flooding analyses, apparent cause evaluation (ACE), and other supporting documentation to determine if a violation existed regarding the apparent performance deficiency of not adequately assessing plant

conditions or taking appropriate actions to ensure equipment in battery room 'A' or 'B' would not be challenged by a design basis flood.

The inspectors performed an in-depth review of CENG's ACE associated with CR-2013-005643, Licensee Event Reports (LERs) 05000244/2013-003-00 and 05000244/2013-003-01, "Unanalyzed Condition for Potential Floodwater Intrusion into Vital Battery Rooms," and other documentation. In addition, the inspectors performed on-site tours, interviewed site personnel, worked with Office of Nuclear Reactor Regulation technical staff concerning risk analysis, and reviewed corrective actions associated with the condition. URI 05000244/2013004-01 is closed to the apparent violation discussed below.

b. Findings

Introduction. The inspectors identified a preliminary White finding associated with an apparent violation of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," for CENG staff's failure to assure that significant conditions adverse to quality were promptly identified and corrected. Specifically, CENG failed to identify the need to hydrostatically seal two cable penetrations between manhole 1 and battery room 'B' after the site's design basis flood height was changed during the NRC Systematic Evaluation Program (SEP) in 1983; promptly correct the significant adverse condition in May 2013 when the condition was identified and take timely action in early September 2013 when CENG was presented with evidence challenging it's May 2013 evaluation related to manhole 1 and the improperly sealed penetrations. As a result, various Deer Creek flooding scenarios could have resulted in flooding of both battery rooms.

Description. Located south of the site in the owner controlled area is Deer Creek. UFSAR Section 2.4.2.1, "Flood Design Considerations," states that the plant is protected from a Deer Creek flood at an elevation of 273.8 feet, which is equivalent to a Deer Creek flood of 26,000 cubic feet per second (cfs). Section 3.4.1.1.3, "Deer Creek Flood Protection," states that a Deer Creek discharge of 26,000 cfs corresponds to an elevation of 272.0 feet on the north and east side of the auxiliary building. During a Deer Creek flood, flood waters from Deer Creek flow around the east and west sides of the plant toward the screen house and Lake Ontario, which are located on the north side of the site. Located on the east side of the plant is the transformer yard, which would be impacted by a flood height of approximately 2 feet above grade, because the general plant grade is approximately 270 feet. Located in the transformer yard are two manhole chambers that comprise manhole 1. Within each chamber of manhole 1 is a 2.5-foot by 8-inch penetration into battery room 'B' at a level of approximately 266.75 feet.

In 1977, the NRC staff initiated Generic Safety Issue 156, "Systematic Evaluation Program." The SEP reviewed the designs of older operating nuclear power plants. The staff defined issues for which the regulatory requirements had changed, warranting an evaluation at each of the plants licensed before 1975 when the Standard Review Plan was issued. The original flood analysis for Ginna showed a maximum flood elevation of 253.5 feet, which was below the 270-foot elevation of manhole 1. At the time of original construction, flood protection measures were not required in manhole 1. In 1983, as part of the SEP, Ginna agreed to provide protection to a level of 273.8 feet as stated in the UFSAR. In addition to updating the flooding design basis levels in the UFSAR, the updated numbers were used in Ginna's submittals related to Fukushima near-term task force recommendation 2.3. Although the flood protection level was raised in 1983,

Ginna did not evaluate the potential for flooding through manhole 1 and, therefore, did not identify the need to correct the significant condition adverse to quality—the two unsealed cable penetrations located at a level of 266.75 feet.

On May 29, 2013, the east and west chambers of manhole 1 were opened to complete flooding walkdown inspections of the two penetrations as part of the NRC's post Fukushima review activities. The east and west chambers of manhole 1 are located in the transformer yard on the east side of the plant directly adjacent to the control building. One penetration was between the east chamber of manhole 1 and battery room 'B', and the other penetration was between the west chamber of manhole 1 and battery room 'B'. During the May 2013 inspection which focused only on the penetrations, the inspectors and CENG personnel identified that the two penetrations appeared to be unsealed and only contained ceramic fiber insulation. By May 31, CENG personnel determined that each chamber of manhole 1 also contained a drain. CR-2013-003407 documented these conditions and documented an evaluation that calculated flow into the manhole chambers via the edges around the manhole covers and holes in the manhole covers. This assessment calculated 50.3 gallons per minute (gpm) of flow into each chamber of manhole 1 based on a flood height of 1.73 feet above the outside of the manhole. Additionally, the assessment calculated that each manhole drain was capable of passing 95 gpm of water. The CR noted that a walkdown of the floor drains was required to verify that the floor drains were as designed and capable of passing the calculated flow rate. The supervisor review section of the CR stated that the "condition could not affect operability of a structure, system, and component … Functionality of penetration is acceptable." The operability section of the CR stated, "Manhole 1 is capable of preventing flooding of the battery rooms as designed. The assessment shows that the drains are capable of removing floodwater during the design basis flood."

The inspectors questioned the PM frequency and previous testing of the drains, but no records could be located indicating that the drains had ever been inspected or tested. The inspectors were subsequently informed that the manhole drain inspections were not planned until October 2. The inspectors noted that CENG staff had no definitive plans to seal the penetrations between manhole 1 and battery room 'B,' only a potential enhancement action with a due date of December 1, 2014. The inspectors expressed concerns to CENG personnel about the drains being clear and able to pass the calculated flows, because the drains had never been inspected or tested; the inspectors were concerned that the drains would not be able to pass adequate flow to ensure that the two penetrations between the two chambers of manhole 1 and battery room 'B' would not be challenged by design basis flooding conditions.

On September 5, CENG electricians were performing periodic manhole inspections. These inspections check for water in manhole chambers and pump it out, if necessary. The inspectors accompanied the electricians on this inspection, and the inspectors captured photographs of substantial debris in both chambers of manhole 1 and both manhole 1 drains. In one chamber, a large sheet of plastic laid on the chamber floor among a layer of mud, rocks, and other debris. Other debris in one or both chambers of the manhole included large and small pieces of wood, 3-inch diameter pieces of foam, tie wraps, large nails and bolts, varying sizes of rocks and stones, rope, large pieces of hard plastic, wire, sticks, and tools. The photographs captured by the inspectors also documented likely water staining of the cinder block walls in both manhole chambers and significant debris was clearly visible in both drains. These photographs were shared with CENG management on September 5. CR-2013-005262 documented the debris in

manhole 1, but stated that the condition could not affect operability of an SSC and that the drain lines would pass anticipated flow. The inspectors questioned this assessment and again expressed concern that the drains would not be capable of passing the necessary flow to ensure that the unsealed penetrations would not be challenged. CENG staff took no additional immediate actions.

On September 17, CENG personnel were reviewing the photographs that the inspectors provided on September 5 and determined that the manhole drains were missing their covers. At this point, CENG staff elevated the issue to a priority two work order (WO). Compensatory measures were also established to check the 5-day weather forecast and maintain plastic covers and sandbags over the manhole covers. Plans to test the drains and clean the manhole chambers were also expedited. Finally, a modification package was created to permanently seal the penetrations between manhole 1 and battery room 'B'.

On September 20, CENG personnel tested the manhole 1 drains to determine the flow rate the drains were capable of passing; neither drain was able to pass the amount of water needed to prevent water accumulation. CR-2013-005643 documented that the drains failed to demonstrate the ability to pass the required flow and noted that the penetrations between manhole 1 and battery room 'B' could be challenged. CENG management concluded that an unanalyzed condition existed due to unqualified battery room penetrations and partially blocked manhole chamber drains, and CENG staff reported the condition to the NRC in event notification 49374 in accordance with 10 CFR 50.72(b)(3)(ii)(B).

CENG staff performed additional analyses and determined that there was a potential for flooding of both battery rooms during Deer Creek floods greater than 18,000 cfs. As previously stated, the design basis flood is 26,000 cfs. Specifically, the two chambers of manhole 1 fill up and begin to impact battery room 'B' at flood flow rates greater than 18,000 cfs via the two unsealed penetrations. Flood waters would enter into the two chambers of manhole 1 via openings in the two manhole covers and via open conduits from other manholes that were not considered as part of the May 2013 evaluation after the unsealed penetrations were identified. Additional analysis performed after September 20 and consideration of these open conduits between manhole 1 and other manholes determined that even had the drains in the two chambers of manhole 1 been clean, the drains would not have been able to pass enough flood water to prevent flooding of the battery rooms. The manhole 1 drains were determined to be capable of passing 95 gpm each; for floods of approximately 18,000 cfs, the flow into the two chambers of manhole 1 could have reached up to approximately 738 gpm.

For a Deer Creek flood of 18,000 cfs, after the two chambers of manhole 1 had become partially filled with water, the flood waters would begin to flow into battery room 'B' via the two unsealed penetrations; the flow rate into battery room 'B' would reach up to approximately 738 gpm. The flood waters would also enter battery room 'A' under a non-watertight fire door that connects battery rooms 'A' and 'B'. Although a 45 gpm sump pump is present in battery room 'A', it would not be able to accommodate the flood waters. Within 5.5 hours of flood waters beginning to enter battery room 'B', battery rooms 'A' and 'B' would contain approximately 5 feet of water. The water level would have caused the loss of the safety function of both trains of 125 volt DC station batteries.

For Deer Creek floods greater than 21,000 cfs, offsite power would also be lost, and the loss of the DC system would lead to an eventual loss of all alternating current (AC) power to the site—an unrecoverable station blackout (SBO)—with no capability for using installed plant equipment for decay heat removal or inventory control.

On October 4, CENG implemented and completed engineering change package (ECP) 13-000854, "Battery Room to Manhole 1 Penetrations Flood Barrier," Revision 0000, which installed permanent hydrostatic seals in both penetrations between manhole 1 and battery room 'B', thereby addressing the flooding concern.

Analysis. The inspectors determined that the failure to assure that significant conditions adverse to quality were promptly identified and corrected was a performance deficiency within CENG staff's ability to foresee and correct and should have been prevented, and was a failure to meet the requirements of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action." Specifically, CENG failed to identify the need to correct two non-hydrostatically sealed cable penetrations between manhole 1 and battery room 'B' after the site's design basis flood height was changed during the NRC SEP in 1983; additionally, CENG neither promptly corrected the significant adverse condition in May 2013 when the condition was identified, nor took timely action in early September 2013 when CENG was presented with evidence challenging its May 2013 evaluation related to manhole 1 and the improperly sealed penetrations. As a result, various Deer Creek flooding scenarios within the design basis could have resulted in flooding of both battery rooms from 1983 until October 4, 2013, when hydrostatic seals were installed.

This finding is more than minor because it is associated with the protection against external factors attribute of the Mitigating Systems cornerstone and affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, propagating flood water could damage mitigating equipment needed to prevent core damage with a site flood level below the design basis level of 273.8 feet because of the unsealed penetrations in manhole 1.

In accordance with IMC 0609.04, "Initial Characterization of Findings," and Exhibit 2 of IMC 0609, Appendix A, "The Significance Determination Process (SDP) For Findings At-Power," issued June 19, 2012, the inspectors utilized Section B, "External Event Mitigation Systems (Seismic/Fire/Flood/Severe Weather Protection Degraded)," of Appendix A and determined the finding involved the loss or degradation of equipment or function specifically designed to mitigate a flooding initiating event, which requires the inspector to go to Exhibit 4, "External Events Screening Questions." The inspectors determined that a DRE was needed because the loss of equipment and function would degrade two or more trains of a multi-train system or function, and the loss of equipment and function would degrade one or more trains of a system that supports a risk-significant system or function.

The staff determined that, currently, there is not an existing SDP risk tool that is suitable to assess the significance of this finding with high confidence, mainly because of the uncertainties associated with extreme flood frequency extrapolations based on limited available historical data. Therefore, the risk evaluation was performed using IMC 0609, Appendix M, "Significance Determination Process Using Qualitative Criteria," issued April 12, 2012. A planning SERP was held on December 17, 2013, which concurred with the use of Appendix M for this case.

In support of the Appendix M evaluation, a bounding analysis was conducted by the inspectors and Region I senior reactor analysts assisted by an Office of Nuclear Reactor Regulation risk analyst. Information used in this analysis included detailed plant walkdowns and review of design basis information, operating and emergency procedures, and additional analysis conducted by CENG personnel. The change in CDF estimates ranged from Green, a finding of very low safety significance, to Yellow, a finding of substantial safety significance.

A SERP held on January 28, 2014, made a preliminary determination that the finding was of low to moderate safety significance (White) based on quantitative and qualitative evaluations. Details of these evaluations are included in Attachment 1 of this report.

The finding no longer presents an immediate safety concern and no long-term corrective measures are required because CENG personnel implemented and completed modification ECP 13-000854 which installed permanent watertight seals in both penetrations between manhole 1 and battery room 'B' on October 4, 2013, thereby addressing the flooding concern.

This finding has a cross-cutting aspect in the area of Problem Identification and Resolution, Corrective Action Program, because CENG personnel did not thoroughly evaluate problems such that the resolutions addressed causes, which includes properly classifying, prioritizing, and evaluating for operability and reportability of conditions adverse to quality. Specifically, CENG personnel did not thoroughly evaluate and assess impacts to the plant such that resolutions addressed causes when two unsealed penetrations into battery room 'B' were identified on May 29, 2013; CENG's evaluation associated with CR-2013-003407 was not thorough and did not consider all flow paths for flooding into manhole 1. Additionally, the condition adverse to quality was not properly evaluated for operability. CENG personnel had an additional opportunity to thoroughly evaluate and assess impacts to the plant such that resolutions addressed causes and properly evaluate for operability when inspectors presented evidence of degraded manhole 1 conditions, e.g., clogged manhole drains, to CENG management on September 5, 2013 [P.1(c)].

Enforcement. 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," requires, in part, that measures shall be established to assure that conditions adverse to quality such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and non-conformances are promptly identified and corrected. Contrary to the above, between 1983 and October 4, 2013, Ginna did not promptly identify or correct a significant condition adverse to quality involving a non-conformance in two cable penetrations between manhole 1 and battery room 'B'. were promptly identified and corrected. Specifically, CENG failed to identify the need to hydrostatically seal two cable penetrations between manhole 1 and battery room 'B' after the site's design basis flood height was changed during the NRC Systematic Evaluation Program (SEP) in 1983; promptly correct the significant adverse condition in May 2013 when the condition was identified and take timely action in early September 2013 when CENG was presented with evidence challenging it's May 2013 evaluation related to manhole 1 and the improperly sealed penetrations. As a result, until October 4, various Deer Creek flooding scenarios could have resulted in flooding both battery rooms, the safety function of the 125 volt DC station batteries could have been lost during floods greater than 18,000 cfs, and the loss of the DC system could have led to an eventual loss of all AC power to the

site—an unrecoverable SBO —with no capability for using installed plant equipment for decay heat removal or inventory control during floods greater than 21,000 cfs. Immediate corrective actions included placing this issue in the CAP as CR-2013-003407, CR-2013-005262, and CR-2013-005643, and hydrostatically sealing the penetrations. These issues are being characterized as an apparent violation in accordance with the NRC's Enforcement Policy, and its final significance will be dispositioned in separate future correspondence. **(Apparent Violation 05000244/2013005-01, Failure to Identify and Correct Non-Hydrostatically Sealed Penetrations into Battery Room 'B')**

1R04 Equipment Alignment

Partial System Walkdowns (71111.04Q – 2 samples)

a. Inspection Scope

The inspectors performed partial walkdowns of the following systems:

- 'B' EDG during 'A' EDG planned maintenance on October 16, 2013
- 'B' and 'C' safety injection (SI) pumps during 'A' SI pump planned maintenance on December 9 and 10, 2013

The inspectors selected these systems based on their risk significance relative to the reactor safety cornerstones at the time they were inspected. The inspectors reviewed applicable operating procedures, system diagrams, the UFSAR, TSs, CRs, and the impact of ongoing work activities on redundant trains of equipment in order to identify conditions that could have impacted system performance of their intended safety functions. The inspectors also performed field walkdowns of accessible portions of the systems to verify system components and support equipment were aligned correctly and were operable. The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no deficiencies. The inspectors also reviewed whether CENG staff had properly identified equipment issues and entered them into the CAP for resolution with the appropriate significance characterization.

b. Findings

No findings were identified.

1R05 Fire Protection

Resident Inspector Quarterly Walkdowns (71111.05Q – 4 samples)

a. Inspection Scope

The inspectors conducted tours of the areas listed below to assess the material condition and operational status of fire protection features. The inspectors verified that CENG staff controlled combustible materials and ignition sources in accordance with administrative procedures. The inspectors verified that fire protection and suppression equipment was available for use as specified in the area pre-fire plan, and passive fire barriers were maintained in good material condition. The inspectors also verified that

station personnel implemented compensatory measures for out of service (OOS), degraded, or inoperable fire protection equipment, as applicable, in accordance with procedures.

- 'A' EDG vault on October 15, 2013
- 'A' battery room on November 29, 2013
- Control room on December 13, 2013
- Intermediate building clean side top floor on December 28, 2013

b. Findings

No findings were identified.

1R07 Heat Sink Performance (71111.07A – 2 samples)

a. Inspection Scope

The inspectors reviewed the EDG jacket water heat exchanger (HX) and lube oil cooler, and the 'A' spent fuel pool (SFP) HX to determine their readiness and availability to perform their safety functions. The inspectors reviewed the design basis for the components and verified CENG's commitments to NRC Generic Letter, 89-13. The inspectors observed actual performance tests for the HXs and/or reviewed the results of previous inspections of the HXs. The inspectors discussed the results of the most recent inspections with engineering staff and reviewed pictures of the as-found and as-left conditions. The inspectors verified that CENG staff initiated appropriate corrective actions for identified deficiencies. The inspectors also verified that the number of tubes plugged within the HXs did not exceed the maximum amount allowed.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program and Licensed Operator Performance (71111.11Q – 2 samples; 71111.11A – 1 sample)

.1 Quarterly Review of Licensed Operator Requalification Testing and Training

a. Inspection Scope

The inspectors observed licensed operator simulator training on November 13, 2013, which included a pressurizer level detector failure, leak in the normal letdown line, both main steam isolation valves failing shut, and two stuck open steam generator safety valves. The inspectors evaluated operator performance during the simulated event and verified completion of risk significant operator actions, including the use of abnormal and emergency operating procedures (EOPs). The inspectors assessed the clarity and effectiveness of communications, implementation of actions in response to alarms and degrading plant conditions, and the oversight and direction provided by the control room

supervisor. The inspectors verified the accuracy and timeliness of the emergency classification made by the shift manager and the TS action statements entered. Additionally, the inspectors assessed the ability of the crew and training staff to identify and document crew performance problems.

b. Findings

No findings were identified.

.2 Quarterly Review of Licensed Operator Performance in the Main Control Room

a. Inspection Scope

The inspectors observed operator performance of ER-FIRE.0, "Control Room Response to Fire Alarms and Reports," Revision 00904, and during a one percent decrease in power for planned testing of the TDAFW pump on November 18, 2013. The inspectors observed pre-shift briefings and reactivity control briefings to verify that the briefings met the criteria specified in CENG procedures CNG-OP-1.01-1000, "Conduct of Operations," Revision 01000, and CNG-OP-3.01-1000, "Reactivity Management," Revision 00701. Additionally, the inspectors observed procedure performance to verify that procedure use, crew communications, and coordination of activities between work groups similarly met established expectations and standards.

b. Findings

No findings were identified.

.3 Annual Review

a. Inspection Scope

On December 11, 2013, a region-based inspector conducted an in-office review of results of the CENG-administered annual operating tests. The inspection assessed whether pass rates were consistent with the guidance of IMC 0609, Appendix I, "Operator Requalification Human Performance Significance Determination Process," issued December 6, 2011. Comprehensive written exams were administered in the first quarter of 2013. The inspector verified that:

- Individual pass rates on the dynamic simulator tests were greater than 80 percent (pass rate was 88.5 percent)
- Individual pass rates on the job performance measures of the operating exam were greater than 80 percent (pass rate was 100 percent)
- More than 80 percent of the individuals passed all portions of the requalification exam (pass rate was 100 percent)
- Crew pass rates were greater than 80 percent (pass rate was 100 percent)

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12Q – 3 samples)

a. Inspection Scope

The inspectors reviewed the samples listed below to assess the effectiveness of maintenance activities on SSC performance and reliability. The inspectors reviewed system health reports, CAP documents, maintenance WOs, and maintenance rule basis documents to ensure that CENG staff was identifying and properly evaluating performance problems within the scope of the maintenance rule. For each sample selected, the inspectors verified that the SSC was properly scoped into the maintenance rule in accordance with 10 CFR 50.65 and verified that the (a)(2) performance criteria established by CENG staff were reasonable. As applicable, for SSCs classified as (a)(1), the inspectors assessed the adequacy of goals and corrective actions to return these SSCs to (a)(2). Additionally, the inspectors ensured that CENG staff was identifying and addressing common cause failures that occurred within and across maintenance rule system boundaries.

- Chemical and volume control system (CVCS) following identification of scoping issues on November 7, 2013
- Service water (SW) system due to 'B' SW pump failure during the second quarter of 2013
- Preferred auxiliary feedwater (AFW) system following failure of the TDAFW DC oil pump to automatically start on November 18, 2013

b. Findings

b1. Programmatic Failure to Scope SSCs within the Maintenance Rule Monitoring Program

Introduction. The inspectors identified a Green NCV of 10 CFR 50.65(b), because CENG staff did not include safety-related and non-safety-related SSCs within the scope of the maintenance rule monitoring program. Specifically, CENG staff failed to appropriately include an estimated 90 safety-related and non-safety-related SSCs within the scope of the maintenance rule monitoring program, which could have resulted in a failure to detect SSC degradation and to provide reasonable assurance that these SSCs are capable of fulfilling their intended functions.

Description. Since March 2013, the inspectors and CENG staff have identified an estimated 90 SSCs that were not appropriately included within the scope of the maintenance rule monitoring program. 10 CFR 50.65(b) states, "The scope of the monitoring program… shall include safety-related and non-safety-related SSCs." 10 CFR 50.65(b)(1) describes the safety-related SSCs that shall be included within the monitoring program, and 10 CFR 50.65(b)(2) describes the non-safety-related SSCs that shall be included like those "used in plant EOPs." CENG procedure CNG-AM-1.01-1023, "Maintenance Rule Program," Revisions 00200 and 00201, effective May 11, 2012, and April 29, 2013, respectively, provide instructions for determining SSCs that are within the scope of the maintenance rule monitoring program. With respect to non-safety-related SSCs used in EOPs, CENG's procedure states that SSCs explicitly referenced or whose use is implied in the EOPs are in scope. Ginna procedure EP-3-S-0308, "Maintenance Rule Scoping," Revision 00902, effective December 7, 2011, also provides instructions for determining SSCs that are within the scope of the maintenance rule monitoring program. With respect to non-safety-related SSCs used in EOPs, EP-3-

S-0308 explains that E, ES, ECA, and FR series EOPs need to be considered. All SSCs used in these procedures are to be identified and classified and then a determination made as to which SSCs provide significant value to the EOP mitigating strategy. EP-3-S-0308 considers an SSC to provide significant value if it is under utility control, provides a significant fraction of the functional ability to mitigate damage or radioactive release, and is not included in an EOP only to preclude equipment damage that is strictly an economic consideration.

In March 2013, the inspectors noted that the Technical Requirements Manual discusses four boron injection flow paths; one of these flow paths included air-operated valve (AOV)-110A, the boric acid to blender control valve. The inspectors recognized that AOV-110A was not included within the scope of the maintenance rule monitoring program and then noted that AOV-110A was utilized in procedure FR-S.1, "Response to Reactor Restart/ATWS," Revision 02000, which includes steps to initiate emergency boration of the reactor coolant system (RCS). After checking the status of SI and verifying that at least one charging pump is running, operators are directed by FR-S.1 to align a boration path through motor-operated valve 350, the immediate borate valve; if this response is not obtained, FR-S.1 directs operators to initiate boration at maximum rate using flow control valve FCV-110A. The inspectors questioned CENG personnel about the scoping of AOV-110A and determined that AOV-110A should have been scoped in accordance with Ginna procedure EP-3-S-0308 and CENG procedure CNG-AM-1.01-1023. CENG staff entered this issue into its CAP as CR-2013-002083. As part of the corrective actions associated with this CR, an extent-of-condition review was performed by CENG personnel and a total of 40 components, including AOV-110A and other AOVs associated with the CVCS, were placed within the scope of the maintenance rule monitoring program after CENG's maintenance rule expert panel approved these changes on April 19, 2013. However, the extent-of-condition narrowly focused on one part of the CVCS system and did not consider other non-safety-related AOVs used in the EOPs that may not have been appropriately included within the scope of the maintenance rule monitoring program during original scoping.

In November 2013, the inspectors noted that AOV-112C, volume control tank outlet valve, was listed in OPG-AUTO-SOFTWARE, "Control Room Software Operation," Revision 02400, as one of the single point equipment identification numbers that causes plant CDF or large early release frequency (LERF) risk to be orange or red when removed from service. The inspectors recognized that AOV-112C was not included within the scope of the maintenance rule monitoring program and then noted that AOV-112C is utilized in procedure E-1, "Loss of Reactor or Secondary Coolant," Revision 04100, which includes steps to check if charging flow has been established. After operators check the status of running charging pumps, the alignment of the charging pump suction flow path to the refueling water storage tank (RWST) is verified by ensuring level control valve (LCV)-112B open and LCV-112C closed. The inspectors questioned CENG personnel about the scoping of AOV-112C and determined that AOV-112C should have been scoped per Ginna procedure EP-3-S-0308 and CENG procedure CNG-AM-1.01-1023. CENG entered this issue into its CAP as CR-2013-006628. AOV-112C was placed within the scope of the maintenance rule monitoring program by CENG's maintenance rule expert panel on November 13.

Additional maintenance rule scoping issues that were identified in the last 2 years illustrate the programmatic issue of not appropriately including SSCs within the scope of the maintenance rule monitoring program in accordance with 10 CFR 50.65(b) and

procedures CNG-AM-1.01-1023 and EP-3-S-0308. On July 24, 2013, CR-2013-004444 documented three safety-related RWST alarm relays that were not scoped within the maintenance rule; subsequently, these relays were included within the scope of the maintenance rule monitoring program by the maintenance rule expert panel on September 4. On October 18, CR-2013-006139 documented two safety-related low air-pressure time delay relays for the 'A' and 'B' EDGs that were not scoped within the maintenance rule; subsequently, these relays were included within the scope of the maintenance rule monitoring program by the maintenance rule expert panel on November 13. Finally, the maintenance rule expert panel conducted reviews of E-0, "Reactor Trip or Safety Injection," Revision 4500, and E-1, "Loss of Reactor or Secondary Coolant," Revision 04100. The panel identified an additional 46 components from E-0 that were not included within the scope of the maintenance rule monitoring program and should have been. Reviews of other EOPs are ongoing and expected to identify additional SSCs that were not appropriately scoped within the maintenance rule monitoring program based upon the initial results of the maintenance rule expert panel's review of E-1; CR-2013-006674 documents CENG staff's ongoing review of the EOPs.

Analysis. The inspectors determined that CENG staff's failure to meet the requirements of 10 CFR 50.65(b) and appropriately place SSCs within the scope of the maintenance rule monitoring program was a performance deficiency that was within CENG staff's ability to foresee and correct and should have been prevented. Specifically, CENG personnel did not include an estimated 90 SSCs within the scope of the maintenance rule monitoring program, and the maintenance rule expert panel determined that each of these SSCs should have been included within the scope of the maintenance rule monitoring program. The inspectors determined that the failure to scope an estimated 90 safety-related and non-safety-related components in the maintenance rule was more than minor, because if left uncorrected, the finding could become a more significant safety concern. Specifically, the failure to monitor SSC performance and condition could have resulted in a failure to detect SSC degradation and to provide reasonable assurance that these SSCs are capable of fulfilling their intended functions. The failure to adequately scope an estimated 90 or more components associated with the CVCS and emergency boration, both EDGs, and other systems utilized in multiple EOPs could have resulted in the failure to detect degradation within multiple systems and to provide reasonable assurance that these SSCs are capable of fulfilling their intended functions. Additionally, this issue is similar to Example 3j described in IMC 0612, Appendix E, "Examples of Minor Issues," issued August 11, 2009, which states that issues are not minor if significant programmatic deficiencies were identified with the issue that could lead to worse errors if uncorrected. The inspectors evaluated the finding using IMC 0612, Attachment 0609.04, "Initial Characterization of Findings," issued June 19, 2012. The attachment instructs inspectors to utilize IMC 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," issued June 19, 2012. Using Exhibit 2, "Mitigating Systems Screening Questions," of IMC 0609, Appendix A, the inspectors determined this finding was not a deficiency affecting the design or qualification of a mitigating SSC, did not represent a loss of system and/or function, and did not represent an actual loss of function of at least a single train. Therefore, the inspectors determined the finding was of very low safety significance (Green).

This finding has a cross-cutting aspect in the area of Problem Identification and Resolution, Corrective Action Program, because CENG personnel did not thoroughly evaluate problems such that the resolutions addressed causes and extent of conditions. Specifically, CENG staff had multiple opportunities following the inspectors' identification

of maintenance rule scoping issues on March 27, 2013, and prior to November 7, 2013, to thoroughly evaluate recent maintenance rule scoping problems such that the resolutions addressed causes and extent of conditions [P.1(c)].

Enforcement. 10 CFR 50.65(b) requires, in part, that specific safety-related and non-safety-related SSCs shall be included within the scope of the maintenance rule monitoring program; for example, non-safety-related SSCs used in plant EOPs shall be scoped. Contrary to the above, an estimated 90 SSCs associated with the CVCS, EDGs, and other systems utilized in multiple EOPs were not included within the scope of the maintenance rule monitoring program by CENG staff since the maintenance rule became effective in 1996. As a result, the failure to adequately scope an estimated 90 or more components associated with the CVCS and emergency boration, both EDGs, and other systems utilized in multiple EOPs could have resulted in the failure to detect degradation within multiple systems and to provide reasonable assurance that these SSCs are capable of fulfilling their intended functions. CENG's immediate corrective actions included placing these issues into the CAP as CR-2013-002083, CR-2013-004444, CR-2013-004993, CR-2013-006139, CR-2013-006628, and CR-2013-006674. Because this violation is of very low safety significance and has been entered into CENG's CAP, this finding is being treated as an NCV consistent with Section 2.3.2 of the NRC Enforcement Policy. **(NCV 05000244/2013005-02, Programmatic Failure to Scope SSCs within the Maintenance Rule Monitoring Program)**

b2. Failure to Modify or Establish a PM for the TDAFW DC Lube Oil Pump Switch

Introduction. A self-revealing Green finding (FIN) was identified for failure to modify or establish a PM schedule for the TDAFW DC lube oil pump control switch. On November 18, 2013, plant personnel found the main control room switch for the TDAFW DC lube oil pump failed due to switch contact oxidation. This resulted in the DC oil pump failing to automatically start when demanded during a surveillance test and the continued inoperability of the TDAFW pump.

Description. On November 18, during a surveillance test of the TDAFW system, the DC lube oil pump failed to automatically start as expected when the AC lube oil pump was stopped. Operators halted the surveillance test and continued the TDAFW pump inoperability (the pump was declared inoperable previously due to the testing), thereby entering a 72-hour TS action statement. The DC pump was subsequently successfully started from the main control room by taking the switch to the start position, confirming that the DC pump, and therefore, the TDAFW pump was available. CENG investigation found that the main control room switch for the DC lube oil pump had failed to reset to the after-trip position which prevented the automatic start function from occurring.

CENG engineering personnel completed an ACE for this event to determine causes and propose corrective actions. As part of this process, the failed switch was sent out for failure analysis. The failure analysis identified multiple sets of contacts that had buildup on the silver plated contacts, which caused excessive resistance between the contacts. Based on this, the direct cause of the switch failing to reset and the DC lube oil pump failing to automatically start was determined to be oxidation on the switch contacts resulting in excessive resistance.

Further investigation by engineering personnel determined that the DC lube oil pump control switch and two other motor-operated valve control switches were not identified in the response to NRC Bulletin 80-20, “Failures of Westinghouse Type W-2 Spring Return to Neutral Control Switches,” issued in 1980, as having a spring return to neutral position. The presence of a spring return to the neutral position left these switches susceptible to failure in that an automatic start function might not reset to the proper position, the after-trip position. In the 1980 Bulletin response, 24 safety-related switches were identified and corrective action was taken at that time. Continuity tests were completed on the switches and continuity tests were performed at least every 31 days until the switches were modified. All 24 switches were subsequently modified such that the main control board green light indicated continuity of the circuit. Three other switches, including the TDAFW DC lube oil pump switch, were not modified and no other actions were taken such as establishing a PM schedule. In 1996, the TDAFW DC lube oil pump main control board switch was replaced due to it being difficult to operate; other similar switches were also replaced in this time frame due to age-related switch failures. Once again, no PM schedule was instituted at this time. CENG staff concluded that the TDAFW DC lube oil pump switch should have either been modified in 1980 or had a PM established for the switch. Additionally in 1996, there was a missed opportunity to identify that no PM had been established for the switch.

As immediate corrective actions for the November 18 TDAFW DC lube oil switch failure, CENG staff initiated CR-2013-006727, replaced the switch, verified continuity of the other two switches that were not modified in 1980, and established a compensatory action to verify continuity of the other two switches following manipulation of the switch until they are replaced. Additionally, an appropriate PM will be established for the three switches unless they are modified such that the main control board green light indicates continuity of the circuit.

Analysis. The inspectors determined that the failure to modify or establish any PMs for the TDAFW DC lube oil pump switch was a performance deficiency within CENG staff’s ability to foresee and correct and should have been prevented. Specifically, in 1980 when 24 switches were modified, three switches, including the TDAFW DC lube oil pump switch, were not modified and no other actions were taken such as establishing a PM schedule. This ultimately resulted in the failure of the switch to reset and failure of the pump to automatically start when demanded on November 18. This finding is more than minor because it is associated with the equipment performance attribute of the Mitigating Systems cornerstone and affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, due to the failure of the main control board switch for the TDAFW DC lube oil pump, the pump failed to start during testing resulting in the continued inoperability of the TDAFW pump. The inspectors evaluated the finding using Attachment 0609.4, "Initial Characterization of Findings," issued June 19, 2012, to IMC 0609, “Significance Determination Process,” issued June 2, 2011. The attachment instructs the inspectors to utilize IMC 0609, Appendix A, “Significance Determination Process for Findings At-Power,” issued June 19, 2012. Using Exhibit 2, “Mitigating Systems Screening Questions,” of IMC 0609 Appendix A, the inspectors determined this finding was not a deficiency affecting the design or qualification of a mitigating SSC, did not represent a loss of system and/or function, and did not represent an actual loss of function of at least a single train. Therefore, the inspectors determined the finding to be of very low safety significance (Green).

In accordance with IMC 0612, the finding does not have a cross-cutting aspect because the performance deficiency occurred in 1980 and is not reflective of present plant performance.

Enforcement. Ginna's response to NRC Bulletin 80-20 did not meet management standards in that three switches that were susceptible to failure were not modified, and did not have a PM schedule established. This issue was entered into CENG's CAP as CR-2013-006727. This finding does not involve enforcement action because no violation of a regulatory requirement was identified. Because this finding does not involve a violation and is of very low safety significance, it is identified as a FIN. **(FIN 05000244/2013005-03, Failure to Modify or Establish a PM for the TDAFW DC Lube Oil Pump Switch)**

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 – 4 samples)

a. Inspection Scope

The inspectors reviewed station evaluation and management of plant risk for the maintenance activities listed below to verify that CENG staff performed the appropriate risk assessments prior to removing equipment from service. The inspectors selected these activities based on potential risk significance relative to the reactor safety cornerstones. As applicable for each activity, the inspectors verified that CENG personnel performed risk assessments as required by 10 CFR 50.65(a)(4) and that the assessments were accurate and complete. When CENG personnel performed emergent work, the inspectors verified that operations personnel promptly assessed and managed plant risk. The inspectors reviewed the scope of maintenance work and discussed the results of the assessment with the station's probabilistic risk analyst to verify plant conditions were consistent with the risk assessment. The inspectors also reviewed the TS requirements and inspected portions of redundant safety systems, when applicable, to verify risk analysis assumptions were valid and applicable requirements were met.

- Planned maintenance on the 'A' battery room sump pump on October 8, 2013
- Planned maintenance on the 'A' EDG system on October 16, 2013
- Planned maintenance on the 'D' standby AFW system with the technical support center battery charger OOS on October 29, 2013
- Planned maintenance on the S08 relay room halon system on November 6, 2013

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15 – 4 samples)

a. Inspection Scope

The inspectors reviewed operability determinations for the following degraded or non-conforming conditions:

- 'C' SI pump high motor bearing temperature on October 1, 2013

- ‘A’ SFP HX aging effects on November 11, 2013
- ‘A’ residual heat removal (RHR) non-conforming splice tape on December 3, 2013
- ‘B’ SW pump high-differential pressure on December 13, 2013

The inspectors selected these issues based on the risk significance of the associated components and systems. The inspectors evaluated the technical adequacy of the operability determinations to assess whether TS operability was properly justified and the subject component or system remained available such that no unrecognized increase in risk occurred. The inspectors compared the operability and design criteria in the appropriate sections of the TSs and UFSAR to CENG’s evaluations to determine whether the components or systems were operable. Where compensatory measures were required to maintain operability, the inspectors determined whether the measures in place would function as intended and were properly controlled by CENG personnel. The inspectors determined, where appropriate, compliance with bounding limitations associated with the evaluations.

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18 – 1 sample)

Permanent Modification

a. Inspection Scope

The inspectors evaluated a modification to the SI system implemented by ECP 2012-000220, “Safety Injection Accumulator Back-Leakage Mitigation.” The inspectors verified that the design bases, licensing bases, and performance capability of the affected systems were not degraded by the modification. In addition, the inspectors reviewed modification documents associated with the upgrade and design change, including the revised piping and instrument drawings, the 10 CFR 50.59 screening form, and instructions to operators for operating the system. Additionally, the inspectors observed portions of the post-modification testing following installation and interviewed engineering and operations personnel concerning operation of the system.

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19 – 4 samples)

a. Inspection Scope

The inspectors reviewed the post-maintenance tests for the maintenance activities listed below to verify that procedures and test activities ensured system operability and functional capability. The inspectors reviewed the test procedure to verify that the procedure adequately tested the safety functions that may have been affected by the maintenance activity, that the acceptance criteria in the procedure were consistent with the information in the applicable licensing basis and/or design basis documents, and that the procedure had been properly reviewed and approved. The inspectors also

witnessed the test or reviewed test data to verify that the test results adequately demonstrated restoration of the affected safety functions.

- 'C' SI pump planned maintenance on October 1, 2013
- 'A' EDG planned maintenance on October 22, 2013
- 'B' component cooling water planned breaker maintenance on October 28, 2013
- 'A' motor-driven AFW planned maintenance on November 12, 2013

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22 – 4 samples)

a. Inspection Scope

The inspectors observed performance of surveillance tests and/or reviewed test data of selected risk-significant SSCs to assess whether test results satisfied TSs, the UFSAR, and CENG procedure requirements. The inspectors verified that test acceptance criteria were clear, tests demonstrated operational readiness and were consistent with design documentation, test instrumentation had current calibrations and the range and accuracy for the application, tests were performed as written, and applicable test prerequisites were satisfied. Upon test completion, the inspectors considered whether the test results supported that equipment was capable of performing the required safety functions. The inspectors reviewed the following surveillance tests:

- STP-O-2.1QB, SI Pump 'B' Quarterly Test on October 2, 2013
- STP-O-R-19, EDG 'A' – Auto-Start Undervoltage Logic Test on October 17, 2013
- S-12.4, RCS Leakage Surveillance Record Instructions on November 14, 2013
- S-12.4, RCS Leakage Surveillance Record Instructions on December 30, 2013

b. Findings

No findings were identified.

Cornerstone: Emergency Preparedness

1EP6 Drill Evaluation (71114.06 – 1 sample)

Training Observations

a. Inspection Scope

The inspectors observed a simulator training evolution for licensed operators on November 13, 2013, which required emergency plan implementation by an operations crew. CENG staff planned for this evolution to be evaluated and included in performance indicator (PI) data regarding drill and exercise performance. The inspectors observed event classification and notification activities performed by the crew. The inspectors also attended the post-evolution critique for the scenario. The focus of the inspectors' activities was to note any weaknesses and deficiencies in the crew's

performance and ensure that CENG evaluators noted the same issues and entered them into the CAP.

b. Findings

No findings were identified.

2. RADIATION SAFETY

Cornerstone: Public Radiation Safety and Occupational Radiation Safety

2RS1 Radiological Hazard Assessment and Exposure Controls (71124.01 – 1 sample)

a. Inspection Scope

From December 2 to 5, 2013, the inspectors conducted the following activities to verify that CENG staff was properly implementing physical, administrative, and engineering controls for access to locked high radiation areas and other radiological controlled areas (RCAs) during normal operations. Implementation of these controls was reviewed against the criteria contained in 10 CFR 20, relevant TSs, and CENG's procedures.

Radiological Hazard Assessment, Control, and Work Coverage

The inspectors toured accessible RCAs in the intermediate building, auxiliary building, and dry cask equipment building. Independent radiation surveys were performed of selected areas to confirm the accuracy of survey data and postings.

The inspectors identified a radiological-significant job being performed in the RCA—the replacement of the 'A' and 'B' reactor coolant drain tank (RCDT) pumps in the RHR sub-basement. The inspectors reviewed the applicable radiation work permit (RWP) 13-5006, the as low as reasonably achievable (ALARA) job review, radiation protection technician coverage, respiratory protection used, and the electronic dosimeter dose/dose rate alarm set points for the associated task to determine if the radiological controls were acceptable and if the set points were consistent with plant policy.

The inspectors determined that dosimetry was appropriately specified and properly located on the body, workers wore the appropriate respiratory protection, and air samples were taken due to the potential of generating airborne contamination when the pumps were disassembled.

The inspectors evaluated the effectiveness of contamination controls by touring work areas, reviewing survey data, and observing practices at various work locations in the auxiliary building and at the control point.

During plant tours, the inspectors verified that continuous air samplers were operating and located in areas where potential airborne contamination could occur. When observing the replacement of the RCDT pumps, the inspectors verified that area air samples were being taken and workers were outfitted with breathing zone analyzers or were wearing powered air purifying respirators.

Locked High Radiation Area Controls

The inspectors reviewed procedures related to the control of high dose rate hot spots, locked high radiation areas, and very high radiation areas. The inspectors discussed these procedures with radiation protection supervision to determine if any changes made to these procedures reduce safety measures. During plant tours, the inspectors verified locked high radiation areas were properly secured, posted, and monitored and that CENG personnel could account for keys to locked high and very high radiation areas.

Contamination and Radioactive Material Control

During plant tours, the inspectors confirmed that contaminated materials were properly bagged, surveyed, labeled, and segregated from work areas. The inspectors verified that drums containing radioactive materials were properly labeled identifying the drum contents and associated radiation level.

The inspectors observed workers using contamination monitors to determine if various tools and equipment were potentially contaminated and met criteria for releasing the materials from the RCAs.

Instructions to Workers

The inspectors confirmed that detailed procedures were implemented associated with dosimeter use including routine dosimeter issuance, multi-badging, and extremity dosimeter use. The inspectors reviewed CRs related to the proper use of dosimetry to determine if the cause was properly determined and that the corrective actions were effective to preclude recurrence.

Radiation Worker and Radiation Protection Technician Performance

During tours of RCAs, the inspectors questioned radiation workers and radiation protection technicians regarding the radiological conditions at the work site and the radiological controls that applied to their task. Additionally, radiological-related CRs were reviewed to evaluate if the incidents were caused by repetitive radiation worker or technician errors and to determine if an observable pattern traceable to a similar cause was evident.

The inspectors observed the supervisory oversight provided to workers replacing the RCDT pumps to determine if workers were properly informed, including identification of the radiological conditions associated with their tasks, electronic dosimetry dose and dose rate set points, and contamination controls and dose mitigation measures.

Problem Identification and Resolution

The inspectors evaluated CENG's CAP for assuring that access controls to radiological-significant areas were effective and properly implemented by reviewing relevant CRs, personnel contamination event reports, and electronic dosimetry alarm reports. The inspectors evaluated whether the problems were identified in a timely manner, extent-of-condition and cause evaluations were performed, and corrective actions were effective to preclude repetitive problems.

b. Findings

No findings were identified.

2RS2 Occupational ALARA Planning and Controls (71124.02 – 1 sample)

a. Inspection Scope

From December 2 to 5, 2013, the inspectors performed the following activities to verify that CENG staff was properly implementing operational, engineering, and administrative controls to maintain personnel exposure ALARA for activities performed during routine plant operations. Implementation of these controls was reviewed against the criteria contained in 10 CFR 20 and CENG's procedures.

Inspection Planning

The inspectors reviewed pertinent information regarding site cumulative exposure history, exposure challenges for 2013, current exposure trends, and the 5-year ALARA exposure reduction plan.

Radiological Work Planning

In reviewing CENG's ALARA program, the inspectors evaluated the departmental interfaces between radiation protection, operations, maintenance crafts, and engineering to identify missing ALARA program elements and interface problems. The evaluation was accomplished by interviewing site staff and reviewing station ALARA committee meeting minutes.

The inspectors reviewed the assumptions and basis for the 2013 exposure plan. The inspectors evaluated the implementation of CENG's procedures associated with monitoring and re-evaluating dose estimates when the forecasted cumulative exposure for tasks was approached. The inspectors reviewed the exposures for 10 workers who received the highest dose for 2013 to confirm that no individual exceeded the regulatory annual limit or the PI criteria.

Radiation Worker Performance

The inspectors reviewed the dose estimates for a job-in-progress—the replacement of RCDT pumps 'A' and 'B' located in the RHR sub-basement. The inspectors verified that the estimate was properly made by using the estimated work hours and current dose rate readings. The inspectors confirmed workers used low dose waiting areas in the sub-basement when not engaged in the work activity and a supervisor informed workers

of their accumulated dose and dose rates, and coordinated their activities to lessen exposure.

Source Term Reduction and Control

The inspectors reviewed the status and historical trends for the reactor source term. Through review of survey maps and interviews with the ALARA engineer, the inspectors evaluated recent source term measurements and control strategies. Specific strategies included the use of improved filtration methods, chemistry controls, system flushes, and temporary shielding.

The inspectors assessed the effectiveness of temporary shielding and tank/pipe flushing for reducing auxiliary building area dose rates that were affected by the residual irradiated metallic debris material from the removal of reactor baffle plate bolts during a past outage. The inspectors evaluated the effectiveness of the residual irradiated metallic debris material clean-up project by reviewing survey maps and postings.

Problem Identification and Resolution

The inspectors reviewed elements of CENG's CAP related to implementing the ALARA program to determine if problems were being entered into the program for timely resolution. CRs related to programmatic dose challenges, personnel contaminations, dose and dose rate alarms, and the effectiveness in predicting and controlling worker exposure were reviewed.

b. Findings

No findings were identified.

2RS3 In-Plant Airborne Radioactivity Control and Mitigation (71124.03 – 1 sample)

a. Inspection Scope

From December 2 to 5, 2013, the inspectors verified in-plant airborne concentrations were being controlled consistent with ALARA principles and that respiratory protection devices were properly used and maintained. The inspectors used the requirements in 10 CFR Part 20, the guidance in Regulatory Guide (RG) 8.15, "Acceptable Programs for Respiratory Protection," Revision 1, and CENG's procedures as criteria for determining compliance.

Engineering Controls

The inspectors reviewed the UFSAR to identify areas of the plant designed as potential airborne radiation areas and any associated ventilation systems or airborne monitoring instrumentation. This review included instruments used to monitor effluents and identify changing in-plant airborne radiological conditions.

The inspectors reviewed CENG staff's use of permanent and temporary ventilation to determine whether CENG personnel used ventilation systems as part of its engineering controls to control airborne radioactivity. The inspectors reviewed procedural guidance for use of installed plant systems to reduce dose and assessed whether the systems were used, to the extent practicable, during high-risk activities.

Respiratory Protection

The inspectors verified that respiratory protection was appropriately issued and properly used by workers replacing the RCDT pumps. The work was performed on contaminated components of the RHR sub-basement where potential airborne contamination could occur. In support of this activity, the inspectors verified that workers wore breathing zone samplers and that portable area air samplers were operating to quantify and characterize any airborne contamination during the performance of the work.

The inspectors observed operation and location of area airborne monitors, which are used on each elevation of the auxiliary building to routinely monitor and warn of changing airborne concentrations.

b. Findings

No findings were identified.

2RS4 Occupational Dose Assessment (71124.04 – 1 sample)

a. Inspection Scope

From December 2 to 5, 2013, an inspection was conducted to ensure occupational dose was appropriately monitored and assessed. The inspectors used the requirements in 10 CFR Part 20, the guidance in RG 8.13, "Instructions Concerning Prenatal Radiation Exposures," Revision 3, and CENG's procedures as criteria for determining compliance.

External Dosimetry

The inspectors evaluated whether CENG's dosimetry vendor was National Voluntary Laboratory Accreditation Program certified. The inspectors evaluated the onsite storage of the optically stimulated luminescent dosimeters before issuance, during use, and before processing and reading. The inspectors also reviewed the guidance provided to radiation workers with respect to the care and storage of dosimeters and the proper location for wearing them.

Internal Dose Assessment

The inspectors reviewed the implementation of the internal dose assessment program. Included in this review were the various methods used to determine the committed effective dose equivalent including calculations of derived air concentrations from airborne monitoring and bioassay techniques. These methods were applied in response to an incident in which the results from an air sample measurement indicated the presence of trace contamination during the fall of 2013. To accurately assess dose to the worker, CENG personnel analyzed the lapel air sample and conducted whole body

counting. The inspectors evaluated the techniques used to establish the uptake to the individual and the resulting dose.

Declared Pregnant Workers

The inspectors assessed the process used by CENG staff to inform workers of the risks of radiation exposure to the embryo/fetus, the regulatory aspects of declaring a pregnancy, and the specific process used for monitoring and controlling exposure to a declared pregnant worker. The inspectors reviewed CENG's documentation and monitoring results for two declared pregnant workers who were employed during the inspection period.

b. Findings

No findings were identified.

2RS5 Radiation Monitoring Instrumentation (71124.05 – 1 sample)

a. Inspection Scope

From December 2 to 5, 2013, an inspection of radiation monitoring instrumentation was conducted to verify CENG staff was assuring the accuracy and operability of radiation monitoring instruments that were used to protect workers and the public. The inspectors used the requirements in 10 CFR 20, the offsite dose calculation manual (ODCM), the TSs, and CENG's procedures as criteria for determining compliance.

Inspection Planning

The inspectors reviewed the UFSAR to identify radiation instruments associated with monitoring plant areas, airborne radioactivity, effluents, and workers. In addition, the inspectors reviewed a listing of in-service survey instrumentation including air samplers and small article monitors along with radiation monitoring instruments used to detect and analyze workers' external contamination and external dose. The inspectors reviewed personnel contamination monitors. The inspectors assessed whether an adequate number and type of instruments were available to support operations.

The inspectors reviewed procedures that govern instrument source checks and calibrations. The inspectors reviewed relevant calibration and source check procedures for adequacy. The inspectors reviewed the area and effluent radiation monitor alarm set point values and bases as provided in the ODCM and the UFSAR.

Walkdowns and Observations

During plant tours, the inspectors selected several portable survey instruments in use or available for issuance and assessed calibration and source check stickers for currency as well as material condition and operability.

The inspectors walked down portable area radiation monitors and continuous air monitors to determine whether they were appropriately positioned relative to the radiation sources or areas they were intended to monitor and located in low radiation background areas. The inspectors compared monitor response with actual area

conditions for consistency. The inspectors selected effluent monitors, area monitors, personnel contamination monitors, and small article monitors and verified that the periodic source checks were performed in accordance with CENG procedures.

Calibration and Testing Program

The inspectors selected various effluent instrumentation used to quantify and control radiological liquid and gaseous releases to verify that functional performance testing and calibrations had been routinely performed and there were no indications of degraded instrument performance. The inspectors also selected laboratory analytical instruments used for radiological analyses (e.g. Apex Gamma Spectroscopy System) to verify that the daily performance checks did not indicate degraded instrument performance.

Problem Identification and Resolution

The inspectors evaluated whether problems associated with radiation monitoring instrumentation were being identified by CENG personnel at an appropriate threshold and were properly addressed for resolution in CENG's CAP. The inspectors assessed the appropriateness of the corrective actions for a sample of problems documented by CENG personnel that involve radiation monitoring instrumentation.

b. Findings

No findings were identified.

2RS6 Radioactive Gaseous and Liquid Effluent Treatment (71124.06 – 1 sample)

a. Inspection Scope

From December 2 to 5, 2013, an inspection was conducted to ensure the gaseous and liquid effluent processing systems were maintained so radiological discharges were properly reduced, monitored, and evaluated and to verify the accuracy of effluent releases and public dose calculations resulting from radioactive effluent discharges.

The inspectors used the requirements in 10 CFR 20, the ODCM, applicable industry standards, and CENG's procedures as criteria for determining compliance.

Event Report and Effluent Report Reviews

The inspectors reviewed the annual radiological effluent release report for 2012 submitted as required by the ODCM/TSs. The inspectors reviewed anomalous results, unexpected trends, and abnormal releases identified by CENG personnel. The inspectors verified that these abnormal releases were evaluated, entered in the CAP, and adequately resolved.

The inspectors identified radioactive effluent monitor operability issues reported by CENG staff as provided in the 2012 annual radioactive effluent release report and reviewed these issues and verified that they were entered into the CAP and adequately resolved.

ODCM and UFSAR Review

The inspectors reviewed the UFSAR descriptions of the radioactive effluent monitoring systems, treatment systems, and effluent flow paths to identify system design features and required functions. The inspectors reviewed changes to the ODCM made since the last inspection. The inspectors reviewed the evaluations of the changes and assessed whether they were technically justified and maintained effluent releases ALARA.

The inspectors reviewed CENG documents to determine if CENG personnel had identified any non-radioactive systems that have become contaminated as documented in either an event report or the ODCM. The inspectors reviewed selected evaluations and verified that no contaminated systems had an unmonitored effluent discharge path to the environment.

Procedures, Special Reports, and Other Documents

The inspectors reviewed CRs related to the effluent program issued since the previous inspection to identify any additional focus areas for the inspection based on the scope of problems described in these reports.

The inspectors reviewed effluent program implementing procedures including those associated with effluent sampling and analysis, effluent monitor set point determinations, and dose calculations.

The inspectors reviewed results from the inter-laboratory and intra-laboratory comparison programs for the effluent monitoring program since the last inspection to determine the quality and accuracy of the analysis program.

Walkdowns and Observations

The inspectors walked down selected components of gaseous and liquid discharge systems to verify that equipment configuration and flow paths align with the descriptions in the UFSAR to assess equipment material condition. Special attention was made to identify potential unmonitored release points, building alterations that could impact airborne or liquid effluent controls, and ventilation system leakage that communicates directly with the environment.

Liquid discharge monitoring equipment inspected included:

- R-18, liquid radwaste
- R-19, steam generator blow down
- R-20A/B, spent fuel HXs

Gaseous discharge monitoring equipment inspected included:

- R-10B, R-13, R-14, plant ventilation iodine, particulate, and noble gas monitors
- R-10A, R-11, R-12, containment purge iodine, particulate, and noble gas monitors

The inspectors reviewed CENG's surveillance test and calibration records for these selected liquid and gaseous radiation monitors and for air cleaning equipment (i.e., fans,

charcoal filters, and high-efficiency particulate air filters in the SFP area air filtration system) to assure that the equipment met the operability criteria.

The inspectors observed a chemistry technician obtain a noble gas sample and a titrated vapor sample from the R-10B plant vent effluent monitor. The inspectors evaluated the technician's performance using the governing procedure to assure that a representative sample was properly acquired.

Sampling and Analyses

The inspectors selected for evaluation an incident (CR-2013-005762) in which the normal gaseous effluent monitors (R-10A, R-11, R-12) were OOS due to a faulty flow indicator to verify that controls were in place to ensure that alternate compensatory sampling was performed consistent with the ODCM.

The inspectors determined that the facility does not routinely rely on the use of compensatory sampling in lieu of adequate system maintenance based on the frequency of compensatory sampling since the last inspection.

The inspectors reviewed the results of the inter-laboratory and intra-laboratory comparison program to verify the quality of the radioactive effluent sample analyses. The inspectors also assessed whether the intra- and inter-laboratory comparison program included hard-to-detect isotopes.

Dose Calculations

The inspectors reviewed three radioactive liquid and three gaseous waste discharge permits to verify that the projected doses to members of the public were accurate and based on representative samples of the discharge path and that radioactive liquid and gaseous waste was being processed and discharged in accordance with CENG procedures.

The inspectors evaluated the methods used to determine the isotopes that were included in the discharge permits and annual radioactive effluent release reports to ensure all applicable radionuclides were included within detectability standards. The review included CENG's current waste stream analyses to ensure hard-to-detect radionuclides were included in the effluent releases.

The inspectors determined whether the calculated doses were within the 10 CFR 50, Appendix I, and ODCM dose criteria. The inspectors determined that CENG staff was tracking cumulative doses on a monthly, quarterly, and annual basis and comparing dose to the regulatory criteria.

Post-Accident Effluent Engineering Controls

The inspectors selected the SFP charcoal filtration system (an installed ventilation system used to mitigate the potential release of airborne radioactivity during a fuel transfer accident) and evaluated whether the ventilation system operating parameters were consistent with maintaining concentrations of airborne radioactivity within acceptance criteria. The inspectors reviewed related surveillance procedures, charcoal filter test data, and test flow measurements to determine if operability criteria were met.

Groundwater Protection Initiative (GPI) Program

The inspectors reviewed reported groundwater monitoring results, recent sampling results, and changes to CENG's written program for identifying and controlling contaminated spills or leaks to groundwater. Changes to the GPI included the installation of five additional monitoring wells.

The inspectors observed technicians obtaining a groundwater sample from monitoring well GW-11. The inspectors evaluated whether the technicians complied with the sampling procedure and appropriately documented the activity.

The inspectors reviewed past identified leakage or spill events and entries made into CENG's 10 CFR 50.75(g) decommissioning files. The inspectors reviewed evaluations of leaks or spills and reviewed the effectiveness of any remediation actions. The inspectors reviewed onsite contamination events involving contamination of ground water and assessed whether the source of the leak or spill was identified and terminated.

For past spills, leaks, or unexpected liquid or gaseous discharges, the inspectors assessed that an evaluation was performed based on sufficient radiological surveys and determined whether an evaluation had been performed to include consideration of hard-to-detect radionuclides, and determined whether CENG staff completed offsite notifications as provided in its GPI implementing procedures.

Problem Identification and Resolution

The inspectors assessed whether problems associated with the effluent monitoring and control program were being identified by CENG personnel at an appropriate threshold and were properly addressed for resolution in CENG's CAP. In addition, the inspectors evaluated the appropriateness of the corrective actions for a selected sample of problems documented by CENG personnel.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator Verification (71151 – 2 samples)

.1 Occupational Exposure Control Effectiveness

a. Inspection Scope

The inspectors reviewed implementation of CENG's occupational exposure control effectiveness PI (OR01) program. Specifically, the inspectors reviewed CRs and associated documents for occurrences involving locked high radiation areas, very high

radiation areas, and unplanned exposures occurring from October 1, 2012, through October 1, 2013, against the criteria specified in Nuclear Energy Institute (NEI) 99-02, "Regulatory Assessment Performance Guideline," Revision 6, to verify that all occurrences that met the NEI criteria were identified and reported as PIs.

b. Findings

No findings were identified.

.2 Radiological Effluent Technical Specification/Offsite Dose Calculation Manual Radiological Effluent Occurrences

a. Inspection Scope

The inspectors reviewed relevant release reports for the period October 1, 2012, through October 1, 2013, for issues related to the public radiation safety PIs (PR01), which measure radiological effluent release occurrences that exceed 1.5 millirems per quarter whole body or 5.0 millirems per quarter organ dose for liquid effluents; 5 millirads per quarter gamma dose, 10 millirads per quarter beta air dose, and 7.5 millirads per quarter for organ dose gaseous effluents.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152 – 4 samples)

.1 Routine Review of Problem Identification and Resolution Activities

a. Inspection Scope

As required by Inspection Procedure 71152, "Problem Identification and Resolution," the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify that CENG personnel entered issues into the CAP at an appropriate threshold, gave adequate attention to timely corrective actions, and identified and addressed adverse trends. In order to assist with the identification of repetitive equipment failures and specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the CAP and periodically attended CR screening meetings.

b. Findings

No findings were identified.

.2 Semi-Annual Trend Review

a. Inspection Scope

The inspectors performed a semi-annual review of site issues, as required by Inspection Procedure 71152, to identify trends that might indicate the existence of more significant safety issues. In this review, the inspectors included repetitive or closely related issues that may have been documented by CENG personnel outside of the CAP, such as trend

reports, PIs, major equipment problem lists, system health reports, maintenance rule assessments, and maintenance or CAP backlogs. The inspectors also reviewed CENG's CAP database for the third and fourth quarters of 2013 to assess CRs written in various subject areas (equipment problems, human performance issues, etc.), as well as individual issues identified during the NRCs daily CR review (Section 4OA2.1). The inspectors reviewed CENG's quarterly trend report for the second and third quarters of 2013, conducted under CNG-QL-1.01-1008, "Periodic QPA Performance Reporting

Process," Revision 00500, to verify that CENG personnel were appropriately evaluating and trending adverse conditions in accordance with applicable procedures.

b. Findings and Observations

No findings were identified.

The inspectors evaluated a sample of issues and events that occurred over the course of the past two quarters to determine whether issues were appropriately considered as emerging or adverse trends. The inspectors verified that these issues were addressed within the scope of the CAP or through department review and documentation in the quarterly trend presentation for overall assessment. For example, the inspectors noted that CENG personnel had appropriately documented in the CAP (CR-2013-006225) a "trend in lack of conservative approach in operability assumptions and documentation supporting operability determinations," and the inspectors noted that CENG staff were appropriately tracking and trending 'B' station battery performance following an increase in the number of CRs related to the system.

.3 Annual Sample: Review of the Operator Workaround Program

a. Inspection Scope

The inspectors reviewed the cumulative effects of the existing operator workarounds, operator burdens, existing operator aids and disabled alarms, and open main control room deficiencies to identify any effect on EOP operator actions, and any impact on possible initiating events and mitigating systems. The inspectors evaluated whether station personnel had identified, assessed, and reviewed operator workarounds as specified in CENG procedure, CNG-OP-1.01-2010, "Operator Workaround/Challenge Control," Revision 00000.

The inspectors reviewed CENG's process to identify, prioritize and resolve main control room distractions to minimize operator burdens. The inspectors reviewed the system used to track these operator workarounds and recent CENG self-assessments of the program. The inspectors also toured the control room and discussed the current operator workarounds with the operators to ensure the items were being addressed on a schedule consistent with their relative safety significance.

b. Findings and Observations

No findings were identified.

The inspectors determined that the issues reviewed did not adversely affect the capability of the operators to implement abnormal procedures or EOPs. The inspectors

also verified that CENG staff entered operator workarounds and burdens into the CAP at an appropriate threshold and planned or implemented corrective actions commensurate with their safety significance.

.4 Annual Sample: Time Critical Operator Actions

a. Inspection Scope

The inspectors performed an in-depth review of CENG's root cause analysis and corrective actions associated with CR-2012-002825 and CR-2012-006530 concerning time critical operator actions associated with the 2012 problem identification and resolution and triennial fire protection inspection findings.

The inspectors assessed CENG's problem identification threshold, cause analyses, extent-of-condition reviews, compensatory actions, and the prioritization and timeliness of CENG's corrective actions to determine whether CENG personnel were appropriately identifying, characterizing, and correcting problems associated with time critical operator actions and whether the planned or completed corrective actions were appropriate. The inspectors compared the actions taken to the requirements of CENG's CAP.

b. Findings and Observations

No findings were identified.

The inspectors determined that CENG personnel appropriately identified, characterized, and implemented corrective actions related to time critical operator actions associated with the problem identification and resolution and triennial fire protection team inspection findings. The inspectors noted that as a result of extent-of-condition reviews, CENG personnel identified additional time critical operator action commitments that were tied to licensing bases. These additional time critical actions were placed in CENG's CAP to be time validated to ensure that the credited time critical actions can be performed within the licensing commitment. The inspectors noted that CENG personnel had identified that some of the time critical actions that were assigned to be completed by the CAP had not been completed and the corrective action was closed to a time critical actions management program. Time validation tasks for these time critical actions were assigned to be performed under the time critical actions management program. The inspectors verified that CENG's time critical actions management program had developed appropriate timelines and schedules to complete the identified time critical action validations.

The inspectors determined CENG staff's overall response to the issues was commensurate with the safety significance, was timely, and the actions taken and planned were reasonable to address time critical actions associated with problem identification and resolution and triennial fire protection inspection findings.

.5 Annual Sample: Actuation of Rupture Discs in the Service Water System

a. Inspection Scope

The inspectors performed an in-depth review of CENG's evaluations and effectiveness of corrective actions associated with numerous recent CRs regarding the actuation of rupture discs in the SW system. Specifically, CENG staff had identified a number of instances of rupture discs in the SW system having ruptured due to pressure transients in the system. As a result of these failures, CENG staff completed an ACE to identify the failure mechanisms associated with the actuation of the rupture discs.

The inspectors assessed CENG's problem identification threshold, associated analyses and evaluations, and prioritization and timeliness of corrective actions. The inspectors performed this review to determine whether CENG personnel were appropriately identifying, characterizing, and correcting problems associated with this issue and whether the planned and completed corrective actions were appropriate. The inspectors verified CENG personnel were adequately tracking rupture disc performance following corrective actions to minimize pressure transients on the discs and have included operating experience reviews in CRs and ACEs. The inspectors conducted interviews with a mechanical design engineering supervisor and additional engineering personnel to assess the adequacy, effectiveness, and timeliness of implemented corrective actions.

b. Findings and Observations

No findings were identified.

The rupture discs were installed into the SW system between 2010 and 2012 as a modification to increase the life of the relief valves, which function as the over-pressure protection system for the SW system. The raw water in the SW system was degrading the valves requiring increased maintenance on the system. Installation of the rupture discs upstream of the relief valve stops contact between the raw water and the valve. The inspectors found that CENG personnel had identified the trend of rupture discs actuating and have appropriately evaluated the matter in accordance with CENG procedures. The inspectors reviewed several of the subject CRs, the corresponding corrective actions, and one ACE and concluded that CENG staff had appropriately evaluated the problem and identified the necessary corrective actions. The inspectors found CENG staff's conclusion reasonable that the majority of rupture discs were actuating due to filling transients, which can occur during normal testing and maintenance activities when a void is introduced into a section of piping due to the method of system isolation. The inspectors found that the issues had been accurately documented within the CAP and appropriate extent-of-condition reviews had been performed to assess the impact of filling transients on the rupture discs within the SW system.

CENG personnel appropriately evaluated the causes of the rupture discs actuating and identified two distinct failure modes—system pressure transients and piping vibrations. CENG staff have implemented procedural changes to decrease the instantaneous pressure spikes from the filling transients and have performed walkdowns of the SW system to identify if any supports can be added to minimize piping vibration.

Additionally, CENG staff have added quarterly performance monitoring of all SW rupture discs into the performance monitoring basis document for the SW system.

The inspectors determined CENG staff's overall response to the issue was commensurate with the safety significance, was timely, and included appropriate corrective actions. The inspectors determined that the corrective actions were reasonable to resolve the issue and that the rupture discs were still capable of performing their intended function, to protect the relief valves from fouling during interaction with the raw SW and consequently minimizing outage time for the SW system.

4OA3 Follow-Up of Events and Notices of Enforcement Discretion (71153 – 2 samples)

.1 (Closed) LER 05000244/2013-003-00: Unanalyzed Condition for Potential Floodwater Intrusion into Vital Battery Rooms

On September 20, 2013, CENG staff determined that there was a potential for flooding of both battery rooms during a design basis flood due to unqualified wall penetration material. Accumulation of water in the manhole vaults adjacent to battery room 'B' could potentially challenge unqualified penetration barriers between the manhole vaults and battery room 'B', which could then also impact battery room 'A'. Flooding through these penetrations had not been previously evaluated. Compensatory actions consisted of monitoring the weather forecast and placing plastic covering and sandbags over the manhole covers until the penetrations between the manhole vaults and battery room 'B' were sealed watertight on October 4, 2013. CENG staff entered the issue into its CAP as CR-2013-005643. There was no actual safety consequences associated with this event. The enforcement aspects of this issue are discussed in Section 1R01. The inspectors did not identify any new issues during the review of the LER. This LER is closed.

.2 (Closed) LER 05000244/2013-003-01: Unanalyzed Condition for Potential Floodwater Intrusion into Vital Battery Rooms

CENG staff conducted an ACE and determined that the condition was caused by a change to the flooding analysis performed in 1983. CENG staff determined that the flood level was raised, but Ginna staff did not evaluate the potential for flooding through this manhole or any other underground sources other than the EDG vaults. Ginna staff agreed to provide protection to a higher level of flood flow. CENG staff determined that the condition could have prevented the fulfillment of a safety function, because had a design basis flood occurred prior to sealing the battery room penetration, the safety function of the 125 volt DC station batteries would have been lost. Loss of the DC system would lead to an eventual loss of all AC power to the site with no capability for using installed plant equipment for decay heat removal or inventory control. There was no actual safety consequences associated with this event. The enforcement aspects of this issue are discussed in Section 1R01. The inspectors did not identify any new issues during the review of the LER. This LER is closed.

4OA6 Meetings, Including Exit

On January 29, 2014, the inspectors presented the inspection results to Mr. Joseph Pacher, Vice President, and other members of the Ginna staff. The inspectors verified that no propriety information was retained by the inspectors or documented in this report.

ATTACHMENTS: QUANTITATIVE AND QUALITATIVE EVALUATIONS (ATTACHMENT 1)
SUPPLEMENTARY INFORMATION (ATTACHMENT 2)

QUANTITATIVE AND QUALITATIVE EVALUATIONS

Ginna's Updated Final Safety Analysis Report (UFSAR) flooding analysis translates flood heights onsite to Deer Creek flow rates based on a hydraulic stream flow study, such that a design flood height of 273.8 feet would be equivalent to a Deer Creek flow of 26,000 cubic feet per second (cfs). This is less than the probable maximum flood (PMF) of 38,700 cfs.

From a base case perspective, the occurrence of a significant flood at Deer Creek is a challenging event for the plant, which was aggravated by the existence of the performance deficiency. Action to align city water to provide a makeup source for the standby auxiliary feedwater (AFW) pumps and cooling for the 'B' emergency diesel generator (EDG) needs to be completed within 45 minutes of the water level reaching the access bridge handrails in accordance with ER-SC.2, "High Water Flood Plan." Under design conditions once the creek capacity is exceeded, water will begin to accumulate in the screen house (elevation 253.55 feet). The plant is designed with flood detectors (level switches) in the circulating water pump pits in the screen house, which automatically trip the circulating water pumps at a level of 2 feet above the pit floor, resulting in a plant trip. As the flooding progresses and the turbine building floods, a loss of service water (SW) occurs, followed by losses of turbine and motor-driven AFW pumps, and instrument air. The loss of SW results in a loss of cooling to the component cooling water system, and procedures require that reactor coolant pumps (RCPs) be tripped. Instrument air is lost as the turbine building floods, resulting in the closure of the chemical and volume control system (CVCS) letdown isolation valve. The volume control tank (VCT) suction valve to the running charging pumps fails as-is-open and the suction valve from the refueling water storage tank (RWST) fails as-is-closed. The closure of the letdown isolation valve results in operators identifying that they need to realign suction from the VCT to the RWST by opening a local manual valve to ensure that the charging pumps continue to provide RCP seal cooling with seal injection.

CENG staff conducted an analysis to determine at what flood height, below the design value, the unsealed penetrations in manhole 1 would affect equipment relied upon to prevent core damage. CENG staff determined that a flood corresponding to flow rates at Deer Creek between 18,000 cfs and 21,000 cfs (from here on referred to as Case 1) would eventually result in a loss of all DC power, while not directly affecting any other equipment assumed available during the base case flood. For flow rates between 21,000 cfs and the design basis flow of 26,000 cfs (from here on referred to as Case 2), the scenario would proceed along the same line as Case 1, but would eventually result in an unrecoverable station blackout (SBO) as a result of the unexpected loss of the B EDG and an expected loss of offsite power (LOOP) as the switchyard would also be impacted by the flood in Case 2.

A bounding detailed risk evaluation (DRE) was completed in three parts. First, the increase in conditional core damage probabilities (CCDPs) for the two cases were assessed given the performance deficiency. Then the available information on flood frequencies corresponding to specific Deer Creek flow rates was used. Finally, the change in CCDPs and the associated estimated flood frequencies were combined to get a bounding estimate of the increase in CDF given the performance deficiency, over an operating year [as limited by guidance provided in NRC's Inspection Manual Chapters (IMCs)]. This was a performance deficiency directly related to an external event issue (i.e., external flooding), and there were no other contributing external events assessed. From a metric perspective, this significance determination process (SDP) is dominated by CDF, as opposed to large early release frequency (LERF), because it was assessed that there was not an increased chance of a steam generator tube rupture or other scenarios that could dominate LERF.

The input assumptions were highly uncertain and were varied to calculate a range of risk estimates. The values for flood frequency, the availability of remaining mitigating systems, and successful completion of key operator actions were key inputs to the evaluation. The change in CDF estimates ranged from Green, a finding of very low safety significance, to Yellow, a finding of substantial safety significance. Flood exceedance probabilities were obtained from UFSAR Figure 2.4-3, "Peak Discharge at Deer Creek Versus Probability of Occurrence Per 1000 Years," and from Table 1 of USFAR Section 2.4, Reference 9, "Letter from D. M. Crutchfield, NRC, to J. E. Maier, NRC, Subject: Integrated Plant Safety Assessment Report (IPSAR) Section 4.5, Plant Flooding by Deer Creek - R. E. Ginna Nuclear Power Plant, dated August 19, 1983," for the respective cases. The senior reactor analyst (SRA) also considered additional risk information provided by CENG's probabilistic risk assessment staff.

Part 1 - Estimation of the Increase in CCDP Given the Performance Deficiency

- Case 1: 18,000 cfs

  Successful mitigation in this case relies on the availability of city water and the operator actions to align it for steam generator makeup via the standby AFW pumps and cooling for the 'B' EDG in the event that offsite power is challenged. The 'A' EDG is not credited since it cannot be electrically isolated from the impacts of a design basis flood. The city water system was assumed to be available, although it is recognized that extreme weather events could impact its availability as well. The human error probability to align the systems was estimated by CENG staff to be 2E-2. The SRA walked down the actions involved in accomplishing this task for this event and found this estimate to be reasonable.

  A basic event tree was developed to model the event. The standby AFW system receives its motive and control power from alternating current (AC) sources that would be available for the event. It was assumed that even with a loss of DC and all control room indications and controls that standby AFW would be able to perform the secondary heat removal function. If this is not the case, then the CCDP would be 1.0. It should be noted that a base case LOOP frequency was assumed in this scenario, and the impact of such a large natural event could be reasonably expected to increase the likelihood of such an event taking place concurrently. This would also increase the CCDP, ranging from a CCDP estimated with base case LOOP frequency up to the scenario considered in Case 2 (i.e., CCDP = 1).

  Even if the standby AFW is available, it was assumed that successful rapid cooldown and depressurization would not be feasible, and therefore, no credit was provided for this action. This increased the likelihood of a RCP seal loss-of-coolant accident (LOCA).

  Using Ginna's standardized plant analysis risk (SPAR) model, Revision 8.21, the SRA estimated the base case CCDP at approximately 9.81E-2 for this case, dominated by a failure to align city water to the standby AFW system.

- Case 2: 21,000 cfs

  The conditions discussed in Case 1 would occur in a similar manner but at an accelerated rate as a result of the higher flood rate. Once flow exceeds 21,000 cfs, the plant's east switchgear begins to submerge and offsite power is lost (i.e., a non-recoverable plant centered LOOP is expected to take place). In this condition, CENG staff expects that 'A' DC power would be available to start the 'B' EDG prior to the loss of all DC. When all DC is lost, all control evolutions would need to be conducted manually. Loss of all DC results in a loss of EDG

room cooling. Without EDG room cooling, CENG estimated that the EDG engine would fail within several hours. Even if this did not occur, the EDG engine would run out of fuel in the day tank (approximately 9 hours). With no power to the diesel fuel oil transfer pumps the engine could not continue to run. Recovery actions in the room are not credible, because it is unmanned during the event, and the water level outside the EDG room would preclude entry into the room or possibly cause flood waters to enter the room if a room entry was attempted. Therefore, it is assumed that for flows greater than 21,000 cfs, the site would have experienced an unrecoverable SBO.

Using Ginna's SPAR model, Revision 8.21, the SRA estimated the Case 2 CCDP to be essentially 1.0 for floods that exceed 21,000 cfs, dominated by SBO sequences with no immediate recovery of offsite power or onsite emergency power systems.

Part 2 - Estimation of Deer Creek Flood Frequencies

The inspectors and risk analysts used several NRC estimates of flooding frequency and associated risk insights to develop bounding estimates of the flooding frequencies associated with Case 1 and Case 2 Deer Creek flow rates.

It should be noted that there are no standard techniques or consensus methods to extrapolate flood frequencies into the ranges relevant to this significance determination process (SDP). Most of the literature available on extrapolating flood frequencies is not intended to provide high confidence beyond the available historical record (typically 100 years or less). In rare cases, additional confidence may be provided if the information is coupled with more refined methods or additional data, which does not exist at Ginna. Even in these cases, the level of confidence of extreme floods well beyond the historical record is very limited, as will be discussed below. The method employed to obtain the frequencies will be based on judgment and the values should be adequate for a bounding quantitative assessment, as indicated per IMC 0609, Appendix M. Events associated with extreme natural phenomena, such as the PMF are highly site specific; thus, it is problematic to assume generic values. Hence, there is no simple tool to assess this performance deficiency in a generic way. In addition, the PMF is not usually directly associated with a frequency, which increases the complexity in estimating initiating event frequencies for this SDP in a timely manner, as no single method could produce significant confidence in the flood frequency estimates of such events.

- Bounding Frequency Based on UFSAR Method (UFSAR Lognormal Probability Plot)

  The current licensing basis for flooding is discussed in Section 2.4 of the USFAR and originated from the NRC's IPSAR, Section 4.5, "Plant Flooding by Deer Creek," August 19, 1983. From the probability plot, the staff estimated frequencies are approximately 1E-4 and 7E-5 for the 18,000 cfs and 21,000 cfs floods, respectively.

- Bounding Frequency Estimate based on NRC IPSAR Wakeby Distribution Method (Wakeby)

  In IPSAR Section 4.5, "Plant Flooding by Deer Creek," the NRC also developed flood frequencies by fitting a Wakeby probability. A key input for this method is the mean annual maximum flow for Deer Creek. It is important to note that Deer Creek is an ungauged, unregulated stream; therefore, an estimate of flow had to be derived from stream flow information from other streams in the region. This was accomplished via regional stream flow data, where stream gauges around a specific region are used as surrogates for the at-site flood response. This method is commonly used to add additional data points when performing

flood extrapolations when at-site data is unavailable. As stated in the IPSAR for Ginna, NUREG-0821, small-gauged drainage basins with relatively short records do not yield consistent results when subjected to frequency analysis. The NRC estimated the peak annual flow to be 700 cfs. It should also be noted that even for the streams used as surrogates for Deer Creek, there is variability in the mean annual maximum flow and therefore, it would be expected that any estimate at Deer Creek would have some degree of uncertainty due to the lack of at-site data.

Using this method, CENG staff estimated frequencies of 1.4E-6 and 6E-7 for floods of 18,000 cfs and 21,000 cfs, respectively, which as stated above, well exceeds the credible ranges of extrapolation for the type of data available at Ginna for this assessment. It should also be noted that the reliance on Wakeby distribution as a superior distribution for flood frequency extrapolation analysis was a trend in the 1980s, given its flexibility for fitting flood data. Since then, reliance on this approach has subsided, and from the available literature, no consensus was found on the use of the Wakeby distribution as the single most appropriate fit for flood frequency extrapolations in the United States. This is compounded by the fact that when extrapolating for such extreme frequency values, the validity of one distribution over another becomes even less meaningful. In effect, it was observed that with the data available from other streams, a number of other commonly suggested distributions (e.g., log-logistic distribution) could have been equal or better fits for various combinations of the limited available data, producing potentially significantly different flood frequency estimates. It was also noted that some of the data is also sensitive to low outliers (e.g., low flood values) potentially biasing extrapolated results in a non-conservative direction. These insights highlight the fact that the resulting frequency for such an extreme extrapolation is highly sensitive to many input parameters, such that any extrapolated flood frequency curve will have significant variability in their point estimate (which would be compounded by a large uncertainty range associated with it).

Part 3 - Total Estimated Change in CDF

Based on the above steps, the change in CDF estimates, varied in order of magnitude ranges between high E-7 (Green - a finding of very low safety significance) to low E-5 (Yellow - a finding of substantial safety significance).

For Case 1, the dominant sequences included failure to align city water and small RCP seal LOCAs caused by the loss of the running charging pumps following a loss of DC, the loss of SW leading to successful tripping of RCPs, and the failure to depressurize to less than 1720 psi leading to the increased chances of small seal LOCAs with the inability to use shutdown cooling and/or high-pressure recirculation due to loss of SW.

For Case 2, the dominant sequence was a LOOP with subsequent failures of the emergency power systems resulting in an unrecoverable SBO.

Sensitivity cases were performed that challenged the availability of city water and secondary side heat removal. This increased the change in CDF order of magnitude estimates from low E-6 (White - a finding of low to moderate safety significance) to mid E-5 (Yellow - a finding of substantial safety significance).

CENG's Risk Evaluation

CENG's evaluation of the CCDP associated with the specific Case 1 and Case 2 flooding scenarios was largely consistent with the NRC's analysis. Of note, differences in the Human Reliability Analysis value for the swapping of the charging pump suction from the VCT to the RWST would make CENG results lower than NRC estimates by a factor of 10.

CENG's evaluation focused on the flooding frequency. Although specified in its UFSAR as the method to estimate flooding probabilities to 273.8 feet, CENG staff stated that the bounding frequency based on the UFSAR method (UFSAR Lognormal Probability Plot) is overly conservative. As a result, CENG staff performed several different frequency estimates mainly focused on the manipulation of the Wakeby method described above. These variations are summarized below:

- CENG staff added an order of magnitude to the flood frequency with a revised estimated average annual peak flow (from 700 cfs to 450 cfs). This approach provides results with frequencies of 1.7E-6 and 7E-7 per year based on 18,000 cfs and 21,000 cfs floods, respectively.

- The next method used by CENG staff set out to further refine the regional creek flow data in order to estimate the Deer Creek peak flow rate. Using an antecedent rainfall condition (ARC) of II (typical soil conditions) this method resulted in an annual peak flow of 468 cfs. The original NRC data estimated the range between 350 and 700 cfs. The resulting frequencies were 2.9E-7 and 1.6E-7 per year based on 18,000 cfs and 21,000 cfs floods, respectively.

- Flooding calculations are highly sensitive to ARC. CENG staff further adjusted their calculations by taking the average of ARCII and ARCIII (wet or saturated). This resulted in a peak annual flow of 639 cfs and corresponding flood frequencies of 1.4E-6 and 6.2E-7 per year based on 18,000 cfs and 21,000 cfs floods, respectively.

- Lastly, CENG staff evaluated a combination approach using the Wakeby distribution for flood values up to 1E-4 per year and then using the probability paper approach to finish the projection. The difference between the original probability graphing approach used by the NRC and the one provided by CENG staff is that Ginna modified flow data and assumed a PMF frequency of 1E-7. This approach provides results of 1.4E-6 and 7.5E-7 per year based on 18,000 cfs and 21,000 cfs floods, respectively.

Discussion of Uncertainties in Flooding Analysis

As indicated previously, the August 19, 1983, letter explicitly stated the concern with potentially questionable results when extrapolating hydrologic phenomena into such low probabilities. The limitations of using limited historical data are still valid today based on available literature and recent interactions between NRC and other U.S. federal agencies at the jointly sponsored Workshop on Probabilistic Flood Hazard Assessment, held at the NRC Headquarters in Rockville, Maryland, between January 29 and January 31, 2013 (ML13277A074). For example, a report produced by the U.S. Department of the Interior, Bureau of Reclamation, titled "Hydrologic Hazard Curve Estimating Procedures," DSO-04-08 (2004), discusses a prescriptive procedure for generating hydrologic hazard curves for use in dam safety evaluations. It discusses the significant uncertainty and inconsistencies involved in analyses techniques used in developing hydrologic hazard curves for extreme events, as well as a suite of methods that are used to

address such issues with varying levels of data sources and modeling effort. It also presents typical and optimal credible limits depending on the availability of data, which is replicated below:

Type of data used for flood frequency analysis	Limit of credible extrapolation for annual exceedance probability	
	Typical	Optimal
At-site stream flow data	1 in 100	1 in 200
Regional stream flow data	1 in 500	1 in 1,000
At-site stream flow and at-site paleoflood data	1 in 4,000	1 in 10,000
Regional precipitation data	1 in 2,000	1 in 10,000
Regional stream flow and regional paleoflood data	1 in 15,000	1 in 40,000
Combinations of regional data sets and extrapolation	1 in 40,000	1 in 100,000

Furthermore, this report explicitly states that for gauged stream flow records that rarely exceed 100 years, “extrapolation beyond twice the length of record, or to about 1 in 200 annual exceedance probability, is generally not recommended (Interagency Advisory Committee on Water Data, 1982).” In addition, “for regional stream flow data the optimal limit of credible extrapolation is established at 1 in 1,000 annual exceedance probability by considering the number of stations in the region, lengths of record, and degree of independence of these data.”

The approach provided in the August 19, 1983, letter represented an initial attempt to perform a combination of regional stream flow data. Significant effort needs to be placed in the selection of additional stream gauge information with respect to its applicability at the site, and it is unclear whether this was attempted at the time. It is important to note that regionalization is usually used to complement at-site data, which is not available for Deer Creek. Hence, as in 1983, it is questionable whether an extrapolation based on currently available stream flow data for the given conditions at Ginna could, at best, be credibly extrapolated out to an annual exceedance probability of 1 in 1,000 year.

It should also be noted that the uncertainty bounds in the use of stream flow gauge data for frequency extrapolation of extreme events would be significantly wide. This is compounded by the fact that the data alone cannot capture additional uncertainty in the behavior of a watershed under such circumstances (i.e., the characteristics of a flood could be significantly altered for events in excess of a 1,000 year return period when compared to observed events within 100 years or so). In other words, the underlying physical behavior of the watershed could be grossly mischaracterized by such extrapolations.

Finally, the use of assumed dryer conditions is likely unrealistic. Because the amount of precipitation in an extreme weather event is usually considerably greater than even the most severe storms experienced in the region, and because relatively wet antecedent conditions are often assumed, the PMF runoff volume is often a high percentage of the water input, on the order of 75 percent or more.

IMC 0609 APPENDIX M, TABLE 4.1

Qualitative Decision-Making Attributes for NRC Management Review

A SERP held on January 28, 2014, made a preliminary determination that the finding was of low to moderate safety significance (White) based on the quantitative and qualitative evaluations. Additional considerations are listed below:

Decision Attribute	Applicable to Decision?	Basis for Input to Decision – Provide qualitative and/or quantitative information for management review and decision making.
1. Finding can be bounded using qualitative and/or quantitative information?	Yes.	The SRAs performed a bounding quantitative assessment using simple event and fault trees in Ginna's SPAR model and information from the NRC Risk Assessment Standardization Project Manual, Volume 2 (External Events). The bounding risk is Yellow. The uncertainty in the input assumptions contributed multiple orders of magnitude to the overall results and was varied to represent a range of potential values for flood frequency and likelihood of successful flood protection actions. The input assumptions were varied using NRC and CENG inputs. The results justify a greater than Green finding. The condition is defined by the sum of two different creek flow cases. • Case 1 is for floods between 18,000 cfs and 21,000 cfs that do not assume a LOOP occurs with 100% probability. It should be noted that this could be non-conservative, since an intense storm might challenge offsite power availability with respect to the nominal probabilities that were assigned. • Case 2 is for floods between 21,000 cfs and 26,000 cfs that result in a plant center LOOP proceeding to an unrecoverable SBO.
2. Defense-in-Depth affected?	Yes.	CENG failed to maintain adequate flood protection to ensure that the site could survive its design basis flood. The design basis flood equates to 26,000 cfs. This is about 65% of the PMF flow. The flooding associated with the performance deficiency occurs at flows as low as 18,000 cfs, 72% of the design, or 47% of the PMF. As a result of the missing flood seals, for floods greater than 18,000 cfs, all safety-related DC power would be lost on the site. CENG staff estimated that this would occur approximately 5 hours after entering ER-SC.2, High Water (Flood) Plan. The loss of DC results in the loss of all control room indication and control. As a result, the ability to rapidly cool down and depressurize to prevent RCP seal LOCAs is also lost. Recovery of this condition is not credited since the flood levels would preclude action.

		As flooding exceeds 21,000 cfs, offsite power would be lost. As a result of the loss of DC, the protected EDG would fail due to room overheating and/or fuel oil depletion. Either case is deemed non-recoverable due to the flooding impacts. This results in an unrecoverable SBO. The significant mitigation actions directly prescribed by ER-SC.2, High Water (Flood) Plan include: • Connect alternate cooling to the EDG • Install flood control flapper valves • Seal EDG doors • Seal battery room doors • Isolate 'B' EDG from screenhouse
3. Performance Deficiency effect on the Safety Margin maintained?	Yes	The bypass of the flood barrier reduced the safety margin in that the licensee cannot meet the safety analysis acceptance criteria in the licensing basis that requires flood protection up to a flood level corresponding to a Deer Creek stream flow of 26,000 cfs, due to the unsealed penetrations between manhole 1 and battery room 'B' and the identification of clogged manhole drains. This follows the discussion in Regulatory Guide 1.174 and other available NRC documents on discussions of safety margin.
4. The extent the performance deficiency affects other equipment.	Yes.	The performance deficiency would result in failures of redundant DC trains for floods that are well below the site design basis. This cascades into losses of the protected EDG during a LOOP (>21,000 cfs case) and all control room indication and control.
5. Degree of degradation of failed or unavailable component(s).	Yes.	The performance deficiency increases the potential for flood waters rendering safety equipment unavailable.
6. Period of time affect on the performance deficiency.	Yes.	Greater than 1 year. Specifically, Ginna changed its flooding design basis level from 253.5 feet to 273.8 feet in 1983, and did not identify until May 2013 that penetrations in a manhole located in the site transformer yard were below flood grade (at approximately 270 feet) and were required to be hydrostatically sealed. Additionally, CENG staff did not implement compensatory measures until September 17 2013, and did not correct the nonconformance until October 4, 2013.
7. The likelihood that the licensee's recovery actions would successfully mitigate the performance deficiency.	Yes.	Based on walkdowns and interviews with site personnel, the inspectors and SRA determined the recovery of the DC system and EDG was not credible. These spaces would be physically isolated due to the flooding. Station procedures did not pre-emptively station personnel in these areas to respond to or mitigate the event. In addition, water damage to electrical components or overheating of the EDG would make recovery highly unlikely even if access could be made.

8. Additional qualitative circumstances associated with the finding that regional management should consider in the evaluation process	Yes	Procedures list considerations for reducing load and aligning city water to the standby AFW system. The failure to have city water aligned for floods that are well within the licensing and design basis could result in core damage. Although the design basis flood conditions are known, procedures do not assist the operator with guidance that the following conditions would likely occur. Specifically: • The reactor would automatically trip on flooding in the turbine building or the screen house. • Instrument air would be lost. In addition portable diesel air compressors would also be flooded out. • Due to the loss of instrument air and SW, prompt action would be required to realign the charging pump suction from the VCT to the RWST to minimize the potential for an RCP seal LOCA. The lognormal probability plot method was incorporated by CENG into their UFSAR, Figure 2.4-3, and November 27, 2012, Fukushima Lessons-Learned Recommendation 2.3, Flooding Walkdown, 50.54(f) response. In their white paper, CENG staff stated that "CENG does not agree with assigning the PMF a probability of 1E-5 and, therefore, neither the original results nor the revised results are considered valid for providing a flood frequency value." However, CENG staff failed to address its adequacy related to their current licensing basis or changes they plan to make to address their disagreement in their official licensing documents. The PMF is a deterministic value that represents the flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in a particular drainage area. Therefore, the PMF frequency is often assumed. It is usually assumed that the value selected is conservative. Due to the high uncertainty of extrapolating frequencies in these ranges this is difficult to validate. Given that, the following are relatively certain: • The floods of concern would occur at a greater frequency than the PMF. • With the given performance deficiency it is likely that the core would have been challenged.

SUPPLEMENTARY INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

J. Pacher, Vice President, Ginna
M. Philippon, Plant General Manager
S. Doty, Manager, Maintenance
L. Edwards, General Supervisor, Chemistry
K. Garnish, General Supervisor, Operations Support
T. Harding, Director, Licensing
J. Jackson, Supervisor, Engineering
D. Markowski, General Supervisor, System Engineering
T. Mogren, Manager, Engineering Services
T. Paglia, Manager, Operations
J. Scalzo, Director, Emergency Preparedness
R. Sova, Acting General Supervisor, Radiation Protection
S. Wihlen, Manager, Integrated Work Management

LIST OF ITEMS OPENED, CLOSED, DISCUSSED, AND UPDATED

Open

05000244/2013005-01	AV	Failure to Identify and Correct Non-Hydrostatically Sealed Penetrations into Battery Room 'B' (Section 1R01)

Open/Closed

05000244/2013005-02	NCV	Programmatic Failure to Scope SSCs within the Maintenance Rule Monitoring Program (Section 1R12)
05000244/2013005-03	FIN	Failure to Modify or Establish a PM for the TDAFW DC Lube Oil Pump Switch (Section 1R12)

Closed

05000244/2013004-01	URI	Design Basis External Flooding and Unsealed Penetrations in the 'B' Battery Room (Section 1R01)
05000244/2013-003-00	LER	Unanalyzed Condition for Potential Floodwater Intrusion into Vital Battery Rooms (Section 4OA3)
05000244/2013-003-01	LER	Unanalyzed Condition for Potential Floodwater Intrusion into Vital Battery Rooms (Section 4OA3)

LIST OF DOCUMENTS REVIEWED

Section 1R01: Adverse Weather Protection

Procedures
CNG-CA-1.01-1000, Corrective Action Program, Revision 00902
CNG-OP-1.01-1002, Conduct of Operability Determinations/Functionality Assessments, Revision 00201
ER-SC.2, High Water Flood Plan, Revision 00802
ER-SH.1, Response to Loss of Screen House, Revision 00201
O-22, Cold Weather Walkdown Procedure, Revision 01000
O-22, Cold Weather Walkdown Procedure, Revision 01001

Drawings
33013-0014, 34.5 KV Ducts and Control Duct Plan and Profile, Revision K
33013-0025, Control Cable Manhole 1 Top, Bottom Slab, Side Walls and Details, Revision E
33013-0025, Control Cable Manhole 1 Top, Bottom Slab, Side Walls and Details, Revision F
33013-2681, Sump Pumps, Drains, and Sewage Pumps P&ID, Revision 13
D311-0004, Floor and Equipment Drains – Turbine Room Mezzanine Floor Elevation 271 feet 0 inches; Plumbing-Control Room Toilet Room Elevation 289 feet 6 inches, Revision 009

Condition Reports

CR-2009-001557	CR-2013-003407	CR-2013-005262	CR-2013-005470
CR-2013-005643	CR-2013-005919	CR-2013-005952	CR-2013-005972
CR-2013-006225			

Work Orders

WO C92024716	WO C92304679	WO C92428057	WO C92431691

Miscellaneous
ECP-13-000854, Battery Room to Manhole 1 Penetrations Flood Barrier, Revision 0000
Generic Safety Issue 156, Systematic Evaluation Program
Integrated Plant Safety Assessment Report (NUREG-0821)
LER 05000244/2013-003-00, Unanalyzed Condition for Potential Floodwater Intrusion into Vital Battery Rooms, November 15, 2013
LER 05000244/2013-003-01, Unanalyzed Condition for Potential Floodwater intrusion into Vital Battery Rooms, December 13, 2013
NRC Risk Assessment Standardization Project Manual
UFSAR
Walkdown Record Form, Penetrations from Manhole 1 to Battery Rooms, May 30, 2013

Section 1R04: Equipment Alignment

Procedures
STP-O-30.1, Safety Injection System Valve and Breaker Position Verification, Revision 00101
STP-O-30.11, Emergency Diesel Generator Pre-Startup Alignment, Revision 00501

Drawings
33013-1239, Diesel Generator 'B' P&ID, Revision 24, Sheet 2
33013-1250, Station Service Cooling Water Safety-Related P&ID, Revision 63, Sheet 1
33013-1262, Safety Injection and Accumulators P&ID, Revision 32, Sheet 1

Condition Reports
CR-2013-001772 CR-2013-006091

Section 1R05: Fire Protection

Procedures
FRP-14.0, Intermediate Building Clean Side Top Floor, Revision 00902
FRP-17.0, Battery Room 'A', Revision 00701
FRP-20.0, Control Room, Revision 00800
FRP-24.0, Diesel Generator Room 'A' and Vault, Revision 00500

Drawings
21488-0102, Battery Room 'B' West Wall Elevation Penetration Locations Floor Elevation 253 feet 6 inches, Revision 11, Sheet 2
21488-0103, Battery Room 'A' North Wall Section A-A Penetration Locations Floor Elevation 253 feet 6 inches, Revision 7, Sheet 1
21488-0103, Battery Room 'A' West Wall Elevation Penetration Locations Floor Elevation 253 feet 6 inches, Revision 8, Sheet 2
21488-0110, Fire Barrier General Arrangement Sheet Diesel Generator 'A' Room Vault East and North Walls Penetration Locations Floor Elevation 244 feet 0 inches, Revision 5
21488-0120, Fire Barrier General Arrangement Sheet Intermediate Building – Clean Side Stair Tower and North Wall Penetration Locations Floor Elevation 298 feet 4 inches and 315 feet 4 inches, Revision 5, Sheet 9
21488-0120, Fire Barrier General Arrangement Sheet Intermediate Building Clean Side Partial Elevation West Wall Penetration and Pyrocrete Locations Floor Elevation 315 feet 4 inches, Revision 1, Sheet 13
33013-2121, Plant Arrangement Intermediate Building Plans – Elevation 293 feet 0 inches, 298 feet 4 inches, and 315 feet 4 inches, Revision 002
33013-2557, Fire Response Plan Intermediate Building Plans – Elevation 293 feet 0 inches, 298 feet 4 inches, and 315 feet 4 inches, Revision 003
33013-2559, Fire Response Plan Control Building Plan Views, Revision 013

Condition Reports
CR-2013-006016 CR-2013-006062 CR-2013-006085

Work Order
WO C91329339

Miscellaneous
DA-ME-98-004, Combustible Loading Analysis, Revision 11
Plant Change Record 2006-0031, Control Room Enhancements, Revision 0
R.E. Ginna Fire Protection Program, Revision 8.0

Section 1R07: Heat Sink Performance

Condition Reports

CR-2009-006875	CR-2010-007127	CR-2011-002020	CR-2011-005973
CR-2011-006287	CR-2011-007941	CR-2013-001775	CR-2013-004886
CR-2013-006538	CR-2013-006590	CR-2013-006685	CR-2013-006718

Work Orders

WO C91250416	WO C92131006

Miscellaneous

AI-2012-000771-001
Generic Letter 89-13, Service Water System Problems Affecting Safety-Related Equipment, July 18, 1989
LR-LEAC-PROGPLAN, Selective Leaching of Materials Program, Revision 3
LR-SWS-PROGPLAN, SW System Program, Revision 3
SW System Reliability Optimization Program, Revision 12

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

Procedures

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STP-O-13.4.33, Station Halon Systems Bottle Weighing and S08 (Relay Room and Computer Room) Air Flow Test, Revision 00200

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STP-O-2.7.1A, Loop 'A' Service Water Pump Test, Revision 01201
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RP-SUR-POST, Radiological Postings and Boundary Control, Revision 01300
RP-SUR-RADIATION, Performance of Radiological Surveys, Revision 01000

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CR-2013-004729 CR-2013-005644 CR-2013-006519

Miscellaneous
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RP-SUR-POST, Radiological Postings and Boundary Control, Revision 01300
RP-SUR-RADIATION, Performance of Radiological Surveys, Revision 01000

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CR-2013-004729 CR-2013-005644 CR-2013-006519

Miscellaneous
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CNG-RP-1.01-3001, Alpha Monitoring and Control, Revision 00000
RP-2803, Determining External Exposure Control Levels, Revision 00101
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RP-SUR-POST, Radiological Postings and Boundary Control, Revision 01300
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Section 2RS4: Occupational Dose Assessment

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RP-2803, Determining External Exposure Control Levels, Revision 00101
RP-ALA-Plan/RWP-Prep, Radiation Work Permit, Revision 00500
RP-SUR-POST, Radiological Postings and Boundary Control, Revision 01300
RP-SUR-RADIATION, Performance of Radiological Surveys, Revision 01000

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RP-ALA-Plan/RWP-Prep, Radiation Work Permit, Revision 00500
RP-SUR-POST, Radiological Postings and Boundary Control, Revision 01300
RP-SUR-RADIATION, Performance of Radiological Surveys, Revision 01000

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CH-701, Liquid Waste Continuous Release, Revision 00400
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CHA-RETS-VARIATION, Identification of Items Reportable in the Annual Radioactive Effluent Report of the Annual Radiological Environmental Operating Report, Revision 00700
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IP-RPP-8, 10 CFR 50.75(g) Record Keeping, Revision 00100
P9, Radiation Monitoring System, Revision 09809
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A-601.10, Time Critical Action Management Program, Revision 00300
CNG-CA-1.01-1000, Corrective Action Program, Revision 00902
CNG-OP-1.01-2010, Operator Workaround/Challenge Control, Revision 00000
CNG-QL-1.01-1008, Periodic QPA Performance Reporting Process, Revision 00500

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CR-2007-006081	CR-2010-003240	CR-2011-002518	CR-2011-005345
CR-2011-005418	CR-2011-007120	CR-2011-007867	CR-2012-001084
CR-2012-002825	CR-2012-003811	CR-2012-006184	CR-2012-006501
CR-2012-006530	CR-2012-007021	CR-2012-007027	CR-2012-007068
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CA-2010-000599
CA-2012-000598
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Section 4OA3: Follow-up of Events and Notices of Enforcement Discretion

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LER 05000244/2013-003-00, Unanalyzed Condition for Potential Floodwater Intrusion into Vital Battery Rooms, November 15, 2013
LER 05000244/2013-003-01, Unanalyzed Condition for Potential Floodwater Intrusion into Vital Battery Rooms, December 13, 2013

LIST OF ACRONYMS

10 CFR	Title 10 of the *Code of Federal Regulations*
AC	alternating current
ACE	apparent cause evaluation
ADAMS	Agencywide Documents Access and Management System
AFW	auxiliary feedwater
ALARA	as low as reasonably achievable
AOV	air-operated valve
ARC	antecedent rainfall condition
CAP	corrective action program
CCDP	conditional core damage probability
CDF	core damage frequency
CENG	Constellation Energy Nuclear Group, LLC
cfs	cubic feet per second
CR	condition report
CVCS	chemical and volume control system
DC	direct current
DRE	detailed risk evaluation
ECP	engineering change package
EDG	emergency diesel generator
EOP	emergency operating procedure
FIN	finding
GPI	groundwater protection initiative
gpm	gallons per minute
HX	heat exchanger
IMC	Inspection Manual Chapter
IPSAR	Integrated Plant Safety Assessment Report
LCV	level control valve
LER	licensee event report
LERF	large early release frequency
LOCA	loss-of-coolant accident
LOOP	loss of offsite power
NEI	Nuclear Energy Institute
NCV	non-cited violation
NRC	Nuclear Regulatory Commission
ODCM	offsite dose calculation manual
OOS	out of service
P&ID	piping and instrument drawing
PI	performance indicator
PM	preventive maintenance
PMF	probable maximum flood
RCA	radiological controlled area
RCDT	reactor coolant drain tank
RCP	reactor coolant pump
RCS	reactor coolant system
RG	regulatory guide
RHR	residual heat removal
RWP	radiation work permit
RWST	refueling water storage tank

SBO	station blackout
SDP	significance determination process
SEP	Systematic Evaluation Program
SERP	significance and enforcement review panel
SFP	spent fuel pool
SI	safety injection
SPAR	standardized plant analysis risk
SRA	senior reactor analyst
SSC	structure, system, and component
SW	service water
TDAFW	turbine-driven auxiliary feedwater
TS	technical specification
UFSAR	Updated Final Safety Analysis Report
URI	unresolved item
VCT	volume control tank
WO	work order