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

August 13, 2013

Mr. Christopher Costanzo, Vice President
Nine Mile Point Nuclear Station
Constellation Energy Nuclear Group, LLC
P.O. Box 63
Lycoming, NY 13093

SUBJECT: NINE MILE POINT NUCLEAR STATION - NRC INTEGRATED INSPECTION REPORT 05000220/2013003 AND 05000410/2013003

Dear Mr. Costanzo:

On June 30, 2013, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Nine Mile Point Nuclear Station (NMPNS) Units 1 and 2. The enclosed inspection report documents the inspection results, which were discussed on July 25, 2013, with you and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

This report documents one self-revealing apparent violation concerning the improper restoration of a direct current electrical bus which resulted in a loss of all shutdown cooling. The safety significance of the violation is still under review pending the outcome of a Phase III risk analysis by NRC Senior Reactor Analysts. However, the violation does not represent an immediate safety concern because Constellation has conducted a prompt human performance event review, entered the issue into their corrective action program (CAP), and conducted a root cause analysis. Additionally, corrective actions including a review of all emergency, off-normal, and normal system operating procedures are in progress. This violation with the supporting circumstances and details is documented in this inspection report.

This report documents two NRC-identified findings and two self-revealing findings of very low safety significance (Green). These findings were determined to involve violations of NRC requirements. However, because of the very low safety significance, and because they are entered into your CAP, the NRC is treating these findings as non-cited violations (NCVs) consistent with Section 2.3.2 of the NRC Enforcement Policy. If you contest any NCVs in this report, you should provide a response within 30 days of the date of this inspection report with the basis of your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington D.C. 20555-0001; with copies to the Regional Administrator, Region I; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Resident Inspector at NMPNS. In addition, if you disagree with the

cross-cutting aspect assigned to any finding 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 NMPNS.

In accordance with Title 10 of the *Code of Federal Regulations* 2.390 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 Public Document Room or from the Publicly Available Records component of the NRC's Agencywide Documents Access 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/

Daniel L. Schroeder, Chief
Reactor Projects Branch 1
Division of Reactor Projects

Docket Nos: 50-220 and 50-410
License Nos: DPR-63 and NPF-69

Enclosure: Inspection Report 05000220/2013003 and 05000410/2013003
w/Attachment: Supplementary Information

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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket Nos:	50-220 and 50-410
License Nos:	DPR-63 and NPF-69
Report No:	05000220/2013003 and 05000410/2013003
Licensee:	Constellation Energy Nuclear Group, LLC (CENG)
Facility:	Nine Mile Point Nuclear Station, Units 1 and 2
Location:	Oswego, NY
Dates:	April 1, 2013 through June 30, 2013
Inspectors:	K. Kolaczyk, Senior Resident Inspector E. Miller, Resident Inspector B. Dionne, Health Physicist B. Haagensen, Resident Inspector P. Kaufman, Senior Reactor Inspector J. Krafty, Resident Inspector J. Laughlin, Emergency Preparedness Inspector J. Lilliendahl, Reactor Inspector A. Rosebrook, Senior Project Engineer B. Scrabeck, Project Engineer
Approved by:	Daniel L. Schroeder, Chief Reactor Projects Branch 1 Division of Reactor Projects

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SUMMARY

IR 05000220/2013003, 05000410/2013003; 04/01/2013 - 06/30/2013; Nine Mile Point Nuclear Station (NMPNS) Units 1 and 2; Surveillance Testing, Problem Identification and Resolution, Follow-Up of Events and Notices of Enforcement Discretion.

This report covered a 3-month period of inspection by resident inspectors and announced inspections performed by regional inspectors. One apparent violation was identified. The safety significance of this violation is still under review pending the outcome of a Phase III risk analysis by NRC Senior Reactor Analysts. Additionally, two NRC-identified findings and two self-revealing findings of very low safety significance (Green) were identified, all of which were non-cited violations (NCVs). 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 January 28, 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: Initiating Events

- TBD. A self-revealing apparent violation of Technical Specification (TS) 6.4.1, "Procedures," was identified at Unit 1 because CENG failed to properly recover from a loss of a vital direct current (DC) bus in accordance with station off-normal procedures resulting in an unplanned loss of all shutdown cooling (SDC) when time to boil was less than 2 hours. Specifically, during the restoration from the loss of battery bus 12, operators failed to identify a SDC trip signal before attempting restoration of the DC bus, which ultimately lead to a SDC pump trip (i.e. loss of decay heat removal from the reactor). Corrective actions included conducting a prompt human performance event review, entering the issue into their corrective action program (CAP), and conducting a root cause analysis. Planned corrective actions include a review of all emergency, off-normal, and normal system operating procedures.

  The inspectors determined that CENG's failure to properly restore battery bus 12 in accordance with N1-SOP-47A.1, "Loss of DC," Revision 00101, and N1-OP-47A, "125 VDC Power System," Revision 02500, was a performance deficiency that was reasonably within CENG's ability to foresee and correct and should have been prevented. The performance deficiency was determined to be more than minor because the inspectors determined it affected the configuration control aspect of the Initiating Events cornerstone and adversely affected the associated cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. The significance of the finding is designated as To Be Determined (TBD) until a Phase 3 analysis can be completed by the NRC's Senior Reactor Analysts. The inspectors determined this finding has a cross-cutting aspect in the area of Human Performance, Resources, because CENG did not ensure that personnel, equipment, procedures, and other resources were available and adequate to assure nuclear safety - complete, accurate

and up-to-date design documentation, procedures, work packages, and correct labeling of components. Specifically, CENG procedures N1-SOP-47A.1 and N1-OP-47A did not contain adequate guidance to ensure recovery from a loss of a DC bus would not result in an unexpected plant transient [H.2(c)]. (Section 4OA3)

Cornerstone: Mitigating Systems

- Green. A self-revealing NCV of TS 5.4.1, "Procedures," was identified at Unit 2 when a CENG instrumentation and control (I&C) technician did not properly implement procedure N2-ISP-LDS-Q010, "Reactor Building General Area Temperature Instrument Channel Functional Test," Revision 00102. As a result, a residual heat removal (RHR)/reactor core isolation cooling (RCIC) isolation bypass switch was inadvertently left in the NORMAL position during surveillance testing resulting in an unplanned RCIC isolation. CENG entered this issue into their CAP as CR-2013-002461. Other corrective actions included performing a human performance stand down that reinforced use of human performance tools and the need to identify and mark critical steps during pre-job briefs, retraining the I&C technicians involved in the event on proper use of human performance error prevention techniques, and improving bypass switch verification steps for procedure N2-ISP-LDS-Q010 and other similar lead detection system surveillances procedures.

  This finding is more than minor because it is associated with the human 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 (i.e., core damage). Specifically, the inadvertent isolation rendered the RCIC system inoperable and unable to perform its function for approximately 6 hours. Additionally, this finding is similar to example 4.b of IMC 0612, Appendix E, "Examples of Minor issues," and is more than minor due to the procedural error leading to a plant transient, i.e. an unplanned RCIC isolation. This finding was evaluated 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," issued June 19, 2012. Unit 2 is a boiling-water reactor (BWR)-5, and as a result, RCIC is treated as having a separate high-pressure injection safety function. A detailed analysis was conducted using SAPHIRE version 8.0.8.0 and Unit 2 SPAR model 8.17. Using an exposure period of 6 hours and conservatively assuming no recovery of the failed equipment, this finding had a change in core damage frequency of low E-8. The dominant accident sequence was a grid-related loss of offsite power with a failure of Division III power and the failure to recover offsite power and the emergency diesel generators (EDGs) in 30 minutes. Since the change in core damage frequency was less than 1E-7, contributions from large early release and external event did not need to be considered. Therefore, this finding was of very low safety significance (Green). This finding has a cross-cutting aspect in the area of Human Performance, Work Practices, because the I&C technicians did not effectively employ self-checking and place-keeping when implementing the test procedure which directly contributed to the resulting procedural error [H.4(a)]. (Section 1R22)

- Green. The inspectors identified an NCV at Unit 2 of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," because CENG did not assure that the replacement of cells in battery 2C were prescribed and performed by appropriate procedures which resulted in degraded accuracy

of test results and potential degradation of safety-related battery cells. In response to this issue, CENG generated CR-2013-005235 and initiated actions to evaluate replacing the new cells.

This finding is more than minor because it was 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. 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," issued June 19, 2012, the inspectors determined this finding is of very low safety significance (Green) because the performance deficiency was not a design or qualification deficiency, did not involve an actual loss of safety function, did not represent actual loss of a safety function of a single train for greater than its TS allowed outage time, and did not screen as potentially risk-significant due to a seismic, flooding, or severe weather initiating event. This finding has a cross-cutting aspect in the area of Human Performance, Decision-Making component, because CENG did not use conservative assumptions in decision making. Specifically, CENG did not monitor the cells in storage, question the adequacy of the discharged cells, charge the cells prior to installation, or fully evaluate the implications of the test and recharge results [H.1(b)]. (Section 4OA2)

- Green. The inspectors identified an NCV at Unit 2 of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," because CENG did not verify the adequacy of the design with respect to battery 2C. Specifically, by failing to size the battery to the most limiting time period, the sizing calculation significantly overstated the available design margin. CENG's corrective actions included generating condition report CR-2013-005117 and evaluating the condition for operability.

  This finding is more than minor because it was associated with the design control 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. 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," issued June 19, 2012, the inspectors determined this finding is of very low safety significance (Green) because the performance deficiency was not a design or qualification deficiency, did not involve an actual loss of safety function, did not represent actual loss of a safety function of a single train for greater than its TS allowed outage time, and did not screen as potentially risk-significant due to a seismic, flooding, or severe weather initiating event. The inspectors did not assign a cross-cutting aspect because the finding was not indicative of current performance. (Section 4OA2)

Cornerstone: Barrier Integrity

- Green. A self-revealing NCV of TS 3.3.3, "Leakage Rate," was identified for CENG's failure from December 3 to December 13, 2012, to maintain containment leakage less than 1.5 percent by weight of the containment air per day and less than 0.6 percent by weight of the containment air per day for all penetrations and all primary containment isolation valves subject to 10 CFR Part 50, Appendix J, Types 'B' and 'C' tests, when pressurized to

35 pound per square inch gauge when reactor coolant system (RCS) temperature is above 215°F and primary containment integrity is required. CENG entered this issue into their CAP as CR-2012-011247. Corrective actions included cleaning iron oxide from the primary containment vent and purge valve and replacing the resilient seals.

This finding is more than minor because it is associated with the structure, system, component (SSC), and barrier performance attribute of the Barrier Integrity cornerstone and affected the cornerstone objective to provide reasonable assurance that physical design barriers (fuel cladding, reactor coolant system, and containment) protect the public from radionuclide releases caused by accidents or events. Specifically, containment leakage exceeded the leakage limits outlined in the Unit 1 TS 3.3.3 from December 3 to December 13, 2012. This finding was evaluated in accordance with IMC 0609.04, "Initial Characterization of Findings," and Table 6.2, "Phase 2 Risk Significance-Type B Findings at Full Power," of IMC 0609, Appendix H, "Containment Integrity Significance Determination Process," issued May 6, 2004. The inspectors determined this finding was of very low safety significance (Green) because the leakage was less than 100 percent of containment volume per day for the duration of the leak. This finding has a cross-cutting aspect in the area of Problem Identification and Resolution, CAP, because CENG failed to take appropriate corrective action to address safety issues and adverse trends in a timely manner commensurate with their safety significance. Specifically, following identification of the adverse trend regarding the frequency of nitrogen addition to the drywell, CENG did not assess in a timely manner the significance of the leakage and the impact on primary plant containment [P.1(d)]. (Section 4OA3)

REPORT DETAILS

Summary of Plant Status

Unit 1 began the inspection period at 100 percent power. On April 14, 2013, Unit 1 reduced power to 32 percent to conduct emergency condenser testing and to down power for refueling outage (N1R22). On April 15, Unit 1 was removed from the grid to commence N1R22. Unit 1 returned to service and synchronized to the grid on May 15. On June 21, Unit 1 down powered to 83 percent to perform a rod pattern adjustment, turbine stop valve replacement, and a reactor recirculation pump swap. Unit 1 returned to rated power on June 22 and remained at or near full power for the remainder of the inspection period.

Unit 2 began the inspection period at 100 percent power. On May 28, Unit 2 down powered to 65 percent to investigate diverging feedwater flows between two operating feedwater pumps. Following identification of a degraded automatic feedwater regulating valve and removal of the 'B' feedwater pump from service, Unit 2 returned to 100 percent on May 31, and remained at or near full power for the remainder of the inspection period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01 – 2 samples)

.1 Readiness for Seasonal Extreme Weather Conditions

a. Inspection Scope

The inspectors performed a review of CENG's readiness for the onset of seasonal high temperatures. The review focused on Unit 1 fire protection and diesel fire pump, technical support center ventilation, control room and reactor building (RB) air conditioning systems, and Unit 2 service water and heating, ventilation, and air conditioning systems. The inspectors reviewed the Updated Final Safety Analysis Report (UFSAR), TSs, 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 readiness procedure and applicable operating procedures. The inspectors performed walkdowns of the selected systems to ensure station personnel identified issues that could challenge the operability of the systems during hot weather conditions. Documents reviewed for each section of this inspection report are listed in the Attachment.

b. Findings

No findings were identified.

.2 Summer Readiness of Offsite and Alternate Alternating Current (AC) Power Systems

a. Inspection Scope

The inspectors performed a review of plant features and procedures for the operation and continued availability of the offsite and alternate AC power system to evaluate readiness of the systems prior to seasonal high grid loading. The inspectors reviewed changes to CENG's procedures affecting these areas and the communications protocols between the transmission system operator and CENG implemented since the previous sample in 2012. This review focused on changes to the established program and material condition of the offsite and alternate AC power equipment. The inspectors assessed whether CENG established and implemented appropriate procedures and protocols to monitor and maintain availability and reliability of both the offsite ac power system and the onsite alternate AC power system. The inspectors evaluated the material condition of the associated equipment by interviewing the season readiness coordinator, reviewing condition reports and open work orders and walking down portions of the offsite and AC power systems including the 345 kilovolt (kV) and 115 kV switchyards.

b. Findings

No findings were identified.

1R04 Equipment Alignment

Partial System Walkdown (71111.04Q – 5 samples)

a. Inspection Scope

The inspectors performed partial walkdowns of the following systems:

- Unit 1, Spent fuel pool (SFP) cooling system during the conduct of refueling maintenance related activities on April 15, 2013
- Unit 1, Core sprays 112 and 122 following the completion of surveillance activities on April 21, 2013
- Unit 1, Isolation condenser loop 12 following the completion of maintenance activities on May 15, 2013
- Unit 1, Diesel and electric fire pumps while the maintenance fire pump was operating with a degraded discharge relief valve on May 22, 2013
- Unit 1, Control room emergency ventilation system following the completion of maintenance activities on May 30, 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, work orders, condition reports, 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 – 6 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 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, degraded, or inoperable fire protection equipment, as applicable, in accordance with procedures.

- Unit 1, Drywell (FA3/R1) on April 16, 2013
- Unit 1, RB elevation 340 feet (FA1/R6A and FA2/R6B) on April 19, 2013
- Unit 1, RB elevation 198 feet southwest (FA2/R1B) on April 21, 2013
- Unit 1, RB elevation 237 feet east (FA1/R1A) on April 21, 2013
- Unit 1, RB elevation 237 feet west (FA2/R1B) on April 21, 2013
- Unit 1, Power board 12 (FA-17A) on April 26, 2013

b. Findings

No findings were identified.

1R07 Heat Sink Performance (71111.07 – 2 samples)

a. Inspection Scope

The inspectors reviewed the samples listed below 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 discussed the results of the most recent inspection with engineering staff and reviewed pictures of the as-found and as-left conditions. The inspectors verified that CENG initiated appropriate corrective actions for identified deficiencies.

- Unit 1, Emergency diesel generator (EDG) 103 raw water heat exchanger on May 3, 2013
- Unit 2, 2HVY*UC2A service water pump bay 'A' unit cooler on May 7, 2013

1R08 Inservice Inspection Activities (71111.08 – 1 sample)

a. Inspection Scope

From April 15 to 18, 2013, the inspectors conducted a review of CENG's implementation of inservice inspection (ISI) program activities for monitoring degradation of the RCS boundary and risk-significant piping system boundaries for Unit 1 during the N1R22. The sample selection was based on the inspection procedure objectives and risk priority of those components and systems where degradation would result in a significant increase in risk of core damage. The inspectors observed in-process nondestructive examinations (NDEs), reviewed documentation, and interviewed CENG personnel to verify that the NDE activities performed were conducted in accordance with the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, 2004 Edition.

NDE Activities and Welding Activities

The inspectors performed direct observations of NDE activities in process and reviewed records of NDEs listed below:

ASME Code Required Examinations

- Remote visual examination (VT-3) of reactor vessel nozzle N16-1-N3A and manual ultrasonic testing (UT) examination of three 12-inch diameter emergency condenser supply piping welds.
- Data records of manual UT phased array examination of five 28-inch diameter reactor vessel nozzle-to-vessel dissimilar metal safe end-to-nozzle welds (32-WD-042, N2A; 32-WD-082, N2B; 32-WD-122, N2C; 32-WD-164, N2D; 32-WD-208, N2E), manual UT of four 12-inch diameter emergency condenser supply piping welds, dye penetrant testing and UT of branch connection-decontamination port welds on the recirculation system suction piping, and UT thickness readings of various diameter RB closed loop cooling system piping located at elevation 225 foot in the drywell.

The inspectors reviewed certifications of the NDE technician, process, and equipment in identifying the condition or degradation of risk-significant SSCs and evaluated the activities for compliance with the requirements of Unit 1's risk informed ISI program, ASME Boiler and Pressure Vessel Code, Section XI, and 10 CFR 50.55a.

Augmented or Industry Imitative Examinations

Based on industry operating experience, the inspectors reviewed NDE data records of the recirculation system suction piping decontamination port branch connection welds to verify that the activities were performed in accordance with applicable examination procedures and industry guidance.

Modification/Repair/Replacement Consisting of Welding Activities

The inspectors reviewed the following welding activities to verify specifications and control of the welding processes, weld procedures, welder qualifications, and NDE examinations were in accordance with ASME code requirements.

The repair and replacement of reactor water cleanup (RWCU) dissimilar metal pipe weld 33-WD-046 was reviewed. The inspectors reviewed the associated flaw evaluation, NDE data records, and repair/replacement WO package.

During manual phased array UT of a 6-inch diameter schedule 80 stainless steel pipe to carbon steel RWCU pipe dissimilar metal weld, a 4.25-inch long circumferential flaw indication was detected in the heat-affected zone of the stainless steel side of the weld. The indication did not meet ASME Code, Section XI 2004, IWB-3514-2 acceptance criteria so a flaw evaluation was required. The flaw evaluation concluded that sufficient structural margin was demonstrated for the as-found flaw indication.

However, a review of construction radiographs by CENG indicated that there had been two previous weld repairs directly adjacent to this indication. CENG determined that the residual stresses of the weld were likely to be high due to the prior weld repairs and the crack growth rate would be high enough to possibly propagate the flaw beyond the ASME code limit of through-thickness. Based on this information, CENG replaced the weld and adjacent pipe by installing a new spool piece.

The inspectors verified the welding activities and applicable NDE techniques were performed in accordance with ASME Code requirements.

Re-examination of an Indication Previously Accepted for Service After Analysis

There were no samples available for review during this inspection that involved examinations with recordable indications that have been accepted for continued service from the previous Unit 1 outage through the current outage.

Drywell Visual Examination

The inspectors examined the condition of Unit 1 drywell liner surface at various elevation levels inside the drywell. During the inspection, surface corrosion was noted on the drywell liner and on several systems including the RB closed-cooling water system. CENG was monitoring the condition of the liner and RB closed-cooling water system to ensure the corrosion was not impacting system or component operability.

Identification and Resolution of Problems

The inspectors reviewed a sample of condition reports which involved ISI-related activities to confirm that non-conformances were being properly identified, reported, and resolved.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program and Licensed Operator Performance (71111.11Q – 4 samples)

.1 Quarterly Review of Licensed Operator Requalification Testing and Training (2 samples)

a. Inspection Scope

The inspectors observed:

- Unit 1, Licensed operator simulator training which included a loss of condenser vacuum, a stuck open electro-matic relief valve (ERV), and an anticipated transient without scram on April 2, 2013
- Unit 2, Licensed operator performance during a simulator training scenario that included high temperatures on the main transformer, degraded service water, and a loss of the offsite electrical grid on May 23, 2013

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. 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 classifications made by the shift manager and the TS action statements entered by the shift technical advisor. 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 (2 samples)

a. Inspection Scope

The inspectors observed:

- Unit 2, Control room operations during a period of increased site activity due to a failure of an on-site power loop that supplied electrical power to several non-essential buildings within the protected area as well as several plant information technology systems on April 9, 2013
- Unit 1, Control room operations during a plant shutdown to commence planned refueling outage N1R22 on April 14, 2013

The inspectors reviewed CNG-OP-1.01-1000, “Conduct of Operations,” Revision 00900, and verified that procedure use, crew communications, and coordination of plant activities among work groups similarly met established expectations and standards. Additionally, the inspectors observed test 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.

1R12 Maintenance Effectiveness (71111.12Q – 4 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 work orders, and maintenance rule basis documents to ensure that CENG 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 was 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.

- Unit 1, Neutron monitoring on May 14, 2013
- Unit 2, High-pressure core spray (HPCS) on May 14, 2013
- Unit 1, Service water on May 16, 2013
- Unit 1, Containment spray on May 17, 2013

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 – 8 samples)

a. Inspection Scope

The inspectors reviewed station evaluation and management of plant risk for the maintenance and emergent work activities listed below to verify that CENG 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 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.

- Unit 2, Unplanned elevated risk condition that resulted from an inadvertent isolation of the RCIC system on April 2, 2013
- Unit 2, Loss of maintenance supply power to 2VBB*UPS3B on April 5, 2013
- Unit 1, Power boards 102 and 16 following electrical realignment on May 1, 2013
- Unit 1, Planned maintenance on pressure safety valve 201.970, emergency condenser vent isolation IV-05-03, and emergency condenser 112 HX HTX-60-44 on May 2, 2013
- Unit 2, Planned maintenance on the Division I control room air conditioning system on May 13, 2013
- Unit 1, Unplanned maintenance on the turbine bypass valve control system on May 14, 2013
- Unit 1, Planned maintenance on the 102 EDG raw water pump on May 23, 2013
- Unit 2, Unplanned maintenance on the 2SWP*P1B service water pump on June 11, 2013

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15 – 9 samples)

a. Inspection Scope

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

- Unit 1, Acceptance criteria associated with N1-ST-C5, secondary containment, and RB emergency ventilation system operability testing on April 13, 2013
- Unit 1, Emergency service water 11 pump (72-04) trip during surveillance testing on April 17, 2013
- Unit 1, Damaged containment spray nozzle deflectors on May 3, 2013
- Unit 1, Source range monitors due to under-vessel work on May 3, 2013
- Unit 1, Steam leakage from vent valve 05-11 on May 19, 2013
- Unit 2, RCIC high-energy line break barrier door on May 20, 2013
- Unit 1, Core spray topping pump 122 bearing cooling water flow on June 11, 2013
- Unit 2, Elevated drywell floor drain leakage on June 11, 2013
- Unit 1, Elevated drywell floor drain leakage on June 25, 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. The inspectors determined, where appropriate, compliance with bounding limitations associated with the evaluations.

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18 – 3 samples)

.1 Temporary Modifications (1 sample)

a. Inspection Scope

The inspectors reviewed a temporary change to ventilation damper 2HVP*AOD5A which supplies outside air to the Division III diesel generator room. The inspectors reviewed 10 CFR 50.59 documentation and conducted a field walkdown of the modification to verify that the temporary modification did not degrade the design bases, licensing bases, and performance capability of the affected systems.

b. Findings

No findings were identified.

.2 Permanent Modifications (2 samples)

a. Inspection Scope

The inspectors evaluated the following modifications:

- Engineering Change Package (ECP) 12-00616 – Installation of a damper for Unit 1 downstream of BV-210-25
- ECP 13-000167 – Installation of replacement pump for Unit 1 service water radiation monitor

The inspectors verified that the design bases, licensing bases, and performance capability of the affected system was not degraded by the modifications. In addition, the inspectors reviewed modification documents associated with the upgrade and design change including the post-installation test procedure, the 10 CFR 50.59 screening form, and the operational impact assessment form.

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19 – 5 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 was 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.

- Unit 1, Control room ventilation/smoke purge system test following installation of fire damper BV-21-036 on April 3, 2013
- Unit 1, Power board 102 following National Fire Protection Act 805 modification on April 28, 2013
- Unit 1, Isolation valve IV-39-10R following control circuit stop relay replacement on May 9, 2013
- Unit 1, Replacement of excess flow check valve CKV-32-138 on May 10, 2013
- Unit 1, IV-29-07R diagnostic testing following body-to-bonnet seal replacement on May 23, 2013

b. Findings

No findings were identified.

1R20 Refueling and Other Outage Activities (71111.20 – 1 sample)

a. Inspection Scope

The inspectors reviewed the station's work schedule and outage risk plan for the Unit 1 maintenance and refueling outage (N1R22) which was conducted April 14 through May 15, 2013. The inspectors reviewed CENG's development and implementation of outage plans and schedules to verify that risk, industry experience, previous site-specific problems, and defense-in-depth were considered. During the outage, the inspectors observed portions of the shutdown and cooldown processes and monitored controls associated with the following outage activities:

- Configuration management, including maintenance of defense-in-depth, commensurate with the outage plan for the key safety functions and compliance with the applicable TSs when taking equipment out of service
- Implementation of clearance activities and confirmation that tags were properly hung and that equipment was appropriately configured to safely support the associated work or testing
- Installation and configuration of reactor coolant pressure, level, and temperature instruments to provide accurate indication and instrument error accounting
- Status and configuration of electrical systems and switchyard activities to ensure that TSs were met
- Monitoring of decay heat removal operations
- Impact of outage work on the ability of the operators to operate the SFP cooling system
- Reactor water inventory controls, including flow paths, configurations, alternative means for inventory additions, and controls to prevent inventory loss
- Activities that could affect reactivity
- Maintenance of secondary containment as required by TSs
- Refueling activities
- Fatigue management

- Tracking of startup prerequisites, walkdown of the drywell (primary containment) to verify that debris had not been left which could block the emergency core cooling system suction strainers, and startup and ascension to full power
- Identification and resolution of problems related to refueling activities

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22 – 8 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:

- N1-ST-Q3, Unit 1, High-Pressure Coolant Injection Pump and Check Valve Operability Test for Train 12 on April 1, 2013
- N1-ST-C5, Unit 1, Secondary Containment and Reactor Building Emergency Ventilation System Operability Test for Loop 11 on April 8, 2013
- N1-ISP-LRT-TYC, Unit 1, Local Leak Rate Test for Valves IV-201-09 and IV-201-10 on April 9, 2013
- N2-ISP-LDS-Q010, Unit 2, Reactor Building General Area Temperature Instrument Channel Functional Test on April 18, 2013
- Unit 2, RCS Leakage Determination Surveillance and Calculations on April 24, 2013
- N2-CSP-GEN-D100, Unit 2, Reactor Water/Auxiliary Water Chemistry Surveillance on April 24, 2013
- N1-TSP-201-001, Unit 1, Integrated Leak Rate Test of Primary Containment Type 'A' Test on May 8, 2013
- N1-ST-Q15, Unit 1, Condensate Transfer System Operability Test on May 30, 2013

b. Findings

Introduction. A self-revealing Green NCV of TS 5.4.1, "Procedures," was identified at Unit 2 when a CENG I&C technician did not properly implement procedure N2-ISP-LDS-Q010, "Reactor Building General Area Temperature Instrument Channel Functional Test," Revision 00102. As a result, a RHR/RCIC isolation bypass switch was inadvertently left in the NORMAL position during surveillance testing resulting in an unplanned RCIC isolation.

Description. The RCIC system is designed to provide adequate makeup water to the reactor pressure vessel (RPV) automatically or manually following an RPV isolation accompanied by a loss of coolant flow from the feedwater system. In the event the

steam piping to the RCIC pump system leaks, temperature sensors in the RCIC pump room will close isolation valves in the RCIC system stopping the leak. CENG surveillance procedure N2-ISP-LDS-Q010 is a TS surveillance test that verifies that the group 5 (RHR) and group 10 (RCIC) isolation trip signals will close the respective system isolation valves if a high-temperature condition occurs. The procedure tests this function by simulating a high temperature condition and verifying correct system response. Actual valve movement during testing is prevented by control room operators blocking the test signal.

On April 2, 2013, an unplanned RCIC isolation occurred when I&C technicians did not properly implement procedure N2-ISP-LDS-Q010 to block the test signal. Specifically, step 7.2.1 required I&C technicians to request control room operators to place channel bypass switch E31A-S4B RHR/RCIC ISOLATION BYPASS in BYPASS and to verify the circuit was bypassed by observing annunciator and plant computer alarms prior to lifting thermocouple leads in the field. This was not accomplished which resulted in the isolation of the RCIC system.

Prior to the event, a pre-job brief was conducted by CENG I&C technicians performing the work which focused on the roles and responsibilities of personnel including the lifting of thermocouple leads safely and error free. Placing the RHR/RCIC isolation bypass switch in BYPASS was not identified as a critical step, and no critical steps were annotated in the work document as required by CNG-PR-1.01-1009, “Procedure and Work Order Use and Adherence Requirements,” Revision 00701. However, the requirement for operations personnel to place the isolation switch in BYPASS was discussed during the procedure review with the control room supervisor who assigned a control room operator to perform the task when requested by I&C technicians. Section 3.12 of CNG-PR-1.01-1009 defines place-keeping as physically marking steps to prevent the omission or duplication of the steps to maintain an accounting of steps in progress, steps completed, steps not applicable, and steps not yet performed. It lists among high-risk practices to be avoided by signing or checking off a step as completed before it is completed. After commencing surveillance procedure N2-ISP-LDS-Q010, technicians used improper self-checking and place-keeping by checking and initialing as complete step 7.2.1 to request operators to place the RHR/RCIC isolation bypass switch in BYPASS and to verify annunciator and computer alarm points were in alarm without that step having been performed. Consequently, when thermocouple leads were lifted in the following step, a false high-temperature signal was generated resulting in the closing of RCIC steam supply isolation valves 2ICS*MOV121, 2ICS*MOV128, 2ICS*MOV170, and an unplanned isolation of RCIC. The surveillance test was immediately stopped, the required TS action statements were entered for the RCIC system, and the system was restored to an operable status after approximately 6 hours. The isolation signal was also sent to the RHR system for SDC supply and return valves and for reactor head spray isolation valve which were already closed at power. There was no impact on operability of low-pressure coolant injection or containment spray functions of RHR.

A CENG investigation concluded human error as the primary cause for the inadvertent isolation of the RCIC system. A contributing cause was the failure to implement adequate corrective actions following a similar RCIC isolation event in 2007. Immediate corrective actions for this event included a human performance stand down that reinforced use of human performance tools and the need to identify and mark critical steps during pre-job briefs, retraining the I&C technicians involved in the event on proper use of human performance error prevention techniques, and improving bypass switch

verification steps for procedure N2-ISP-LDS-Q010 and other similar leak detection system surveillance procedures. CENG entered this issue in their CAP as CR-2013-002461.

Analysis. The inspectors determined that CENG's failure to correctly implement surveillance test procedure N2-ISP-LDS-Q010 was a performance deficiency that was within CENG's ability to foresee and correct and should have been prevented. This finding is more than minor because it is associated with the human 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 (i.e., core damage). Specifically, the inadvertent isolation rendered the RCIC system inoperable and unable to perform its function for approximately 6 hours. Additionally, this finding is similar to Example 4.b. of IMC 0612, Appendix E, "Examples of Minor Issues," and is more than minor due to the procedural error leading to a plant transient, i.e. an unplanned RCIC isolation.

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," issued June 19, 2012, this finding represents a loss of safety function. Unit 2 is a BWR-5, and as a result, RCIC is treated as having a separate high- pressure injection safety function. A detailed analysis was conducted using SAPHIRE Version 8.0.8.0 and Unit 2 SPAR Model 8.17. Using an exposure period of 6 hours and conservatively assuming no recovery of the failed equipment, this finding had a change in core damage frequency of low E-8. The dominant accident sequence was a grid- related loss of off-site power with a failure of Division III power and the failure to recover off-site power and the EDGs in 30 minutes. Since the change in core damage frequency was less than 1E-7, contributions from large early release and external event did not need to be considered. Therefore, this finding was determined to be of very low safety significance (Green).

This finding had a cross-cutting aspect in the area of Human Performance, Work Practices, because the I&C technicians did not effectively employ self-checking and place-keeping when implementing N2-ISP-LDS-Q010 which directly contributed to the resulting procedural error [H.4(a)].

Enforcement. TS 5.4.1, "Procedures," requires written procedures to be established, implemented, and maintained covering the applicable procedures recommended in Regulatory Guide (RG) 1.33, "Quality Assurance Program Requirements (Operation)," Appendix A, Revision 2, dated February 1978. Section 8.b(2)(b) of RG 1.33 requires, in part, specific procedures for surveillance tests on containment isolation. CENG surveillance test procedure N2-ISP-LDS-Q010, "Reactor Building General Area Temperature Instrument Channel Functional Test," directed that the RHR/RCIC ISOLATION BYPASS switch be placed in BYPASS to prevent an inadvertent containment isolation while lifting thermocouple leads. Contrary to above, on April 2, 2013, technicians lifted thermocouple leads without ensuring the isolation switch was bypassed, resulting in an unplanned isolation of the RCIC system. Because this issue is of very low safety significance (Green) and was entered into CENG's CAP as CR-2013-002461, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy. **(NCV 05000410/2013003-01, Failure to Follow Containment Isolation System Surveillance Procedure Resulting in Isolation of the Reactor Coolant Isolation Cooling System)**

Cornerstone: Emergency Preparedness

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

a. Inspection Scope

The Office of Nuclear Security and Incident Response headquarters' staff performed an in-office review of the latest revisions of various emergency plan implementing procedures and the emergency plan located under ADAMS accession number ML131071146 as listed in the Attachment.

CENG determined that in accordance with 10 CFR 50.54(q), the changes made in the revisions resulted in no reduction in the effectiveness of the plan and that the revised plan continued to meet the requirements of 10 CFR 50.47(b) and Appendix E to 10 CFR Part 50. The NRC review was not documented in a safety evaluation report and did not constitute approval of CENG-generated changes; therefore, this revision is subject to future inspection.

b. Findings

No findings were identified.

1EP6 Drill Evaluation (71114.06 – 1 sample)

Training Observation

a. Inspection Scope

The inspectors observed a simulator training evolution for CENG's licensed operators on April 2, 2013, which required emergency plan implementation by an operations crew. The inspectors observed Unit 1 licensed operator performance during an evaluated simulator scenario that included a loss of condenser vacuum, a stuck open ERV, and an anticipated transient without scram. CENG planned for this evolution to be evaluated and included in performance indicator data regarding drill and exercise performance. The inspectors observed event classification and notification activities performed by the crew. 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)

a. Inspection Scope

From April 22 to 25, 2013, the inspectors reviewed and assessed CENG's performance in assessing the radiological hazards and exposure control in the workplace associated with licensed activities and the implementation of appropriate monitoring and exposure control measures for both individual and collective exposures.

The inspectors interviewed the radiation protection manager, radiation protection supervisors, radiation protection technicians (RPTs), and radiation workers. The inspectors performed walkdowns of various portions of the plant, performed independent radiation dose rate measurements, observed work activities in radiological control areas, and reviewed CENG documents during the N1R22 outage. The inspectors used the requirements in 10 CFR 20, guidance in Regulatory Guide (RG) 8.38, "Control of Access to High and Very High Radiation Areas of Nuclear Plants," TSs, and CENG's procedures required by TSs as criteria for determining compliance.

Inspection Planning

The inspectors reviewed the results of radiation protection program audits. The inspectors reviewed reports of operational occurrences related to occupational radiation safety since the last inspection on March 21, 2013.

Radiological Hazard Assessment

The inspectors conducted walkdowns and independent radiation measurements to evaluate material, work and radiological conditions in the facility including the drywell, RB, refueling floor, and turbine building (TB).

The inspectors selected the following radiological risk-significant work activities that involved exposure to radiation:

- Refueling floor activities
- Drywell control rod drive under-vessel work
- Drywell scaffolding
- Drywell ISI
- RWCU valve repairs

For these work activities, the inspectors assessed whether the pre-work surveys performed were appropriate to identify and quantify the radiological hazard and to establish adequate protective measures. The inspectors evaluated the radiological survey program to determine if radiological hazards were properly identified.

The inspectors observed work in potential airborne radioactivity areas and evaluated whether the air samples from under the reactor vessel, from the reactor cavity and for

entries into the tent for repair of the SFP gate, were representative of the breathing air zone and were properly evaluated. The inspectors evaluated whether continuous air monitors on the refueling floor in the RB and at the drywell entrance were located to ensure appropriate detection sensitivity and were representative of actual work areas. The inspectors evaluated CENG's program for monitoring levels of loose surface contamination in areas of the plant.

Instructions to Workers

The inspectors reviewed the following radiation work permits (RWPs) used to access high radiation areas and evaluated if the specified work control instructions and control barriers were consistent with TS requirements for locked high radiation areas:

- RWP 113330H, RB 261 RWCU Valve Work
- RWP 113802H, Drywell Under-Vessel Work
- RWP 113890A, RB 340 Reactor Disassembly and Reassembly
- RWP 113890B, RB 340 Underwater Work on Refuel Floor
- RWP 113890E, RB 340 Reactor Cavity and Equipment Storage Pit Decon
- RWP 113806H, Drywell ISI
- RWP 113815, RB 261 Flow Accelerated Corrosion (FAC) ISI
- RWP 113810, Drywell General Scaffolding Activities

The inspectors assessed whether permissible dose for radiological-significant work under each RWP was clearly identified. The inspectors evaluated whether electronic personal dosimeter alarm set points were in conformance with survey indications and plant procedural requirements.

The inspectors reviewed CR-2013-002474 and CR-2012-002974 for occurrences where a worker's electronic personal dosimeter noticeably malfunctioned or alarmed. The inspectors evaluated whether workers responded appropriately to the off-normal condition. The inspectors assessed whether the issue was included in the CAP and whether compensatory dose evaluations were conducted.

For work activities that could suddenly and severely increase radiological conditions, i.e., upper elevation of drywell during spent fuel movement and low power range monitor moves, the inspectors assessed CENG's means to inform workers of these changes that could significantly impact their occupational dose.

Contamination and Radioactive Material Control

The inspectors observed the access control point where CENG monitors potentially contaminated material leaving the radiological control area and inspected the methods used for control, survey, and release from these areas. The inspectors observed the

performance of personnel surveying and releasing material for unrestricted use and evaluated whether the release surveys were performed in accordance with plant procedures and process knowledge concerning the equipment.

Radiological Hazards Control and Work Coverage

The inspectors evaluated ambient radiological conditions and performed independent radiation measurements during plant walkdowns. The inspectors assessed whether the conditions were consistent with applicable posted surveys, RWPs, and associated worker briefings.

The inspectors assessed whether radiation monitoring devices were placed on the individual's body consistent with CENG procedures. The inspectors assessed whether the dosimeter was placed in the location of highest expected dose and that CENG properly implemented an NRC-approved method of determining effective dose equivalent.

The inspectors reviewed the application of dosimetry to effectively monitor exposure to personnel in high radiation work areas with significant dose rate gradients; e.g., RWCU repairs and workers under vessel in the control rod drive area.

The inspectors reviewed the following RWPs for work within airborne radioactivity areas with the potential for individual worker internal exposures:

- RWP 113802H, Under-Vessel Control Rod Drive Work
- RWP 113330H, RWCU Valve Work
- RWP 113890E, RB 340 Reactor Cavity and Equipment Storage Pit Decontamination

The inspectors evaluated airborne radioactive controls and monitoring including potential for significant airborne levels. The inspectors assessed applicable containment barriers integrity and the operation of temporary high-efficiency particulate air ventilation system.

Risk-Significant High Radiation Area and Very High Radiation Area Controls

The inspectors discussed the controls and procedures for high risk high radiation areas and very high radiation areas with the radiation protection manager. The inspectors discussed with first-line health physics supervisors the controls in place for special areas that have the potential to become very high radiation areas during refueling outages. The inspectors evaluated the controls for very high radiation areas and areas with the potential to become a very high radiation area to ensure that an individual was not able to gain unauthorized access to these areas.

Radiation Worker Performance

The inspectors observed the performance of radiation workers during the N1R22 with respect to stated radiation protection work requirements. The inspectors assessed whether workers were aware of the radiological conditions in their workplace, the RWP controls and limits, and whether their behavior reflected the level of radiological hazards present.

Radiation Protection Technician Proficiency

The inspectors observed the performance of the RPTs during the N1R22 with respect to controlling radiation work. The inspectors evaluated whether technicians were aware of

the radiological conditions in their workplace, the RWP controls and limits, and whether their behavior was consistent with their training and qualifications with respect to the radiological hazards and work activities.

Problem Identification and Resolution

The inspectors evaluated whether problems associated with radiation monitoring and exposure control were being identified by CENG at an appropriate threshold and were properly addressed for resolution in the CENG's CAP. The inspectors assessed the appropriateness of the corrective actions for a selected sample of problems documented by CENG that involved radiation monitoring and exposure controls. The inspectors assessed CENG's process for applying operating experience to their plant.

b. Findings

No findings were identified.

2RS2 Occupational ALARA Planning and Controls (71124.02)

a. Inspection Scope

The inspectors assessed performance with respect to maintaining occupational individual and collective radiation exposures as low as reasonably achievable (ALARA) during the N1R22. The inspectors used the requirements in 10 CFR 20, RG 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations will be As Low As Is Reasonably Achievable," RG 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Is Reasonably Achievable," TSs, and CENG's procedures required by TSs as criteria for determining compliance.

Inspection Planning

The inspectors reviewed pertinent information regarding CENG's collective dose history, current exposure trends, and ongoing or planned activities in order to assess current performance and exposure challenges.

The inspectors reviewed changes in the radioactive source term by reviewing the trend in average contact dose rates on reactor recirculation piping for the time period between 1984 and the present Unit 1 outage. The inspectors reviewed ALARA procedures that specified the processes used to estimate and track exposures for radiological work activities.

Radiological Work Planning

The inspectors selected the following work activities that had the highest exposure significance:

- ALARA Plan 2013-1-002, Drywell Under-Vessel Activities and Associated Activities N1R22
- ALARA Plan 2013-1-004, Drywell Operations and Local Leak Rate Test Activities

- ALARA Plan 2013-1-006, Drywell ISI Activities
- ALARA Plan 2013-1-007, Recirculation Pump Seals Replacement and Motor PMs (Numbers 11, 13, and 15)
- ALARA Plan 2013-1-010, Drywell Scaffold Activities
- ALARA Plan 2013-1-014, Drywell Emergency Relief Valve and Pilot Valve Work Activities
- ALARA Plan 2013-1-024, Main Steam Isolation Valve 01-02 Stem Replacement Actuator Remove/Replace and Testing
- ALARA Plan 2013-1-029, Balance of Plant FAC Activities in RWCU Heat Exchanger Room and Valve Aisles
- ALARA Plan 2013-1-030, Refuel Floor Activities
- ALARA Plan 2013-1-031, RWCU Miscellaneous Maintenance, Preventive Maintenance, Surveillance Testing, Operations N1R22

The inspectors reviewed the ALARA work activity evaluations, exposure estimates, and exposure reduction requirements. The inspectors determined whether CENG reasonably grouped the radiological work into work activities based on historical precedence, industry norms, and/or special circumstances.

The inspectors assessed when CENG's planning identified appropriate dose reduction techniques, considered alternate dose reduction features, and estimated reasonable dose goals. The inspectors evaluated whether the ALARA assessment had taken into account decreased worker efficiency from use of respiratory protective devices and/or heat stress mitigation equipment. The inspectors determined whether work planning considered the use of remote technologies as a means to reduce dose and the use of dose reduction insights from industry operating experience and plant-specific lessons learned. The inspectors assessed the integration of ALARA requirements into work procedure and RWP documents.

Verification of Dose Estimates and Exposure Tracking Systems

The inspectors reviewed the assumptions and basis for the current annual collective dose estimate and outage collective dose estimate for accuracy. The inspectors reviewed applicable procedures to determine the methodology for estimating exposures from specific work activities and for department and station collective dose goals.

The inspectors evaluated whether CENG had established measures to track, trend, and reduce occupational doses for ongoing work activities. The inspectors assessed whether dose threshold criteria were established to prompt additional reviews and/or additional ALARA planning and controls.

The inspectors evaluated CENG's method of adjusting exposure estimates or re-planning work when unexpected changes in scope or emergent work were encountered. The inspectors assessed whether adjustments to exposure estimates were based on sound radiation protection and ALARA principles or if they were just adjusted to account for failures to plan/control the work.

Source Term Reduction and Control

The inspectors used station records to determine the historical trends and current status of plant source term known to contribute to elevated facility collective exposure. The inspectors assessed whether CENG had made allowances or developed contingency plans for expected changes in the source term as the result of changes in plant fuel performance issues or changes in plant primary chemistry.

Radiation Worker Performance

The inspectors observed radiation workers and RPTs performance during refueling outage activities in radiation areas, airborne radioactivity areas, and high radiation areas. The inspectors evaluated whether workers demonstrated the ALARA philosophy in practice and whether there were any procedure or RWP compliance issues.

Problem Identification and Resolution

The inspectors evaluated whether problems associated with ALARA planning and controls were being identified by CENG at an appropriate threshold and were properly addressed for resolution in the CENG's CAP.

b. Findings

No findings were identified.

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

a. Inspection Scope

This area was inspected to verify in-plant airborne concentrations were being controlled consistent with ALARA principles and the use of respiratory protection devices on-site does not pose an undue risk to the wearer. The inspectors used the requirements in 10 CFR 20, the guidance in RG 8.15, "Acceptable Programs for Respiratory Protection," RG 8.25, "Air Sampling in the Workplace," NUREG-0041, "Manual of Respiratory Protection Against Airborne Radioactive Material," TSs, and CENG's procedures required by TSs as criteria for determining compliance.

Inspection Planning

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 identify changing airborne radiological conditions such that actions to prevent an overexposure may be taken. The review included an overview of the respiratory protection program and a description of the types of devices used. The inspectors reviewed procedures for maintenance, inspection, and use of respiratory protection equipment as well as procedures for maintenance and testing of breathing air quality.

Engineering Controls

The inspectors reviewed CENG's use of permanent and temporary ventilation to determine whether CENG uses 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 are used during high-risk activities.

The inspectors selected two temporary ventilation system setups on the refuel floor used to support work in contaminated areas. The inspectors assessed whether the use of these systems is consistent with procedural guidance and ALARA principles.

The inspectors reviewed airborne monitoring protocols for the drywell and refueling floor continuous air monitors used to monitor and warn of changing airborne concentrations in the plant and evaluating whether the alarms and set points are sufficient to prompt worker action to ensure that doses are maintained within the limits of 10 CFR 20 and the ALARA concept.

The inspectors assessed whether CENG had established threshold criteria for evaluating levels of airborne beta-emitting and alpha-emitting radionuclides.

Use of Respiratory Protection Devices

The inspectors selected RWCU repairs and under-vessel control rod drive work activities where respiratory protection devices were used to limit the intake of radioactive materials and assessed whether CENG performed an evaluation concluding that further engineering controls were not practical and that the use of respirators is ALARA. The inspectors also evaluated whether CENG had established means (such as routine bioassay) to determine if the level of protection (protection factor) provided by the respiratory protection devices during use was at least as good as that assumed in work controls and dose assessment.

Problem Identification and Resolution

The inspectors evaluated whether problems associated with the control and mitigation of in-plant airborne radioactivity were being identified by CENG at an appropriate threshold and were properly addressed for resolution in CENG's CAP. The inspectors assessed whether the corrective actions were appropriate for a selected sample of problems involving airborne radioactivity and were appropriately documented.

b. Findings

No findings were identified.

2RS4 Occupational Dose Assessment (71124.04)

a. Inspection Scope

From April 22 to 25, 2013, the inspectors reviewed occupational doses to ensure they were appropriately monitored and assessed. The inspectors used the requirements in 10 CFR 20, RG 8.13, "Instruction Concerning Prenatal Radiation Exposure," RG 8.36,

"Radiation Dose to the Embryo/Fetus," RG 8.40, "Methods for Measuring Effective Dose Equivalent from External Exposure," TSs, and CENG's procedures required by TSs as criteria for determining compliance.

Inspection Planning

The inspectors reviewed the results of Unit 1 radiation protection program audits related to internal and external dosimetry. A review was conducted of procedures associated with dosimetry operations including issuance/use of external dosimetry, assessment of internal dose, and evaluation of and dose assessment for radiological incidents. The inspectors evaluated whether CENG had established procedural requirements for determining when external dosimetry and internal dose assessments are required.

External Dosimetry

The inspectors evaluated whether CENG's dosimetry vendor was accredited with the National Voluntary Laboratory Accredited Program and if the approved irradiation test categories for each type of personnel dosimeter used were consistent with the types and energies of the radiation present and the way the dosimeter is being used.

The inspectors evaluated the onsite storage of dosimeters before issuance, during use, and before processing and reading. The inspectors also reviewed the guidance provided to radiation workers with respect to care and storage of dosimeters.

The inspectors assessed the use of electronic personal dosimeters to determine if CENG uses a correction factor to address the response of the electronic personal dosimeter as compared to the dosimeter of legal record for situations when the electronic personal dosimeter is used to assign dose and whether the correction factor is based on sound technical principles.
The inspectors reviewed two CAP documents for adverse trends related to electronic personal dosimeters. The inspectors assessed whether CENG had identified any adverse trends and implemented appropriate corrective actions.

Internal Dosimetry

Routine Bioassay (In Vivo)

The inspectors reviewed procedures used to assess the dose from internally deposited radionuclides using whole body counting equipment. The inspectors evaluated whether the procedures addressed methods for differentiating between internal and external contamination, the release of contaminated individuals, determining the route of intake and the assignment of dose.

The inspectors reviewed CENG's evaluation for use of its portal radiation monitors as a passive monitoring system. The inspectors assessed if instrument minimum detectable activities were adequate to determine the potential for internally deposited radionuclides sufficient to prompt an investigation.

Special Bioassay (In Vitro)

There was no internal dose assessments obtained using whole body count results for the inspectors to review. There was no internal dose assessments obtained using urinalysis or fecal sample results for the inspectors to review.

The inspectors reviewed the vendor laboratory quality assurance program and assessed whether the laboratory participated in an industry-recognized cross check program including whether out-of-tolerance results were reviewed, evaluated, and resolved appropriately.

Internal Dose Assessment – Airborne Monitoring

The inspectors reviewed CENG's program for dose assessment based on airborne monitoring and calculations of derived air concentration calculations. The inspectors determined whether flow rates and collection times for air sampling equipment were adequate to allow appropriate lower limits of detection to be obtained. CENG had performed internal dose assessments using airborne/derived air concentration monitoring for some work in the cavity during the N1R22.

Internal Dose Assessment – Whole Body Count Analyses

CENG has not documented any internal dose assessments using whole body count results during the period reviewed.

Special Dosimetry Situations

Declared Pregnant Workers

The inspectors assessed the process used by CENG to inform workers of the risks of radiation exposure to the embryo/fetus, the regulatory aspects of declaring a pregnancy, and the specific process to be used for monitoring and controlling exposure to a declared pregnant worker. CENG has not documented any internal dose assessments for declared pregnant workers during this inspection period.

Dosimeter Placement and Assessment of Effective Dose Equivalent for External Exposures

The inspectors reviewed CENG's methodology for monitoring external dose in non-uniform radiation fields or where large dose gradients exist. The inspectors evaluated CENG's criteria for determining when alternate monitoring such as use of multi-badging is to be implemented.

The inspectors reviewed dose assessments performed for workers performing under-vessel work and RWCU repairs. These workers used multi-badging to evaluate effective dose equivalent and the dose assessment was performed consistent with CENG procedures and dosimetry standards.

Shallow Dose Equivalent

There were no dose assessments for shallow dose equivalent available for review. The inspectors evaluated CENG's method for calculating shallow dose equivalent from distributed skin contamination or discrete radioactive particles.

Assigning Dose of Record

For the special dosimetry situations reviewed in this section, the inspectors assessed how CENG assigns dose of record for total effective dose equivalent, shallow dose equivalent, and lens dose equivalent. This included an assessment of external and internal monitoring results, supplementary information on individual exposures, and radiation surveys when dose assessment was based on these techniques.

Problem Identification and Resolution

The inspectors assessed whether problems associated with occupational dose assessment are being identified by CENG at an appropriate threshold and are properly being addressed for resolution in CENG's CAP. The inspectors assessed the appropriateness of the corrective actions for a selected sample of problems documented by CENG involving occupational dose assessment.

b. Findings

No findings were identified.

2RS7 Radiological Environmental Monitoring Program (71124.07)

a. Inspection Scope

From May 6 to 10, 2013, the inspectors verified that the radiological environmental monitoring program (REMP) quantifies the impact of radioactive effluent released to the environment and sufficiently validates the integrity of the radioactive gaseous and liquid effluent release program.

The inspectors used the requirements in 10 CFR 20; 10 CFR 50, Appendix A, Criterion 60, "Control of Release of Radioactivity to the Environment;" 10 CFR 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operations to Meet the Criterion As Low As Is Reasonably Achievable for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents;" 40 CFR 190, "Environmental Radiation Protection Standards for Nuclear Power Operations;" 40 CFR 141, "Maximum Contaminant Levels for Radionuclides;" RG 1.23, "Meteorological Monitoring Programs for Nuclear Power Plants;" RG 4.1, "Radiological Environmental Monitoring for Nuclear Power Plants;" RG 4.15, "Quality Assurance for Radiological Monitoring Programs;" NUREG-1302, "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Boiling Water Reactors;" applicable industry standards; and CENG procedures as criteria for determining compliance.

Inspection Planning

The inspectors reviewed CENG's annual radiological environmental operating reports for 2011 and 2012 and the results of any assessments since the last inspection to verify that the REMP was implemented and reported in accordance with requirements. This review included changes to the offsite dose calculation manual (ODCM) in environmental monitoring, sampling locations, monitoring and measurement frequencies, land-use census, inter-laboratory comparison program, and analysis of environmental data.

The inspectors reviewed Units 1 and 2 ODCMs to identify locations of environmental monitoring stations. The inspectors reviewed Units 1 and 2 UFSARs for information regarding the environmental monitoring program and meteorological monitoring instrumentation. The inspectors reviewed quality assurance audits and technical evaluations performed on the vendor analytical laboratory program.

The inspectors reviewed Units 1 and 2 radioactive effluent release reports for 2011 and 2012 and the most recent results from waste stream analysis to determine if CENG was sampling and analyzing for the predominant radionuclides released in plant effluents.

Site Environmental Inspection

The inspectors walked down five air sampling stations and five environmental thermo luminescent dosimeter (TLD) monitoring stations to determine whether they were located as described in the ODCM and to determine the equipment material condition.

For the air samplers and TLD stations selected, the inspectors reviewed the calibration and maintenance records to verify that they demonstrated adequate operability for these components. Additionally, the review included the calibration and maintenance records of four composite water samplers.

The inspectors performed an assessment of any compensatory environmental sampling upon loss of a required sampling station.

The inspectors observed the collection and preparation of four environmental samples from surface water and fish to verify that environmental sampling was representative of the effluent release pathways as specified in the ODCM and that sampling techniques were in accordance with procedures.

Based on direct observation and review of records, the inspectors assessed whether the meteorological instruments were operable, calibrated, and maintained in accordance with procedures. The inspectors assessed whether the meteorological data readout and recording instruments in the control room and at the meteorological tower were operable and accurate.

The inspectors evaluated whether missed and/or anomalous environmental samples were identified and reported in the annual radiological environmental operating reports. The inspectors selected five events that involved a missed sample or inoperable sampler to verify that CENG had identified the cause and had implemented corrective actions. The inspectors reviewed the assessment of any sample results detected above the lower limits of detection and reviewed CENG's evaluation of associated radioactive effluent release data that was the potential source of the released material. The 2011

radiological environmental operator report noted the detection of Iodine from the Fukushima Daiichi accident during March and April 2011.

The inspectors selected the following five SSCs that contained licensed material for which there was a credible mechanism for radioactive material to reach ground water:

- Unit 1 drywell, reactor, and turbine building sumps
- Unit 2 drywell, reactor, and turbine building sumps
- Unit 2 stack condensate transfer line to radwaste
- Old radwaste sumps W 11, 12, and 13, and concentrator waste tank cubicle
- Waste water treatment facility clarified tanks and sludge pits

The inspectors assessed whether CENG had implemented a sampling, inspection, and monitoring program to provide early detection of leakage from these SSCs to ground water.

The inspectors evaluated whether decommissioning records of leaks, spills, and environmental remediation since the previous inspection were retained in a retrievable manner in the 10 CFR 50.75(g) decommissioning file. Two records were added to the decommissioning file in 2012. The first was Unit 1 turbine building roof replacement, and the second was tritium in-leakage to the Unit 1 screen house.

The inspectors reviewed any significant changes made by CENG to the ODCM as the result of changes to the land census, long-term meteorological conditions, or modifications to the sampler stations since the last inspection. The inspectors reviewed technical justifications for any changed sampling locations to ensure that the changes did not affect CENG's ability to monitor the impact of plant operations on the environment.

The inspectors assessed whether the detection sensitivities for environmental samples were below the lower limits of detection specified in the ODCM. The inspectors reviewed quality control charts for laboratory radiation measurement instrument and actions taken for degrading detector performance. The inspectors also reviewed the results of the vendor's quality control program including the inter-laboratory comparison to assess the adequacy of the vendor's program.

The inspectors reviewed the results of Entergy Nuclear Northeast (Entergy) inter-laboratory and intra-laboratory comparison program to verify the adequacy of environmental sample analyses performed by James A. Fitzpatrick Nuclear Power Plant environmental laboratory. The inspectors assessed whether the results included for the media radionuclide mix was appropriate for the facility.

Identification and Resolution of Problems

The inspectors assessed whether problems associated with the REMP and meteorological monitoring programs were being identified by CENG at an appropriate threshold and correction actions were assigned for resolution in CENG's CAP.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator Verification (71151)

RCS Specific Activity and RCS Leak Rate (4 samples)

a. Inspection Scope

The inspectors reviewed CENG's submittal for the RCS specific activity (BI01) and RCS leak rate (BI02) performance indicators for both Unit 1 and Unit 2 for the period of April 1, 2011, through March 31, 2013. (Note: An additional 12 months of BI02 data was reviewed due to CENG having updated and revised the BI02 performance indicator data since the previous inspection.) To determine the accuracy of the performance indicator reported during those periods, the inspectors used definitions and guidance contained in Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 6. The inspectors also reviewed RCS sample analysis and control room logs of daily measurements of RCS leakage and compared that information to the data reported by the performance indicator. Additionally, the inspectors observed surveillance activities that determined the RCS identified leakage rate, and chemistry personnel taking and analyzing an RCS sample.

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 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.

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 outside of the CAP such as trend reports, performance indicators, 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 first and second quarters of 2013 to assess condition reports written in various subject areas (equipment problems, human performance issues, etc.) as well as individual issues identified during the NRC's daily condition report review (Section 4OA2.1). The inspectors reviewed CENG's quarterly trend report for the first quarter 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.

Two trends were identified by the inspectors that had not been identified by CENG. The inspectors noted a negative trend in the reliability and availability of the emergency core cooling system (ECCS) keep-fill pumps on Unit 2. The low-pressure core spray keep-fill pump 2CLS*P2 failed on January 9, 2013, due to motor overload (CR-2013-000218). On February 28, the HPCS keep-fill pump suddenly failed (CR-2013-001633). As part of an extent-of-condition review for the low-pressure core spray keep-fill pump failing, operators identified that Division II RHR system keep-fill pump 2RHS*P2 motor had an abnormal noise. On April 12, CENG replaced 2RHS*P2 motor. The ECCS keep-fill pumps are Goulds Pump Model 3196ST with 215T Westinghouse motors rated for 575 volts. Westinghouse investigations determined that each motor had a turn-to-turn failure. The failure of the HPCS keep-fill pump resulted in Licensee Event Report (LER) 2013-002, "Failure of High-Pressure Core Spray System Pressure Pump due to a Motor Winding Failure," in accordance with 10 CFR Part 50.73(a)(2)(v)(D) and 10 CFR Part 21. All three keep-fill pump motors have been replaced, and CENG has entered these issues into their CAP as noted by the condition reports above.

The inspectors noted a decrease in the reliability of the Unit 1 RB sumps, and as a result, an increase in the number of emergency operating procedure entries by control room operators due to sump failures. The decrease in reliability was noted by three separate events regarding Unit 1 RB sumps that resulted in emergency operating procedure entries. These events occurred on January 20, April 12, and April 24, and were documented in CR-2013-000532, CR-2013-002743 and CR-2013-003371, respectively. The inspector's review identified that although CENG had properly assessed sump performance per the NRC maintenance rule 10 CFR 50.65 for the train level criteria, CENG did not assess sump performance against the system level criteria. CENG documented this issue in CR-2013-004828 and entered this issue into their CAP. A subsequent CENG evaluation determined the RB floor and equipment sumps had exceeded their performance monitoring group functional failure criteria and the systems

were placed into (a)(1) status. The inspectors determined that this issue was not more than minor because the train level criteria were appropriately being monitored and placing the RB sumps into (a)(1) status for exceeding system level criteria would not have resulted in additional maintenance-related corrective actions being taken by CENG.

.3 Annual Sample: Review of Repetitive Valve Packing Leakage Issues

a. Inspection Scope

The inspectors performed an in-depth review of CENG's root cause analysis and corrective actions associated with CR-2011-007171 and CR-2011-010906 regarding two forced shutdowns of Unit 2 due to excessive unidentified leak rates in 2011. The inspectors focused on the implementation of corrective actions and extent-of-condition and cause reviews as it applied to both units.

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 was appropriately identifying, characterizing, and correcting problems associated with this issue and whether the planned or completed corrective actions were appropriate. The inspectors compared the actions taken to the requirements of CENG's CAP and 10 CFR 50, Appendix B. In addition, the inspectors performed field walkdowns and interviewed engineering personnel to assess the effectiveness of the implemented corrective actions.

b. Findings and Observations

No findings were identified.

On August 6 and December 9, 2011, Unit 2 conducted forced shutdowns due to excessive unidentified leakage rate. In both cases, the increased unidentified leakage was determined to be from the failure of the recirculation discharge gate valve, 2RCS*MOV18A. CENG completed separate root cause analysis for both events and determined the August 6 event was due to a design issue which subjects the packing to excessive vibrations due to the valve gate being exposed to RCS system flow. The December 9 event was determined to be the result of a workmanship error following the August 6 event which resulted in a burr forming on the valve stem and eventually led to the second packing failure.

The inspectors reviewed the root cause analysis and the ECP associated with the 2001 change in packing design for this valve. The inspectors reviewed photos and drawings of the valve and interviewed engineering personnel. The inspectors concluded that CENGs determination of the root cause and major contributing causes were reasonable and had a sound technical basis. The inspectors also determined that corrective actions for the August 6 event would not have been expected to preclude the December 9 event.

The inspectors reviewed CENG's extent-of-condition reviews and corrective actions related to similar valves on both Units 1 and 2. The inspectors concluded that CENG conducted an appropriate extent-of-condition review and identified other valves which

may be susceptible to the same failure mechanism. CENG also developed corrective actions to enhance their valve packing program and designated an engineer to oversee this program.

The inspectors conducted an independent review of condition reports from 2000 until the present looking for excessive leakage issues associated with valve packing. The inspectors confirmed that a large percentage of issues prior to 2001 and since 2007 have been related to RCS*MOV18A and the underlying design vulnerability. Corrective actions related to this issue included enhancing torque specification values for the packing, developing preventive maintenance items to re-torque the packing periodically, and revising work packages. The inspectors determined these corrective actions were reasonable and had been implemented appropriately and in a timely manner.

The inspectors also observed that appropriate effectiveness reviews were either completed or were scheduled to be completed in a timely manner.

.4 Annual Sample: Human Performance Safety Culture Themes

a. Inspection Scope

This inspection focused on CENGs' evaluation and resolution of an emerging theme in the number of human performance cross-cutting issues associated with NRC inspection findings. Specifically, in the third quarter of 2012, four NRC Green inspection findings across multiple cornerstones were identified as having common cross-cutting aspects in the area of Human Performance, Resources, [H.2(c)], because CENG did not provide complete, accurate, and up-to-date procedures that were adequate to assure nuclear safety. On August 9, 2012, CENG initiated CR-2012-007529 and performed an apparent cause evaluation to assess this trend. The NRC completed Inspection Procedure 71152 in the form of a problem identification and resolution annual sample to assess this trend during the fourth quarter of 2012 to provide information to support the end of cycle assessment. Subsequently, on November 7, CENG initiated CR-2012-010211, "A Cross-Cutting Theme Exists in the Aspect of Human Performance, Resources, Documentation [H.2(c)]," to further assess and address this adverse trend. A root cause analysis was completed and corrective actions were recommended for implementation. The inspectors selected this emerging trend for further review to develop more recent insights into CENG's progress in addressing the cross-cutting theme to provide meaningful input to the mid-cycle assessment process. The inspectors reviewed CENG condition reports, the root cause evaluation, and corrective, preventive, and compensatory actions associated with the emerging theme. The inspectors also interviewed plant personnel. The four findings associated with cross-cutting theme H.2(c) are summarized as follows:

- Unit 1 - Inadequate torque applied to SDC isolation valve closure bolts (CR-2012-001441)
- Unit 2 - Loss of SFP cooling due an inadequate procedure (CR-2012-004850)
- Unit 2 - Inadequate special operating procedure for loss of SFP cooling (CR-2012-007811)
- Unit 2 - Inadequate evaluation and implementation of design modification to the turbine gland seal supply system (CR-2012-006615)

b. Findings and Observations

No findings were identified.

CENG identified an adverse trend existed in the cross-cutting aspect H.2(c) and recognized that the theme affected broad areas of performance as assessed in the fourth quarter of 2012. CENG completed the root cause assessment for the adverse trend in the H.2(c) cross-cutting aspect in December 2012. The root cause analysis evaluated the four Green findings and also independently determined the common causes of these findings.

CENG concluded that the work and administrative control documents and processes were adequate, but the implementation of these processes was not adequate. Formal techniques were used to reach this conclusion. The 46 specific causal factors from the four findings were generalized into 13 general causal areas which were further condensed (or binned) into five causal themes. The process of generalization of the causal factors resulted in the majority of causal factors (53 percent) having the theme of "lack of engineering /challenge assumptions /mindset (willingness to accept answer with no challenge)." CENG further concluded "a less rigorous standard resulted in products that were of insufficient quality. The error drivers may be both process and behavior; however, the results of the common cause analyses did not indicate that process problems were significant errors."

CENG determined that the root cause of the trend was that site leadership had not identified marginal performance relative to the technical rigor in the production of work execution documents and, as such, has not put in place corresponding corrective or mitigating strategies. A contributing cause was listed that existing administrative controls governing changes to work orders and reviews of said changes are too lenient to ensure high quality documents are consistently prepared to support plant operations and maintenance activities.

The root cause team recommended 22 corrective actions in the report. CENG management translated these recommendations into 20 unique corrective actions to be implemented, 18 of which had been completed by the end of the first quarter 2013. The two remaining corrective actions were to complete quarterly effectiveness reviews and a final effectiveness review. The assigned corrective action to prevent recurrence (CAPR159) was formulated to develop and communicate a station policy addressing work documentation quality.

The corrective actions focused substantially on training plant personnel to properly implement their procedures and to hold them accountable if they did not follow the procedures. Three of the recommended corrective actions involved development of or changes to work procedures. CA #59 was to define the term "skill of the craft" in a procedure and was completed on June 12, using guidance obtained from an industry group; CA #55 was to develop and implement a fleet conduct of engineering administrative procedure and was closed to CA #244 to reinforce current expectations for engineering roles and responsibilities; and CA #64 was to develop a process tool to assist in screening pen and ink changes to procedures. This corrective action was also changed to revise site procedures to add a requirement to initiate a condition report if a procedure could not be completed as written. All but one corrective action relied on knowledge-based corrective actions. The only rule-based corrective action was CA #59.

Although the majority of the corrective actions were knowledge-based activities that relied upon one-time training presentations, only two corrective actions were implemented to conduct a needs analysis for the specified training. The needs analysis for CA #58 (improve the use of SDS-006 for bolt-torque requirements) and CA #164 (understanding the work order process) both concluded that no additional or recurring training were required. The one-time training that had been administered would be sufficient to correct the adverse trend. As a result, no changes to the initial site training program will be made and these training topics will not be refreshed periodically during proficiency training.

The inspectors noted the implemented corrective actions rely almost entirely upon a series of one-time training activities to result in institutionalized changes to personnel behavior and organizational culture into the future. Therefore, the effectiveness of the corrective actions could diminish over time as personnel turnover occurs.

The effectiveness reviews for the corrective actions are scheduled to start in the third quarter of 2013. There have been no effectiveness reviews completed on the efficacy of the corrective actions for this cross-cutting aspect theme as of June 2013.

The inspectors could not conclude that CENG's root cause analysis and resultant corrective actions are correct and effective since they have only recently been fully implemented. However, the number of findings with a cross-cutting aspect in procedure adequacy has declined from four to two from the end of cycle to mid cycle NRC reviews.

.5 Annual Sample: Battery Low Specific Gravities

a. Inspection Scope

The inspectors performed an in-depth review of CENG's evaluations and corrective actions associated with low-specific gravity in the safety-related station batteries. Specifically, an adverse trend of low-specific gravity readings for cells in all three safety-related 125 volts direct current (VDC) station batteries at Unit 2 were identified in CR-2012-001315.

The inspectors assessed CENG's problem identification threshold, extent-of-condition reviews, compensatory actions, and the prioritization and timeliness of CENG's corrective actions to determine whether CENG was appropriately identifying, characterizing, and correcting problems associated with this issue and whether the planned and completed corrective actions were appropriate. The inspectors compared the actions taken to the requirements of 10 CFR 50, Appendix B. In addition, the inspectors performed field walkdowns and interviewed engineering personnel to assess the effectiveness of the implemented corrective actions.

b. Findings and Observations

CENG determined the most probable cause of the low-specific gravities was that the battery vendors had removed some electrolyte prior to shipping the battery cells to NMPNS; and then once at NMPNS, water was added to the cells that diluted the concentration of sulfuric acid.

CENG performed a thorough review of the low-specific gravity issue and obtained information from the battery vendors to support the probable cause. Corrective actions included adjusting the method for calculating specific gravity and evaluating adding electrolyte to restore the specific gravity to the manufacturer's recommended level. CENG verified, based on surveillance testing, that although the specific gravities were lower than normal, the concentration of sulfuric acid was adequate to obtain sufficient battery capacity to meet the design basis requirements of the batteries.

The inspectors reviewed condition reports, selected battery test results, and correspondence from the battery vendors regarding the low-specific gravity issue. The inspectors determined CENG's overall response to the issue was commensurate with the safety significance, was timely and included appropriate compensatory actions. The inspectors determined that the actions taken were reasonable to resolve the low-specific gravity issue. As part of the review, the inspectors determined that two findings existed as described below.

b.1 Inadequate Procedural Implementation for Battery Cell Replacement

Introduction. The inspectors identified a Green NCV of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," because CENG did not assure that the replacement of cells in battery 2C was prescribed and performed by appropriate procedures which resulted in degraded accuracy of test results and potential degradation to safety-related battery cells.

Description. The Division III emergency battery bank, battery 2C, at Unit 2 uses jars that contain three cells each to provide reliable direct current (DC) power for essential DC loads required during normal and abnormal conditions. CENG determined that two jars required replacing (a total of six cells). In preparation for this activity, CENG procured three jars and stored them in the warehouse. The inspectors determined that several procedural inadequacies existed during storage and subsequent cell replacement.

The cells in the warehouse were not monitored or maintained in accordance with vendor recommendations. Specifically, the vendor requires that cells stored in spaces that are not air conditioned should have individual cell voltages checked monthly and charged when needed to prevent excessive discharge. Although CENG had previously noted their poor practices with regards to battery storage and has ongoing corrective actions to provide better storage facilities (as documented in CR-2010-012200), CENG did not take action to adequately monitor cells in the warehouse. As a result, when the three jars for battery 2C were obtained from the warehouse, one was found to be visibly sulfated and had to be discarded, and the other two were found undercharged. Sulfation is an indication of chronic undercharging and eventually results in permanent loss of capacity. Although CR-2012-010907 identified the poor condition of the cells, the cell replacement was continued with potentially degraded cells.

The newly installed cells were not charged prior to or upon installation. This is required in the vendor manual and the station battery cell replacement procedure, N2-EMP-GEN-673, "24/48 VDC and 125 VDC Batteries – Cell and Connector Replacement," Revision 00400.

Battery 2C was then subjected to a modified performance test with the newly installed and uncharged cells. This resulted in over-discharging the new cells. Of the new cells,

the two lowest reached 0.903 VDC and 1.167 VDC as opposed to the expected end voltage of approximately 1.75 VDC. This resulted in a battery capacity of 95 percent. In comparison a normal battery at the age of battery 2C would have a capacity of approximately 105 percent. Using uncharged cells artificially lowered the test results which diminished the ability to use the test results for future trending and could mask poor performance of the remaining cells.

Finally, after the modified performance test, one of the new cells did not recharge properly. Specifically the vendor states that an equalization charge should be performed until the lowest cell is within 0.05 volt of the average of all of the cells. During the equalization charge for battery 2C after the modified performance test, one of the new cells did not rise to within 0.05 volt of the average of all of the cells. Although CR-2012-010901 recognized that the acceptance criteria had not been met, the acceptance criteria was determined to be unnecessary. CENG did not recognize that the failure to recharge properly was an indication that the previous procedural inadequacies may have degraded the cell.

CENG entered these inspector-identified issues into the CAP as CR-2013-005235. CENG corrective actions included reviewing the previous battery 2C test results and the work order for the next scheduled modified performance test and verifying battery 2C will remain operable until the next test scheduled for September 2013. CENG also initiated CR-2013-005074 to replace the two newly installed jars.

Analysis. The inspectors determined that the failure to assure that the replacement of cells in battery 2C was prescribed and performed by appropriate procedures was a performance deficiency that was reasonably within CENG's ability to foresee and correct and should have been prevented. This finding was more than minor because it was associated with the equipment performance attribute of the Mitigating Systems cornerstone and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences.

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," issued June 19, 2012, the inspectors determined this finding to be of very low safety significance (Green) because the performance deficiency was not a design or qualification deficiency, did not involve an actual loss of safety function, did not represent actual loss of a safety function of a single train for greater than its TS allowed outage time, and did not screen as potentially risk significant due to a seismic, flooding, or severe weather-initiating event.

This finding has a cross-cutting aspect in the area of Human Performance, Decision-Making Component, because CENG did not use conservative assumptions in decision making. Specifically, CENG did not monitor the cells in storage, question the adequacy of the discharged cells, charge the cells prior to installation, or fully evaluate the implications of the test and recharge results [H.1(b)].

Enforcement. 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions,

procedures, or drawings. Contrary to the above, CENG did not assure that the November 2012 replacement of cells in battery 2C was prescribed and performed by appropriate procedures which resulted in degraded accuracy of test results and potential degradation to safety-related battery cells. Because this violation was of very low safety significance (Green) and has been entered into CENG's CAP (CR-2013-005235), this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy. **(NCV 05000410/2013003-02, Inadequate Procedural Implementation for Battery Cell Replacement)**

b.2 Inadequate Design Control for Battery 2C

Introduction. The inspectors identified a Green NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," because CENG did not verify the adequacy of the design with respect to battery 2C. Specifically, by failing to size the battery to the most limiting time period, the sizing calculation significantly overstated the available design margin.

Description. The Division III emergency battery bank, battery 2C, uses jars that contain three cells each to provide reliable DC power for essential DC loads required during normal and abnormal conditions at Unit 2. The inspectors reviewed EC-145, "Verification of Adequacy of Division III Battery 2BYS*BAT2C," Revision 2, to determine if the calculation appropriately verified the adequacy of the size of the installed battery 2C. The inspectors noted that the calculation evaluated the battery based on two time periods, a 1-minute period and a 119-minute period. In accordance with Institute of Electrical and Electronics Engineers (IEEE) Standard 485-1997, "IEEE Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications," and EC-145, the battery should be sized based upon the most demanding time period. The inspectors determined that the sizing was incorrect. Specifically, although EC-145 determined that the first time period (1 minute) was the most demanding, the battery sizing was based upon the less demanding second time period (119 minutes).

In response to this issue, CENG agreed that the calculation was incorrect, entered this issue into their CAP (CR-2013-005117), and evaluated the condition for operability. CENG performed the battery sizing calculation based upon the correct time period and determined that the battery capacity margin reduced from 26 percent to negative 11 percent (i.e., the battery was undersized by 11 percent). CENG reduced the battery design and aging margins from the calculation and were able to increase the capacity margin to positive 10 percent which demonstrated a reasonable expectation of operability. The significance of reducing the design margin was that the original calculation would have permitted modifications to the Division III DC system that could have actually overloaded the battery. The significance of reducing the aging margin is that the battery would not have been able to perform its design function as the battery aged.

The inspectors independently performed battery sizing calculations and agreed with CENG's results.

Analysis. The inspectors determined that the failure to verify the adequacy of the design with respect to battery 2C was a performance deficiency that was reasonably within CENG's ability to foresee and correct and should have been prevented. This finding was more than minor because it was associated with the design control attribute of the

Mitigating Systems cornerstone and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences.

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," issued June 19, 2012, the inspectors determined this finding is of very low safety significance (Green) because the performance deficiency was not a design or qualification deficiency, did not involve an actual loss of safety function, did not represent actual loss of a safety function of a single train for greater than its TS allowed outage time, and did not screen as potentially risk-significant due to a seismic, flooding, or severe weather-initiating event.

This finding did not have a cross-cutting aspect because it was not indicative of current performance. Specifically, EC-145 was last revised in 2008.

Enforcement. 10 CFR 50, Appendix B, Criterion III, "Design Control," states, in part, that design control measures shall provide for verifying or checking the adequacy of design. Contrary to the above, from July 17, 2008, to June 12, 2013, CENG's design control measures had not appropriately verified the adequacy of the design regarding battery 2C. Specifically, by failing to size the battery to the most limiting time period, the sizing calculation significantly overstated the available design margin. Because this violation was of very low safety significance (Green) and has been entered into CENG's CAP (CR-2013-005117), this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy. **(NCV 05000410/2013003-03, Inadequate Design Control for Battery Sizing Calculation)**

4OA3 Follow-Up of Events and Notices of Enforcement Discretion (71153 – 6 samples)

.1 Plant Events

a. Inspection Scope

For the plant events listed below, the inspectors reviewed and/or observed plant parameters, reviewed personnel performance, and evaluated performance of mitigating systems. The inspectors communicated the plant events to appropriate regional personnel, and compared the event details with criteria contained in IMC 0309, "Reactive Inspection Decision Basis for Reactors," for consideration of potential reactive inspection activities. As applicable, the inspectors verified that CENG made appropriate emergency classification assessments and properly reported the event in accordance with 10 CFR Parts 50.72 and 50.73. The inspectors reviewed CENG's follow-up actions related to the events to assure that CENG implemented appropriate corrective actions commensurate with their safety significance.

- Unit 1 loss of battery board 12 and SDC on April 16, 2013
- Loss of all SDC pumps for 17 minutes on April 16, 2013

b. Findings

Introduction. The inspectors documented an apparent violation of Unit 1 TS 6.4.1, "Procedures," because CENG failed to properly restore from a loss of a vital DC bus in accordance with station off-normal procedures resulting in an unplanned loss of all SDC when time to boil was less than 2 hours. Specifically, operators failed to recognize a potential for loss of SDC during battery bus 12 restoration in accordance with N1-SOP-47A.1, "Loss of DC," Revision 00101, and N1-OP-47A, "VDC Power System," Revision 02500.

Description. Unit 1 shut down for a refueling outage on April 15, 2013. On April 16, Unit 1 was in cold shutdown at 118 degrees Fahrenheit with a temperature band of 110 to 120 degrees Fahrenheit. The reactor vessel head was installed, and the head bolts were in the process of being detensioned in preparation for reactor cavity flood up and reactor vessel head removal. Primary containment was open for planned maintenance. Decay heat removal was via the SDC pump 12. SDC pumps 11 and 13 were secured with their breakers racked out to the test position for planned loss of offsite power/loss of coolant accident testing (LOOP/LOCA).

During LOOP/LOCA testing, the SDC pumps and ECCS pumps in train associated with the bus are racked to their test position. Operators are stationed in the field to restore these pumps to normal so the pumps are still considered to be available. This is permitted by NMPNS TS's; however, automatic functions of the pumps are not available (such as auto start on a low-low reactor vessel level signal).

At 2:45 p.m. on April 16, a contractor walking down a tagout associated with an ERV modification made an error and opened the breaker cabinet door for the vital DC bus 12. The vital DC bus 12 cabinet door contains a mechanical interlock which opens battery breaker 12 and the static battery charger DC output breaker, de-energizing the DC switchgear when the door is open. Upon opening the breaker cabinet door and hearing the breakers trip, the contractor realized he was in the incorrect cabinet and immediately contacted the control room and notified them of the event. The vital bus was considered protective equipment and a sign on the cabinet door cautioned that the door interlock would trip the breakers in that cabinet. The loss of the vital DC bus 12 resulted in a partial loss of indication in the main control room, loss of DC control power for the associated bus, and a high-temperature trip signal for the SDC 12 being generated. However, since DC power to the trip solenoid was also lost, the SDC pump 12 continued to run. The ECCS pumps associated with the #12 bus were inoperable due to loss of control power.

In response to the event, operators entered procedure N1-SOP-47A, "Loss of DC," Revision 00101. The flowchart in SOP-47A.1 directs the operator to transfer selected loads normally powered from battery bus 12 to their alternate power supplies and then directs restoration of the bus. However, a decision was made to not take actions specified in N1-SOP-47A.1 and pursue restoring the vital DC bus 12 using system operating procedure N1-OP-47A, 125 "VDC Power System," Revision 02500. The inspectors noted that N1-SOP-47A.1 Section 5.1 contains two caution statements stating that pump trip signals may have been generated while the bus was de-energized and those signals must be cleared prior to restoration or a pump trip may occur when the bus is restored and power is supplied to the DC trip coils. However, neither N1-SOP-47A.1 nor N1-OP-47A contained a list of tripping circuits and tripping actions which are

associated with the vital DC bus 12. Operators failed to recognize the bus 12 high-temperature trip signal present on the alarm log and the plant process computer displays prior to attempting to restore bus 12. The presence of the trip signal was also indicated by a control room annunciator which was locked-in since the loss of battery bus 12 at 2:45 p.m.

At 3:45 p.m., field operators attempted to close static battery charger 171A DC output breaker to restore the battery bus from its alternate power supply. Due to the high-temperature trip signal already being present on the SDC pump 12, when operators attempted to close the static battery charger 171A output breaker, the DC trip coil received enough power to energize the relay and trip the SDC pump 12 just before the static battery charger 171A output breaker tripped due to the mechanical interlock. Operators did not immediately recognize that they had lost SDC pump 12 via their indications at the control panel (i.e.; annunciator, pump current, pump flow). Upon recognizing the loss of SDC at approximately 3:50 p.m., operators entered N1-SOP-6.1 "Loss of SFP/RX Cavity Level/Decay Heat Removal," Revision 00501.

At 3:50 p.m., the control room directed the breakers for SDC pumps 11 and 13 to be racked to their normal positions and that SDC be restored using the 11 and 13 SDC pumps. The 11 SDC pump breaker was restored at 4:03 pm and SDC flow was restored at 4:17 pm when the SDC 11 temperature control valve was opened, restoring cooling flow to the reactor. Reactor vessel temperature rose from 118 to 145 degrees Fahrenheit as a result of the loss of SDC. At 5:11 p.m., the normal DC power distribution lineup was restored.

CENG immediately conducted prompt investigations of both the loss of battery bus 12 and loss of SDC events, entered both events into their CAP as CR-2013-002926 and CR-2013-002916, and conducted a root cause analysis. CENG determined the root cause for the loss of SDC was inadequate procedural guidance for restoring the DC power. Contributing causes included operators proceeding in the face of uncertainty, management oversight of operations, and inadequate use of operational experience which could have precluded this event. Corrective actions to prevent recurrence included a review of operations procedures to ensure those procedures contain adequate levels of detail to safely recover from the event and restore the system to normal operation.

Analysis. The inspectors determined that CENG's failure to properly restore the battery bus 12 in accordance with plant procedures was a performance deficiency that was reasonably within CENG's ability to foresee and correct and should have been prevented. The performance deficiency was determined to be more than minor because the inspectors determined it affected the configuration control aspect of the Initiating Events cornerstone and adversely affected the associated cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, operators failed to recognize a potential for loss of SDC during battery bus 12 restoration in accordance with N1-SOP-47A.1, "Loss of DC," Revision 00101, and N1-OP-47A, "VDC Power System," Revision 02500. This performance deficiency initiated a plant transient, loss of shutdown cooling.

The inspectors evaluated the finding using IMC 0609 Attachment 0609.04, "Initial Characterization of Findings," issued June 19, 2012, and IMC 0609 Appendix G, "Shutdown Operations Significance Determination Process," issued February 28, 2005.

IMC 0609 Appendix G Table 1, "Losses of Control," states a quantitative analysis is required for:

- Loss of Thermal Margin (PWRs and BWRs)

  (Inadvertent change in RCS temperature due to loss of RHR)/(change in temperature that would cause boiling) > 0.2 (temperature margin to boil)

In this case, RCS temperature changed 27 degrees (145 to 118 degrees Fahrenheit) and the change in temperature to boiling was 94 degrees (212 to 118 degrees Fahrenheit). Temperature margin to boil was greater than 0.2 (0.2872); thus, a quantitative analysis was required. The significance of the finding is designated as To Be Determined (TBD) until a Phase 3 analysis can be completed by Regional and Headquarters Senior Reactor Analysts.

The inspectors determined this finding had a cross-cutting aspect in the area of Human Performance, Resources, because CENG did not ensure that personnel, equipment, procedures, and other resources were available and adequate to assure nuclear safety - complete, accurate and up-to-date design documentation, procedures, and work packages, and correct labeling of components. Specifically, CENG procedures N1-SOP-47A.1 and N1-OP-47A did not contain adequate guidance to ensure recovery from a loss of a DC bus would not result in an unexpected plant transient [H.2(c)].

Enforcement. Unit 1 TS 6.4.1, "Procedures," requires, in part, that written procedures and administrative policies shall be established, implemented, and maintained that meet or exceed the requirements and recommendations of Sections 5.1 and 5.3 of American National Standards Institute N18.7-1972 "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants," and cover the following activities: the applicable procedures recommended in RG 1.33, "Quality Assurance Program Requirements (Operation)," Appendix A, "Typical Procedures for Pressurized-Water Reactors and Boiling-Water Reactors," dated November 3, 1972. RG 1.33, Appendix A, Section 4, "Procedure for Startup, Operation, and Shutdown of Safety-Related BWR Systems," requires procedures for onsite DC system, and Section 6, "Procedures for Combating Emergencies and Other Significant Events," requires, in part, procedures for including loss of electrical power (and/or degraded power sources). CENG procedures N1-OP-47A, "125 VDC Power System," Revision 02500, and N1-SOP-47A.1, "Loss of DC," Revision 00101, implement this requirement. Contrary to the above, on April 16, 2013, operators were unable to properly implement N1-OP-47 and N1-SOP-47A.1 following a loss of the battery bus 12 resulting in a temporary loss of all decay heat removal. This issue is being characterized as an apparent violation in accordance with the NRC's Enforcement Policy, and its final significance will be dispositioned in a separate future correspondence. **(Apparent Violation 05000220/2013003-04, Improper Bus Restoration Results in a Loss of Shutdown Cooling)**

.2 (Closed) LER 05000220/2012-006-00: Technical Specification Required Shutdown Due to Containment Leakage

a. Inspection Scope

On December 13, 2012, Unit 1 commenced a shutdown after observing nitrogen leakage from primary containment over a period of 10 days. NRC Inspection Report

05000220/2012005 documented CENG's immediate response and the NRC's initial review of the event. As of the end of the inspection documented in that report, CENG's evaluation of the causes for the leakage was still ongoing. The inspectors had identified an issue of concern regarding the total amount of leakage from primary containment vent and purge valves and its relation to exceeding the required value in TS 3.3.3. The NRC opened URI 05000220/2012005-03 to track CENG's completion of the root cause evaluation, the quantification of the amount of leakage from primary containment for the event, and the NRC's subsequent review of CENG's completed evaluation.

To close URI 05000220/2012005-03 the inspectors reviewed and independently verified CENG's calculation regarding the quantity of leakage from primary containment from December 3 – December 13. The inspectors also reviewed Appendix J Type B and C testing of the primary containment vent and purge valves to determine leakage quantities and how they impacted overall primary containment leakage. The inspectors also reviewed the cause of the leakage and CENG's actions to address the cause which was included in CR-2012-011157. URI 05000220/2012005-03 is closed to the violation discussed below. The enforcement actions associated with this LER are discussed below. This LER is closed.

b. Findings

Introduction. A self-revealing Green NCV of TS 3.3.3, "Leakage Rate," was identified for CENG's failure from December 3 to December 13, 2012, to maintain containment leakage less than 1.5 percent by weight of the containment air per day and less than 0.6 percent by weight of the containment air per day for all penetrations and all primary containment isolation valves subject to 10 CFR Part 50, Appendix J, Types 'B' and 'C' tests, when pressurized to 35 pounds per square inch gauge (psig) when RCS temperature is above 215 degrees Fahrenheit and primary containment integrity is required.

Description. On December 3, 2012, at 11:31 a.m., Unit 1 established primary containment integrity and commenced a reactor startup from an unplanned outage. The following day at 2:40 a.m., CENG operators commenced adding nitrogen gas into the primary containment as part of a planned activity to reduce primary containment oxygen concentration to less than 4 percent as required by TS 3.3.1, "Oxygen Concentration." This activity was completed at 10:55 a.m. on December 4. Once an appropriate nitrogen concentration has been achieved in the containment, additional makeup is generally not required. However, from December 6 through December 8, on three occasions, operators added additional nitrogen to the containment to maintain pressure within procedural limits. This issue was documented in CR-2012-011157, "Adverse Trend in Unit 1 Nitrogen Usage." CENG commenced initial troubleshooting activities which included examining systems and components that were possible sources of nitrogen leakage; however, a definitive source for the leakage was not identified. On December 12, following a fourth addition of nitrogen, CENG increased the importance of the issue, formed an issue response team, and staffed the outage control center. As part of the investigation process, operators cycled several containment isolation valves in the nitrogen purge and vent system and attempted to quantify the amount of seat leakage through the valves by opening test fittings located between isolation valves. In parallel with the troubleshooting efforts, CENG and vendor personnel began to develop analytical tools that could be used to quantify the amount of containment leakage.

On December 13, at 6:47 p.m., after observing a decrease in containment pressure following a fifth nitrogen addition and receiving preliminary data that a containment isolation valve local leak-rate test between reactor containment inert gas purge and fill drywell cooling system isolation valves IV-201-31 and IV-201-32 may fail, CENG commenced a plant shutdown because primary containment integrity as required in TS 3.3.3 could not be assured. On December 13, at 11:33 p.m., the plant reached cold shutdown and exited plant TS 3.3.3.

Subsequent testing of containment isolation valves revealed that three valves in the reactor containment inert gas purge and fill drywell cooling system, valves IV-201-10, IV-201-31, and IV-201-32 had unacceptable seat leak rates. These conditions were documented in condition reports 2012-011210 and 2012-011288. When the valves were disassembled and examined, CENG identified that iron oxide (i.e., rust) buildup on the valve resilient seats had prevented the valves from closing tightly and adversely impacted seat leakage performance. The reactor containment inert gas purge and fill drywell cooling system is a carbon steel system and the internal piping surface adjacent to the valves had visible signs of iron oxide degradation. CENG corrective actions included removing the loose surface rust, installing new resilient seats on the valves, and successfully performing as-left local leak-rate tests on the subject valves. Additional corrective actions were outlined in CR-2012-011247.

CENG analysis determined that based upon the nitrogen supplied to the drywell, containment leakage from December 3 through December 13, 2012, exceeded the limits in TS 3.3.3 which requires containment leakage to be less than 1.5 percent by weight of the containment air per day and less than 0.6 percent by weight of containment air per day for all penetrations and all primary containment isolation valves subject to 10 CFR Part 50, Appendix J, Types ‘B’ and ‘C’ tests, when pressurized to 35 psig when RCS temperature is above 215°F and primary containment integrity is required. Specifically, leakage was calculated to be between 1,421 and 2,023 standard cubic feet per hour verses a calculated limit of 647 standard cubic feet per hour.

Analysis. The inspectors determined that CENG’s failure to maintain containment leakage from December 3 through December 13, 2012, within the limits required by TS 3.3.3 was a performance deficiency that was within CENG’s ability to foresee and correct and should have been prevented. This finding is more than minor because it is associated with the SSC and barrier performance attribute of the Barrier Integrity cornerstone and affected the cornerstone objective to provide reasonable assurance that physical design barriers (fuel cladding, RCS, and containment) to protect the public from radionuclide releases caused by accidents or events. Specifically, containment leakage from December 3 through December 13 exceeded the leakage limits outlined in Unit 1 TS 3.3.3.

In accordance with IMC 0609.04, “Initial Characterization of Findings,” and Table 6.2, “Phase 2 Risk Significance-Type B Findings at Full Power,” of IMC 0609, Appendix H, “Containment Integrity Significance Determination Process,” issued May 6, 2004, the inspectors determined this finding was of very low safety significance (Green) because the leakage was less than 100 percent of containment volume per day for the duration of the leak.

This finding has a cross-cutting aspect in the area of Problem Identification and Resolution, CAP, because CENG failed to take appropriate corrective action to address

safety issues and adverse trends in a timely manner commensurate with their safety significance. Specifically, following identification of the adverse trend regarding the frequency of nitrogen addition to the drywell, CENG did not assess in a timely manner the significance of the leakage and the impact on primary plant containment. As a result, plant operation continued for several days with drywell leakage that exceeded the limits outlined in TS 3.3.3 [P.1(d)].

Enforcement. TS 3.3.3, "Leakage Rate," requires containment leakage to be less than 1.5 percent by weight of the containment air per day and less than 0.6 percent by weight of the containment air per day for all penetrations and all primary containment isolation valves subject to 10 CFR Part 50, Appendix J, Types 'B' and 'C' tests, when pressurized to 35 psig when RCS temperature is above 215 degrees Fahrenheit and primary containment integrity is required. Contrary to the above, from December 3 through 13, 2012, containment leakage exceeded 1.5 percent by weight. Specifically, following a December 13 plant shutdown, CENG determined containment leakage during this period to have been between 1,421 and 2,023 standard cubic feet per hour verses a calculated limit of 647. Because this violation is of very low safety significance (Green) and CENG entered this issue into their CAP as CR-2013-011247, this finding is being treated as an NCV consistent with consistent with Section 2.3.2 of the NRC Enforcement Policy. **(NCV 05000220/2013003-05, Containment Leakage Exceeds Technical Specification 3.3.3 Limits)**

.3 (Closed) LER 05000220/2012-006-01: Technical Specification Required Shutdown Due to Containment Leakage

This LER was revised on June 14, 2013, to reflect changes in corrective actions that were outlined in the original LER submittal. In the original LER, CENG indicated that during the spring 2013 refueling outage, the internal surfaces of the horizontal drywell vent and purge piping that contained valves IV-201-09, IV-201-10, IV-201-31, and IV-201-32 would be coated with a material that would minimize the recurrence of rust buildup on the piping. Further, during the outage, the vertical piping that contained valves IV-201-07, IV-201-08, IV-201-16, and IV-201-17 would be inspected; and based on the inspection findings, a coating strategy (if required) would be developed for that piping. Subsequent to submittal of the original LER, CENG determined that based upon the difficultly associated with application of a suitable coating to the pipes and the potential of subsequent coating failure, a protective coating would not be installed.

In lieu of the original corrective actions, CENG indicated that the horizontal section of pipe would be inspected each refueling outage. The vertical piping would not be inspected. These corrective actions were based, in part, on results from inspections conducted during the 2013 N1R22 that identified rust accumulation only on the horizontal sections of pipe. The enforcement aspects of this issue are discussed in section 4OA3.2 of this report. The inspectors did not identify any new issues during the review of this revised LER. This LER is closed.

.4 (Closed) LER 05000220/2012-007-00: High-Pressure Coolant Injection System Logic Actuation Following an Automatic Turbine Trip Signal due to High Reactor Water Level

On November 6, 2012, while Unit 1 was in cold shutdown, an unexpected rise in reactor water level occurred causing an automatic turbine trip signal and actuation of the high-pressure coolant injection initiation logic. Operators immediately closed the 12

feedwater pump discharge blocking valve and stabilized reactor water level, stopping the transient. At Unit 1, high-pressure coolant injection is a mode of operation of the condensate and feedwater system that utilizes the condensate storage tanks, main condenser hotwell, two condensate pumps, two feedwater booster pumps, and two motor-driven feedwater pumps. The rise in reactor water level resulted from the 12 feedwater flow control valve (FCV) FCV-29-137 unexpectedly failing partially open when instrument air was removed from the valve during a tagout in preparation for maintenance on the valve. FCV-29-137 has a series of lockup valves that are designed to hold the FCV stem in position in the event instrument air is lost. CENG determined FCV-29-137 partially opened due to a degraded top cylinder lockup valve O-ring. The enforcement aspects of this issue are discussed in NRC Integrated Inspection Report 05000220/2013002, Section 1R22. The inspectors did not identify any new issues during the review of the LER. This LER is closed.

.5 (Closed) LER 05000410/2013-001-00: Reactor Core Isolation Cooling System Isolation Due to a Temperature Switch Unit Failure

On January 23, 2013, at 3:16 p.m., Unit 2 was operating at 100 percent power when an unexpected isolation signal for containment isolation valves in the RCIC and RHR system occurred due to a failure of a RB general area temperature switch (2RHS*TS85A). The isolation resulted in the RCIC system being unavailable for injection into the reactor vessel if called upon during an event. The affected RHR isolation valves were already in the closed position which is their normal position during power operation. The failure also occurred concurrently with the HPCS system being inoperable for planned surveillance testing. With both RCIC and HPCS inoperable, high-pressure coolant makeup capability was lost. At 3:50 p.m., HPCS was restored and declared operable. Temperature switch 2RHS*TS85A was replaced at 11:04 p.m., and on January 24, at 1:17 a.m., RCIC was declared operable. The cause of the temperature switch failure was determined to be age-related capacitor degradation. The enforcement aspects of this issue are discussed in NRC Integrated Inspection Report 05000410/2013002, Section 1R12. The inspectors did not identify any new issues during the review of the LER. This LER is closed.

.6 (Closed) LER 05000410/2013-002-00: Failure of High-Pressure Core Spray System Pressure Pump Due to Motor Winding Failure

On February 28, 2013, Unit 2 was operating at 100 percent power when the HPCS system pressure pump failed. At the time of the failure, the HPCS system was inoperable for planned maintenance. The pump failure was due to turn-to-turn short in the motor winding. The HPCS system pressure pump is designed to maintain a positive pressure on the HPCS discharge header to prevent voids from forming. CENG replaced the HPCS pressure pump motor and returned the HPCS system to an operable status on March 6. The HPCS system discharge piping remained full during the period when the pressure pump was OOS. The inspectors reviewed the maintenance history of the HPCS pressure pump motor and determined that when the motor bearings were replaced in January 2011, the work order documented a satisfactory visual inspection and meggar testing of the motor windings. The inspectors reviewed the LER and determined that no findings or violations of NRC requirements were identified. This LER is closed.

4OA6 Meetings, Including Exit

Exit Meeting

On July 25, 2013, the inspectors presented the inspection results to Mr. Christopher Costanzo, Site Vice President, and other members of the NMPNS staff. The inspectors verified that no propriety information was retained by the inspectors or documented in this report.

ATTACHMENT: SUPPLEMENTARY INFORMATION

SUPPLEMENTARY INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

C. Costanzo, Vice President
J. Stanley, Plant General Manager
P. Bartolini, Supervisor, Design Engineering
K. Clark, Director, Security
S. Dack, Seasonal Readiness Coordinator / Cycle Manager
J. Dean, Supervisor, Quality Assurance
S. Dhar, Design Engineering
J. Dosa, Director, Licensing
J. Gillard, Emergency Preparedness Analyst
J. Holton, Supervisor, Systems Engineering
G. Inch, Principle Engineer,
M. Kunzwiler, Security Supervisor
J. Leonard, Supervisor Design Engineering
C. McClay, Senior Engineer
F. Payne, Manager, Operations
P. Politzi, Work Week Manager
J. Reid, Design Engineer
B. Scaglione, System Engineer
J. Schulz, System Engineer
M. Shanbhag, Licensing Engineer
R. Staley, System Engineer
T. Syrell, Manager, Nuclear Safety and Security
J. Thompson, General Supervisor, Mechanical Maintenance
A. Verno, Director, Emergency Preparedness

LIST OF ITEMS OPENED, CLOSED, DISCUSSED, AND UPDATED

Opened

05000220/2013003-04	AV	Improper Bus Restoration Results in a Loss of Shutdown Cooling (Section 4OA3)

Opened/Closed

05000410/2013003-01	NCV	Failure to Follow Containment Isolation System Surveillance Procedure Resulting in Isolation of the Reactor Coolant Isolation Cooling System (Section 1R22)
05000410/2013003-02	NCV	Inadequate Procedural Implementation for Battery Cell Replacement (Section 4OA2)
05000410/2013003-03	NCV	Inadequate Design Control for Battery Sizing Calculation (Section 4OA2)
05000220/2013003-05	NCV	Containment Leakage Exceeds Technical Specification 3.3.3 Limits (Section 4OA3)

Closed

05000220/2012005-03	URI	Assessment of Containment Leakage Due to Containment Isolation Valve Failure (4OA3)
05000220/2012-006-00 and 05000220/2012-006-01	LER	Technical Specification Required Shutdown Due to Containment Leakage (Section 4OA3)
05000220/2012-007-00	LER	High-Pressure Coolant Injection System Logic Actuation Following an Automatic Turbine Trip Signal Due to High Reactor Water Level (Section 4OA3)
05000410/2013-001-00	LER	Reactor Core Isolation Cooling System Isolation Due to a Temperature Switch Unit Failure (Section 4OA3)
05000410/2013-002-00	LER	Failure of High-Pressure Core Spray System Pressure Pump Due to Motor Winding Failure (Section 4OA3)

LIST OF DOCUMENTS REVIEWED

Section 1R01: Adverse Weather Protection

Procedures

N1-OP-64, Meteorological Monitoring, Revision 00603
N2-OP-102, Meteorological Monitoring, Revision 01103
N2-OP-102, Attachment 3, Hot Weather Preparation Checklist, Revision 01102
NAI-PSH-11, Seasonal Readiness Program, Revision 00700

Condition Reports

CR-2010-008430
CR-2011-008564
CR-2011-009058
CR-2011-009946
CR-2011-010519
CR-2012-001034
CR-2012-002008
CR-2012-004258
CR-2012-004448
CR-2012-007341
CR-2013-000154

Work Orders

WO C90679919
WO C91178423
WO C91425002
WO C91570604
WO C91570606
WO C91711577
WO C91847825
WO C91860534
WO C91862547
WO C91862559
WO C91883258
WO C91883511
WO C91883613
WO C91897710
WO C91901545
WO C91919260
WO C91920244
WO C91966877
WO C92033133
WO C92008152
WO C92008169
WO C92015166
WO C92044771
WO C92067054
WO C92073630
WO C92073671
WO C92073704
WO C92107827
WO C92110489
WO C92116209
WO C92133487
WO C92135500
WO C92139868
WO C92154168
WO C92156668
WO C92156894
WO C92161257
WO C92221738
WO C92226912
WO C92285675
WO C92292596

Miscellaneous

Diesel Trend Analysis
Summer Readiness Status, Attachment 1
System Seasonal Readiness Evaluations, Attachment 2
Unit 1 Scheduler Evaluation for Summer Readiness from June 15 to September 15
Unit 2 Scheduler Evaluation for Summer Readiness from June 15 to September 15

Section 1R04: Equipment Alignment

Procedures

N1-OP-13, Emergency Cooling System, Revision 03700
N1-OP-48, Control Room Ventilation System, Revision 02400
NIP-OUT-01, Shutdown Safety, Revision 03700

Condition Reports
CR-2013-004333
CR-2013-004347

Drawings
B-69017-C, Emergency Condenser Number 11 Steam Flow, Revision 1
C-180007-C, Reactor Core Spray Piping and Instrumentation Drawing (P&ID), Revision 58
C-18008-C, Spent Fuel Storage Pool Filtering and Cooling System, Revision 38
C-18030-C, Fire Protection Water System, Revision 38
C-18047-C, Control Room Heating Ventilation and Air Conditioning System, Revision 48
C-181017-C, Emergency Cooling System, Revision, Revision 55

Miscellaneous
Plant Configuration Change 1M00888

Section 1R05: Fire Protection

Procedure
N1-PFP-0101, Unit 1 Pre-Fire Plans, Revision 00200

Condition Report
CR-2013-002902

Miscellaneous
USAR Section 10, Revision 16

Section 1R07: Heat Sink Performance

Procedure
N1-ST-Q25, Emergency Diesel Generator Cooling Water Quarterly Test, Revision 02201

Work Order
WO C91454468

Section 1R08: In-Service Inspection

Procedures
NDEP-PT-3.00, Liquid Penetrant Examination, Revision 01900
NDEP-UT-6.23, UT Examination of Ferritic Piping Welds, Revision 01100
NDEP-UT-6.24, UT Examination of Austenitic Piping Welds, Revision 01101
NDEP-VT-2.01, ASME Section XI Visual Examination, Revision 19
NDEP-VT-2.07, In-Vessel Visual Examination, Revision 1300
NIP-IIT-02, ASME Section XI Repair and Replacement Program, Revision 00701
SI-UT-130, Phased Array Ultrasonic Examination of Dissimilar Metal Welds, Revision 0

Condition Reports
CR-2012-000816

CR-2012-003805
CR-2012-010291
CR-2013-000506
CR-2013-001573
CR-2013-002975
CR-2013-002977
CR-2013-002978
CR-2013-003442

Drawing
C-18009, Reactor Water Cleanup P&ID, Revision 60, Sheet 1

Work Order
WO C92260831

NDE Records
BOP-UT-13-014, UT Calibration/Thickness Examination Records of RBCLC System Piping to Recirculation Pump 11 Motor MOT-32-187, dated April 21, 2013
BOP-UT-13-015, UT Calibration/Thickness Examination Records of RBCLC System Piping to Recirculation Pump 12 Motor MOT-32-188, dated April 21, 2013
BOP-UT-13-016, UT Calibration/Thickness Examination Records of RBCLC System Piping to Recirculation Pump 13 Motor MOT-32-189, dated April 21, 2013
BOP-UT-13-017, UT Calibration/Thickness Examination Records of RBCLC System Piping to Recirculation Pump 14 Motor MOT-32-190, dated April 21, 2013
BOP-UT-13-018, UT Calibration/Thickness Examination Records of RBCLC System Piping to Recirculation Pump 15 Motor MOT-32-191, dated April 21, 2013
BOP-UT-13-021, UT Calibration/Thickness Examination Records of General Corrosion of RBCLC System Piping Inside U1 Drywell 225 Feet Elevation, dated April 24, 2013
ISI-PT-13-003, Liquid Penetrant Examination Record of Branch Connection – Decontamination Port Weld 32-WD-011 on Recirculation System Suction Piping, dated April 24, 2013
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Outage Control Center Logs for Tuesday, April 16, 2013
PM Template for Small and Intermediate HP Motors
Unit 1 Station Alarm Log for Tuesday, April 16, 2013
Work Control Center Turnover Sheet for April 16, 2013, Days to Night

LIST OF ACRONYMS

10 CFR	Title 10 of the *Code of Federal Regulations*
AC	alternating current
ADAMS	Agencywide Documents Access and Management System
ALARA	as low as reasonably achievable
ASME	American Society of Mechanical Engineers
BWR	boiling-water reactor
CAP	corrective action program
CENG	Constellation Energy Nuclear Group, LLC
DC	direct current
ECCS	emergency core cooling system
ECP	engineering change package
EDG	emergency diesel generator
ERV	electro-matic relief valve
FA	fire area
FAC	flow accelerated corrosion
FCV	flow control valve
HPCS	high-pressure core spray
I&C	instrumentation and control
IEEE	Institute of Electrical and Electronics Engineers
IMC	Inspection Manual Chapter
ISI	inservice inspection
kV	kilovolt
LER	licensee event report
LOCA	loss of coolant accident
LOOP	loss of offsite power
NDE	nondestructive examination
NCV	non-cited violation
NMPNS	Nine Mile Point Nuclear Station, LLC
NRC	Nuclear Regulatory Commission
ODCM	offsite dose calculation manual
psig	pounds per square inch gauge
RB	reactor building
RCIC	reactor core isolation cooling
RCS	reactor coolant system
REMP	radiological environmental monitoring program
RG	regulatory guide
RHR	residual heat removal
RPT	radiation protection technician
RPV	reactor pressure vessel
RWCU	reactor water cleanup
RWP	radiation work permit
SDC	shutdown cooling
SDP	significance determination process
SFP	spent fuel pool
SSC	structure, system, and component

ST	surveillance testing
TLD	thermo luminescent dosimeter
TS	technical specification
UFSAR	Updated Final Safety Analysis Report
UT	ultrasonic testing
VDC	volts direct current