UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
2443 WARRENVILLE RD. SUITE 210
LISLE, IL 60532-4352

January 12, 2017

Mr. Bryan C. Hanson
Senior VP, Exelon Generation Company, LLC
President and CNO, Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: CLINTON POWER STATION - NRC COMPONENT DESIGN BASES INSPECTION, INSPECTION REPORT 05000461/2016009

Dear Mr. Hanson:

On December 1, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed a Component Design Bases Inspection at your Clinton Power Station. Because Exelon Generation Company, LLC, certified to the NRC that it decided to permanently cease power operations at Clinton Power Station by June 1, 2017, on letter titled "Certification of Permanent Cessation of Power Operations," dated June 20, 2016, this Component Design Bases Inspection was adjusted to perform a more detailed assessment of performance in areas potentially impacted by the proposed shutdown. This inspection adjustment was consistent with the guidance contained in Inspection Manual Chapter 2515, "Light-Water Reactor Inspection Program-Operations Phase," dated February 1, 2016. The enclosed report documents the results of this inspection, which were discussed on December 1, 2016, with Mr. B. Kapellas, Plant Manager, and other members of your staff.

Based on the results of this inspection, six NRC-identified findings of very-low safety significance were identified. These findings involved violations of NRC requirements. However, because of their very-low safety significance, and because the issues were entered into your Corrective Action Program, the NRC is treating the issues as Non-Cited Violations in accordance with Section 2.3.2 of the NRC Enforcement Policy.

If you contest the subject or severity of these Non-Cited-Violations, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with copies to the Regional Administrator, Region III; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Clinton Power Station. 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 III, and the NRC Resident Inspector at the Clinton Power Station.

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 2.390, “Public Inspections, Exemptions, Requests for Withholding,” of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC’s Public Document Room or from the Publicly Available Records (PARS) component of the NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Mark Jeffers, Chief
Engineering Branch 2
Division of Reactor Safety

Docket No. 50–461
License No. NPF–62

Enclosure:
IR 05000461/2016009

cc: Distribution via LISTSERV®

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No:	50–461
License No:	NPF–62
Report No:	05000461/2016009
Licensee:	Exelon Generation Company, LLC
Facility:	Clinton Power Station
Location:	Clinton, IL
Dates:	October 31 - December 1, 2016
Inspectors:	N. Féliz Adorno, Senior Reactor Inspector, Lead J. Benjamin, Senior Reactor Inspector, Operations L. Rodriguez, Reactor Inspector, Mechanical J. Robbins, Reactor Inspector, Electrical
Approved by:	M. Jeffers, Chief Engineering Branch 2 Division of Reactor Safety

Enclosure

Table of Contents

SUMMARY

Inspection Report 05000461/2016009, 10/31/2016 – 12/01/2016; Clinton Power Station; Component Design Bases Inspection.

The inspection was a 3-week onsite baseline inspection that focused on the design of components. Because Exelon Generation Company, LLC, certified to the U.S. Nuclear Regulatory Commission (NRC) that it decided to permanently cease power operations at Clinton Power Station by June 1, 2017, this Component Design Bases Inspection was adjusted to perform a more detailed assessment of performance in areas potentially impacted by the proposed shutdown, as allowed by Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program-Operations Phase," dated February 1, 2016. The inspection was conducted by a team of four regional engineering inspectors. Six Green findings were identified by the team. These findings were considered Non-Cited Violations (NCVs) of NRC regulations. The significance of inspection findings is indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using IMC 0609, "Significance Determination Process," dated April 29, 2015. Cross-cutting aspects are determined using IMC 0310, "Aspects Within the Cross-Cutting Areas," dated December 4, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy, dated November 1, 2016. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6, dated July 2016.

NRC-Identified and Self-Revealed Findings

Cornerstone: Mitigating Systems

Green: The team identified a finding of very-low safety significance (Green) and an associated NCV of Title 10 of the *Code of Federal Regulations* (CFR), Part 50, Appendix B, Criterion XVI, "Corrective Action," for the licensee failure to promptly identify that the incapability of the residual heat removal (RHR) design to support Technical Specifications (TS) operability requirements was a condition adverse to quality. Specifically, when reactor water temperature was greater than 150 degrees Fahrenheit, RHR could not be realigned from shutdown cooling mode of operations to provide the TS required functions of the emergency core cooling system, suppression pool cooling, containment spray, and feedwater leakage control system. The licensee captured this issue in their Corrective Action Program (CAP) as Action Request (AR) 02742439 and AR 03948042, and planned to submit a License Amendment Request to align TS requirements with the design capabilities.

The performance deficiency was determined to be more-than-minor because it was associated with the Mitigating Systems cornerstone attribute of design control and adversely affected the associated cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the performance deficiency resulted in voluntarily declaring TS functions inoperable when performing shutdown cooling operations, which did not ensure the associated mitigating systems availability or capability to respond to an initiating event. The team determined that this finding was of very low safety significance (Green). Specifically, there were no known instances where the finding: (1) represented a loss of system safety function; (2) represented an actual loss of safety function of at least a single train or two separate safety systems out-of-service for greater than their TS allowed outage time; (3) involved non-TS trains of

equipment; (4) involved a degradation of a functional RHR auto-isolation on low reactor vessel level; (5) impacted external event protection; or (6) involved fire brigade issues. The team did not identify a cross-cutting aspect associated with this finding because it did not reflect current licensee performance since the performance deficiency occurred more than 3 years ago. (Section 4OA2.b(1))

Cornerstone: Barrier Integrity

Green. The team identified a finding of very-low safety significance (Green) and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the licensee failure to use a technically appropriate analytical methodology in the control room radiological habitability calculation. Specifically, the licensee used a methodology that inappropriately characterized the control room heating, ventilation and air-conditioning (HVAC) system outside air intake design resulting in a calculated control room dose following a loss of coolant accident that exceeded the applicable limit. The licensee captured this issue in their CAP as AR 02742442, completed an operability evaluation, and issued an NRC event notification.

The performance deficiency was determined to be more-than-minor because it was associated with the Barrier Integrity cornerstone attribute of design control and affected the cornerstone objective of providing reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. Specifically, the performance deficiency resulted in the control room expected dose following a loss of coolant accident to exceed the applicable limits prompting an operability evaluation. The finding screened as of very-low safety significance (Green) because it only represented a degradation of the radiological barrier function provided for the control room. Specifically, the finding did not affect the control room barrier function against smoke or a toxic atmosphere. The team did not identify a cross-cutting aspect associated with this finding because it was not confirmed to reflect current performance due to the age of the performance deficiency. Specifically, the affected calculations were performed more than 3 years ago. (Section 1R21.3.b(1))

Green. The team identified a finding of very-low safety significance (Green) and an associated NCV of Paragraph (b)(2)(i) of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," for the licensee failure to scope non-safety related mitigating structure, systems, and components (SSCs) used within an emergency operating procedure (EOP) into Maintenance Rule Program. Specifically, an EOP used spent fuel pool (SFP) low-level and high-temperature parameters as distinct entry criteria but the associated components were not included in the scope of the Maintenance Rule Program. The licensee captured the team concerns in their CAP as AR 02736193, performed an extent of condition to identify any other SSC addition to the EOPs requiring them to be added to the Maintenance Rule Program scope, and initiated plans to incorporate the affected SSCs into the Maintenance Rule Program scope.

The performance deficiency was determined to be more-than-minor because it was associated with the Barrier Integrity cornerstone attribute of SSC performance and affected the cornerstone objective of providing reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. Specifically, a key aspect of the Maintenance Rule is to ensure that maintenance activities are performed in a manner that provide reasonable assurance that SSCs within its scope perform reliably and are capable of providing their intended

Maintenance Rule function(s). In the case of the SFP temperature instruments, the licensee was not performing preventive maintenance to ensure that degradation, such as instrument drift, did not adversely affect their ability to detect and alarm EOP entry conditions such that mitigating actions could be implemented to preserve secondary containment. The finding screened as of very-low safety significance (Green) because it only represented a degradation of the radiological barrier function provided for the control room. Specifically, the finding did not cause SFP temperature to exceed the maximum analyzed limit, a detectible release of radionuclides, water inventory to decrease below the analyzed limit, or an adverse effect to the SFP neutron absorber or fuel loading pattern. The team determined that the finding had a cross-cutting aspect in the area of human performance because the licensee did not use a systematic process for evaluating and implementing changes when updating the affected EOP in 2015. (Section 1R21.3.b(2)) [H.3]

Severity Level IV. The team identified a Severity Level-IV NCV of 10 CFR 50.68, "Criticality Accident Requirements," Paragraph (b)(8), for the licensee failure to amend the Updated Final Safety Analysis Report (UFSAR) to indicate they chose to comply with 10 CFR 50.68(b). Specifically, in 2005, the licensee chose to comply with 10 CFR 50.68(b) but did not amend the UFSAR following the issuance of the associated license amendment. The licensee captured this issue in their CAP as AR 02741851, reasonably confirmed compliance with 10 CFR 50.68(b) requirements (1) through (7) was maintained, and initiated plans to update the UFSAR to specifically indicate that Clinton Power Station chose to comply with 10 CFR 50.68(b).

The Significance Determination Process does not specifically consider the impact to the regulatory process in its assessment of licensee performance. Therefore, it was necessary to address this violation, which potentially impacts the NRC's ability to regulate, using traditional enforcement to adequately deter non-compliance. Specifically, failure to update the UFSAR challenges the regulatory process because it serves as a reference document used, in part, for recurring safety analyses, evaluating License Amendment Request, and in preparation for and conduct of inspection activities. The team determined the traditional enforcement violation was a Severity Level-IV violation in accordance with Section 6.1.d.3 of the Enforcement Policy because the un-updated UFSAR had not been used to evaluate a facility or procedure change that resulted in a condition evaluated as having low-to-moderate or greater safety significance by the Significance Determination Process. However, it had a material impact on safety or licensed activities. Specifically, the un-updated UFSAR could be used to perform evaluations of facility or procedure changes, which would have the potential to result in unacceptable conditions and/or regulatory decisions. Traditional enforcement violations are not assessed for cross-cutting aspects. (Section 1R21.3.b(3))

Green. The team identified a finding of very-low safety significance (Green) and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the licensee failure to verify the adequacy of design assumptions related to time critical operator actions made in calculations associated with the control room HVAC and RHR emergency SFP cooling functions. Subsequently, it was determined that operators did not fully understand the control room HVAC system operational demands and that the operational assumptions of the RHR emergency SFP cooling design were unrealistic. The licensee captured these issues into the CAP as AR 02739012, AR 03943566, and AR 02741909; reasonably demonstrated that SFP makeup sources would be available

to cope with a prolonged loss of SFP cooling; conducted operator training; and provided refined procedural guidance to ensure the control room HVAC system would be operated consistent with the design assumptions.

The performance deficiency was determined to be more-than-minor because it was associated with the Barrier Integrity cornerstone attribute of human performance and adversely affected the cornerstone objective of providing reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. Specifically, the pilot validations of the control room HVAC system operational assumptions demonstrated a significant reduction in margin due to, in part, a lack of operator understanding of the operational assumptions. Additionally, a preliminary review of procedures associated with SFP cooling and RHR determined the operational assumptions of the calculation related to RHR emergency SFP cooling were not bounding. The team determined that this finding was of very low safety significance (Green). Specifically, the control room HVAC system finding example only represented a degradation of the radiological barrier function provided for the control room in that it did not affect the control room barrier function against smoke or a toxic atmosphere. In addition, the finding example related to emergency SFP cooling did not cause SFP temperature to exceed the maximum analyzed limit, a detectible release of radionuclides, water inventory to decrease below the analyzed limit, or an adverse effect to the SFP neutron absorber or fuel loading pattern. The team determined that the finding had a cross-cutting aspect in the area of Human Performance because the operation and engineering organizations did not effectively communicate and coordinate their respective roles in developing the control room HVAC system validation in a manner that supported nuclear safety. (Section 1R21.6.b(1)) [H.4]

Green: The team identified a finding of very-low safety significance (Green), and an associated NCV of 10 CFR Part 50, Appendix B, Criterion V, “Instruction, Procedures, and Drawings,” for the licensee failure to follow the operability evaluation procedure after the identification of a significant design error associated with the control room HVAC system. Specifically, the licensee did not identify the affected safety function, and promptly restore or confirm system operability. The licensee captured these issues into the CAP as AR 03948266 and performed a preliminary engineering evaluation using another alternative analytical methodology that reasonably determined the control room HVAC system remained operable.

The performance deficiency was determined to be more-than-minor because it was associated with the Barrier Integrity cornerstone attribute of human performance and adversely affected the cornerstone objective of providing reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. Specifically, the performance deficiency resulted in a condition where reasonable doubt on the operability of the control room HVAC system remained following the identification of a significant design error. The finding screened as of very-low safety significance (Green) because it only represented a degradation of the radiological barrier function provided for the control room. Specifically, the finding did not affect the control room barrier function against smoke or a toxic atmosphere. The team identified that the finding had a cross-cutting aspect in the area of Human Performance because the licensee did not provide training to maintain a knowledgeable workforce that would facilitate an adequate implementation of the operability evaluation process following the identification of a non-conforming design-related issue. (Section 4OA2.b(2)) [H.9]

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R21 Component Design Bases Inspection (71111.21)

.1 Introduction

The objective of the Component Design Bases Inspection is to verify that design bases have been correctly implemented for the selected risk-significant components and that operating procedures and operator actions are consistent with the design and licensing bases. As plants age, their design bases may be difficult to determine and an important design feature may be altered or disabled during a modification. The Probabilistic Risk Assessment (PRA) model assumes the capability of safety systems and components to perform their intended safety function successfully. This inspectable area verifies aspects of the Initiating Events, Mitigating Systems, and Barrier Integrity cornerstones for which there are no indicators to measure performance.

Exelon Generation Company, LLC, certified to the U.S. Nuclear Regulatory Commission (NRC) that it decided to permanently cease power operations at Clinton Power Station by June 1, 2017, on letter titled, “Certification of Permanent Cessation of Power Operations,” dated June 20, 2016. As a result, this Component Design Bases Inspection was adjusted to perform a more detailed assessment of performance in areas potentially impacted by the planned shutdown, as allowed by Inspection Manual Chapter (IMC) 2515, “Light-Water Reactor Inspection Program-Operations Phase,” dated February 1, 2016.

Specific documents reviewed during the inspection are listed in the Attachment to this report.

.2 Inspection Sample Selection Process

The team used the guidance contained in IMC 2515 to adjust the inspection sample selection process and criteria described in Inspection Procedure 71111.21 to perform a more detailed assessment of performance in areas potentially impacted by the planned shutdown. Based on this approach, a number of samples were selected for the inspection.

The team also considered equipment reliability issues in the selection of samples for detailed review. These included items such as performance test results, significant corrective actions, repeated maintenance activities, Maintenance Rule (a)(1) status, system health reports, and resident inspector input of problem areas/equipment. Consideration was also given to the uniqueness and complexity of the design, operating experience, and the available defense in depth margins. A summary of the reviews performed and the specific inspection findings identified are included in the following sections of the report.

The team also identified procedures and modifications for review that were associated with the selected components. In addition, the team selected operating experience issues associated with the selected component samples.

This inspection constituted 20 samples (i.e., 11 components and 9 operating experience) as defined in Inspection Procedure 71111.21-05 and as adjusted using the guidance contained in IMC 2515 for power reactors preparing for transition to decommissioning phase.

.3 Component Design

a. Inspection Scope

The team reviewed the Updated Final Safety Analysis Report (UFSAR), Technical Specifications (TS), design basis documents, drawings, calculations, and other available design basis information, to determine the performance requirements of the selected components. The team used applicable industry standards, such as the American Society of Mechanical Engineers Code and Institute of Electrical and Electronics Engineers Standards, to evaluate acceptability of the systems' design. The team reviewed the selected components design to assess their capability to perform their required functions and support proper operation of the associated systems. Examples of attributes that were needed for a component to perform its required function included process medium, energy sources, control systems, operator actions, and heat removal. The attributes that verified component condition and tested component capability were appropriate and consistent with the design bases may have included installed configuration, system operation, detailed design, system testing, equipment and environmental qualification, equipment protection, component inputs and outputs, operating experience, and component degradation.

For each of the components selected, the team reviewed the maintenance history, preventive maintenance (PM) activities, system health reports, operating experience-related information, vendor manuals, electrical and mechanical drawings, and licensee corrective action documents. Field walkdowns were conducted for all accessible components selected to assess material condition, including age-related degradation, configuration, potential vulnerability to hazards, and consistency between the as-built condition and the design. In addition, the team interviewed licensee personnel from multiple disciplines such as operations, engineering, and maintenance. Other attributes reviewed are included as part of the scope for each individual component.

The following 11 components (samples) were reviewed:

- Control Room Ventilation Non-Modulating Dampers (0VC01YA/B, 0VC02YA/B, 0VC03YA/B, 0VC04YA/B, 0VC06YA/B, 0VC08YA/B, 0VC09YA/B, 0VC10YA/B, 0VC11YA/B, 0VC48YA/B, 0VC49YA/B, 0VC69Y, 0VC70Y, 0VC81YA/B, 0VC114YA/B, and 0VC115YA/B): The team reviewed calculations related to control room pressurization, leakage, and radiological habitability to assess the dampers capability to perform their function. In addition, the team reviewed the scope of the control room envelope to assess the design capability to permit access and occupancy of the control room under accident conditions without exceeding the applicable radiological limits. The team also reviewed test procedures and completed tests to assess the associated methodology, acceptance criteria, and test results. In addition, the team reviewed calculations for degraded voltage, control logic, and cable ampacity.

- Control Room Chiller (0VC13CA/B): The team reviewed the control room chiller thermal analysis and control room heat up calculations to assess its capability to maintain temperature within design limits. In addition, the team reviewed the implementation of the Generic Letter (GL) 89-13 Program and its commitments associated with this heat exchanger. Specifically, the team reviewed inspect-and-clean and eddy current test procedures and completed surveillances to assess the associated methodologies, acceptance criteria, and test results.

- Control Room Makeup and Supply Air Filter Units (0VC09SA/B and 0VC07SA/B): The team reviewed calculations related to control room pressurization and radiological habitability to assess the consistency of applicable assumptions with the filter design parameters. In addition, the team reviewed test procedures and completed tests to assess the associated methodology, acceptance criteria, and test results. These tests included those related to the charcoal absorber penetration and system bypass, and methyl iodide penetration. In addition, it included those tests related to the high efficiency particulate air filter penetration and system bypass, and pressure drop.

- Control Room Chilled Water Pump (OVC08A/B): The team reviewed hydraulic calculations related to net positive suction head and pump minimum required flow to assess the pump capability to perform its required function. In addition, the team reviewed calculations related to pump motor power requirements.

- Spent Fuel Pool: The team reviewed calculations and control measures associated with spent fuel pool (SFP) inventory, including siphoning prevention design features, control of temporary hoses, and minimum required water level. In addition, the team reviewed calculations and control measures, including monitoring activities, associated with SFP temperature and water chemistry controls. The team also reviewed maintenance activities intended to manage the health of the SFP, including the liner. Lastly, the team reviewed load drop analyses and the SFP heavy load operational restrictions.

- Spent Fuel Pool Cooling Pump (1FC02PA/B): The team reviewed the following hydraulic calculations to assess the pump capability to respond to design basis events: pump minimum required flow, minimum required net positive suction head, vortexing, and pump motor cooling minimum required flow. In addition, the team reviewed analyses associated with gas intrusion, such as makeup tank minimum water level setpoint and instrument design configuration. Test procedures and completed surveillances were also reviewed, including quarterly and comprehensive in-service testing, to assess the associated acceptance criteria and test results. The team also reviewed analyses associated with internal flooding due to postulated pipe failures to assess challenges to the pump, motor, or power required for proper operation. In addition, the team reviewed calculations for degraded voltage, control logic, and cable ampacity.

- Spent Fuel Pool Cooling Surge Tank (1FC01TA/B): The team reviewed SFP surge tank inventory and temperature calculations to assess the tank capability to supply the SFP cooling pumps with an adequate water supply. In addition, the team reviewed inventory control design and operational features, including normal and emergency makeup capabilities, and tank level instrument setpoints.

- Spent Fuel Pool Cooling Heat Exchanger (1FC01AA/B): The team reviewed heat transfer calculations and analyses to assess the heat exchanger capability to respond to design basis events. The review included an assessment of cooling water and SFP water flow rates and temperatures, tube plugging limits, and heat transfer capacity. In addition, the team reviewed chemistry controls in place for the heat exchangers. Test procedures, completed thermal performance tests, and water chemistry reports were reviewed to assess the associated acceptance criteria, methodology, and test results.

- Spent Fuel Pool Racks (1F16E002): The team reviewed criticality analyses and control measures associated with the SFP racks, including the associated safety analyses, rack geometric arrangement, fuel placement controls, and neutron absorbing materials. In addition, the team reviewed seismic analyses to assess the rack design capability to prevent an adverse geometric reconfiguration during an earthquake.

- Shutdown Service Water Pump (1SX01PA/B): The team reviewed service water (SX) pump calculations and analysis, including minimum required system flow, pump cooling, and flood protection. In addition, the team reviewed test procedures and completed tests, including quarterly and comprehensive inservice testing, to assess the associated methodology, acceptance criteria, and test results. Additionally, the team reviewed information related to underground cable monitoring and testing associated with this component. Lastly, the team reviewed pump motor calculations and analysis associated with voltage drop, degraded voltage, minimum required voltage, cable ampacity, and protective devices.

- 125 Volts Direct Current Batteries (1DC01/2E): The team reviewed calculations and analyses related to battery loads, division separation, battery sizing and capacity, and electrical isolation between class 1E and non-1E. This review was performed to assess the battery capability to support the design basis required voltage requirements of the 125 Volts Direct Current safety-related loads under both normal and design basis accident conditions. In addition, the team reviewed discharge calculations to assess the minimum predicted voltage capability to support inverter operation. The team also reviewed a sample of completed surveillance tests, service duty discharge tests, and age management activities to assess the associated acceptance criteria, methodology, and test results.

b. Findings

(1) Non-Conservative Control Room Radiological Habitability Assessment

Introduction: The team identified a finding of very-low safety significance (Green) and an associated Non-Cited Violation (NCV) of Title 10 of the *Code of Federal Regulations* (CFR), Part 50, Appendix B, Criterion III, “Design Control,” for the licensee failure to use a technically appropriate analytical methodology in the control room radiological habitability calculation. Specifically, the licensee used a methodology that inappropriately characterized the control room heating, ventilation, and air-conditioning (HVAC) system outside air intake design resulting in a calculated control room dose following a loss of coolant accident (LOCA) that exceeded the applicable limit.

Description: Revision 11 of UFSAR 1.2.1.2.6, “Shielding and Access Control Criterion,” stated, “The control room is shielded against radiation so that occupancy is possible under accident conditions and whole body doses are less than those set by Criterion 19 of 10 CFR Part 50, Appendix A.” Revision 11 of UFSAR 3.1.2.2.10.1, “Evaluation Against Criterion 19,” stated, “Under accident conditions, sufficient shielding and ventilation are provided to permit occupancy and access to the control room without receiving more than 5 rem whole body or 30 rem thyroid.” Calculation C-020, “Reanalysis of Loss of Coolant Accident Using Alternate Source Terms,” Revision 6, evaluated, in part, the radiological consequence of a LOCA to the control room habitability.

On November 10, 2016, the team noted that C-020 used the methodology described in Regulatory Guide 1.194, Section 3.3.2, which stated, “This section applies to CR [control room] ventilation system configurations that have two outside air intakes, each of which meets applicable design criteria of an engineered safeguards feature (ESF), including single-failure criterion, …” This methodology credited the ability to select the intake exposed to the lowest dose allowing for certain calculated dose concentrations to be reduced by a factor of 4. However, the control room HVAC system dual outside air intakes did not meet the single-failure criterion. Elimination of the reduction factor resulted in a higher calculated control room dose following a LOCA which exceeded the 5 rem limit.

The licensee captured the team concerns in their Corrective Action Program (CAP) as Action Request (AR) 02742442. As an immediate corrective action, the licensee completed an operability evaluation that determined the control room remained operable by, in part, crediting actual as found values associated with key controlling parameters instead of licensing basis limits. In addition, the licensee issued NRC Event Notification 52377, pursuant to 10 CFR 50.72, “Immediate Notification Requirements for Operating Nuclear Power Reactors,” because the incorrect method used for the control room habitability calculation resulted in an unanalyzed condition. The proposed corrective action to restore compliance at the time of this inspection included revising the affected calculation and performing an apparent cause evaluation.

Analysis: The team determined that the failure to use an analytical methodology that was technically appropriate to characterize the control room HVAC system outside air intake design in the control room radiological habitability assessments was contrary to 10 CFR Part 50, Appendix B, Criterion III, “Design Control,” and was a performance deficiency. The performance deficiency was determined to be more-than-minor because it was associated with the Barrier Integrity cornerstone attribute of design control and affected the cornerstone objective of providing reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. Specifically, the performance deficiency resulted in the control room expected dose following a LOCA to exceed the applicable limits prompting an operability evaluation.

The team determined the finding could be evaluated using the Significance Determination Process (SDP) in accordance with IMC 0609, “Significance Determination Process,” Attachment 0609.04, “Initial Characterization of Findings,” issued on October 7, 2016. Because the finding impacted the Barrier Integrity cornerstone, the team screened the finding through IMC 0609 Appendix A, “The Significance Determination Process for Findings At-Power,” issued on June 19, 2012, using Exhibit 3, “Barrier Integrity Screening Questions.” The finding screened as of very-low safety significance (Green) because it

only represented a degradation of the radiological barrier function provided for the control room. Specifically, the finding did not affect the control room barrier function against smoke or a toxic atmosphere.

The team did not identify a cross-cutting aspect associated with this finding because it was not confirmed to reflect current performance due to the age of the performance deficiency. Specifically, the affected calculations were performed more than 3 years ago.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that the licensee provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program.

Contrary to the above, as of December 1, 2016, the licensee failed to verify the adequacy of the control room HVAC system design, a safety-related system, structure, and component (SSC). Specifically, the licensee used a methodology that was not applicable to the control room HVAC system dual outside air intake design in the control room radiological habitability calculation resulting in a calculated dose that exceeded the applicable limit.

The licensee was still evaluating its planned corrective actions. However, the team determined that the continued non-compliance does not present an immediate safety concern because the licensee reasonably determined that the control room envelope remained operable as discussed in Section 4OA2.1.b(2) of this report.

Because this violation was of very-low safety significance and was entered into the licensee's CAP as AR 02742442, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy. **(NCV 05000461/2016009-01; Non-Conservative Control Room Radiological Habitability Assessment)**

(2) Failure to Scope Spent Fuel Pool Temperature and Level Instruments into the Maintenance Rule Program

Introduction: The team identified a finding of very-low safety significance (Green) and an associated NCV of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," for the licensee failure to scope nonsafety-related mitigating SSCs used within an emergency operating procedure (EOP) into the Maintenance Rule Program. Specifically, an EOP used SFP low-level and high-temperature parameters as distinct entry criteria but the associated components were not included in the scope of the Maintenance Rule Program.

Description: In May of 2015, the licensee added SFP temperature above 150 degrees Fahrenheit and SFP level below elevation 753 feet and 4 inches as two new distinct entry criteria in Revision 30 of EOP-8, "Secondary Containment Control." Additionally, EOP-8 was revised to include additional actions if SFP level could not be maintained above elevation 753 feet and 4 inches. The new EOP entry criteria and decision making steps were added based on the Boiling Water Reactor Owner's Group guidance documents. These documents were revised based upon Institute of Nuclear Power Operations Industry Event Report 11-2, "Fukushima Daiichi Nuclear Station SFP Loss of Cooling and Makeup," and an associated elevated importance of maintaining adequate decay heat removal to the SFP. Additionally, the UFSAR described that the 150 degrees Fahrenheit temperature limit was set to assure that the auxiliary building environment does not exceed equipment environmental limits.

On around November 2, 2016, the team noted the SSCs relied upon to detect when these new EOP entry criteria were met were not included in the scope of the Maintenance Rule Program. Specifically, the licensee relied on control room annunciator alarm 5040-1F, "High Temperature Spent Fuel Pool Storage," to detect when the SFP temperature EOP entry criterion was met. This alarm was set at 150 degrees Fahrenheit and used SFP temperature recorder 1TR-FC079 to display the output temperature sensed by SFP thermocouple temperature instrument 1TEFC079. During this inspection, the licensee could not locate any documented PM or testing performed on the SFP temperature instrument and recorder other than a PM to perform replacement of the paperless recorder disk (Ref: AR 02741764). The licensee informed the team that the instrument was calibrated upon installation in January 1999 and the PM was retired on March 16, 2001, based, in part, upon the components not being within the scope of the Maintenance Rule Program, drift not reducing system reliability, and being coded in Procedure ER-AA-210, "Preventative Maintenance Program," as a non-critical run-to-maintenance component (Ref: PMER # 01-00793). Similarly, the licensee relied on control room annunciator alarm 5040-2F, "Low Level Spent Fuel Pool," to detect when the SFP level EOP entry criterion was met. This alarm used SFP level instruments 1LS-FC078 and associated level switches. The SFP level switches had a 2-year instrument check PM activity. The team consulted with the Office of Nuclear Reactor Regulations (NRR), and determined these instruments met the Maintenance Rule Program scoping criteria and were not required as a result of NRC Order EA-12-051, "Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation."

The licensee captured the team concerns in their CAP as A R02736193. As an immediate corrective action, the licensee performed an extent of condition to identify any other SSC addition to the EOPs requiring them to be added to the Maintenance Rule Program scope. The proposed corrective action to restore compliance at the time of this inspection was to incorporate the SFP temperature and level instruments into the Maintenance Rule Program scope.

Analysis: The team determined that the licensee's failure to scope the nonsafety-related SFP temperature and level components into the Maintenance Rule Program was contrary to 10 CFR 50.65(b)(2)(i) and was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the Barrier Integrity cornerstone attribute of SSC performance and affected the cornerstone objective of providing reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. Specifically, a key aspect of the Maintenance Rule is to ensure that maintenance activities are performed in a manner that provide reasonable assurance that SSCs within its scope perform reliably and are capable of providing their intended Maintenance Rule function(s). In the case of the SFP temperature instruments, the licensee was not performing PMs to ensure that degradation, such as instrument drift, did not adversely affect their ability to detect and alarm EOP-8 entry conditions such that mitigating actions could be implemented to preserve secondary containment.

The team determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," issued on October 7, 2016. Because the finding impacted the Barrier Integrity cornerstone, the team screened the finding through IMC 0609, Appendix A, "The Significance Determination Process for Findings At-Power," issued on

June 19, 2012, using Exhibit 3, "Barrier Integrity Screening Questions." The finding screened as of very-low safety significance (Green) because it did not cause SFP temperature to exceed the maximum analyzed limit, a detectible release of radionuclides, water inventory to decrease below the analyzed limit, or an adverse effect to the SFP neutron absorber or fuel loading pattern.

The team determined that the finding had a cross-cutting aspect in the area of Human Performance because the licensee did not use a systematic process for evaluating and implementing changes when updating EOP-8 in 2015. [H.3]

Enforcement: Title 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Paragraph (b)(2)(i) requires, in part, that the scope of the Monitoring Program specified in 10 CFR 50.65(a)(1) includes nonsafety-related SSCs that are relied upon to mitigate accidents or transients or are used in plant EOPs.

Contrary to the above, since May 15, 2015, the licensee failed to scope nonsafety-related SSCs that are relied upon to mitigate accidents or transients or are used in plant EOPs into the Monitoring Program. Specifically, SFP temperature and level instrumentation that are used in EOP-8 were not included in the scope of the monitoring program established by the licensee pursuant 10 CFR 50.65(a)(1).

The licensee was still evaluating its planned corrective actions. However, the team determined that the continued non-compliance does not present an immediate safety concern because the finding did not involve an actual degraded condition.

Because this violation was of very-low safety significance and was entered into the licensee's CAP as AR 02736193, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy. **(NCV 05000461/2016009-02; Failure to Scope Spent Fuel Pool Temperature and Level Instruments into the Maintenance Rule Program)**

(3) Failure to Amend the Updated Final Safety Analysis Report Indicating Choice to Comply with 10 CFR 50.68(b)

Introduction: The team identified a Severity Level (SL)-IV NCV of 10 CFR 50.68, "Criticality Accident Requirements," Paragraph (b)(8), for the licensee failure to amend the UFSAR to indicate they had chosen to comply with 10 CFR 50.68(b). Specifically, in 2005, the licensee chose to comply with 10 CFR 50.68(b) but did not amend the UFSAR following the issuance of the associated license amendment.

Description: In 1998, the NRC amended its regulations to give power reactor licensees the option of either meeting the criticality accident requirements of 10 CFR 70.24, "Criticality Accident Requirements," or 10 CFR Part 50.68, which shares the same title. On August 18, 2004, the licensee submitted a License Amendment Request (LAR) RS-04-113, "Request for Technical Specification Change to Support Onsite Spent Fuel Storage Expansion," to the NRC to revise TS 4.3, "Fuel Storage." This LAR was associated with the replacement of some of the SFP storage racks with a new design. Attachment 5, Section 2.3.g, of the LAR indicated that the new racks were intended to meet, in part, 10 CFR 50.68 requirements. On October 31, 2005, the NRC approved the LAR in License Amendment No. 170. Section 2.0, "Regulatory Evaluation," of the associated Safety Evaluation Report indicated the NRC reviewed the LAR against 10 CFR 50.68(b) requirements. However, during this inspection period, the team

noted the UFSAR had not been amended to indicate the licensee's choice to comply with 10 CFR 50.68(b) as required by 10 CFR 50.68(b)(8). In addition, the UFSAR did not include implicit or explicit descriptions associated with compliance to 10 CFR 50.68(b)(1), 10 CFR 50.68(b)(5), and 10 CFR 50.68(b)(7).

The licensee captured this issue in their CAP as AR 02741851. As an immediate corrective action, the licensee reasonably confirmed compliance to 10 CFR 50.68(b) requirements (1) through (7) was maintained. The proposed corrective action to achieve compliance with 10 CFR 50.68(b)(8) at the time of this inspection was to update the UFSAR to specifically indicate that Clinton Power Station chose to comply with 10 CFR 50.68(b).

Analysis: The team determined this violation was associated with a minor performance deficiency. Specifically, the licensee failure to amend the UFSAR to indicate they chose to comply with 10 CFR 50.68(b) was contrary to 10 CFR 50.68(b)(8) and was a performance deficiency. The performance deficiency was of minor safety significance because the team answered "no" to all the minor screening questions in block 3 of IMC 0612, Appendix B.

The SDP does not specifically consider the impact to the regulatory process in its assessment of licensee performance. Therefore, it was necessary to address this violation which potentially impacts the NRC's ability to regulate using traditional enforcement to adequately deter non-compliance. Specifically, a failure to update the UFSAR challenges the regulatory process because it serves as a reference document used, in part, for recurring safety analyses, evaluating LARs, and in preparation for and conduct of inspection activities. As a result, the violation was evaluated using NRC Enforcement Policy, dated November 1, 2016. The team determined the violation was a SL-IV violation in accordance with Section 6.1.d.3 of the Enforcement Policy because the un-updated UFSAR had not been used to evaluate a facility or procedure change that resulted in a condition evaluated as having low-to-moderate or greater safety significance by the SDP. However, it had a material impact on safety or licensed activities. Specifically, the un-updated UFSAR could be used to perform evaluations of facility or procedure changes, which would have the potential to result in unacceptable conditions and/or regulatory decisions.

Traditional enforcement violations are not assessed for cross-cutting aspects.

Enforcement: Title 10 CFR 50.68, "Criticality Accident Requirements," Paragraph (b)(8), requires licensees to amend the UFSAR no later than the next update required by 10 CFR 50.71, "Maintenance of Records, Making of Reports," Paragraph (e), indicating that the licensee had chosen to comply with 10 CFR 50.68(b). Title 10 CFR 50.71(e) requires, in part, that licensees periodically update the UFSAR as provided in Paragraph (e)(4). Title 10 CFR 50.71(e)(4) requires, in part, that UFSAR revisions be filed annually or 6 months after each refueling outage provided the interval between successive updates does not exceed 24 months.

Contrary to the above, since 2007, the licensee failed to amend the UFSAR no later than the next update required by 10 CFR 50.71(e) to indicate they had chosen to comply with 10 CFR 50.68(b). Specifically, the licensee did not amend their UFSAR within the timeframe required by 10 CFR 50.71(e) following the issuance of License Amendment No. 170 on October 31, 2005, which approved a change where the licensee chose to comply with 10 CFR 50.68(b).

The licensee was still evaluating its planned corrective actions. However, the team determined that the continued non-compliance does not present an immediate safety concern because the licensee reasonably confirmed compliance with 10 CFR 50.68(b) requirements (1) through (7) was maintained.

Because this was a SL-IV violation, and was entered into the licensee's CAP as AR 02741851, this violation is being treated as a NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy. **(NCV 05000461/2016009-03; Failure to Amend the Updated Final Safety Analysis Report Indicating Choice to Comply with 10 CFR 50.68(b))**

.4 Operating Experience

a. Inspection Scope

The team reviewed the licensee's evaluation of nine operating experience issues (samples) to assess the licensee evaluation and resolution of NRC generic concerns. The operating experience issues listed below were reviewed in depth as part of this inspection:

- GL 2007-01, "Inaccessible or Underground Power Cable Failures that Disable Accident Mitigation Systems or Cause Plant Transient;"
- GL 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves;"
- Information Notice (IN) 09-26, "Degradation of Neutron-Absorbing Materials in the Spent Fuel Pool;"
- IN 11-03, "Non-Conservative Criticality Safety Analyses for Fuel Storage;"
- Bulletin 94-01, "Potential Fuel Pool Draindown Caused by Inadequate Maintenance Practices at Dresden Unit 1;"
- GL 85-11, "Completion of Phase II of 'Control of Heavy Loads at Nuclear Power Plants' NUREG-0612;"
- Bulletin 96-02, "Movement of Heavy Loads Over Spent Fuel, Over Fuel in the Reactor Core, or Over Safety-Related Equipment;"
- IN 88-65, "Inadvertent Drainages of Spent Fuel Pools;" and
- IN 14-14, "Potential Safety Enhancements to Spent Fuel Pool Storage."

The team also assessed the accuracy of the licensee response to GL 16-01, "Monitoring of Neutron-Absorbing Materials in Spent Fuel Pools." Because this response was still under the review of NRR, the team did not assess the associated evaluation and resolution of this generic issue. Thus, this review did not constitute an inspection sample.

b. Findings

No findings were identified.

.5 Modifications

a. Inspection Scope

The team reviewed three permanent plant modifications related to selected risk-significant components to verify that the design bases, licensing bases, and performance capability of the components had not been degraded through modifications. The modifications listed below were reviewed as part of this inspection effort:

- Engineering Change (EC) 370372, “Review and Approve Spare SX Motor Documentation, Electrical Drawings, and Seismic Qualification Package,” Revision 1;
- EC 392511, “Fuel Pool Cooling (FC) Pump Trip Reliability - Low Suction Press,” Revision 1; and
- EC 401731, “Division 1 Battery Inter-Rack Jumper Support,” Revision 0.

b. Findings

No findings were identified.

.6 Operating Procedure Accident Scenarios

a. Inspection Scope

The team performed a detailed reviewed of selected procedures associated with the inspection samples. For these procedures, in plant action were walked down with a licensed operator and any interfaces with other departments were evaluated. The procedures were compared to UFSAR, design assumptions, and training materials to assess their consistency. The following operating procedures were reviewed in detail:

- 1893.04M400, “Pre-Fire Plan Fuel Handling Floor,” Revision 4a;
- 3208.01, “Cycled/Makeup Condensate,” Revision 15c;
- 3317,01, “Fuel Pool Cooling and Cleanup,” Revision 31e;
- 3312.03, “Shutdown Cooling & Fuel Pool Cooling Assist,” Revision 10e;
- 3402.01, “Control Room HVAC,” Revision 30b;
- 4006.02, “Loss of Decay Heat Removal in Reactor Vessel Pool/Spent Fuel Pool,” Revision 0d;
- 4303.01P017, “Spent Fuel Pool Makeup from Fire Protection,” Revision 2e;
- 4979.07, “Dropped of Stuck Irritated Fuel Bundle,” Revision 8e;
- 5040.02, “Low Level Spent Fuel Storage Pool,” Revision 26e;
- 9290.01, “Load Movement Over Fuel Assemblies,” Revision 30; and
- EOP-8, “Loss of Secondary Containment,” Revision 30.

For the procedures listed, time critical operator actions were reviewed for reasonableness. This review included observation of licensed operator crews actions during the performance of a failure of control room HVAC system to shift to the high radiation mode scenario on the station simulator to assess operator knowledge level, procedure quality, availability of special equipment where required, and capability to perform time critical operator actions within the required time. In addition, the team evaluated operations interfaces with other departments. The following operator actions were reviewed:

- Two SFP pump and two SFP heat exchanger operation;
- Makeup to the SFP surge tank with cycled condensate water;
- Makeup to the SFP with fire protection water;
- Makeup to the SFP with SX;
- Upper containment overflow makeup to the SFP;
- Component cooling water SFP heat exchanger outlet throttling operation;
- Swapping SFP heat exchanger cooling from component cooling water to SX;
- Aligning Residual Heat Removal RHR for emergency SFP cooling mode; and
- Control room HVAC system failure to shift to the high radiation mode during a LOCA.

b. Findings

(1) Failure to Verify the Adequacy of Design Assumptions Related to Time Critical Operator Actions

Introduction: The team identified a finding of very-low safety significance (Green) and an associated NCV of 10 CFR 50, Appendix B, Criterion III, “Design Control,” for the licensee failure to verify the adequacy of design assumptions related to time critical operator actions. Specifically, the licensee failed to verify operator action time response assumptions made in calculations to support control room HVAC and RHR capability to cool the SFP.

Description: The licensee established Revision 3 of Procedure OP-AA-102-106, “Operator Response Time Program,” to identify and validate operator time critical actions (TCAs) that were assumed to be performed within a specified time frame in design calculations and associated licensing basis. The program established the standards under which the various TCAs are scoped into the program, controlled, validated, and documented. The validation process was developed by both the operations and engineering departments, and was structured in a manner to ensure that credited operator actions can be performed under the limiting conditions existing within the current licensing basis (e.g., bounding event, limiting single failure, minimum staffing, equipment accessibility).

On December 10, 2015, the licensee performed a validation (i.e., TCA-7) intended to confirm operators would identify the failure of the control room HVAC train in service to realign from the normal to the high radiation operating mode, and take manual action to start and align the standby control room HVAC train in high radiation mode within 20 minutes consistent with the assumptions of Calculation C-020, "Reanalysis of Loss of Coolant Accident Using Alternate Source Terms," Revision 6. This calculation evaluated, in part, the radiological consequences of a LOCA to the control room operators. However, during this inspection, the team noted the validation was not performed with control room minimum staffing. Specifically, TS 5.2.2, "Unit Staff," required a minimum of 2 senior reactor operators and 2 reactor operators. However, TCA-7 was performed with the normal control room staff compliment of 3 senior reactor operators and 3 reactor operators. The team also noted the validation was not performed with a LOCA. In addition, the licensee did not address these differences as required by Procedure OP-AA-102-106, Steps 4.1.7, 4.3.4, 4.3.10, and 4.3.13, and Attachment 1. The team was concerned because minimum staffing during a LOCA would add significant complexities and competing operational priorities which would likely increase the as-found response time of 12 minutes.

The licensee captured the TCA-7 issues in the CAP as AR 02739012 and performed a pilot TCA-7 validation during this inspection with minimum staffing and a LOCA, which the inspection team observed. The licensee determined the TCA was completed in 14 minutes. However, the team noted the licensee declared the TCA as completed prematurely. Specifically, the licensee determined the TCA was completed when the standby control room HVAC train was started in high radiation mode. However, the Calculation C-20 assumptions included proper alignment of the intake damper, which occurred at approximately 19 minutes. The licensee captured this issue in the CAP as AR 03943566. Corrective actions included creating an assignment to develop a new TCA-7 validation scenario, developing a new smart card procedure defining the necessary steps credited in the TCA, and holding crew tail gate discussions to raise awareness to ensure that these actions would be performed within the assumed time for an actual event.

In addition, the licensee identified similar issues associated with other TCAs and captured them in the CAP as AR 02740663, AR 02741339, AR 02740908, and AR 02740900.

The team also noted a separate issue involving the licensee failure to recognize a TCA related to cooling the SFP using RHR. Specifically, Revision 12 of UFSAR 9.1.3, "Spent Fuel Pool Cooling and Cleanup Systems," stated, in part, that a train of RHR can be used for emergency SFP cooling but prohibits usage when the RHR system is required for decay heat removal. Calculation 1FC32, "Confirm that the Volume of Water in the Spent Fuel Pool Is Such that there Is Enough Heat Absorption Capability to Allow Sufficient Time for Switching Over to the Residual Heat Removal System for Emergency Cooling," Revision 0A, evaluated the SFP heat up during a loss of the normal SFP cooling system at power and assumed that it would take approximately 3.5 hours to shutdown and cooldown the plant to permit RHR usage for SFP cooling and an additional 1.0 hour to align the RHR train for this purpose. However, the team noted that a TCA had not been identified, developed, and validated as required by OP-AA-102-106, Steps 2.5, 3.1.2, and 3.2.1. Additionally, based upon a review of the associated procedures and plant walkdowns, the team questioned if the assumed response times were realistic. The licensee reviewed the associated procedures and estimated that the

actions could be completed in 6.5 to 9.5 hours. The licensee entered these issues into the CAP as AR 02741909. The proposed corrective action to achieve compliance at the time of this inspection was to develop an associated TCA and revise Calculation 1FC32.

Analysis: The team determined that the failure to verify the adequacy of design assumptions related to time critical operator actions was contrary to Procedure OP-AA-102-106 and was a performance deficiency. The performance deficiency was determined to be more-than-minor because it was associated with the Barrier Integrity cornerstone attribute of human performance and adversely affected the cornerstone objective of providing reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. Specifically, the pilot validations of the control room HVAC system operational assumptions demonstrated a significant reduction in margin due to, in part, a lack of operator understanding of the operational assumptions. Additionally, a preliminary review of procedures associated with SFP cooling and RHR determined the operational assumptions of the calculation related to RHR emergency SFP cooling were not bounding.

The team determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," issued on October 7, 2016. Because the finding impacted the Barrier Integrity cornerstone, the team screened the finding through IMC 0609, Appendix A, "The Significance Determination Process for Findings At-Power," issued on June 19, 2012, using Exhibit 3, "Barrier Integrity Screening Questions." The team determined that this finding was of very low safety significance (Green). Specifically, the TCA-7 finding example only represented a degradation of the radiological barrier function provided for the control room in that it did not affect the control room barrier function against smoke or a toxic atmosphere. In addition, the finding example related to emergency SFP cooling did not cause SFP temperature to exceed the maximum analyzed limit, a detectible release of radionuclides, water inventory to decrease below the analyzed limit, or an adverse effect to the SFP neutron absorber or fuel loading pattern.

The team determined that the finding had a cross-cutting aspect in the area of Human Performance because the operation and engineering organizations did not effectively communicate and coordinate their respective roles in developing TCA-7 in a manner that supported nuclear safety. [H.4]

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that the licensee provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program.

Contrary to the above, as of December 1, 2016, the licensee failed to verify the adequacy of the design as evidenced by the following examples:

- The licensee did not verity the control room HVAC design, a safety-related SSC, would be capable of maintaining adequate control room habitability following a LOCA and a single failure. Specifically, the design relied on time critical operator action assumptions that were not verified to be correct using the most limiting conditions.

- The licensee did not verify the RHR design, a safety-related SSC, would be capable of providing emergency SFP cooling. Specifically, the design relied on time critical operator action assumptions that were not verified to be correct and were subsequently determined to be unrealistic during this inspection.

The licensee was still evaluating its planned corrective actions. However, the team determined that the continued non-compliance does not present an immediate safety concern because the finding did not result in actual SFP degraded conditions and the licensee reasonably demonstrated that SFP makeup sources would be available to cope with a prolonged loss of SFP cooling. In addition, the licensee immediately conducted operator training and provided control room operators refined procedural guidance to ensure the control room HVAC system would be operated consistent with the design assumptions.

Because this violation was of very-low safety significance and was entered into the CAP as AR 02739012, AR 02741909, and AR 03943566, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy.
(NCV 05000461/2016009-04, Failure to Verify the Adequacy of Design Assumptions Related to Time Critical Operator Actions)

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems

.1 Review of Items Entered Into the Corrective Action Program

a. Inspection Scope

The team reviewed a sample of problems identified by the licensee associated with the selected inspection samples and that were entered into the CAP. The team reviewed these issues to assess the licensee's threshold for identifying engineering issues and the effectiveness of corrective actions related to engineering issues. In addition, corrective action documents written on issues identified during the inspection were reviewed to assess the incorporation of the problem into the CAP. The specific corrective action documents reviewed by the team are listed in the attachment to this report.

b. Findings

(1) Failure to Promptly Identify that the Incapability of the Residual Heat Removal Design to Support Technical Specifications Operability Requirements Was a Condition Adverse to Quality

Introduction: The team identified a finding of very-low safety significance (Green) and an associated NCV of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," for the licensee failure to promptly identify that the incapability of the RHR design to support TS operability requirements was a condition adverse to quality (CAQ). Specifically, when reactor water temperature was greater than 150 degree Fahrenheit, RHR could not be realigned from shutdown cooling (SDC) mode of operations to provide the TS required functions of the emergency core cooling system, suppression pool cooling, containment spray, and feedwater leakage control system.

Description: During this inspection, the team noted the licensee was aware that the design of the RHR system could not support certain TS limiting condition of operations (LCOs) while it was aligned for SDC but failed to recognize this as a CAQ. This was evidenced by the fact that step 6.4 and cautions of procedure 3312.03, "Residual Heat Removal Shutdown Cooling Operations & Fuel Pool Cooling and Assist," Revision 10e, directed operators to declare multiple TS LCOs inoperable when operating RHR in SDC and with reactor water temperature greater than 150 degrees Fahrenheit. These LCOs were LCO 3.5.1, "Emergency Core Cooling Systems-Operating;" LCO 3.5.2, "Emergency Core Cooling Systems-Shutdown;" LCO 3.6.1.7, "Containment Spray," LCO 3.6.1.9, "Feedwater Leakage Control System;" and LCO 3.6.2.3, "Residual Heat Removal Suppression Pool Cooling." The team also noted that a recent operator log documented this practice. The team was concerned because the licensee failed to recognize that the inability to maintain the operability of multiple SSCs, as required by TS, was a CAQ that needed to be corrected.

The licensee confirmed the LCOs were declared inoperable under the described conditions because valves 1E12-F004A(B) would need to open to realign RHR from SDC mode to support the other LCO functions. However, these valves would not be capable of opening at water temperatures greater than 150 degrees Fahrenheit due to pressure locking/thermal binding concerns. Specifically, the licensee documented the valves' susceptibility to pressure locking/thermal binding in Letter Y-105681, dated November 29, 1995, as part of their efforts to respond to NRC GL 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves." However, the licensee did not treat the valves' susceptibility to pressure locking/thermal binding as a CAQ because they incorrectly concluded: (1) the valves did not have a safety function to open when in SDC operations; and (2) they could revise their SDC procedure to voluntarily declare the valve associated with the SDC train in operation as inoperable under conditions where the valve would be susceptible to pressure locking/thermal binding. In addition, the licensee confirmed that opening the valves at water temperatures greater than 212 degrees Fahrenheit would have the potential to lead to steam void formation. For example, the water inside of the pipe would flash to steam following RHR realignment from SDC to Emergency Core Cooling Systems mode of operation at water temperatures higher than saturation conditions to respond to a shutdown LOCA, leading to, in part, water hammer concerns.

The team discussed this issue with NRR and reviewed historical licensing basis documents. The team also reviewed the TS Basis and noted the basis for LCO 3.0.2 stated:

> The Completion Times of the Required Actions are also applicable when a system or component is removed from service intentionally. The reasons for intentionally relying on the ACTIONS include, but are not limited to, performance of Surveillances, preventive maintenance, corrective maintenance, or investigation of operational problems. Entering ACTIONS for these reasons must be done in a manner that does not compromise safety. Intentional entry into ACTIONS should not be made for operational convenience. Alternatives that would not result in redundant equipment being inoperable should be used instead.

As a result, it was determined the intent of the affected TS LCOs was, in part, to ensure the specified SSCs were operable and that it was not acceptable to rely on TS required actions and associated completion times as corrective actions for CAQs that are known and expected.

The licensee captured this issue in their CAP as AR 2742439 and AR 3948042. The proposed corrective action to achieve compliance at the time of this inspection was to request a LAR to align TS with the plant design capabilities.

Analysis: The team determined the failure to promptly identify that the incapability of the RHR design to support TS operability requirements was a CAQ was contrary to 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," and was a performance deficiency. The performance deficiency was determined to be more-than-minor because it was associated with the Mitigating Systems cornerstone attribute of design control and adversely affected the associated cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the performance deficiency resulted in voluntarily declaring TS functions inoperable when performing SDC operations, which did not ensure the associated mitigating systems availability or capability to respond to an initiating event.

The team determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," issue date October 7, 2016. Because the finding impacted the Mitigating Systems cornerstone during shutdown conditions the team screened it using IMC 0609, Appendix G, "Shutdown Operations Significance Determination Process," issue date May 9, 2014, Attachment 1, "Shutdown Operations Significance Determination Process Phase 1 Initial Screening and Characterization of Findings," issue date May 9, 2014, Exhibit 3, "Mitigating Systems Screening Questions." The team determined that this finding was of very-low safety significance (Green). Specifically, there were no known instances where the finding: (1) represented a loss of system safety function; (2) represented an actual loss of safety function of at least a single train or two separate safety systems out-of-service for greater than its TS allowed outage time; (3) involved non-TS trains of equipment; (4) involved a degradation of a functional RHR auto-isolation on low reactor vessel level; (5) impacted external event protection; or (6) involved fire brigade issues.

The team did not identify a cross-cutting aspect associated with this finding because it did not reflect current licensee performance since the performance deficiency occurred more than 3 years ago.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requires, in part, that CAQs, such as deficiencies and non-conformances are promptly identified and corrected.

Contrary to the above, since November 29, 1995, the licensee failed to promptly identify and correct a CAQ. Specifically, the licensee recognized that valves 1E12-F004A(B) could not be opened to support TS LCOs 3.5.1, 3.5.2, 3.6.1.7, 3.6.1.9, and 3.6.2.3 under certain conditions while RHR was aligned for SDC. However, the licensee did not identify this condition as a CAQ and, as a result, did not capture it in the CAP and correct it.

At the time of this inspection, the licensee was still evaluating its planned corrective actions. However, the team determined that the continued non-compliance did not present an immediate safety concern because the associated TS allowable outage times provided reasonable safety assurance if the proposed LAR is not submitted and approved by the next plant shutdown.

Because this violation was of very-low safety significance, and was entered into the licensee's CAP as AR 2742439 and AR 3948042, this violation is being treated as a NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy.
(NCV 05000461/2016009-05; Failure to Promptly Identify that the Incapability of the Residual Heat Removal Design to Support Technical Specification Operability Requirements Was a Condition Adverse to Quality)

(2) Failure to Follow the Operability Determination Process Following the Identification of a Control Room Heating, Ventilation and Air-Conditioning System Design Issue

Introduction: The team identified a finding of very-low safety significance (Green), and an associated NCV of 10 CFR Part 50, Appendix B, Criterion V, "Instruction, Procedures, and Drawings," for the licensee failure to follow the operability evaluation procedure after the identification of a significant design error associated with the control room HVAC system. Specifically, the licensee did not identify the affected safety function, and promptly restore or confirm system operability.

Description: During this inspection, the licensee created AR 02742442 to capture the team concerns documented in Section 1R21.3.b(1) of this report associated with a control room HVAC system design error. As a result, the licensee performed an operability evaluation that concluded the control room HVAC system remained operable. However, the team noted the operability evaluation had the following significant weaknesses that reasonably challenged its conclusion:

- The licensee failed to recognize that operability is impacted whenever a TS SSC cannot perform its specified function. Specifically, the evaluation recognized that the issue represented a non-conforming design issue that could affect the system capability to maintain the maximum control room occupancy dose within the required limit during a LOCA. However, it determined that the issue did not impact operability because the issue did not result in physical equipment degradation.

- The licensee credited compensatory actions that did not restore operability. Specifically, operations created a standing order for operators to don respirators during a LOCA. The entry conditions of the first two revisions of the standing order were only applicable when the control room envelope boundary was inoperable. However, the design error did not affect control room envelope boundary. Thus, the standing order would not be executed during the conditions applicable for the non-conforming condition. In addition, the team noted that the use of respirators could not restore or establish the control room HVAC system operability because they do not support the system capability to perform its specified safety function.

- The licensee credited an alternative analytical methodology for operability that was not technically appropriate. Specifically, the operability evaluation was based, in part, on an alternative analysis that determined the system would

perform its function by assuming that containment spray, which was not previously credited, would be operated in a specific manner. However, the licensee did not create an instruction (e.g., standing order) to ensure operators would operate containment spray in a manner that was consistent with the analysis assumptions. In addition, the licensee did not evaluate the effects on containment of operating containment spray in the assumed manner. Specifically, the team was concerned about the possibility of overcooling containment resulting in unanalyzed negative pressure conditions.

The licensee captured this issue in their CAP as AR 03948266. Corrective actions included performing a preliminary engineering evaluation using another alternative analytical methodology that reasonably determined the control room HVAC system remained operable. At the time of this inspection, the licensee was still processing the results of this preliminary evaluation through their formal operability determination process.

Analysis: The team determined that the failure to follow the operability evaluation procedure after the identification of a significant design error associated with the control room HVAC system was contrary to 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," and was a performance deficiency. The performance deficiency was determined to be more-than-minor because it was associated with the Barrier Integrity cornerstone attribute of human performance and adversely affected the cornerstone objective of providing reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. Specifically, the performance deficiency resulted in a condition where reasonable doubt on the operability of the control room HVAC system remained following the identification of a significant design error.

The team determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," issued on October 7, 2016. Because the finding impacted the Barrier Integrity cornerstone, the team screened the finding through IMC 0609 Appendix A, "The Significance Determination Process for Findings At-Power," issued on June 19, 2012, using Exhibit 3, "Barrier Integrity Screening Questions." The finding screened as of very-low safety significance (Green) because it only represented a degradation of the radiological barrier function provided for the control room. Specifically, the finding did not affect the control room barrier function against smoke or a toxic atmosphere.

The team identified that the finding had a cross-cutting aspect in the area of Human Performance because the licensee did not provide training to maintain a knowledgeable workforce that would facilitate an adequate implementation of the operability evaluation process following the identification of a non-conforming design-related issue. [H.9]

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality be prescribed by documented procedures of a type appropriate to the circumstances and be accomplished in accordance with these procedures. The licensee established Procedure OP-AA-108-115, Revision 17, as the implementing procedure for determinations of operability of safety-related SSCs included in TSs, an activity affecting quality.

Contrary to the above, from November 18 to December 1, 2016, the licensee failed to follow procedure OP-AA-108-115 as evidenced by the following examples:

- Step 4.5.2.2 of the procedure stated, in part, "Compensatory measures may be used to: […] Restore inoperable SSC to an operable but degraded or non-conforming status." Step 2.1 defined compensatory measure as "An interim action, either physical or administrative, that is taken to maintain or enhance an operable but degraded or nonconforming SSC to ensure its specified safety function can be performed until final corrective action to resolve the condition is completed."

  Contrary to these steps, the licensee used a compensatory action that did not ensure the specified safety function of the nonconforming SSC could be performed. Specifically, operations created a standing order for operators to don respirators that would not be executed during the conditions applicable for the non-conforming condition. In addition, the use of respirators could not restore or establish the control room HVAC system operability because they do not support the system capability to perform its specified safety function.

- Step 4.1.5 stated "Immediately determine operability from a detailed examination of the deficiency." Step 2.14 stated, in part, "A system, structure, division/train, component, or device shall be operable or have operability when it's capable of performing its specified safety function(s)…" It also stated "In order to be considered operable, an SSC must be capable of performing the safety functions specified by its design, within the required range of design physical conditions, initiation times, and mission times."

  Contrary to these steps, the licensee did not determine operability of the control room HVAC when there was reasonable doubt it would be capable of performing its safety function following the discovery of a nonconforming design. Specifically, the licensee assumed that operability could only be challenged by physical equipment degradation.

- Step 4.5.17.2 stated, in part, "The use of any analytical method must be technically appropriate to characterize the SSC involved, the nature of the degraded or nonconforming condition, and specific facility design."

  Contrary to this step, the licensee used an analytical method that was not technically appropriate to characterize the specific facility design. Specifically, the analytical method assumed that containment spray would be operated in a specific manner that was not assured by procedures and the licensee did not create a temporary instruction to ensure operators would operate containment spray in a manner that was consistent with the analysis assumptions. In addition, the assumed containment spray operation had the potential to overcool containment and this effect was not evaluated.

At the time of this inspection, the licensee was still evaluating its planned corrective actions. However, the team determined that the continued non-compliance did not present an immediate safety concern because the licensee reasonably concluded the system was operable based upon a preliminary engineering analysis.

Because this violation was of very-low safety significance, and was entered into the licensee's CAP as AR 02742442, this violation is being treated as a NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy. **(NCV 05000461/2016009-06; Failure to Follow the Operability Determination Process Following the Identification of a Control Room Heating, Ventilation and Air-Conditioning System Design Issue)**

4OA6 Management Meeting

.1 Exit Meeting Summary

On December 1, 2016, the team presented the inspection results to Mr. B. Kapellas, and other members of the licensee staff. The licensee acknowledged the issues presented. The team confirmed that several documents reviewed were considered proprietary and were handled in accordance with the NRC policy related to proprietary information.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

B. Kapellas, Plant Manager
S. Gackstetter, Site Engineering Director
C. Dunn, Operations Director
D. Shelton, Regulatory Assurance Manager
M. Heger, Senior Manager Design Engineering
D. Avery, Regulatory Assurance Representative

U.S. Nuclear Regulatory Commission

M. Jeffers, Chief, Engineering Branch 2
N. Féliz Adorno, Senior Reactor Inspector

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000461/2016009-01	NCV	Non Conservative Control Room Radiological Habitability Assessment (Section 1R21.3.b(1))
05000461/2016009-02	NCV	Failure to Scope SFP Temperature and Level Instruments into the Maintenance Rule Program (Section 1R21.3.b(2))
05000461/2016009-03	NCV	Failure to Amend the UFSAR Indicating Choice to Comply with 10 CFR 50.68(b) (Section 1R21.3.b(3))
05000461/2016009-04	NCV	Failure to Verify the Adequacy of Design Assumptions Related to Time Critical Operator Actions (Section 1R21.6.b(1))
05000461/2016009-05	NCV	Failure to Promptly Identify that the Incapability of the RHR Design to Support TS Operability Requirements Was a CAQ (Section 4OA2.b(1))
05000461/2016009-06	NCV	Failure to Follow the Operability Determination Process Following the Identification of a Control Room HVAC System Design Issue (Section 4OA2.b(2))

LIST OF DOCUMENTS REVIEWED

The following is a list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors reviewed the documents in their entirety, but rather, that selected sections of portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

CALCULATIONS

Number	Description or Title	Date or Revision
VC-91	Minimum Available and Maximum Required NPSH for the VC System Chilled Water Pumps	0
VC-82	Control Room Pressurization with Two Open Floor Drains	0
VC-68	Min./Max. Flow & Density Determination for VC	0
VC-40	Allowable Tolerances for VC Airflows	0
C-020	Reanalysis of Loss of Coolant Accident Using Alternate Source Terms	6
C-022	Site Boundary and Control Room Dose Following a FHA in Containment Using AST	0
VC-86	Evaluation of Control Room Chillers for SX Acceptance Criteria	1
EQ-CL006	Environmental Qualification of The Okonite Company Low Voltage Power and Control Cables	04/01/03
EQ-CL007	Environmental Qualification of Okonite 5KV Power Cables Splice Tapes and Tapes Configurations	24
EC 399907	SX Cable Submergence Evaluation	0
EC 392511	Fuel Pool Cooling Pump Trip Reliability – Low Suction Pressure	1
EC 370372	Review and Approve Spare SX Motor Documentation, Electrical Drawings, and Seismic Qualification	1
EC 401731	Division 1 Battery Inter-Rack Jumper Support	0
19-D-28	Review of Division 1 DC System Review 1A	15
19-AK-13	CPS Load Control Calculation	3
19-AK-13	LOCA09-1E fed by RAT, 138kV and 345kV System at 105%, 1E buses at 4300V via SVC, Fault Currents for Bus 1AP07E and 1AP09E	3
19-AN-08	4160V ESF Switchgear Buses 1A1 and 1B1 Motor Relay Settings	4
01FC43	Thermal-Hydraulic Analysis, Holtec Calc HI-2033116	2A
01FC07	Allowable Value for FC Pump Trip	3A
01FC25	FC HX Performance	5
01FC42	Criticality Safety Analysis for Clinton, HI-2033135	2
01SX52	Process Type Heat Exchanger Acceptance	0
IP-M-0563	Determination of Allowable Leak Rates and Loss of UHS Volume from Shutdown Service Water (SX) Boundary Valves	2B
HI-2033124	Spent Fuel Storage Expansion at Clinton Power Station	2
IP-F-0096	Nuclear Evaluation of High Density Spent Fuel Storage Racks at Low Temperature	0
EC390921	Fuel Pool Cooling and Cleanup HX Test Data and Performance Evaluation-1FC01AA	0
IP-M-0197	Evaluation of Potential Inleakage through Screen House Penetration Seals below Probable Maximum Flood Level	0
IP-M-0825	FC Surge Tank Vortex Evaluation	0
EC 265230	Re-Rack Project Safe Load Path Deviation	1

CORRECTIVE ACTION DOCUMENTS (GENERATED DUE TO THE INSPECTION)

Number	Description or Title	Date
AR02735956	CDBI Calculation VC-91 Has an Incorrect Term	11/02/16
AR02740900	CDBI: ADMIN Gaps Identified in Review of OP-CL-102-106-1001	11/14/16
AR02740908	CDBI: OP-AA-102-106 Attachment 1 Info Needs Updated	11/14/16
AR02741020	CDBI 2016: NRC Observation for ATI 889611-01	11/14/16
AR02741299	CDBI: NRC Observation of CPS 3317.01 and EOP-8 Directions	11/15/16
AR02741339	CDBI – Past TCA's Conducted with Greater than Min Staffing	11/15/16
AR02741520	CDBI FC Surge Tank Vortexing Observation	11/15/16
AR02741555	2016 CDBI FC Surge Tank Levels M05S are Misleading	11/15/16
AR02735934	CDBI: Bolting on New Div 2 SX Pump Requires Coating	11/02/16
AR02735962	CDBI ID: Door 1DR1-16 Will Not Self-Close and Latch	11/02/16
AR02736120	CDBI Unapproved Document Used as Reference in Calc VC-19	11/02/16
AR02736193	2016 CDBI: Spent Fuel Pool Instruments Not in the MT Rule	11/02/16
AR02736537	CDBI ID: Housekeeping Issues in Fuel Building	11/03/16
AR02736756	CDBI: VC Locker Room Exhaust Dampers Incorrectly Classified	11/03/16
AR02737143	CDBI M05-1102 Sht1 Needs Updated Failure Mechanism of Damper	11/04/16
AR02737150	CDBI DC-ME-06-CP Has Incorrect Addition Control Room Leakage	11/04/16
AR02737155	CDBI Drawing Rev Has a Note Removed that Is Still Referenced	11/04/16
AR02737285	2016 CDBI: Housekeeping Equip Stored on Elec Junction Box	11/04/16
AR02739012	CDBI ID: Validation Errors of Operator Response Time Action	11/09/16
AR02739642	CDBI 2016- WO Task Not Cancel Requested When Work Was Completed	11/10/16
AR02740040	CDBI: Statement in USAR Not Updated for SFP Re-Rerack	11/11/16
AR02741764	CDBI 2016: Spent Fuel Pool Instrumentation Being Accurate	11/16/16
AR02741851	NRC CDBI Identified USAR Update Needed	11/16/16
AR02741862	CDBI – NRC Questions Staffing on TCA Validations	11/16/16
AR02741909	CDBI – Potential New TCA for FC Cooling from RHR A System	11/16/16
AR02741937	NRC CDBI – Generic Letter Response GL2016-01 Needs Update	11/16/16
AR02742297	CDBI Calculation C-022 Needs to be Updated with Current Data	11/15/16
AR02742333	CDBI 2016: EC 399907 EC Eval for Submerged Cables	11/17/16
AR02742439	CDBI – Need Action to Track Resolution of CDBI Question	11/17/16
AR02742442	CDBI: Inappropriate Calculation Method for CR Habitability	11/17/16
AR02742446	CDBI: Coding of Corrective Actions Not IAW PI-AA-125	11/17/16
AR02742785	CDBI Revise 01FC25 to Include Analysis with Tube Plugging	11/18/16
AR03943566	CDBI – Observations of Piloted TCA-7 Performance	11/21/16
AR03943594	CDBI – DWG V54417-600 SH2 of 7 Contains Typo – CCP	11/21/16
AR03943717	CDBI: Timeliness of NRC Report	11/21/16
AR03944282	CDBI – Fire Protection System Lesson Plan Not in EDMS	11/22/16
AR03946256	CDBI – 5040.02 Window 2D and 2E Need Refinement	11/28/16
AR03946310	CDBI: Revise CPS 2700.12/13 for Valve Throttling Positioning	11/28/16
AR03946387	CDBI – VC Tracer Gas Test Trending	11/28/16
AR03946468	CDBI – Past IR Returned to Ops for OP/Functionality Review	11/28/16
AR03946485	CDBI Incorrect SFP Elevation in TS 4.3.2	11/28/16
AR03946490	CDBI – Bundle and Core Design Verif Guide Missing Info	11/28/16
AR03946974	CDBI FC Check Valve IST Flow Rate Issue	11/28/16
AR03946979	CDBI No Spent Fuel Pool Siphon Breaker Sizing Calculation	11/29/16
AR03948042	CDBI RHR TS 3.5.1 Mode 3 Applicability	12/01/16

CORRECTIVE ACTION DOCUMENTS (REVIEWED DURING THE INSPECTION)

Number	Description or Title	Date
AR02484166	VC Damper 49YB Has Leakage Through Blades	04/13/15
AR02484163	VC Damper 48YB Has Leakage Through Blades	04/13/15
AR02631112	Damper Blade Not Making Contact	02/24/16
AR02631463	VC A Outlet Temp 0TIVC421 HOOS	02/25/16
AR02700958	Unexpected VC Chiller B Trip	08/04/16
AR01153798	VC Filtered Air In-Leakage Trend Increasing	12/17/10
AR02712999	2016 CDBI FASA, NRC IN2009-26 and IN2011-03 Discrepancies	09/07/16
AR02713000	2016 CDBI FASA - 1FC01AA: FC HXs Not in GL 89-13 Program	09/07/16
AR01509794	1CC075B; CCW Tank Lowers When SX Aligned to FC HX	05/02/13
ATI01206369-01	NRC Information Notice 2011-03: Nonconservative Criticality Safety Analyses for Fuel Storage	06/01/11
AR01674529	OPEX – NRC Info Notice 2014-09 - Spent Fuel Misloading Events	06/24/14
AR00181452	OPEX OE15859 Salem Tritium Leak from Fuel Pool / IN 2004-05	10/17/03
ATI01406618-01	NRC IN 2012-13, “Boraflex Degradation Surveillance Programs and Corrective Actions in the Spent Fuel Pool”	11/08/12
AR01616833	SFP, IFTS to Cask Loading Pool Potential for Loss of Water	02/04/14
AR00987616	IN 2009-26 Degradation of Neutron Absorbing Materials in SFP	11/02/09
AR01377717	Initial Results from Div. 2 SX Flow Balance	06/14/12
AR01037486	2010 CDBI FASA Identifies Flow Balance Procedure Weakness	03/02/10
AR01074788	CDBI NRC Inspector Challenges Information in IR 1037486	05/28/10
AR2596101	1FC004A – Contingency WO needed for Valve Repair	12/04/15
AR2453592	1FC02PB Pump Outboard Bearing Oil Leak	02/11/15
AR1294780	3317.01 2 FC Pump and HX Operation	11/27/11
AR2740900	CDBI: Admin Gaps Identified in Review OP-CL-102-1001	11/14/16
AR2741862	CDBI: Limiting Staff for TCA	11/16/16
AR1558342	FP FASA: OP-CL-102-106-1001 Does Not Contain All TCAs	09/13/13
AR2722442	Inappropriate Calculation Method for CR Habitability	11/17/16
AR2741299	CDBI – CPS 3317.01 and EOP-8 Conflicting Information	11/15/16
AR2742446	CDBI – Coding of Corrective Actions Not IAW PI-AA-125	11/17/16
AR2741339	CDBI – Past TCA’s Conducted With Greater Than Min. Staffing	11/15/16
AR1674529	OPEX – NRC IN 2014-09 – Spent Fuel Misloading Events	06/24/14
AR2414160	OPEX Eval for NRC IN 2014-14 – Potential Safety Enhancement	11/19/14
AR2725126	Perform EOC Review for New MR Function VF-01	10/06/16
AR2740663	Validation Errors of Operator Response Time Actions	11/13/16
AR3948266	CDBI Operability Evaluation for MRC Habitability Observation	12/01/16
AR2739012	CDBI ID: Validation Errors of Operator Response Time Action	11/09/16
AR2741339	CDBI – Past TCA’s Conducted with Greater than Min Staffing	11/15/16
AR2740908	CDBI – OP-AA-102-106 Attachment 1 Info Needs Updated	11/14/16
AR3947667	CDBI – Questions IR 2741909 Action Coding of ACIT	11/30/16
AR2741909	CDBI – Potential New TCA for FC Cooling from RHR A System	11/16/16
AR2736193	CDBI – Spent Fuel Pool Instruments not in MR Scope	11/02/16
AR3948042	CDBI RHR TS 3.5.1. Mode 3 Applicability	12/01/16
AR2739012	CDBI ID: Validation Errors of Operator Response Time Action	11/09/16
AR3947456	CDBI - Questions IR 2736193 Actions Coding of ACITS	11/30/16
AR2742439	CDBI – Need Action to Track Resolution of CDBI Question	11/17/16
AR2741299	CDBI – NRC Observation of CPS 3317.01 and EOP-8 Directions	11/15/16
AR2736537	CDBI ID Misc Tools Laying Loose Around Protected “A” SFP Pump	11/02/16

DRAWINGS

Number	Description or Title	Revision
M05-1102 Sh. 1	P&ID Control Room HVAC	U
M05-1102 Sh. 2	P&ID Control Room HVAC	J
M05-1102 Sh. 3	P&ID Control Room HVAC	N
M05-1102 Sh. 4	P&ID Control Room HVAC	M
E02-0VC99	Control Room HVAC System (VC) Control Room HVAC Return Fan A	U
E02-0VC99	Control Room HVAC System (VC) Radiation Detectors and Isolation Signal Initiation Logic	R
E02-0VC99	Control Room HVAC System (VC) VC System Alarm Circuit Part 1	U
E02-0VC99	Control Room HVAC System (VC) VC System Alarm Circuit Part 2	T
E02-0VC99	Control Room HVAC System (VC) Control Room HVAC Make-Up Air Fan B	W
E02-1AP03	Electrical Loading Diagram	AB
E02-1AP12	Relaying and Metering Diagram Reserve Auxiliary Transformer, Sheet 7 and 8	S&W
E03-1AP07ED	Internal-External Wiring Diagram 4160V Bus 1A1 Cubicle D (1AP07ED)	W
E03-1AP09EG	Internal-External Wiring Diagram 4160V Bus 1B1 Cubicle G (1AP09EG)	G
E03-1AP21E	External Wiring Diagram Shutdown Service Water MCC 1C (1AP31E)	M
E05-1700-01	Cable Routing Outdoor Duct Runs	H
E05-1701	Cable Routing Outdoor Duct Runs, Sheet 1 of 3	G
E05-1701	Cable Routing Outdoor Duct Runs, Sheet 2 of 3	J
E05-1701	Cable Routing Outdoor Duct Runs, Sheet 3 of 3	B
E02-1AP99	ERAT SVC; Control Bldg One Line Diagram and Panel Schedule, Sheet 123	G
E03-0AP117E	Wiring Diagram ERAT SVC Cab 0AP117E Interconnection, Sheet 4 and 9	C
CPS-14-030	AREVA Engineering Information Record (Environmental Qualification of Radiation Monitors 1RIX-PR006A/B/C/D)	1
M05-1037 Sht. 2	P&ID Fuel Pool Cooling & Clean Up	AE
M05-1037 Sht. 3	P&ID Fuel Pool Cooling & Clean Up	AA
4132 Sht. 3	Phase II Fuel Pool Rack Layout	10
M05-1048 Sht. 9	P&ID Service Air Aux. & Fuel Building	R
MO1-1107	Aux Fuel Bldg & El. 762’0”	D

10 CFR 50.59 DOCUMENTS (SCREENINGS/SAFETY EVALUATIONS)

Number	Description or Title	Revision
CL-2011-S-027	GNF2 Fuel Transition	1
CL-2006-S-051	Spent Fuel Pool Re-Rack Phase 2	0

MISCELLANEOUS

Number	Description or Title	Date
	Response to Generic Letter 2007-01	12/07/07
Letter Y-105681	Susceptibility Evaluation Criteria Operational Screening	11/29/95

MISCELLANEOUS

Number	Description or Title	Date
Letter U-602553	Illinois Power's Response to GL 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves	02/09/96
WCC-EXN-LH1-15-001	Clinton Unit 1 Cycle 17 Bundle Design Reports	09/04/15
CPS-16-026	NRC GL 2016-01, Monitoring of Neutron Absorbing Materials in Spent Fuel Pools, Response Information	10/03/16
Letter Y-209452	Closure Package for IEIN 88-65, "Inadvertent Drainages of Spent Fuel Pools"	10/06/88
Letter Y-210816	Closure Package for IEIN 88-92, "Potential for Spent Fuel Pool Draindown"	06/16/89
Letter RS-16-207	Response to Generic Letter 2016-01	11/03/16
Letter Y-216546	Closure Package for IEB 94-01, "Potential Fuel Pool Draindown Caused by Inadequate Maintenance Practices at Dresden Unit 1"	09/19/94
SLMI-24233	Fire Damper Closure Test from Sargent and Lundy Engineers	10/25/91
87-058	NRC IN 87-13 Review	11/02/87
SE-LOR-501	Operator Response Time Validation Scenario 2 for TCA-7	11/15/15
TCA 7 Validation	VC Manual Start Stby Train and Alignment	12/10/15
SE-LOR-501	Operator Response Time Validation Scenario 2 for TCA-7	11/15/15
MWR D72871	Single Input Calibration Sheet FC EIN 1TRFC079	01/28/99
Data Sht. TE009	Thermo Electric qTE-FC079/80 TE Data Sheet	07/07/78

MODIFICATIONS

Number	Description or Title	Revision
EC 349325	Spent Fuel Storage Capacity Expansion Phase 1 – Rerack Fuel Cask Storage Pool	2
EC 370372	Review and Approve Spare SX Motor Documentation, Electrical Drawings, and Seismic Qualification Package	1
EC 392511	Fuel Pool Cooling (FC) Pump Trip Reliability - Low Suction Press	1
EC 401731	Division 1 Battery Inter-Rack Jumper Support	0

OPERABILITY EVALUATIONS

Number	Description or Title	Date or Revision
EC407244	Operability of the Main Control Room Ventilation System	0
EC389732	Evaluate Past Operability/Reportability of Div. 2 Components With as Found Flow Below Design Values	09/07/12
EC407232	Evaluate the Effectiveness of SCBA in the MCR during Radiological Events	0

PROCEDURES

Number	Description or Title	Revision
9866.01	VG/VC HEPA Filter Leak Test	28
9866.01D001	HEPA Filter Test Data Sheet	27
9866.02	VG/VC Charcoal Adsorber Leak Test	33
9866.02F001	Charcoal Adsorber Leak Test Data Sheet	32
9070.02	Control Room HVAC High Rad, Initiation Functional	33

PROCEDURES

Number	Description or Title	Revision
9070.02D001	Control Room HVAC High Rad, Initiation Functional Data Sheet	29b
3402.01	Control Room HVAC	30b
3402.01P001	Control Room HVAC Train Shifting	6d
9070.05D001	Control Room Differential Pressure Test Data Sheet	0d
9070.05	Control Room Differential Pressure Test	0c
ER-CL-390	Control Room Envelope Habitability Program	0
ER-CL-390-1001	Control Room Envelope Habitability Program Implementation	0
9070.01	Control Room HVAC Air Filter Package Operability Test Run	27c
MA-CL-725-5611	Hydramotor Actuator – Model AH95 and NH95 PM	7
8130.01	Heat Exchanger Maintenance/Repairs	4
ER-AA-300-150	Cable Condition Monitoring Program	3
MA-AA-723-330	Electrical Testing of AC Motors Using Baker Instrument Advanced Winding Analyzer	4
WC-AA-120	Preventive Maintenance Database Revision Requirements	2
DC-AA-300-1006	Decommissioning Transition – ENMM and Post-Shutdown Operations	1
4304.01	Flooding	6b
4303.01P023	Cross-Connecting Div 3 DG to Div 1(2) ECCS Electrical Busses	2A
3317.01	Fuel pool Cooling and Cleanup	31d
4011.02	Spent Fuel Pool Abnormal Water Level Decrease	7
3312.03	RHR – Shutdown Cooling & Fuel Cooling and Assist	10e
MA-CL-716-100	Fuel Receipt and Storage at CPS	10
NF-AA-320	Controlling Special Nuclear Material Receipt and Shipment	15
NF-AB-110	Bundle and Core Design (BWR)	15
NF-AA-610-2000	Spent Fuel Pool Deliverables and Criticality Analyses Design Verification Guides	5
5009.03	Plant Process Computer Alarm Display – 5009-3H	29b
8117.11	Installation and Removal of Upper Containment and Fuel Building Pool Gates	14a
8118.01	Metamic Coupon Sampling & Testing Program	0c
2700.12	Division 1 SX System Flow Balance Verification	9
3703.02	Fuel Handling Platform (F11) Operations	19d
4303.02	Abnormal Lake Level	12c
CY-AB-120-300	Spent Fuel Pool	16
CY-AA-120-400	Closed Cooling Water Chemistry	18
2700.21	Fuel Pool Cooling Heat Exchanger 1A(b), 1FC01AA(B) Thermal Performance Test	4
3203.01	Component Cooling Water (CC)	35a
5040.01	Alarm Panel 5040 Annunciators - Row 1	31b
5040.02	Alarm Panel 5040 Annunciators - Row 2	34
5040.03	Alarm Panel 5040 Annunciators - Row 3	30c
5050.04	Alarm Panel 5040 Annunciators - Row 4	32c
5050.05	Alarm Panel 5040 Annunciators - Row 5	34
5050.06	Alarm Panel 5040 Annunciators - Row 1	31b
3203.01	Component Cooling Water (CC)	35a
3317.01	Fuel Pool Cooling and Cleanup (FC)	31e

PROCEDURES

Number	Description or Title	Revision
4001.02	Automatic Isolation	17c
3312.03	Shutdown Cooling (SDC) & Fuel Pool Cooling Assist (FPC&A)	10e
8106.03F005	Crane Operators Log	15b
RP-AA-300-1005	Removing Items from the Spent Fuel Pool, Reactor Cavity, and Equipment Pit	1
3007.01C005	Operations with a Potential for Draining the Reactor Vessel Checklist	2c
EOP-8	Loss of Secondary Containment	30
3208.01	Cycled/Makeup Condensate (CY/MC)	15c
4200.01	Loss of AC Power	24a
OP-AA-102-106	Operator Response Time Program	3
5050.07	Hi Radiation Cont RM HVAC System Division 1	33
OP-CL-102-106-1001	Operator Response Time Program At CPS	4b
4306.01P007	Flex Spent Fuel Pool Makeup	0
1893.04	Fire Fighting	17a
1893.04M134	Prefire Plan 781 Aux East Division 1 Battery Room	5
1893.04M135	Prefire Plan 781 Aux West Division 2 Battery Room	6
1893.04M370	Prefire Plan 825 Control Room HVAC	7a
1893.04M130	Prefire Plan 781-790 Aux Division 2 Switchgear	5
1893.04M400	Prefire Plan 712 Fuel	5
1893.04M420	Prefire Plan Fuel Handling Floor	4a
MA-AA-716-022	Control of Heavy Loads Program	12
8106.03F008	Fuel Building Crane Operations	0
9290.01	Load Movement Over Fuel Assemblies	30
4979.07	Dropped or Stuck Irradiated Fuel Bundle	8e
5040.02	Low Level Spent Fuel Storage Pool	26e
4011.02	Spent Fuel Pool Abnormal Water Level Decrease	7
MA-CL-716-022-1001	Handling of Heavy Loads	8a
9290.01	Load Movement Over Fuel Assemblies	30
OP-AA-108-117	Protected Equipment Program	4
CPS 1893.01M001	Fire Door Compensatory Measures	5f
4303.01P017	Spent Fuel Pool Makeup From Fire Protection	2e
3703.01	Core Alternations	27e
OP-AA-102-102	General Area Checks and Operator Field Rounds	15
3800.02	Area Operator Logs	19c
4006.02	Loss of Decay Heat Removal in Reactor Vessel Pool/ Spent Fuel Pool	0d
3312.03	RHR – Shutdown Cooling (SDC) & Fuel Pool Cooling and Assist (FPC&A)	10e
3402.01	Control Room HVAC (VC)	30b
CPS Standing Order 2016-12	VC Hi Rad Initiation	00

PROCEDURES

Number	Description or Title	Revision
CPS Standing Order 2016-12	VC Hi Rad Initiation	01
CPS Standing Order 2016-12	VC Hi Rad Initiation	02
OP-CL-101-102-1001	Minimum On-Shift Staffing Functions	7
CPS 3402.01	Emergency Shift of Operating VC Trains Hard Card	30c
EOP-8 Technical Basis	Clinton EOP-8 Secondary Containment Control Technical Basis	7
ER-AA-200-1001	Equipment Classification	1
ER-AA-200	Preventative Maintenance Program	2

SURVEILLANCES (COMPLETED)

Number	Description or Title	Date
WO1917924	Fuel Pool Cooling Pump 1B and 1A Valve IST Testing	07/17/16
WO1937018	9069.01A20 OP SX Pump Oper. Test (SX Pump A)	08/10/16
WO1915452	9069.01B20 OP SX Pump Oper. Test (SX Pump B)	07/05/16
WO1756268	9069.01B20 OP SX Pump Oper. Test (SX Pump B)	10/07/14

TRAINING DOCUMENTS

Number	Description or Title	Revision
H-CL-OPS-233000	Fuel Pool Cooling and Cleanup System	7
N-CL-OPS-DB-LP87559	Secondary Containment Control (EOP-8)	6
FBP07	Emergency Response Training Fire Brigade Program – Hose Streams, Appliances, Tools	6

WORK DOCUMENTS

Number	Description or Title	Date
WO01561549	Perform Differential Pressure Test (Staggered Test Freq) Train A	12/05/12
WO01648466	Perform Differential Pressure Test (Staggered Test Freq) Train B	11/07/14
WO01548640	0VC22YA Inspect High Pressure Back Draft Damper Seal	01/21/14
WO01775883	9070.01B21 Op CNTR RM M/U Air Filter FLW/HTR Operability – Train B	11/07/14
WO00721768	Hydramotor PM – VC Train B Building Damper 70Y	04/18/06
WO00638985	Hydramotor PM	08/02/05
WO01238218	Perform Tracer Gas Inleakage Test on VC ‘B’ System	12/17/10
WO01238219	Perform Tracer Gas Inleakage Test on VC ‘A’ System	12/17/10
WO01790892	MCR Emergency Air Cleanup Auto Start (VC A)	08/25/16
WO01616628	MCR Emergency Air Cleanup Auto Start (VC B)	10/10/14
WO01384392	Inspect/Clean Condenser, Hydrolance Tubes ‘A’	10/25/12
WO01671773	Inspect/Clean Condenser, Hydrolance Tubes ‘B’	10/06/14
WO01911877	Division 1 Battery Quarterly Surveillance	07/21/16
WO01953136	Division 1 Battery Weekly Pilot Cell Check	09/22/16

WORK DOCUMENTS

Number	Description or Title	Date
WO01702351	Division 2 Battery Service Test	04/07/15
WO01914535	Division 2 Battery Quarterly Surveillance	07/07/16
WO01953137	Division 2 Battery Weekly Pilot Cell Check	09/22/16
WO1471402	Perform CPS 2700.21	01/11/12
WO1604551	Test HX Performance	06/25/14
WO1046694	Spent Fuel Pool Metamic Coupon Sampling Program	12/19/08
WO1708913	Perform Fuel Rack Coupon Sampling & Testing	09/28/15
WO1306257	Perform Fuel Rack Coupon Sampling & Testing	08/15/11
WO1609464	Perform Div. I SX System Testing IAW 2700.12	07/02/14
WO1169386	1FC02PA MO/MI Bearings – Increase in Copper in the Oil	01/14/16
WO1700214	9437.67B22 CC Cal. Of Tech. Spec. ARM (AR016-Spent Fuel)	03/25/15
WO1705499	9437.67D22 CC Calibration of Tech. Spec. ARM (AR052)	01/02/15
WO1397301	Perform Div. II SX System Testing IAW 2700.13	04/05/12
WO1701096	9861.09F20 LRT SX Boundary Valve Leak Testing (1CC075A, 76A)	06/22/15
WO1711617	9861.09G20 LRT SX Boundary Valve Leak Testing (1CC075B, 76B)	08/03/15
WO1582400	Inspection Details of Spent Fuel Pool Anti-Siphon Devices	12/10/12

LIST OF ACRONYMS USED

ADAMS	Agencywide Document Access Management System
AR	Action Request
CAP	Corrective Action Program
CAQ	Condition Adverse to Quality
CFR	Code of Federal Regulations
EC	Engineering Change
EOP	Emergency Operating Procedure
GL	Generic Letter
HVAC	Heating, Ventilation and Air-Conditioning
IMC	Inspection Manual Chapter
IN	Information Notice
LAR	Licensee Amendment Request
LCO	Limiting Condition of Operation
LOCA	Loss of Coolant Accident
NCV	Non-Cited Violation
NRC	U.S. Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulations
PARS	Publicly Available Records System
PM	Planned or Preventative Maintenance
RHR	Residual Heat Removal
SDC	Shutdown Cooling
SDP	Significance Determination Process
SFP	Spent Fuel Pool
SL	Severity Level
SSC	Systems, Structures, and Components
SX	Service Water
TCA	Time Critical Action
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report

Letter to Brian Hanson from Mark Jeffers dated January 12, 2017

SUBJECT: CLINTON POWER STATION - NRC COMPONENT DESIGN BASES INSPECTION, INSPECTION REPORT 05000461/2016009

DISTRIBUTION:
Jeremy Bowen
RidsNrrDorlLpl3-2 Resource
RidsNrrPMClinton Resource
RidsNrrDirsIrib Resource
Cynthia Pederson
Darrell Roberts
Richard Skokowski
Allan Barker
Carole Ariano
Linda Linn
DRSIII
DRPIII
ROPreports.Resource@nrc.gov

ADAMS Accession Number ML17013A253

OFFICE	RIII	RIII	RIII	RIII
NAME	NFeliz-Adorno:cl	RSkokowski	MJeffers	
DATE	01/12/17	01/12/17	01/12/17	

OFFICIAL RECORD COPY