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

June 30, 2017

Mr. Dean Curtland
Director of Site Operations
NextEra Energy Duane Arnold, LLC
3277 DAEC Road
Palo, IA 52324–9785

SUBJECT: DUANE ARNOLD ENERGY CENTER – NRC DESIGN BASES ASSURANCE INSPECTION (TEAM): INSPECTION REPORT 05000331/2017008

Dear Mr. Curtland:

On May 19, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed a triennial baseline Design Bases Assurance Inspection (Team) at your Duane Arnold Energy Center. The enclosed report documents the results of this inspection, which were discussed on May 19, 2017, with yourself, and other members of your staff.

Based on the results of this inspection, two NRC-identified findings of very-low safety significance were identified. The findings involved a violation 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 violation(s) or significance 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; and the NRC resident inspector at the Duane Arnold Energy Center.

If you disagree with a cross-cutting aspect assignment or a finding not associated with a regulatory requirement in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region III; and the NRC resident inspector at the Duane Arnold Energy Center.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at http://www.nrc.gov/reading-rm/adams.html and at the NRC Public Document Room in accordance with 10 CFR 2.390, “Public Inspections, Exemptions, Requests for Withholding.”

Sincerely,

/RA/

Mark T. Jeffers, Chief
Engineering Branch 2
Division of Reactor Safety

Docket No. 50–331
License No. DPR–49

Enclosure:
IR 05000331/2017008

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Letter to Dean Curtland from Mark T. Jeffers dated June 30, 2017

SUBJECT: DUANE ARNOLD ENERGY CENTER – NRC DESIGN BASES ASSURANCE INSPECTION (TEAM): INSPECTION REPORT 05000331/2017008

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REGION III

Docket No:	50–331
License No:	DPR-49
Report No:	05000331/2017008
Licensee:	NextEra Energy Duane Arnold, LLC
Facility:	Duane Arnold Energy Center
Location:	Palo, IA
Dates:	May 1–19, 2017
Inspectors:	J. Neurauter, Senior Engineering Inspector, Lead N. Feliz-Adorno, Senior Engineering Inspector, Operations J. Hafeez, Engineering Inspector, Electrical G. O'Dwyer, Engineering Inspector, Mechanical S. Kobylarz, Electrical Contractor M. Yeminy, Mechanical Contractor
Approved by:	M. Jeffers, Chief Engineering Branch 2 Division of Reactor Safety

Enclosure

SUMMARY

Inspection Report 05000331/2017008, 05/01/2017 – 05/19/2017; Duane Arnold Energy Center; Design Bases Assurance Inspection (Team).

The inspection was a 2-week onsite baseline inspection that focused on the design of components and modifications to mitigating systems. The inspection was conducted by regional engineering inspectors and two consultants. Two Green findings were identified by the inspectors. The findings were considered Non-Cited Violations (NCVs) of U.S. Nuclear Regulatory Commission (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 Inspection Manual Chapter 0609, "Significance Determination Process," dated April 29, 2015. Cross-cutting aspects are determined using Inspection Manual Chapter 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.

Cornerstone: Mitigating Systems

Green. A finding of very-low safety significance and an associated NCV of Title 10 of the *Code of Federal Regulations* (CFR), Part 50, Appendix B, Criterion III, "Design Control," was identified by the inspectors for the licensee's failure to designate the function of the residual heat removal service water (RHRSW) system strainer bypass valves as safety-related and establish the proper maintenance activities and testing associated with safety-related components. Specifically, the licensee modified the safety function of these bypass valves to provide cooling river water to the residual heat removal system heat exchangers. The licensee entered the issue into the Corrective Action Program as Condition Report (CR) 02205409. Corrective actions include classifying the open function for the RHRSW strainer bypass valves as safety-related and to re-evaluate the in-service testing requirements for the bypass valves based on the revised classification.

The inspectors determined that the failure to designate the function of the RHRSW bypass valves as safety-related and establish proper maintenance activities and testing associated with safety related components was contrary to 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requirements and was a performance deficiency. This finding was greater-than-minor because if left uncorrected, the performance deficiency had the potential to lead to a more significant safety concern. The finding was of very-low safety significance because it was a design or qualification deficiency that did not represent a loss of operability or functionality. The inspectors did not identify a cross-cutting aspect associated with this finding because the finding was not representative of the licensee's current performance. (Section 1R21.3.b(1))

Green. A finding of very-low safety significance and associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," was identified by the inspectors for the licensee's failure to evaluate gas transport through the modified piping configuration. Specifically, the licensee failed to perform an evaluation to ensure that sufficient vent flow velocity could be achieved for a sufficient time in the modified vent piping configuration to adequately remove any accumulated gas from the top of the "A" Core Spray Pump discharge piping and sweep it down through approximately 11 feet of

added downward vertical vent piping. The licensee entered the issue into the Corrective Action Program as CR 02204664, CR 02205642, and CR 02205957. Corrective actions include to evaluate current venting methods, to determine enhancements, and to determine acceptance criteria for venting such as minimum flow rate and minimum venting time, as necessary to ensure detection and removal of any potential void.

The inspectors determined that the failure to evaluate the modified vent line piping configuration to ensure that any gas in the top of the "A" Core Spray Pump discharge piping would be adequately vented down through the vertical and horizontal sections of added piping 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 Mitigating Systems cornerstone attribute of equipment performance and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The finding was of very-low safety significance because it was a design or qualification deficiency that did not represent a loss of operability or functionality. The finding had an associated cross-cutting aspect in the Human Performance area of Teamwork, where Individuals and work groups communicate and coordinate their activities within and across organizational boundaries to ensure nuclear safety is maintained. Specifically, the licensee failed to coordinate the modification activities between engineering disciplines for structural piping and fluid dynamics. (Section 1R21.4.b(1)) [H.4]

REPORT DETAILS

1. REACTOR SAFETY

Cornerstone: Initiating Events, Mitigating Systems, and Barrier Integrity

1R21 Design Bases Assurance Inspection (Team) (71111.21M)

.1 Introduction

The objective of the design bases assurance inspection is to verify that design bases have been correctly implemented for the selected risk-significant components, modifications, and that operating procedures and operator actions are consistent with 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 inspection also monitors the implementation of modifications to structures, systems, and components as modifications to one system may also affect the design bases and functioning of interfacing systems as well as introduce the potential for common cause failures. The Probabilistic Risk Assessment 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.

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

.2 Inspection Sample Selection Process

The inspectors selected risk significant components and operator actions for review using information contained in the licensee's Probabilistic Risk Assessment and the Duane Arnold Energy Center Standardized Plant Analysis Risk Model. In general, the selection was based upon the components and operator actions having a risk achievement worth of greater than 1.3 and/or a risk reduction worth greater than 1.005. Based on this process, a number of risk-significant components, including those with Large Early Release Frequency implications, were selected for the inspection. The operator actions or operating procedures selected for review included actions taken by operators both inside and outside of the control room during postulated accident scenarios associated with the selected components.

The inspectors performed a margin assessment and detailed review of the selected risk-significant components to verify that the design bases have been correctly implemented and maintained. This design margin assessment considered original design reductions caused by design modification, or power uprates, or reductions due to degraded material condition. Equipment reliability issues were also considered in the selection of components for detailed review. These included items such as performance test results, significant corrective action, repeated maintenance activities, Maintenance Rule (a)(1) status, components requiring an operability evaluation, system health reports, and U.S. Nuclear Regulatory Commission (NRC) 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 inspectors also identified modifications to mitigating systems for review. In addition, the inspectors selected procedures and operating experience issues associated with the selected components.

This inspection constituted 16 samples (8 components [1 component with large early release frequency implications, valve MO-2400], 6 modifications, and 2 operating experiences) as defined in Inspection Procedure 71111.21M-02.01.

.3 Component Design

a. Inspection Scope

The inspectors reviewed the Updated Final Safety Analysis Report (UFSAR), Technical Specifications (TSs), design basis documents, drawings, calculations and other available design basis information, to determine the performance requirements of the selected components. The inspectors used applicable industry standards, such as the American Society of Mechanical Engineers Code, Institute of Electrical and Electronics Engineers Standards, and the National Electric Code, to evaluate acceptability of the systems' design. The NRC also evaluated licensee actions, if any, taken in response to NRC issued operating experience, such as Bulletins, Generic Letters, Regulatory Issue Summaries, and Information Notices. The review was to verify that the selected components would function as designed when required and support proper operation of the associated systems. The 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 to verify that the component condition and tested capability was consistent with the design bases and was appropriate may include 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 inspectors reviewed the maintenance history, preventive maintenance activities, system health reports, operating experience-related information, vendor manuals, electrical and mechanical drawings, and licensee Corrective Action Program (CAP) documents. Field walkdowns were conducted for all accessible components to assess material condition, including age-related degradation and to verify that the as-built condition was consistent with the design. Other attributes reviewed are included as part of the scope for each individual component.

The following eight components (samples) were reviewed:

- 480 Volts Alternating Current (VAC) Essential Motor Control Center (MCC) (B32): The inspectors reviewed calculations that determined the design basis loading, and reviewed starter and breaker sizes and breaker overcurrent settings to verify the setting would ensure reliable operation during design basis conditions. The inspectors also reviewed vendor documentation and the calculated available short circuit current at the MCC to assess the capability of the selected bus and breakers to withstand and interrupt short circuit conditions. The inspectors also reviewed the load flow and voltage analysis for the MCC to

confirm the adequacy of voltage at selected components during design basis conditions. The inspectors reviewed an Engineering Change (EC) that installed new motor starters to confirm the starters' capability to operate reliably during degraded grid voltage and design basis seismic conditions. The inspectors performed a walkdown of the MCC to assess the observable material condition and the operating environment for adverse impact on the equipment.

- 4160VAC – 480VAC Supply Transformer to Essential Load Center (1X31): The inspectors reviewed load flow calculations and vendor data to verify the transformer had sufficient capacity to support the required loads under worst case accident loading and that voltage supplied to the load center was adequate under degraded grid voltage conditions. Short circuit calculations were reviewed to ensure load center breakers were adequately sized for the transformers' contribution to the available fault current. The overcurrent protective relaying for the feeder breaker to the transformer was reviewed to determine whether it provided adequate protection to the transformer, coordination with the load center bus breakers, and whether there would be any adverse interactions within the protection scheme that would reduce system reliability. The inspectors reviewed calibration procedures and records for the transformer feeder breaker protective relays to confirm that the relays were maintained as required and whether there were any adverse performance trends. The inspectors performed a walkdown of the transformer to assess the observable material condition and the operating environment for any adverse impact on the equipment.
- 125 Volts Direct Current (VDC) Battery (1D2): The inspectors reviewed applicable sections of the UFSAR and TSs to determine the battery design requirements and licensing commitments. The inspectors also reviewed the battery sizing calculation to verify the capability of the battery to support momentary and continuous loading for the duration of the duty cycle during accident and station blackout conditions. The voltage drop calculation was also reviewed to confirm the capability of the battery to supply adequate voltage to the loads under limiting conditions for the duration of the duty cycle. The inspectors reviewed the battery testing procedures and the results of recent tests to verify that periodic tests conformed to the TS requirements and industry standards. The inspectors also reviewed a sampling of completed surveillance tests, service duty discharge tests, and performance tests. The review of various discharge tests was to verify the battery capacity was adequate to support the design basis duty cycle requirements and to verify that the battery capacity meets TS requirements.
- 125VDC Battery Charger (1D12): The inspectors reviewed applicable sections of the UFSAR and TSs to determine the battery chargers sizing requirements and licensing commitments. The inspectors also reviewed the battery charger sizing calculation to confirm its capability to maintain the battery in a charged state and to recharge the battery in a timely manner following a loss of offsite power event. The battery charger testing procedures and recent test results were reviewed to confirm that testing conformed to the TS requirements and that test results supported design requirements. The inspectors reviewed a sample of recent incident reports to confirm the capability of the battery charger to support system demands.
- 125VDC Bus (1D10) & 250VDC Bus (1D40): The inspectors reviewed short circuit calculations and verified the interrupting ratings of the fuses and the molded case circuit breakers were above the calculated short circuit currents.

The voltage calculations were reviewed to determine if adequate voltage would be available for the medium voltage and low voltage switchgear circuit breaker open and close coils and spring charging motors. The inspectors also reviewed the short circuit and coordination calculations to assure coordination between the motor feed breaker open and close control circuit fuses, and supply breakers and to verify the interrupting ratings of the control circuit fuses and the control power feed breaker.

- Residual Heat Removal (RHR) Heat Exchanger B (1E201B): The inspectors reviewed the heat removal capacity of the heat exchanger to ascertain that it is capable of removing the plant's decay heat following shutdown under the most limiting conditions. This included a review of the heat exchanger design specification with the data sheets associated with each mode of operation, parameters of performance test results, and the heat exchanger's analysis with the calculated fouling factor and heat transfer coefficient. The inspectors also reviewed the source and flow rate of the cooling water flowing through the heat exchanger's tubes to validate the availability of cooling water with respect to the engineering analyses of the heat exchanger. The inspectors also reviewed the licensee's modification that instituted and proceduralized the bypass of the residual heat removal service water (RHRSW) river water strainer as the safety-related flowpath to ascertain its impact to components affected by the change. The inspectors also reviewed the licensee's response to NRC Generic Letter 89-13, "Service Water Problems Affecting Safety-Related Equipment," dated July 18, 1989, the schedule of inspection and cleaning of the heat exchanger and the number of plugged tubes in the heat exchanger and compared the review results to engineering analyses.
- High Pressure Coolant Injection (HPCI) Turbine Control Valve (HV-2200): The inspectors reviewed the HPCI start signals that initiated the HPCI turbine booster pump and main pump, the design of the HPCI turbine control valve including the valve size, its capability to operate in the steam environment, the valve's functioning with the turbine governor and the feedback signal that maintained the desired pump revolutions per minute, in order to ascertain the capability of the HPCI system to deliver its flow rate assuming the most limiting accident conditions. The inspectors also reviewed the protection of the pump from turbine overspeed to verify that the HPCI system is protected from an unexpected failure due to overspeed. The inspectors also reviewed the emergency operating procedures that directed the operation of the HPCI system under specific plant accident conditions in order to validate that the system is capable to perform its design function under all emergency operating procedures accident conditions.
- Reactor Core Isolation Cooling (RCIC) Steam Supply Inboard Isolation Valve (MO-2400): The inspectors reviewed motor-operated valve calculations and analyses to ensure the valve was capable of functioning under design conditions. These included calculations for required thrust, maximum differential pressure, and valve weak link analysis. Diagnostic testing and insevice testing surveillance results, including stroke time and available thrust, were reviewed to verify acceptance criteria were met and performance degradation could be identified. The inspectors reviewed control logic and schematic diagrams to confirm that the operation of the valve conformed to design requirements and operating procedures. The inspectors also reviewed the circuit protection and the thermal overload application of the Limitorque motor operator to confirm that the circuit was adequately protected and that the valve was capable of performing its

intended safety function during a design basis accident. Voltage drop calculations were reviewed to verify the motor and its associated control circuits had adequate voltage under degraded voltage conditions.

b. Findings

(1) Failure to Evaluate Effect of Crediting Bypass Line As Safety-Related Flowpath

Introduction: The inspectors 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's failure to designate the function of the RHRSW strainer bypass valves as safety-related and establish the proper maintenance activities and testing associated with safety-related components. Specifically, the licensee modified the safety function of these bypass valves to provide cooling river water to the RHR heat exchangers when the pressure differential across the RHRSW strainer reaches 6 pounds per square inch differential (psid) to assure the continued operation of the RHR heat exchanger with sufficient supply of cooling water to remove the plant's decay heat load.

Description: Following two occasions where the pressure differential across the RHRSW strainer pegged high (greater than 13 psid), the licensee performed a design modification in 2006, that provided a safety-related flow path for RHRSW cooling water to the RHR heat exchanger, bypassing the RHRSW strainer when the pressure differential across the strainer reaches 6 psid. However, the inspectors identified that the licensee failed to evaluate all the effects of this modification, such as the safety designation of the bypass path, the effects of opening the bypass path on the RHR heat exchanger with respect to debris reaching the heat exchanger, and the proper setpoint at which the bypass line should be opened. This bypass valve is located at the bottom of a pipe riser, and as such, it is subjected to river water containing silt and debris which accumulate over time and settle at the valve. The inspectors determined that the last time water flowed through this valve was 11 years ago, but the valve has not been subjected to subsequent routine maintenance activities or testing.

Analysis: The inspectors determined that the failure to designate the function of the RHRSW bypass valves as safety-related and establish proper maintenance activities and testing associated with safety related components was contrary to 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requirements and was a performance deficiency. This finding was greater-than-minor because if left uncorrected, the performance deficiency had the potential to lead to a more significant safety concern. Specifically, the bypass valves could degrade with time and if opened when the strainer pressure differential reaches 6 psid, the bypass line could contain debris and silt which may impede the operation of the valve or may be dislodged with the RHRSW flow into the RHR heat exchanger.

The inspectors determined the finding could be evaluated using the Significance Determination Process in accordance with Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," issued on October 17, 2016. In accordance with IMC 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated June 19, 2012, Exhibit 2, "Mitigating Systems Screening Questions," the finding screened as having very-low safety significance (Green) because it was a design or qualification deficiency that did not represent a loss of operability or functionality. Specifically, the inspectors

determined the strainer bypass valves have been cycled several times in the past 15 years for different reasons. The inspectors did not identify a cross-cutting aspect associated with this finding because the finding was not representative of the licensee's current performance.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, states in part that, "Design changes, including field changes, shall be subject to design control measures commensurate with those applied to the original design." Criterion III also states that, "the design control measures shall provide for verifying or checking the adequacy of design."

Contrary to the above, in 2006, the licensee modified the RHRSW strainer bypass line to be a safety-related flow path but did not subject the RHRSW strainer bypass valves to design control measures commensurate with those applied to the original design of the safety-related RHRSW system. Specifically, the licensee failed to designate the function of the RHRSW strainer bypass valves as safety-related and establish the proper maintenance activities and testing associated with safety-related components.

The licensee entered the issue into the CAP as CR 02205409. Corrective actions include classifying the open function for the RHRSW strainer bypass valves as safety-related and to re-evaluate the inservice testing requirements for the bypass valves based on the revised classification. Because this finding was of very-low safety significance (Green) and was entered into the licensee's CAP, this violation is being treated as an NCV, consistent with Section 2.3.2a of the NRC Enforcement Policy. **(NCV 05000331/2017008-01; Failure to Evaluate Effect of Crediting Bypass Line As Safety-Related Flowpath)**

.4 Mitigating System Modifications

a. Inspection Scope

The inspectors reviewed 6 permanent plant modifications to mitigating systems that had been installed in the plant during the last 3 years. This review included in-plant walkdowns for portions of the modified 125VDC, 480VAC MCC, Core Spray (CS), HPCI, RHR, and RHRSW systems. The inspectors reviewed the modifications to verify that the design bases, licensing bases, and performance capability of the components had not been degraded through modifications. The modifications were selected based upon risk significance, safety significance, and complexity. The inspectors reviewed the modifications selected to determine if:

- the supporting design and licensing basis documentation was updated;
- the changes were in accordance with the specified design requirements;
- the procedures and training plans affected by the modification have been adequately updated;
- the test documentation as required by the applicable test programs has been updated; and
- post-modification testing adequately verified system operability and/or functionality.

The inspectors also used applicable industry standards to evaluate acceptability of the modifications. The modifications listed below were reviewed as part of this inspection effort:

- EC 156061 (Engineering Change Package1871), 480V MCC Bucket Replacement;
- EC 156099 (Engineering Change Package 1906), Support Modification of HPCI Suction Piping;
- EC 272555, Add Battery Cells to 1D1 and 1D2 125VDC Batteries;
- EC 280492, RHRSW Pump Motor Cooler Piping Reroute;
- EC 278843, "A" CS High Point Vent Reroute, EBB017; and
- EC 283914, Wetted Cable Replacement for RHR Pumps.

b. Findings

(1) Failure to Evaluate Gas Transport through Modified Piping Configuration

Introduction: The inspectors 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's failure to evaluate gas transport through the modified piping configuration. Specifically, the licensee failed to perform an evaluation to ensure that sufficient vent flow velocity could be achieved for a sufficient time in the modified vent piping configuration to adequately remove any accumulated gas from the top of the "A" CS Pump discharge piping and sweep it down through approximately eleven feet of added vertical vent piping.

Description: Technical Specification Surveillance Requirement 3.5.1.1 required that, for each emergency core cooling system injection/spray subsystem, locations susceptible to gas accumulation be verified monthly to be sufficiently filled with water to ensure emergency core cooling system operability. The previous high point vent for the "A" CS Pump discharge piping was located in the Reactor Water Cleanup heat exchanger room which was a locked high radiation area. To reduce dose and risk to venting personnel, the licensee installed EC 278843 to reroute the high point vent piping release point to a lower dose area outside of the high radiation area using 3/4-inch Schedule 160 pipe. The modification installed approximately eleven feet of horizontal piping from the high point of the CS piping to penetrate through the wall of the Reactor Water Cleanup heat exchanger room. The new vent piping was also routed down approximately 11 feet which placed the new release point approximately 11 feet lower than the previous release point. The modification installation was completed January 30, 2017. During the inspection, the inspectors noted that modification EC 278843 failed to contain an evaluation to demonstrate that the water flow through the vent piping would be of sufficient velocity to entrain any gas accumulated near the high point of the CS piping and overcome the gas buoyancy forces and sweep the gas down the approximately 11 feet of vertical piping and out of the new lower release point. The licensee captured the concerns in its CAP as CR 02205957. The inspectors noted that Surveillance Test Procedure (STP) 3.5.1.14A, "A Core Spray System Water Fill Test," was used to vent the "A" CS system discharge piping through the new piping and satisfy Technical Specification Surveillance Requirement 3.5.1.1. Due to lack of specificity, the inspectors questioned if the procedure was performed in a manner that resulted in a sufficient velocity for a sufficient time to sweep any accumulated gas down the piping

and out the vent. The licensee captured the concern as CR 02205142, which as an immediate corrective action had personnel vent the "B" CS discharge piping which had a vent piping configuration similar to the "A" CS vent piping and determine flow rate.

During the inspection, the inspectors observed the licensee perform the venting procedure. The inspectors observed that the flowrate during the venting was approximately 2.5 gallons per minute. The inspectors requested the licensee to evaluate the flowrate and piping configuration in accordance with the methodology in the NRC's Final Safety Evaluation for National Energy Institute Topical Report NEI-09-10, Revision 1a, "Guidelines for Effective Prevention and Management of System Gas Accumulation," issued March 2013. The licensee calculated the Froude Number as 2.13 and concluded that any accumulated gas would be swept out of the new vent piping. The inspectors performed alternate calculations which resulted in similar calculated values and conclusions as the licensee. Although not specified in the procedure, the inspectors concluded venting practices observed provided adequate developed flow to transport gas and the typical time of venting was sufficient to identify and remove any gas accumulation. The licensee captured the inspectors' concern that the venting procedure was not specific enough in CR 02204664 and CR 02205642.

Analysis: The inspectors determined that the licensee' s failure to evaluate the modified vent line piping configuration to ensure that any gas in the top of the "A" CS Pump discharge piping would be adequately vented down through the vertical and horizontal sections of added piping 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 Mitigating Systems cornerstone attribute of design control and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the licensee's failure to have an evaluation that ensured that the new piping configuration will detect and remove any gas accumulation commensurate with the original design could result in the CS pump discharge piping voiding sufficient to cause hydraulic transients or otherwise degrade the CS system's ability to perform its safety function.

The inspectors determined the finding could be evaluated using the Significance Determination Process in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," issued on October 17, 2016. In accordance with Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated June 19, 2012, Exhibit 2, "Mitigating Systems Screening Questions," the finding screened as having very-low safety significance (Green) because it was a design or qualification deficiency that did not represent a loss of operability or functionality. Specifically, inspectors observed licensee personnel vent the CS system using the current procedure. Although not specified in procedure STP 3.5.1.14A, inspectors concluded venting practices observed provided adequate developed flow to transport gas and the typical time of venting (as indicated by craft that would perform the surveillance) would be sufficient to identify any gas accumulation.

The inspectors determined this finding had an associated cross-cutting aspect in the Human Performance area of Teamwork, where Individuals and work groups communicate and coordinate their activities within and across organizational boundaries to ensure nuclear safety is maintained. Specifically, the licensee failed to coordinate the modification activities between engineering disciplines for structural piping and fluid dynamics. [H.4]

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, states in part that, "Design changes, including field changes, shall be subject to design control measures commensurate with those applied to the original design." Criterion III also states that, "the design control measures shall provide for verifying or checking the adequacy of design."

Contrary to the above, on January 30, 2017, the licensee completed the modification to the "A" CS system vent line but failed to assure accumulated gas voids would be vented commensurate with the original design for venting of the CS system. Specifically, the licensee failed to perform an evaluation to ensure that sufficient vent flow velocity could be achieved for a sufficient time in the modified vent piping configuration to adequately remove any accumulated gas from the top of the "A" CS pump discharge piping.

The licensee entered the issue into the CAP as CR 02204664, CR 02205642, and CR 02205957. Corrective actions include to evaluate current venting methods, to determine enhancements, and to determine acceptance criteria for venting such as minimum flow rate and minimum venting time, as necessary to ensure detection and removal of any potential void. Because this finding was of very-low safety significance (Green) and was entered into the licensee's CAP, this violation is being treated as an NCV, consistent with Section 2.3.2a of the NRC Enforcement Policy.
(NCV 05000331/2017008-02; Failure to Evaluate Gas Transport through Modified Piping Configuration)

.5 Operating Experience

a. Inspection Scope

The inspectors reviewed two operating experience issues (samples) to ensure that NRC generic concerns had been adequately evaluated and addressed by the licensee. The operating experience issues listed below were reviewed as part of this inspection:

- Information Notice 86-14, Supplement 2: "Overspeed Trips of AFW, HPCI and RCIC Turbines;" and
- Part 21 No. 2013-09-00, "Wedge Pin Failure of an Anchor/Darling Double-Disc Gate Valve at Browns Ferry Nuclear Plant Unit 1."

b. Findings

No findings were identified.

.6 Operating Procedure Accident Scenarios

a. Inspection Scope

The inspectors performed a detailed reviewed of the procedures listed below associated with some of the selected inspection samples. For the procedures listed, time operator actions were reviewed for reasonableness and any interfaces with other departments were evaluated. The procedures were compared to UFSAR descriptions, design assumptions, and training materials to assure for consistency. The following operating procedures were reviewed in detail:

- SEP 301.1, "Torus Vent via SBGT," Revision 10;
- OI 149 QRC2, "Torus Cooling initiation," Revision 9;
- OI 149 QRC3, "Manual LPCI initiation," Revision 5;
- OI 416, "RHR Service Water System," Revision 67;
- OI 416 QRC1, "RHRSW Rapid Start," Revision 7; and
- STP 3.5.1-14A, "A CS fill test," Revision 10.

In addition, operator actions were observed during the performance of a small break loss of coolant accident (LOCA) concurrent with a loss of off-site power on the station simulator. For the selected operator actions, the inspectors performed a margin assessment and detailed review of the operator actions listed below. Where possible, margins were determined by the review of the assumed design basis and UFSAR response times and performance times noted during the small break LOCA scenario observed on the station simulator. The following operator actions were reviewed:

- Rapid reactor pressure vessel depressurization following a small break LOCA;
- RHR system alignment following a small break LOCA;
- RHRSW system alignment following a small break LOCA;
- Drywell spray initiation following a small break LOCA; and
- RHRSW strainer hi-differential pressure.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems

.1 Review of Items Entered Into the Corrective Action Program

a. Inspection Scope

The inspectors reviewed one sample of the selected component problems identified by the licensee and entered into the CAP. The inspectors reviewed the issues to verify an appropriate threshold for identifying issues and to evaluate the effectiveness of corrective actions related to design issues. In addition, corrective action documents written on issues identified during the inspection were reviewed to verify adequate problem identification and incorporation of the problem into the CAP. The specific corrective action documents sampled and reviewed by the inspectors are listed in the attachment to this report.

The inspectors also selected one issue identified during previous NRC Component Design Bases Inspections to verify that the concern was adequately evaluated and corrective actions were identified and implemented to resolve the concern, as necessary. The following issue was reviewed:

- NCV 05000331/2014008-03, Failure to Include Minimum Required System Voltage as an Acceptance Criterion in the 125 VDC Station Battery Surveillances Test Procedures.

b. Findings

No findings were identified.

4OA6 Management Meeting(s)

.1 Exit Meeting Summary

On May 19, 2017, the inspectors presented the inspection results to Mr. D. Curtland, and other members of the licensee staff. The licensee acknowledged the issues presented. The inspectors confirmed that none of the potential report input discussed was considered proprietary. Several documents reviewed by the inspectors were considered proprietary information and were either returned to the licensee or controlled in accordance with NRC policy on proprietary information.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

D. Curtland, Site Director
P. Hanson, Site Engineering Director
M. Davis, Licensing Manager
T. Erger, Operations Shift Manager
T. Below, Electrical Design Engineer
C. Catino, Fleet Corporate MOV Program Engineer
Z. Cloe, Mechanical Design Engineer
P. Collingsworth, System Engineer
B. Hendrickson, System Engineer
S. Huebsch, Design Engineering Supervisor
J. Kuehl, MOV Program Engineer
G. Migliuolo, System Engineer
M. Mills, Fleet Corporate MOV Program Engineer
B. Murrell, Licensing Senior Engineer
T. Weaver, Senior Licensing Engineer

U.S. Nuclear Regulatory Commission

C. Norton, Senior Resident Inspector
J. Steffes, Resident Inspector

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000331/2017008-01	NCV	Failure to Evaluate Effect of Crediting Bypass Line As Safety Related Flowpath (Section 1R21.3.b(1))
05000331/2017008-02	NCV	Failure to Evaluate Gas Transport through Modified Piping Configuration (Section 1R21.4.b(1))

Discussed

None.

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	Revision
CAL-E08-004	Main AC Electrical Distribution Analysis	3
CAL-E08-005	AC Safety Related Motor Control Center (MCC) Starter/Contactor Control Circuit Voltage Calculations	1
CAL-E08-006	AC Coordination	2
CAL-E15-01	Cable Heat Up Calculation for Replacement RHR Pump Motor Cables	0
CAL-E-8-008	125VDC System Battery Sizing, Voltage Drop, Short Circuit, Coordination and Charger Sizing	2
CAL-M91-010	Design Basis Reconstitution of the HPCI System	1
CAL-M06-001	HPCI Pump Curve	2
CAL-M97-008	HPCI NPSH Calculation	3
CAL-E93-027	Condensate Storage Tank Low Level Setpoint	5
CAL-M08-027	RHR Heat Exchanger Tube Plugging Limit	0
CAL-E91-002	MOV Torque Switch Settings	45B
CAL-M92-032	MEDP, Pressure, Flow and Temperature Determination for RCIC System MOVs	1
CAL-M93-045	GL 89-10 Weak Link Analysis for MOVs	2
CAL-M95-031	EPRI MOV EPRI Performance Prediction Methodology Implementation for MO2400 MPR 1599 Part 17, MO2400	2
CAL-M09-049	Mark I Piping Analysis for HPCI Suction Piping @ N-226	0
CAL-M09-051	Code Evaluation of N-226 Suction Strainer	0
CAL-M09-052	Code Evaluation of Torus Penetration N-226	0

CORRECTIVE ACTION DOCUMENTS GENERATED DUE TO THE INSPECTION

Number	Description or Title	Date
02202771	Correct Typo in ACP 103.10 Att. 3.	05/02/17
02202879	Oil Seeping from HPCI Lube Oil Filter	05/02/17
02203047	MO2010 Active Safety Function in IST Program	05/03/17
02203102	Potential Corrosion on CV4301-O Air Cylinder	05/03/17
02203104	Potential Corrosion on CV4300-O Spring Can	05/03/17
02203189	CAL-M97-008 Assumption 6 Is Inaccurate	05/04/17
02203393	CAL-E08-008 Contains a Typographical Error	05/04/17
02203486	Lack of Documentation for 1X031	05/05/17
02203510	Formalize Evaluation in ASME Valve Stroke Time Databook	05/05/17
02203580	RHRSW Pump Discharge Strainer Bypass Valves	05/05/17
02204664	GL-08-01 Venting Methodology Enhancements	05/11/17
02204989	Editorial Error Found in CAL-E08-004	05/15/17
02205023	Battery Connecting Bolt Assemblies	05/15/17
02205116	Incorrect Pressure in CAL-M93-045 for MO2400	05/15/17

CORRECTIVE ACTION DOCUMENTS GENERATED DUE TO THE INSPECTION

Number	Description or Title	Date
02205142	Generate WO to Obtain Core Spray Vent Flow Rate	05/15/17
02205352	Maximum Fluid Temperatures for MO2400 Operation	05/16/17
02205409	Reclassify RHRSW Strainer Bypass Valves	05/16/17
02205516	Revise Battery Room Hydrogen Calculations	05/17/17
02205642	Evaluate the Need to Clarify Steps in Various Water Fill Tests	05/17/17
02205776	CAL-M95-031 Rev. 2 Incorrectly States Reactor Pressure	05/18/17
02205812	RHR Ground Relay Settings	05/18/17
02205854	STP NS020001 Enhancements	05/18/17
02205881	RHR Heat Exchanger Performance Test Uncertainty	05/18/17
02205957	Failure to Evaluate Gas Transport for Core Spray High Point Vent	05/18/17

CORRECTIVE ACTION DOCUMENTS REVIEWED DURING THE INSPECTION

Number	Description or Title	Date
02160785	1B32 ODEN Testing	10/06/16
02160835	1B3211 Failed ODEN Testing and Requires Replacement	10/07/16
02160836	1B3232 Failed ODEN Testing and Needs Replacement	10/07/16
02161603	1B3231 Breaker Tripped During PMT	10/11/16
02167045	A RPS MG Set Supply Breaker Tripped on MG Startup	11/02/16
01979847	2014CDBI- Revise Battery STPS to Add ENGR. Review to Test	07/23/14
02069861	Incorrect Flow Error Used in Evaluation of RHR Heat Exchanger Thermal Performance Testing	08/27/15
00313714	High RHRSW Strainer D/P	06/16/06
01968971	HPCI Inboard Isolation Unplanned LCO	05/30/14
01981149	2014 CDBI: Revised MEDP Calculations Not Issued	07/30/14
02000267	Missed QC inspection Point on MO2400-0 Lube and Inspect	10/19/14
02005648	Water in RCIC Steam Supply Line When Spool Piece Installed	11/08/14
02068515	MO2400 Computer Position Indication Erratic	08/20/15
02079832	15TD3CR RCIC Simulator Isolated Unexpectedly	10/07/15
02177922	Recorder Digital Bar Graph Repair Not Documented	01/04/17
CR01854310	Evaluation of Flowserve 10CFR Part 21	03/06/17
RWT02168458	EOP Component List	11/09/16

DRAWINGS

Number	Description or Title	Revision
BECH-E001, Sh. 1	Single Line Diagram Station Connections	39
BECH-E006, Sh. 1	Single Line Meter & Relay Diagram 480V System	32
BECH-E024, Sh. 1	Schematic Meter & Relay Diagram 480V Load Center System	36
BECH-E105, Sh. 12	480V Motor Control Center Schedules	36
BECH-E200, Sh. 4423	Motor Operated Valve Data List	14

DRAWINGS

Number	Description or Title	Revision
BECH-200, Sh. 4323A	Motor Operated Valve Data List	8
BECH-200, Sh. 2290A	Motor Operated Valve Data List	11
BECH-200, Sh. 2700	Motor Operated Valve Data List	12
BECH-200, Sh. 4320A	Motor Operated Valve Data List	8
BECH-200, Sh. 2039A	Motor Operated Valve Data List	8
BECH-200, Sh. 2077	Motor Operated Valve Data List	9
BECH-200, Sh. 2400	Motor Operated Valve Data List	13
609900	ITE Imperial Corporation Power Shield Master EPL Index	15
E009-100	480V Motor Control Center 1B32 (Essential) Location Control Building EL 757'-6" East	32
E009-238	480V Motor Control Center 1B36 (Essential) Location Pumphouse	9
E006-037	Metalclad Switchgear Connection Diagram	8
BECH-SD014	3-Hour Rated Internal Fire Seal For Conduit, Sleeve or Core Drill	1
E012-027	3-Phase Battery Charger Schematic 1D12,1D22,1D120	3
BECH-E005	Single Line Meter & Relay Diagram 4160V System Essential SWGR. 1A3&1A4	16
BECH-E121 <041>	Reactor Core Cooling Systems	11
BECH-E027	Single Line Meter & Relay Diagram 125V DC System	34
BECH-E036	Schematic Diagram Annunciators Cabinets 1CO8-AEC	39
BECH-M109	Condensate and Demineralized Water System	80
APED-E41-006	Elementary Diagram HPCI System	36
BECH-M119	P&ID Residual Heat Removal System	85
D-7212-S-100	Residual Heat Removal	11
APED-E41-031	HPCI Pump Curve Total Head Capacity	1
ISO-GBC-001-04	Isometric – Water Pumphouse RHR Service Water	13
I-780421-A	Strain-O-Matic 180 degrees Flow	5
95415D	Governor Hydraulic Control System	5
APED-E41-2763-006	Section Hydraulic Trip	0
APED-E41-002	High Pressure Coolant Injection System	6
BECH-M124	P&ID RCIC System (Steam Side)	64
M133A-006<1>	4" – 900# Gate Valve, Press. Seal, SMB-00 Motor Operator	14
FSK-03380	Reactor Building Area 5 CS Vent Connection from 8"-EBB-17	9
ISO-EBB-014<01H>	HPCI Turbine Steam Inlet	2
ISO-EBB-014-03H	HPCI Turbine Steam Inlet	1
ISO-HBB-C08-01H	HPCI Pump Suction	1

DRAWINGS

Number	Description or Title	Revision
ISO-HCC-006-03	HPCI Pump Suction	2
ISO-HLE-019-01	HPCI Minimum Flow Line	3
M119AC-01510<1>	Support Mark No. EBB-14-H-3	4
M119AC-01510<2>	Support Mark No. EBB-14-H-3	6
M119AC-01510<3>	Support Mark No. EBB-14-H-3	0
M119AC-01521<1>	Support Mark No. EBB-14-H-14	5
M119AC-01521<2>	Support Mark No. EBB-14-H-14	3
M119AC-01659<1>	Support Mark No. HLE-19-H-23	5
M119AC-01659<2>	Support Mark No. HLE-19-H-23	3
M119AC-06105	Support Mark No. HBB-8-SR-1	4
M119AC-06107<1>	Support Mark No. HBB-8-SR-3	7
M119AC-06107<2>	Support Mark No. HBB-8-SR-3	4
M119AC-06107<3>	Support Mark No. HBB-8-SR-3	5
M119AC-06108	Support Mark No. HBB-8-SR-4	4
M119AC-09730<1>	Support Mark No. HCC-6-SA-1	3
M119AC-09730<2>	Support Mark No. HCC-6-SA-1	3

10 CFR 50.59 DOCUMENTS (SCREENINGS/SAFETY EVALUATIONS)

Number	Description or Title	Date or Revision
5059SCRN 033050	10CFR50.59 Screening ECP 1871	01/20/09
9927	Battery Cell Additions	3
EC# 283914	Wetted Cable Replacement for RHR Pumps	0
32010	RHRSW Strainer Bypass Line	08/09/02
32025	RHRSW Strainer Bypass Line	08/09/02
5059SCRN 043569	Support Modifications for HPCI Suction Piping	2

MISCELLANEOUS

Number	Description or Title	Date or Revision
A100MCC	Vendor Manual Motor Control Centers – Allis Chalmers	23
DBD-R22-002	Auxiliary AC Power System Design Basis Document	10

MISCELLANEOUS

Number	Description or Title	Date or Revision
ECP 1871	AC Safety Related Motor Control Center (MCC) Starter/Contactor Control Circuit Voltage Calculations, ECP 1871, ECN-04, Attachment A, Circuit Analysis Sheets to Support Margin Gains	4
FAT08P5800/1	Final Acceptance Test Procedure	2
IR08P5800/5	Memo for Acceptance Testing and Dedication of Starters and Contactors in accordance with #GP0030, Cutler Hammer Full Voltage Reversing Starter, Horizontal Configuration, NEMA Size 1, 3 Pole, P/N A210M1CAC	1
IR08P5800/6	Memo for Acceptance Testing and Dedication of Starters and Contactors in accordance with #GP0030, Cutler Hammer Full Voltage Non-Reversing Starter, Horizontal Configuration, NEMA Size 2, 3 Pole, P/N A200M2CAC	1
IR08P5800/7	Memo for Acceptance Testing and Dedication of Starters and Contactors in accordance with #GP0030, Cutler Hammer Full Voltage Reversing Starter, Horizontal Configuration, NEMA Size 2, 3 Pole, P/N A210M2CAC	1
IR08P5800/8	Memo for Acceptance Testing and Dedication of Starters and Contactors in Accordance with #GP0030, Cutler Hammer Full Voltage Reversing Starter, Horizontal Configuration, NEMA Size 3, 3 Pole, P/N A210M3CAC	1
IR08P5800/9	Memo for Acceptance Testing and Dedication of Starters and Contactors in Accordance with #GP0030, Cutler Hammer Full Voltage Reversing Starter, Horizontal Configuration, NEMA Size 4, 3 Pole, P/N A210M4CAC	1
IR08P5800/28	Memo for Acceptance Testing and Dedication of Auxiliary/Control Relays in Accordance with #GP0036, Seimens Control Relay, P/N 3RH1122-1AK60	1
Q2-2017	System Health Report 480 VAC Switchgear	03/18/17
QTR08P5800	STS Report No. PA3011-RP-01, Dedication and Qualification Test Report for Allis Chalmers Motor Control Center Retrofit Components	2
QUAL-SC101	Environmental and Seismic Service Conditions	18
SP08P5800/1	Seismic Test Procedure #SP08P5800/1, Dated November, 23, 2008, for Seismic Qualification of Allis Chalmers Motor Control Center Retrofit Components	0
GEI-38854	Type RCV DC Directional Voltage-Differential	04/1959
FAI/09-122	Test Plan for Condensate Storage Tank Potential Vortex Formation in the Suction Flow	0
M010-21	Bowl Assembly Performance Test	08/05/92
BECH-MRS-M304-S	Self-Cleaning Strainers and Backwash Valves	6
BECH-MRS-M010B	RHRSW Pump	2
T147HPCI	Turbine Governor Control System	2
APED-E41-013	HPCI System Instrument Data Sheet	23
SL-7212	Heat Exchanger Specification Sheet	2

MISCELLANEOUS

Number	Description or Title	Date or Revision
GE-NE-A2200100-17-01	Duane Arnold Energy Center Asset Enhancement Program	1
BECH-E200<2400>	MOV Data List for MO2400	13
APED-T23-001<07>	DAEC Plant Unique Analysis Report (PUAR), Volume 7, Residual Heat Removal and Core Spray Strainer Modifications for NRC Bulletin 96-03	1

MODIFICATIONS

Number	Description or Title	Date or Revision
EC 156061	Modification No. 1871, 480V MCC Bucket Replacement, Design Description	10/12/16
EC 156099	ECP-1906 Support Modification of HPCI Suction Piping	5
EC-272555	125 VDC Battery Cell Additions	4
EC 280492	RHRSW Pump Motor Cooler Piping Reroute	0
EC 278843	“A” Core Spray High Point Vent Reroute, EBB017	01/30/17
EC 283914	Wetted Cable Replacement for RHR Pumps	3

OPERABILITY EVALUATIONS

Number	Description or Title	Date
OPR 376	Operability Recommendation on CAP 55366	02/09/08

PROCEDURES

Number	Description or Title	Revision
AOP 301	Loss of Electrical Power	72
ARP 1C08A	Generator and Auxiliary Power	93
CKTBKR-I202-04	ITE/ABB Corporation 480 Volt Load Center Circuit Breaker Overhaul	20
GMP-ELEC-18	Motor Control Center, Load Center, and Electrical Switchgear Inspection, Section B	5
GMP-ELEC-35	Molded Case Circuit Breaker Testing	32
GMP-TEST-31	Electrical Overload Testing	14
OI 304.2	4160V/480V Essential Electrical Distribution System	97
OI 304.2A2	1B-32 De-energization Checklist	5
OI 304.2A15	1B-32 Re-energization Checklist	5
ARP 1C26A	Battery 1D1 Room Exhaust Low Flow	50
Battery-C173-01	Station Battery Charger	38
STP 3.8.4-03B	Service Discharge Test of Battery 1D2	13
STP 3.8.4-04B	Performance Discharge Test of battery 1D2	13
STP 3.8.4-01	Battery Pilot Cell Checks	21
PCP 2.20	Transformer Pit, CST Pit, and FRAC Tank Sampling	27
ARP 1C03C	Reactor and Containment Cooling and Isolation	47
ARP 1C06A	Condensate Storage Tank 1T-5A	71

PROCEDURES

Number	Description or Title	Revision
STP 3.5.3	RCIC/HPCI Suction Transfer Interlock	19
ACP 1208.4	GL 89-13 Heat Exchanger Performance and Trending	15
STP 3.5.1-10	HPCI System Operability Test and Comprehensive Pump Test	37
ACP 103.10	Control of Time Critical Tasks	11
OI 416 QRC 1	RHRSW Rapid Start	7
OI 149 QRC 3	Manual LPCI Initiation	5
OI 149 QRC 2	Initiating Torus Cooling	9
OI 149 QRC 1	Containment Spray Initiation	7
OI 149	Residual Heat Removal System	161
EOP-1	RPV Control	20
EOP-2	Primary Containment Control	18
ARP 1C03B	Annunciator Response Procedure Reactor and Containment Cooling and Isolation	46
OI 416	RHR Service Water System	67
SEP 301.1	Torus Vent Via SBGT	10
STP 3.5.1-14A	"A" Core Spray System Water Fill Test	10

SURVEILLANCES (COMPLETED)

Number	Description or Title	Date or Revision
NS020001	Hydrogen Sampling For Battery Room Loss of Ventilation Test	1
HPP3109.29	Operation of MSA Altair 5 Multi-gas Detector	5
HPP3109.52	Operation of MSA Kwik-Draw Sample Pump	6
STP NS100102B	B River Water Supply and Screen Wash System Vibration Measurement and Operability Test	04/18/17
STP 3.5.1-14A	STP "A" Core Spray System Water Fill Test	02/27/17
STP 3.5.1-14A	STP "A" Core Spray System Water Fill Test	04/03/17
STP 3.5.1-14A	STP "A" Core Spray System Water Fill Test	04/30/17

WORK DOCUMENTS

Number	Description or Title	Date or Revision
WO 1112844	Inspect and Clean Transformer 1X031	05/08/01
WO 1144063	4160V Load CNTR 1X31 FDR OC Relay	01/19/09
WO 1144081	Inspect and Clean Transformer 1X031	02/18/09
WO 1144083	Refurbish Breaker, Degrease/Regrease, Inspect & Cal Prior to Outage 1B0301	02/19/09
WO 01282158-01	1B3231: MA: Replace Old MCC 1B3231 with New per EC 156061	10/12/16
WO 01282160-01	1B3213: Remove Old MCC 1B3213 and Replace per EC 156061	09/23/13
WO 40389932-01	1X031: Inspect Transformer	10/07/16
WO 40390133-02	1B0301: Swap Breaker	08/11/16
WO 40390144-01	150/151-303 Calibrate & Inspect 3 Relays	10/09/16

WORK DOCUMENTS

Number	Description or Title	Date or Revision
WO 40390165-01	1B32: Inspect MCC Wireway Support Members and Load	10/06/16
WO 40390166-01	1B32: Test Molded Case Circuit Breakers and Replace Fuses in MCC 1B32	10/07/16
WO 40401558-01	1B4429: Inspect Breaker & Motor Control Unit	02/25/17
WO 40493191-01	1B3219: CB has Failed ODEN Testing and Needs to be Replaced	10/19/16
WO 40407388	Replace Cable 1A0306-A From 1P229C-M and 1A306	01
WO 40254652	STP3.8.4-04-B Perf Discharge Test of Battery 1D2	01
WO 40388875	STP3.8.4-03-B, 1D2 Battery Service Discharge Test	01
WO 40249611-01	Perform RHR HX 1E201A Heat Transfer Test	01/01/14
WO 40249611-01	1E201B, Performance RHR HX Heat Transfer Test	01/15/14
WO 01283869-01	Clean Coils and Inspect Unit	11/10/10
WO 40273292-01	Strainer 1S090B DP Steadily Rose with RHRSW in Service	10/17/13
WO 01283869-01	Clean Coils and Inspect Unit	10/21/10
WO 01147924	Perform RHR Heat Exchanger Performance Test	01/05/10
WO 40256007-01	River Water Intake Temperature	07/24/13
WO 01283869	Heat Exchanger Bio/Silt Inspection	11/12/10
WO 4013617-001	MO2400-O: Overhaul Limitorque Operator	11/06/12
WO 4013617-004-000-Supp3	Teledyne Diagnostic MO-2400 Valve Testing completed 10/20/2012	11/02/12
WO 40255158	MO2400-O: Inspect Lube Gearbox and Limit Switch	10/20/14
WO 40470713	Performed STP 3.5.1-14	04/03/17
WO 40465167	Performed STP 3.5.1-14	02/27/17
WO 40477795	Performed STP 3.5.1-14	04/30/17

LIST OF ACRONYMS USED

CAP	Corrective Action Program
CFR	*Code of Federal Regulations*
CR	Condition Report
CS	Core Spray
EC	Engineering Change
HPCI	High Pressure Coolant Injection
IMC	Inspection Manual Chapter
LOCA	Loss of Coolant Accident
MCC	Motor Control Center
NCV	Non-Cited Violation
psid	Pounds per Square Inch Differential
NRC	U.S. Nuclear Regulatory Commission
RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
STP	Surveillance Test Procedure
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
VAC	Volts Alternating Current
VDC	Volts Direct Current