UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
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April 26, 2016

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

SUBJECT: BRAIDWOOD STATION, UNITS 1 AND 2 - COMPONENT DESIGN BASES INSPECTION REPORT 05000456/2016008; 05000457/2016008

Dear Mr. Hanson:

On March 25, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed a Component Design Bases Inspection at your Braidwood Station, Units 1 and 2. The enclosed report documents the results of this inspection, which were discussed on March 25, 2016, with Ms. A. Ferko, and other members of your staff.

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

Based on the results of this inspection, two NRC-identified findings of very-low safety significance were identified. Both of the 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 these issues as Non-Cited Violations in accordance with Section 2.3.2 of the NRC Enforcement Policy.

If you contest the subject or severity to any 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 Braidwood 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/

David E. Hills, Acting Chief
Engineering Branch 2
Division of Reactor Safety

Docket Nos. 50–456; 50–457
License Nos. NPF–72; NPF–77

Enclosure:
IR 05000456/2016008; 05000457/2016008

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos. License Nos.	50–456; 50–457 NPF–72; NPF–77
Report No:	05000456/2016008; 05000457/2016008
Licensee:	Exelon Generation Company, LLC
Facility:	Braidwood Station, Units 1 and 2
Location:	Braceville, IL
Dates:	February 22, 2016, through March 25, 2016
Inspectors:	B. Jose, Senior Reactor Engineer, Lead C. Zoia, Operations Engineer G. Crespo, Senior Reactor Engineer, Electrical (R-II, DCI) L. Rodriguez, Reactor Engineer, Mechanical C. Baron, Mechanical Contractor G. Morris, Electrical Contractor
Approved by:	D. Hills, Acting Chief Engineering Branch 2 Division of Reactor Safety

Enclosure

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SUMMARY

Inspection Report 05000456/2016008; 05000457/2016008; 2/22/2016 – 3/25/2016; Braidwood Station, Units 1 and 2; Component Design Bases Inspection.

The inspection was a 3-week onsite baseline inspection that focused on the design of components. The inspection was conducted by regional engineering inspectors and two consultants. Two Green findings were identified by the inspectors. Both of these findings were considered Non-Cited Violations (NCVs) of U.S. Nuclear Regulatory Commission (NRC) regulations. The significance of inspection findings are 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 February 4, 2015. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 5, dated February 2014.

NRC-Identified and Self-Revealed Findings

Cornerstone: Mitigating Systems

Green: The inspectors identified a finding of very-low safety significance and an associated NCV of Title 10 of the *Code of Federal Regulations*, Part 50, Appendix B, Criterion XI, "Test Control," for the licensee's failure to test the 120 Vac molded case circuit breakers (MCCBs) used as isolation devices on the instrument power system. Specifically, although the licensee had committed to test circuit breakers used as isolation devices in response to Final Safety Analysis Report Question 40.73 in 1982, there was no evidence that these MCCBs had ever been tested. The licensee subsequently entered the issue into its Corrective Action Program.

The finding was 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 of the safety-related instrument power system. Specifically, the licensee did not assure, by periodically verifying the time-current characteristic of the MCCBs, that the isolation devices would perform their safety function to isolate the nonsafety-related instrument bus from the safety-related instrument power bus before the safety bus could be affected by a fault on the nonsafety-related load. The inspectors determined that the finding was of very-low safety significance (Green) because it did not cause a reactor trip and the loss of mitigation equipment relied upon to transition the plant from the onset of the trip to a stable shutdown condition. The inspectors determined that there was no cross-cutting aspect associated with this finding because the finding was not indicative of the licensee's current performance. (Section 1R21.3.b(1))

Green: The inspectors identified a finding of very-low safety significance (Green) and an associated NCV of Title 10 of the *Code of Federal Regulations*, Part 50, Appendix B, Criterion III, "Design Control," for the failure to verify the adequacy of the diesel driven Auxiliary Feedwater (AFW) pump design. Specifically, the licensee failed to verify the diesel driven AFW pump could perform its safe shutdown function following a high energy line break (HELB) in the Turbine Building. Since the diesel's air intake was located in the Turbine Building, it would be impacted by a HELB. The licensee entered

this issue into its Corrective Action Program and took immediate corrective actions by declaring the diesel driven AFW pump inoperable and then implementing a temporary plant modification to relocate the diesel air intake to the Auxiliary Building where it is not susceptible to a HELB to restore operability of the pump. The licensee's planned corrective actions are to complete a permanent plant modification to relocate the air intake to a location that is not susceptible to a HELB.

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 to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to verify that the diesel driven AFW pump could perform its safety function following a HELB event in the Turbine Building did not ensure its availability, reliability, and capability to respond to the initiating event. Since the finding did represent an actual loss of function of at least a single Train for greater than its Technical Specification Allowed Outage Time, a Detailed Risk Evaluation was performed which concluded that the estimated change in core damage frequency was approximately 3.4E-7/yr., which represents a finding of very-low safety significance (Green). The inspectors did not identify a cross-cutting aspect associated with this finding because the finding was not indicative of the licensee's current performance. (Section 1R21.3.b(2))

Licensee-Identified Violations

None

REPORT DETAIL

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 the design bases have been correctly implemented for the selected risk-significant components and the 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 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 used information contained in the licensee's Probabilistic Risk-Assessment and the Braidwood Station Standardized Plant Analysis Risk-Model to identify components for this inspection.

The inspectors also used additional component information such as a margin assessment in the selection process. This design margin assessment considered original design reductions caused by design modification, 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 actions, repeated maintenance activities, Maintenance Rule (a)(1) status, components requiring an operability evaluation, U.S. Nuclear Regulatory Commission (NRC) resident inspector input of problem areas/equipment, and system health reports. 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 procedures and modifications for review that were associated with the selected components. In addition, the inspectors selected operating experience issues associated with the selected components.

This inspection constituted 23 samples (15 regular components + 2 Large Early Release Frequency (LERF)-related components and 6 operating experiences) as defined in Inspection Procedure 71111.21-05.

.3 Component Design

a. Inspection Scope

The inspectors reviewed the Updated Final Safety Analysis Report, 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 (IEEE) Standards and the National Electric Code, to evaluate acceptability of the systems' design. The inspectors 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 (INs). The review was to verify 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 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 and to verify 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 17 components were reviewed:

- 125 Vdc Station Battery 112 (1DC02E): The inspectors reviewed calculations and analyses related to battery loads, division separation, battery sizing and capacity, electrical isolation between class 1E and non-1E, hydrogen generation, and battery room transient temperature. The review was performed to determine the adequacy and appropriateness of design assumptions, and to verify the battery was adequately sized to support the design basis required voltage requirements of the 125 Vdc safety-related loads under both normal and design basis accident conditions. The inspectors also reviewed a sampling of completed surveillance tests, service duty discharge tests, and modified 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 TSs requirements.

- 125 Vdc Bus 112 (1DC06E): The inspectors reviewed 125 Vdc short circuit calculations and verified the interrupting ratings of the fuses and the molded case circuit breakers (MCCBs) were above the calculated short circuit currents. The 125 Vdc 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

reviewed the motor control logic diagrams and the 125 Vdc voltage drop calculation to ensure adequate voltage would be available for the control circuit components under all design basis conditions. The inspectors also reviewed the 125 Vdc short circuit and coordination calculations to assure coordination between the motor feed breaker open and close control circuit fuses, and 125 Vdc supply breakers and to verify the interrupting ratings of the control circuit fuses and the 125 Vdc control power feed breaker.

- 120 Vac Inverter 114 (1IP08E) and Instrument Bus 114 (1IP04E): The inspectors reviewed the sizing of the new inverters, inverter maintenance and surveillance, and voltage drop calculations to ensure the safety-related loads fed off the instrument buses have adequate voltage when the inverters are on battery supply during design basis accident conditions. The inspectors reviewed the design for the isolation of the nonsafety-related loads from the safety-related instrument bus and questioned the applicability of using MCCB that have not been tested in this application.

- System Auxiliary Transformer 142-2: The inspectors reviewed the design basis descriptions, equipment specifications, system one-line diagrams, voltage tap settings, nameplate data, short circuit and voltage drop calculations, protective relay settings, and loading requirements to evaluate the capability of the transformer to supply the voltage and current requirements to one train of the electrical distribution loads. Transformer protective relay trip setting calculations were reviewed to verify whether adequate primary and backup protections were provided and appropriate coordination margins considered between upstream and downstream protective devices. Relay setpoint time-current curves were reviewed to verify whether appropriate settings were implemented. Completed transformer maintenance records and thermographic analysis were reviewed to evaluate whether the results were indicative of any adverse trends including oil testing evaluations. The inspectors interviewed the engineering manager and performed visual inspections of the 345/6.9/4.16 Kv system auxiliary transformer 142-2 and its neutral grounding resistors to assess the installation configuration, instrument gauges, material condition, and potential vulnerability to hazards. The inspectors reviewed nameplate data and its application to short circuit studies developed to validate engineering analyses in determining downstream component ratings.

- 4.16 Kvac Engineered Safety Feature Switchgear (Bus 142): The inspectors reviewed vendor specifications, one-line diagrams, calculations, design basis descriptions, drawings, and the Engineered Safety Feature (ESF) Bus 142 loading requirements to evaluate the capability of the 4 Kv ESF Bus 142 to supply the voltage and current requirements to one train (Division 12) of ESF loads. The inspectors reviewed calculations of short circuit, voltage drop, bus and feeder protective relay trip settings to verify the bus ratings were not exceeded and the bus and feeder relays were appropriately coordinated for normal, block and accident loading conditions. The inspectors reviewed the results of completed 4160 Vac Bus 142 preventive maintenance records to verify the test results were within acceptable limits. The loss of voltage and degraded voltage relay settings were also reviewed to verify they satisfied the requirements of TSs 3.8.1. Records of system voltage profiles were reviewed to verify they were consistent with the design basis assumptions. The inspectors performed

walkdowns of the 4 Kv ESF Bus 142 to verify equipment alignment was consistent with design drawings and to assess the observable material conditions and potential vulnerability to hazards.

- Emergency Diesel Generator 1B: The inspectors reviewed the design of the emergency diesel generator (EDG) air start system to verify its capacity to start the EDG within the required time. Specifically, the inspectors reviewed the surveillance test procedures and recent results for fast start testing. The inspectors also reviewed the operability criteria for the air start system to verify the surveillance test procedures were bounding. The inspectors reviewed the design of the EDG exhaust system to verify it was adequately protected from postulated tornado missiles. This review included walkdowns of the EDG systems, interviews with the system engineers, review of procedures, and review of design analyses.

  The inspectors also reviewed the EDG loading calculations including voltage, frequency, current, and loading sequences during postulated loss of offsite power and loss of coolant accidents to verify the capability of the EDGs to perform their intended safety function. Short circuit calculations were reviewed to ensure the ratings of the distribution system components were adequate to interrupt and withstand the maximum available fault currents during EDG paralleling conditions with offsite grid services concurrently with safety injection equipment in operation. The inspectors also performed independent calculations of available phase and ground short circuit currents to ensure the maximum system short circuit duty was within equipment rating. Protective relay setpoint calculations and setpoint calibration test results were reviewed to assess the adequacy of protection during testing and emergency operations. The inspectors also reviewed several TS surveillance test results to verify that applicable test acceptance criteria and test frequency requirements for the EDGs were satisfied. The inspectors interviewed system engineers and discussed system performance, and recent issue reports. The inspectors conducted a field walkdown of the diesel generator unit and ancillary components including alarm indicating lights, air start system, fuel oil system, and ventilation equipment.

- Essential Service Water Crosstie Motor-Operated Valve (1SX005): The team reviewed calculations associated with the 1SX005 valve to assess its capability to reposition during a design basis event. The team also reviewed system health reports, selected corrective action documents, and other records to assess valve operating trends and the licensee's ability to evaluate and correct problems with the valve. Test procedures and completed surveillances were also reviewed to assess the valve's associated acceptance criteria. In addition, the team reviewed a sample of associated operating procedures to assess their consistency with applicable design basis analyses for the valve. A walkdown of the valve was also performed to assess its installation, material condition, and susceptibility to environmental hazards.

- Service Water Outlet Air Operated Valve to B Auxiliary Feedwater Pump Oil Cooler (1SX178): The inspectors reviewed the design of the air-operated valve associated with cooling the diesel-driven auxiliary feedwater (AFW) pump. This review included the controls associated with automatically opening the valve when the engine starts to ensure adequate cooling water. The inspectors

performed walkdowns of the valve and associated equipment, performed interviews with the system engineer, reviewed design analyses, and reviewed previously identified conditions to ensure the valve would be capable of performing its design function.

The inspectors reviewed power and control wiring to this valve to verify voltage drop calculations, circuit protection component type, wiring separation documentation, and vendor manuals.

- 1B Diesel-Driven Auxiliary Feedwater Pump (1AF01PB): The team reviewed analyses associated with the pump and it's supporting subcomponents to assess their capability for providing their accident mitigation functions. The review included analysis for fuel capacity, fuel consumption, net positive suction head (NPSH), system flow, seismic protection, and tornado protection. The team also reviewed a sample of recently completed modifications to assess their impact on the pump and its subcomponents. The team reviewed system health reports, selected corrective action documents, and other records to assess the pump's operating trends and the licensee's ability to evaluate and correct problems with the pump. Test procedures and completed surveillances were also reviewed, including quarterly and comprehensive inservice testing, to assess the pump's associated acceptance criteria and test results. In addition, the team reviewed a sample of operating procedures associated with pump operation to assess their consistency with applicable design basis analyses. A walkdown of the pump and its subcomponents was also performed to assess their installation, material condition, and susceptibility to environmental hazards.

  The inspectors reviewed the starting system including the sizing of the starting battery, the control battery and the 32V Battery chargers. The inspectors reviewed the surveillance testing and maintenance of the batteries and chargers to ensure the capacity and capability of the electric starting system. The inspectors reviewed the automatic interlocks in the starting circuit from the solid state protection system and the related surveillance to ensure the independence of the auto start interlocks.

- 1B Diesel-Driven Auxiliary Feedwater Pump Suction Supply Motor-Operated Valve (1AF017B): The inspectors reviewed calculations and records associated with the 1AF017B valve to assess its capability to reposition during a design basis event. The inspectors reviewed the motor-operated valve (MOV) calculations, including required thrust, current, maximum differential pressure, weak link analysis, and environmental and seismic qualifications to ensure that the valve would be capable of functioning under design and licensing basis conditions. A review of associated procedures and recent surveillances was also conducted to assess the valves associated acceptance criteria, and that changes made were performed in accordance with applicable requirements. The inspectors also reviewed system health reports, work orders, and corrective action documents to assess the licensee's ability to evaluate and correct problems with the valve.

- 1B Centrifugal Charging Pump (1CV01PB): The inspectors reviewed design analyses associated with the centrifugal charging pump capacity, NPSH, and minimum flow to verify the pump's capacity to perform its required functions.

The inspectors reviewed surveillance test procedures and recent results. The inspectors reviewed a sample of operating procedures associated with the pump under normal and accident conditions. The inspectors also evaluated the potential impact of EDG frequency variations on the pump performance. The inspectors performed walkdowns of the pump and associated equipment, conducted interviews with the system engineer, and reviewed a sample of corrective action documents to verify the material condition of the equipment.

- Centrifugal Charging Pump Suction from Refueling Water Storage Tank Motor-Operated Valve (1CV112D): The inspectors reviewed the design of the MOV associated with transferring the suction of the centrifugal charging pumps from the volume control tank to the refueling water storage tank under accident or transient conditions. This review included periodic testing of the control circuits associated with the valve interlocks to ensure the valve will open when required. The inspectors reviewed the electrical power supply to the MOV to ensure the valve would respond under the most limiting voltage transient conditions. The inspectors reviewed valve thrust and differential pressure analyses to verify the capability of the valve to operate under the most limiting system conditions. The inspectors reviewed surveillance test procedures and recent results. The inspectors also performed walkdowns of the valve and associated equipment, performed interviews with the system engineer, and reviewed design analyses to ensure the valve would be capable of performing its design function.

- 1B Residual Heat Removal Pump (1RH01PB): The team reviewed analyses associated with the pump to assess its capability for providing its accident mitigation functions. The review included analysis for NPSH and system flow. The team also reviewed system health reports, selected corrective action documents, and other records to assess the pump's operating trends and the licensee's ability to evaluate and correct problems with the pump. Test procedures and completed surveillances were also reviewed, including quarterly and comprehensive inservice testing, to assess the pump's associated acceptance criteria and test results. In addition, the team reviewed a sample of operating procedures associated with pump operation to assess their consistency with applicable design basis analyses and relevant operating experience. A walkdown of the pump was also performed to assess its installation, material condition, and susceptibility to environmental hazards.

  The inspectors reviewed loading calculations as applied to EDG loading and load sequencing. The review included ER-AA-300-150 Revision 2, "Cable Condition Monitoring Program," and MA-BR-725-515 Revision 11, "Preventive Maintenance of Non-Segregated Bus Duct," that defined the requirements for periodic cleaning, inspecting, and maintaining of safety-related cables associated with the 1B residual heat removal (RHR) pump system. The inspectors reviewed protective relay settings and methods used for testing of alternating current motors using procedure MA-AA-723-330 Revision 4. Testing included hi-potential testing, bearing oil sample testing or change, and insulation testing of the feeder cables.

- Residual Heat Removal Discharge Header to Safety Injection Pumps Motor Operated Valve (1SI8804B): The team reviewed calculations associated with the 1SI8804B valve to assess its capability to reposition during a design basis event. The team also reviewed system health reports and other records to assess valve operating trends and the licensee's ability to evaluate and correct problems with the valve. Test procedures and completed surveillances were also reviewed to assess the valve's associated acceptance criteria. In addition, the team reviewed a sample of associated operating procedures to assess their consistency with applicable design basis analyses for the valve. A walkdown of the valve was also performed to assess its installation, material condition, and susceptibility to environmental hazards.

- Containment Recirculation Sump Isolation Motor-Operated Valve (1SI8811A): The team reviewed calculations associated with the 1SI811A valve to assess its capability to reposition during a design basis event. The team also reviewed a modification associated with the valve to assess its impact on the valve function. The team reviewed system health reports, corrective action documents, and other records to assess valve operating trends and the licensee's ability to evaluate and correct problems with the valve. Test procedures and completed surveillances were also reviewed to assess the valve's associated acceptance criteria. In addition, the team reviewed a sample of associated operating procedures to assess their consistency with applicable design basis analyses for the valve. A walkdown of the valve was also performed to assess its installation, material condition, and susceptibility to environmental hazards.

- Unit 1 Steam Generator Power Operated Relief Valve) A - (Large Early Release Frequency-Related): The inspectors reviewed the design and operating procedures associated with the electrical-hydraulic valve to verify its capability to perform its required functions under transient and accident conditions. The inspectors reviewed surveillance test procedures and recent results, including test procedures for using the local hand pump to operate the valve. The inspectors reviewed the design basis of the local hand pump and the capability of the design to withstand a postulated single failure. The inspectors also performed walkdowns of the valve and associated equipment, performed interviews with the system engineer and operators, and reviewed recent design changes to ensure the valve would be capable of performing its design function.

  The inspectors reviewed power and control wiring to this valve to verify voltage drop calculations, thermal overload sizing, circuit protection component type, wiring separation documentation, and vendor manual L-0432. In addition, the inspectors reviewed stroke testing results.

- Unit 1 Main Steam Isolation Valve A- (Large Early Release Frequency-Related): The inspectors reviewed the design and operating procedures associated with the main steam isolation valve to verify its capability to perform its required functions under transient and accident conditions. The inspectors reviewed surveillance test procedures and recent results, as well as the bases for surveillance test acceptance criteria. The inspectors also performed walkdowns of the valve and associated equipment, and performed interviews with the system engineer to ensure the valve would be capable of performing its design function.

The inspectors reviewed power and control wiring to this valve to verify voltage drop calculations, thermal overload sizing, circuit protection component type, wiring separation documentation, and vendor manual L-0352. In addition, the inspectors reviewed stroke testing results.

b. Findings

(1) Failure to Verify the Tripping Characteristic of Molded Case Circuit Breakers Used as Isolation Devices for the 120 VAC Instrument Power System.

Introduction: The inspectors identified a finding of very-low safety significance (Green) and an associated Non-Cited Violation (NCV) of Title 10, *Code of Federal Regulations* (CFR), Part 50, Appendix B, Criterion XI, "Test Control," for the licensee's failure to test the 120 Vac MCCBs used as isolation devices on the instrument power system. Specifically, the licensee failed to demonstrate the MCCBs would have provided isolation of the downstream nonsafety-related 120 Vac Instrument Power Bus from the upstream safety-related bus by periodically testing the trip setpoint consistent with the MCCB's time-current characteristic curve.

Description: While reviewing the Key Diagram, 20E-1-4002F,120 Vac Instrument Bus 114, the team noted that the MCCBs on the nonsafety-related 120 Vac Instrument Bus were identified as isolation devices. Because of the typical high source impedance of inverters and the constant voltage transformer would limit the available fault current to less than 150 Amperes, the team questioned the operating time of the 100 Ampere supply breaker to the safety-related bus, the 30 Ampere supply breaker to the nonsafety-related bus, and the MCCBs feeding the nonsafety-related loads. The IEEE Standard 384, Section 3.14, defines an isolation device as a device in a circuit that prevents malfunctions in one section of a circuit from causing unacceptable influences in other sections of the circuit or other circuits. The IEEE Standard 384, Section 6.1.2.1, describes the criteria for circuit breaker tripped by fault currents. A circuit breaker automatically tripped by fault current is considered an isolation device, provided the following coordination criteria are met:

a. The circuit breaker time-overcurrent trip characteristic for all circuit faults shall cause the circuit breaker to interrupt the fault current prior to initiation of a trip/opening of any upstream protective device. Periodic testing shall demonstrate that the overall coordination scheme remains within the limits specified in the design criteria. This testing may be performed as a series of overlapping tests.

b. The power source shall supply the necessary fault current for sufficient time to ensure the proper coordination without loss of function of Class 1E loads.

The team discovered the 120 Vac MCCBs had never been tested in spite of the commitment in Final Safety Analysis Report (FSAR) Question 40.73 to test the MCCBs used as isolation devices.

The issue was entered into the licensee's CAP as Assignment Report (AR) 02644513.

Analysis: The inspectors determined the failure to ensure the MCCBs used as isolation devices were adequately tested was contrary to 10 CFR Part 50, Appendix B, Criterion XI, "Test Control" as well as the licensee's commitment contained in FSAR

Question 40.73, and was a performance deficiency. The performance deficiency was determined to be more than minor because if left uncorrected, it would have the potential to lead to a more significant safety concern. Specifically, by not allowing the isolation devices to clear nonsafety-related system faults before affecting the safety-related instrument power system, this increased the likelihood of multiple nonsafety events that could upset multiple safety-related instrument power supplies and instrument systems, components and instrument trip logic. Also, the finding was associated with the Mitigating Systems cornerstone attribute of equipment performance, and affected the cornerstone objective of ensuring the availability of the safety-related instrument power system. Specifically, the licensee did not assure, by periodically verifying the time-current characteristic of the MCCBs, that the isolation devices would perform their safety function to isolate the nonsafety-related instrument bus from the safety-related instrument power bus before the safety bus could be affected by a fault on the nonsafety-related load.

The inspectors determined the finding could be evaluated using the Significance Determination Process in accordance with Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," dated April 29, 2015, Attachment 0609.04, "Initial Characterization of Findings," dated June 19, 2012. Because the finding impacted the Mitigating Systems cornerstone, the inspectors screened the finding through IMC 0609 Appendix A, "The Significance Determination Process for Findings At-Power," using Exhibit 2, "Mitigating Systems Screening Questions." The inspectors determined that the finding was of very-low safety significance (Green) because it did not cause a reactor trip and the loss of mitigation equipment relied upon to transition the plant from the onset of the trip to a stable shutdown condition.

The inspectors 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 lack of testing existed since original plant construction.

Enforcement: Title 10 CFR 50, Appendix B, Criterion XI, "Test Control," requires, in part, that a test program shall be established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents. The test program shall include, as appropriate, proof tests prior to installation, preoperational tests, and operational tests during nuclear power plant or fuel reprocessing plant operation, of structures, systems, and components. Also, the Braidwood response to FSAR Question 40.73 states, in part, that all circuit breakers being used as isolation devices will be tested to verify their tripping characteristic.

Contrary to the above, from 1982, to March 25, 2016, the licensee failed to test MCCBs on the 120 Vac Instrument Power System that were functioning as isolation devices. These MCCBs were only in the Braidwood Preventative Maintenance Program for cycling every 4 years. Because this violation was of very low safety significance and was entered into the licensee's CAP as AR 02644513 this violation is being treated as a NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy.
(NCV 05000456/2016008-01; NCV 05000457/2016008-01, Failure to Trip Test the 120 Vac Instrument Power System MCCBs used as Isolation Devices)

(2) Failure to Verify Air Intake for Diesel Driven Auxiliary Feedwater Pump was Adequately Protected from a High Energy Line Break

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 failure to verify the adequacy of the diesel driven AFW pump design. Specifically, the licensee failed to verify the diesel driven AFW pump could perform its safe shutdown function following a high energy line break (HELB) in the Turbine Building which is a loss of Main Feedwater (MFW) transient.

Description: The AFW system at Braidwood has a safety-related function to provide cooling water to the steam generators under several different design basis scenarios, including a loss of MFW transient, as described in Section 10.4.9 of the FSAR. It must be able to perform its safety function assuming a worst single failure. The AFW system is also credited as one of the mechanical systems used to get to safe shutdown following any postulated pipe break. The plant design, as described in FSAR Section 3.6.1.3.b, is that potentially essential systems are protected against loss of function resulting from any potential break, unless the system has direct communication with the postulated break. If the system has direct communication with the postulated break, the hydraulic design of the system is such that the "escaping" flow is not large enough to degrade theessential system flow below minimum requirements. The AFW system is listed in FSAR Table 3.6-3 as one of the essential systems which may be used for safe shutdown following any postulated pipe break.

The AFW system consists of two subsystems, both capable of independently supplying sufficient feedwater to cool the unit to the required RHR system entry conditions. One subsystem utilizes an electric-motor driven pump, and the second subsystem utilizes a diesel engine to directly drive the second AFW pump. Although the diesel driven AFW pump and the diesel engine itself are located in the seismically qualified Auxiliary Building, the combustion air intake for the diesel engine was originally located in the non-seismically qualified Turbine Building since plant construction.

During the inspection, the inspectors questioned the acceptability of having the diesel combustion air intake in the non-seismic Turbine Building. When preparing their response, the licensee determined that previously completed analyses did not support operability of the diesel engine in the event of a MFW HELB in the Turbine Building. Specifically, the analyses did not account for the air displacement that would occur at the air intake location due to a steam release during the event. The licensee attempted to perform additional analyses to demonstrate the diesel engine's capability to operate after a MFW HELB, but they were unsuccessful because the predicted air density at the air intake after the event would be too low to support operation of the diesel. Therefore, given this condition, during a loss of MFW transient caused by a MFW HELB in the Turbine Building, the diesel driven AFW pump would not be capable of performing its safety function. In addition, if a single failure of the redundant electric motor-driven AFW pump were to occur, the AFW system would not be able to perform its safe shutdown function.

The licensee captured this issue in their CAP as AR 02635702, "CDBI [Component Design Bases Inspection] – Question on AFW Diesel Air Intake." The licensee's immediate corrective actions included declaring the diesel driven AFW pump inoperable, and implementing a temporary plant modification to restore operability of the pump

within the TS allowed completion time of 72 hours. The temporary modification included the relocation of the diesel air intake by sealing the original intake point in the Turbine Building and creating a new intake opening at the diesel itself, inside the Auxiliary Building where it is protected from a HELB. The licensee's planned corrective actions are to complete a permanent plant modification to relocate the air intake to a location that is not susceptible to a HELB.

Analysis: The inspectors determined the failure to verify the diesel driven AFW pump could perform its safe shutdown function following a HELB in the Turbine Building, which is a loss of MFW transient, 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 adversely affected the associated cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to verify the diesel driven AFW pump could perform its safety function following a HELB event in the Turbine Building did not ensure its availability, reliability, and capability to respond to the initiating event.

The inspectors determined the finding could be evaluated using the Significance Determination Process in accordance withIMC 0609, "Significance Determination Process," dated April 29, 2015, Attachment 0609.04, "Initial Characterization of Findings," dated June 19, 2012. Because the finding impacted the Mitigating Systems cornerstone, the inspectors screened the finding through IMC 0609 Appendix A, "The Significance Determination Process for Findings At-Power," using Exhibit 2, "Mitigating Systems Screening Questions." Since the finding did represent an actual loss of function of at least a single Train for greater than its TS Allowed Outage Time (since original plant construction), a Detailed Risk Evaluation was required.

The Senior Reactor Analyst used the Braidwood Standardized Plant Analysis Risk (SPAR) Model, Version 8.24 and Systems Analysis Programs for Hands-On Integrated Reliability Evaluations, Version 8.1.3, for the calculation of the delta core damage frequency (ΔCDF) for the issue.

The following general assumptions were made in the analysis:

- The Exposure Time for the finding was determined to be 1-year, which is the maximum time allowed by the significance determination process.

- The initiating event frequency (IEF) for a MFW line break for a pressurized water reactor is 1.83E-3/yr. (from the 2010 SPAR Initiating Event Data Parameter estimation Update).

- Since a MFW line break initiating event is not present in the Braidwood SPAR model, the Transient event tree (with the failure of the main feedwater pumps, the motor-driven startup feedwater pump, and the condensate pumps) was used as a surrogate.

- Basic Event AFW-XHE-XM-XTIE2A (Operator Fails to Cross-Tie AFW Motor Driven Pump 2A) in the Braidwood SPAR model was set to true (i.e., always failed), since the licensing bases for Braidwood does not presently allow the use of the motor-driven AFW pump cross-tie.

For the Degraded Case:

- Basic Event AFW-EDP-FR-1B (AFW Diesel Driven Pump Fails to Run) in the Braidwood SPAR model was set to true (i.e., always failed).

- Solving the Braidwood SPAR model with assumptions described above gives a conditional core damage probability (CCDP) of 2.03E-4

- The core damage frequency (CDF) Degraded Case for the Degraded Case is obtained by multiplying the IEF for a MFW line break (1.83E-3/yr.) by the CCDP if an initiating event were to occur (2.03E-4) to obtain a CDF Degraded Case of 3.71E-7/yr.

For the Base Case:

- Solving the Braidwood SPAR model with the general assumptions described above gives a CCDP of 1.78E-5

- The CDF Base Case for the Base Case is obtained by multiplying the IEF for a MFW line break (1.83E-3/yr.) by the CCDP if an initiating event were to occur (1.78E-5) to obtain a CDF Degraded Case of 3.26E-8/yr.

The ΔCDF is the difference between the CDF for the Degraded Case and the CDF for the Base Case or 3.4E-7/yr. (i.e., ΔCDF = 3.71E-7/yr. – 3.26E-8/yr. = 3.4E-7/yr.).

Thus, based on the detailed risk evaluation, the estimated change in CDF is approximately 3.4E-7/yr., which represents a finding of very-low safety significance (Green).

Since the total estimated change in CDF was greater than 1.0E-7/yr., IMC 0609, Appendix H, “Containment Integrity Significance Determination Process,” was used to determine the potential risk contribution due to LERF. Braidwood Station is a 4-loop Westinghouse pressurized water reactor with a large dry containment. Sequences important to LERF include steam generator tube rupture events and inter-system loss of coolant accident events. These were not the dominant core damage sequences for this finding.

Based on the detailed risk evaluation, the inspectors determined that the finding was of very-low safety significance (Green).

The inspectors 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 design deficiency existed since original plant construction.

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, since original plant construction, the licensee failed to verify the adequacy of the diesel driven AFW pump design. Specifically, the licensee failed to verify the diesel driven AFW pump could perform its safe shutdown function following a MFW HELB in the Turbine Building which is a loss of MFW transient.

The licensee's immediate corrective actions included declaring the diesel driven AFW pump inoperable, and implementing a temporary plant modification to restore operability of the pump within the TS allowed completion time of 72 hours. The temporary modification included the relocation of the diesel air intake by sealing the original intake point in the Turbine Building and creating a new intake opening at the diesel itself, inside the Auxiliary Building where it is protected from a HELB. The licensee's planned corrective actions are to complete a permanent plant modification to relocate the air intake to a location that is not susceptible to a HELB.

Because this violation was of very-low safety significance, and was entered into the licensee's CAP as AR 02635702, this violation is being treated as a NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy. (NCV 05000456/2016008-02; 05000457/2016008-02, Failure to Verify Air Intake for Diesel Driven AFW Pump was Adequately Protected from a HELB)

.4 Operating Experience

a. Inspection Scope

The inspectors reviewed six operating experience issues to ensure NRC generic concerns had been adequately evaluated and addressed by the licensee. The operating experience issues listed below were reviewed and are considered inspection samples:

- IN 2013-14: MOV Design Deficiency;
- Part 21 Radiation Qualification of Okonite Tape Splices;
- Braidwood AR 01337871: Operating Experience from Three Mile Island, RHR System Could Become Overpressurized By Leaking Reactor Coolant Isolation Check Valves;
- IN 2010-11: Potential for Steam Voiding Causing RHR System Inoperability;
- NRC Regulatory Issue Summary 2015-06: Tornado Missile Protection; and
- IN 2007-27; Recurring Events Involving EDG Operability.

b. Findings

No findings were identified.

.5 Modifications

a. Inspection Scope

The inspectors reviewed five permanent plant modification related to selected risk significant components to verify the design bases, licensing bases, and performance capability of the components had not been degraded through modifications. The modification listed below was reviewed as part of this inspection effort:

- EC 384420: Multiple Spurious Operation - Scenario 14 - Containment Isolation Valves – MOV 1SI8811A;
- DCP 9700003: Replace 125 V Batteries with C&D Type LCUN-33 Cells;
- EC 392818: Interlock for DD-AFW on CST Lo-Lo Level;
- EC E-20-1-95-215: Evaluate Methods to Eliminate Pressure Locking of 1SI8811A/B; and
- EC 394153: FUK: Alternate Service Water Supply to 1/2SX04P Suction Flex Mod 3.

b. Findings

No findings were identified.

.6 Operating Procedure Accident Scenarios

a. Inspection Scope

The inspectors performed a detailed review of the operator actions and the procedures listed below associated with the selected scenarios of (1) a Small Break Loss of Coolant Accident event from a Reactor Coolant Pump Seal failure leading to a transfer of emergency core cooling system to Cold Leg Recirculation, and (2) a Loss of Offsite Power event, leading to a Loss of All Alternating Current Power event. For the procedures listed, time-critical operator actions were reviewed for reasonableness, simulator scenarios were observed, and in-plant actions were walked down with a non-licensed operator or a licensed operator as appropriate. It was evaluated whether there was sufficient information to perform the procedure, whether the steps could reasonably be performed in the available time, and whether the necessary tools and equipment were available. The procedures were compared to Updated Final Safety Analysis Report and design assumptions. In addition, the procedures were reviewed to ensure the procedure steps would accomplish the desired result.

The following operator actions were reviewed:

- Operator actions to mitigate the spurious closure of valve 1SX034 - Time Critical Action #28;
- Operator actions to align high pressure cold leg recirculation – Time Sensitive Action #14;

- Operator actions to cross tie 125 Vdc Bus 111 and 211; and
- Operator actions to take local control of the 1B Steam Generator Power Operated Relief Valve.

The following procedures were reviewed:

- 1BwEP-0, "Reactor Trip or Safety Injection Unit 1," Revision 207;
- 1BwEP-1, "Loss of Reactor or Secondary Coolant Unit 1," Revision 205;
- 1BwEP ES-1.3, "Transfer to Cold Leg Recirculation Unit 1," Revision 203;
- 1BwCA-0.0, "Loss of All AC [Alternating Current] Power Unit 1," Revision 208;
- 1BwOA PRI-8, "Essential Service Water Malfunction Unit 1," Revision 105;
- BwOP DC-7-111, "125V DC [Direct Current] ESF Bus 111 Cross-Tie/ Restoration," Revision 15; and
- BwOP MS-6, "Local Operation of the Steam Generator Power Operated Relief Valves," Revision 18.

b. Findings

No findings of significance 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 a sample of the selected component problems that were identified by the licensee and entered into the CAP. The inspectors reviewed these 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 that were sampled and reviewed by the inspectors are listed in the Attachment to this report.

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

- AR 01571725; 2013 NRC Component Design Bases Inspection – Failure to Evaluate System Auxiliary Transformer O/C Relay Settings.

b. Findings

No findings were identified.

4OA6 Management Meeting

.1 Exit Meeting Summary

On March 25, 2016, the inspectors presented the inspection results to Ms. Amy Ferko, and other members of the licensee staff. The licensee acknowledged the issues presented. Several documents reviewed by the inspectors were considered proprietary information and were either returned to the licensee or handled in accordance with NRC policy on proprietary information.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

A. Ferko, Plant Manager
D. Riedinger, Design Engineering Manager
S. Reynolds, Regulatory Assurance Manager
P. Raush, Operations Director
R. Cameron, Operations Training Manager
R. Hall, Chemistry Manager
R. Schliessmann, Regulatory Assurance
F. Piriano, Design Engineering Supervisor
J. Gastouniotis, Design Engineer
A. Totleben, Design Engineer

U. S. Nuclear Regulatory Commission

M. Shuaibi, Deputy Director, DRS, R-III
J. Benjamin, Senior Resident Inspector
D. Betancourt, Resident Inspector

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened/Closed

05000456/2016008-01; 05000457/2016008-01	NCV	Failure to Verify the Tripping Characteristic of Molded Case Circuit Breakers (MCCBs) Used as Isolation Devices for the 120 Vac Instrument Power System. (Section 1R21.3b (1))
05000456/2016008-02; 05000457/2016008-02	NCV	Failure to Verify Air Intake for Diesel Driven Auxiliary Feedwater Pump was Adequately Protected from a High Energy Line Break. (Section 1R21.3b (2))

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 stated in the body of the inspection report.

CALCULATIONS

Number	Description or Title	Revision/Date
19-AQ-24	Voltage Drop on 480-120V AC Control Transformer Circuits	8
19-AN-3	Protective Relay Settings for 4.16 kV ESF Switchgear.	16
19-AN-29	Second Level Undervoltage Relay Setpoint	2
19-AN-7	Protective Relay Settings for 4.16KV ESF Switchgear	11
19-AQ-68	Division Specific Degraded Voltage Analysis	6
19-AQ-70	Determination of the Minimum Allowable Starting Voltages	1
BRW-98-0717-E	Motor Operated Valves (MOV) Actuator Motor Terminal Voltage and Thermal Overload Sizing Calculation – Auxiliary Feedwater (AF) System.	0
BRW-98-0720-E	Sample of TOL Impedance Calculations (Section 6.1 of NEP-12-02)	6
AF-TH05	Effect of Tornado Missiles on Aux. Feed Pump Diesel Operation	1
ATD-0196	Useable Volume in Diesel Oil Storage Tanks and Day Tanks	5
BRA-1SI8804B	MIDACALC Results BRA-1SI8804B (BRA-1) AC Motor Operated GL96-05 Gate Valve	2
BRW 96-021	Verification of Capability for Braidwood and Byron 24" 1(2) SI8811A & B Valves Susceptible to Pressure Locking	0
BRW 96-028	Estimate the Required Final Closing Thrust Which Will Not Allow the SI8811 Valve Disc to Unseat With a Differential Pressure of Approximately 50 psid	0
BRW-97-0821-M	Safety Injection (SI) MOV Differential Pressure Calculation	0
BRW-03-0122-M	Evaluation of CST Technical Specification at Braidwood Station	1
BRW-04-0038-M	Re-analysis of Loss of Coolant Accident (LOCA) Using Alternative Source Terms	5
BRW-06-0016-M	SI/RHR/CS/CV System Hydraulic Analysis in Support of GSI-191	5
BRW-06-0035-M	NPSH for RHR & CS Pump During Post-LOCA Recirculation	3
BRW-09-0064-M	Net Positive Suction Head Available for the SX Booster Pump 1SX04P	1

CALCULATIONS

Number	Description or Title	Revision/Date
BRW-10-0146-M	AF Diesel Driven Pump Fuel Consumption and Day Tank Requirements	3
BRW-13-0031-M	Transient Analysis of SX System Following Loss of A-C Power	0
BRW-13-0223-M	NPSH and Flow Analysis for SX-AF Pumps during a BDBEE (ELAP)	5
CE-BB-007	MOV Seismic and Weak Link Analysis for Jamesbury 30" Butterfly Valves	7
CMED-058539	Seismic Evaluation for Diesel Driven AF Pump Drive Battery Racks	0
CQD-052069	Review of Seismic Qualification Reports for Corrective Action Report No. 699 – Action to Prevent Recurrence of Nonconformance	06/05/91
DO-EDS-1	Auxiliary Feedwater Pump Diesel Exhaust Pipe Change in Pressure	3
EMD-007921	Review of Seismic Qualification Report for 6" 150 lb. Gate Valve	04/11/77
MSC-BB-009	MOV Seismic Qualification Re-Evaluation	09/09/93
PP-AF-4	IST Pump Evaluation Form for 1/2AF01PB	02/16/09
PP-AF-11	IST Pump Evaluation Form for 1AF01PB	03/28/09
PP-RH-8	IST Pump Evaluation Form for 1RH01PB	10/11/10
3C8-0685-002	Auxiliary Building Flood Level Calculation	16
3C8-0887-001	Confirmation of Safe Shutdown Capability after Auxiliary Building Flooding	4
002-M-065	Braidwood Units 1 & 2 SX Differential Pressure Calculation	1
048311	Missile Impact on Vent Stack for Equipment 1AF01PB-K Exhaust Piping	1A
050089	Piping Stress Analysis for Subsystem 1SX23	2C
050290	Piping Stress Analysis for Subsystem 2SX21	1C
PSA-B-99-06	Byron/Braidwood VCT Vortex Issue Calculations	0
CN-RRA-00-47	Byron/Braidwood Natural Circulation Cooldown TREAT Analysis for the RSG and Uprating Program	0
4101-0006-JLI01	EDG Engine Heat-up Rate Calculation	0
BRW-04-0005-M	RHR, SI, CV, and CS Pump NPSH During ECCS Injection Mode	3
BRW-06-0016-M	SI/RHR/CS/CV System Hydraulic Analysis in Support of GSI-191	5
BRW-98-0535-M	Charging Pump Recirculation Flow Deadhead Calculation	0
BRW-97-0822-M	CVCS MOV Differential Pressure Calculation	0
CN-CRA-07-47	Unit 1 Steam Generator Tube Rupture Margin to Overfill	4

CALCULATIONS

Number	Description or Title	Revision/Date
AOV-MARG-BRW-1-2SX178	Diesel Driven AF Pump SX Outlet Isolation Valve	0
L-VE-403	Battery Room & MEER Division 12 & 22 Time-Temperature Profile	2
BRW-97-475-E	125 V DC Fuse Sizing and Coordination	1
BRW-97-0384-E	125 V DC Battery Sizing Calculation	P
BRW-97-0340-E,	24V Battery Duty Cycle and Sizing for the BRW DD-AF Pumps	3
BRW-96-089-M	Battery Room Ventilation & Hydrogen Concentration following Loss of Battery Room Ventilation	3
BWR-97-0472-E	125V DC Voltage Drop calculation	4
BWR-97-0472-E	125V DC Voltage Drop calculation (Minor Revision)	4A
BWR-97-0473-E	125 V DC Short Circuit Calculation DC01E, DC02E,DC07E	2
BWR-97-0474-E	125 V DC Short Circuit Calculation DC01E, DC02E, DC05E, DC06E	4
BWR-97-0475-E	125V DC Fuse Sizing and Coordination	3

CORRECTIVE ACTION DOCUMENTS Generated Due to the Inspection

Number	Description or Title	Date
01354496	EDG Tripped on Over Speed due to K2 Relay Failure	04/16/12
01496499	Part 21 Review ENS 48863 Power Supply Potential Failures	04/02/13
02631281	Ultrasonic Gel Identified on 1SXA3A at Flowmeter Track	02/24/16
02631874	1RH01PB Pump Casing and Suction Piping Discolored	02/25/16
02635022	CDBI – Tornado Missile Protection of the AF Diesel Exhausts	03/02/16
02635702	CDBI – Question on AFW Diesel Air Intake	03/04/16
02640252	CDBI 2016 50.59 Eval/Analysis Requirement not Fully Addressed	03/14/16
02641380	CDBI – WO 1678863 AF Full Flow Testing Discrepancy	03/16/16
02643372	1BwOSR 5.5.8.RH-5B Procedure Revision Needed	03/21/16
02643642	CDBI – Engineering Judgment Used in Calculation for AF Battery Racks	03/22/16
02644542	CDBI 2016 Guidance for Screening TMP Vulnerabilities	03/23/16
02644566	2016 CDBI – LOCA AST Calculation BRW-04-0038-M Admin Correction	03/23/16
02645148	2016 CDBI – SX Booster Pump Performance Values	03/24/16
02645311	CDBI – Question on Testing Train Separation Valves	03/25/16
02631282	NRC CDBI Walkdown Observation 1SI804B	02/24/16
02631903	NRC CDBI Walkdown Identified 1SI280 Chain Issue	02/25/16

CORRECTIVE ACTION DOCUMENTS Generated Due to the Inspection

Number	Description or Title	Date
02632166	2016 NRC CDBI Oil at Fitting for 1CV01PB Lube Oil Cooler	02/26/16
02638781	CDBI – Potential NRC Concern – EDG Admin Controls	03/10/16
02643828	CDBI – NRC ID'd Vibration on 1MS017B	03/22/16
02644573	CDBI – IST Design Basis Impact of EDG Operation	03/23/16
02632517	FSAR 8.3.1.1.2.3 Discrepancy on Ripple Free Inverter O/P	02/26/16
02638725	Missing Eyewash Station	03/09/16
02639927	Missing Data Entry on 2009 Work Order	03/14/16
02644259	24 V Battery Capacity Test ended Prematurely	03/23/16
02644513	Non-1E to 1E Isolation MCCB Testing	03/22/16
02645145	Basis for Float Current Acceptance Criteria < 5 Amp	03/24/16
02645147	Incorrect Acceptance Criteria of 10 Ohm for 300 Amp Isolation Fuse Resistance	03/24/16
02645143	125 VDC Battery Service Test Acceptance Criteria Used Design Criteria not Results of Voltage Calculation	03/24/16
02632261	CDBI – Document Discrepancies (FSAR vs. TCA#28)	02/26/16

CORRECTIVE ACTION DOCUMENTS Reviewed During the Inspection

Number	Description or Title	Date
00488382	IST Surveillances Need Stroke Time Updates	04/30/06
0566981-12	MA-AA-716-025 and Procedure Revisions	09/17/15
01059033	MSOPS 44: Essential Service Water Flow Diversion	04/20/10
01202772	NRC Questions on Auxiliary Feedwater Pump Suction Piping	04/14/11
01265614	Flow Circulation issue of 1SX04P During Loss of All AC Scenario	09/20/11
01317929	Unevaluated T-Drain Installed on 1SX005 Limit Switch Housing	01/25/12
01376690	1SX005 as Found Wiring Discrepancy	06/11/12
01461230	Received 1SI8811A High Canister Level Alarm	01/11/13
01562356	Wet and Dry Boric Acid Identified at the Body to Bonnet Connection	09/23/13
01674729	Ground Water by Valve 1SI8811A, Follow-up to IR 1674280	06/24/14
02514772	OPEX Evaluation NRC Regulatory Issue Summary 2015-06	06/15/15
02519791	Scaffolding Procedure Inappropriately Used	06/25/15
02551689	Dry Boric Acid at the Pump Seal on the 1RH01PB	09/05/15
01612637	1B CV Pump Cuno Oil Filter D/P High	01/26/14
00798237	Multiple Oil Leaks on 1B CV Pump	07/18/08
01488321	Review of TMI OPEX IR 1337871	03/15/13

CORRECTIVE ACTION DOCUMENTS Reviewed During the Inspection

Number	Description or Title	Date
02630128	Air Leak on Air Flow Control Valve to AOV 1SX178	02/22/16
01235274	Use of MS PORV Hand Pumps	06/30/11
00933914	Replace AF Battery 1AF01EA-A	06/22/09
01336558	MOV Design Deficiency	05/29/11
02420846	Abnormal Trend Battery 112	12/04/14
02482758	BATTERY CELL 2 S.G. 1DC02E	04/09/15
02457193	High Total Connection Resistance On 1DC02E	02/22/15
02592021	Steris Part 21 Radiation Qualification of Okonite Splices	03/02/15
02606727	1AF01PB Two Cells Below Admin Limit	01/01/06
AR 01488321	Review of TMI OPEX IR 1337871	03/15/13
AR 02443510	1B EDG Emergency Stopped – 1DG01KB	01/28/15
AR 01623217	1B EDG Trip During Monthly Test Mode Start – 1DG01KB	02/19/14
AR 02620523	4.0 Critique of 2SI8807A Diagnostic Testing	02/01/16
AR 02635702	CDBI – Question on AFW Diesel Air Intake	03/04/16
AR 00682524	IN 2007-27: Recurring Events Involving EDGs	10/10/07
AR 02408008	FASA Exelon Emergency Diesel Generator Reliability	10/30/15

DRAWINGS

Number	Description or Title	Revision
20E-1-4001A	Station One Line Diagram	E02
20E-1-4002F	Single Line Diagram 120V AC ESF Instrument Inverter Bus 112 & 114; 125V DC ESF Distribution Center 112	E02
20E-1-4007D	Key Diagram 480V ESF Substation Bus 132X (1AP12E)	P
20E-1-4030DC02	Schematic Diagram 125V DC Battery Charger 112 1DC04E	Q
20E-1-4008J	Key Diagram 480V Auxiliary Building ESF MCC 132X1 (1AP23E)	AJ
20E-1-4008Y	Key Diagram 480V Auxiliary Building ESF MCC 132X3 (1AP24E)	AF
20E-1-4008L	Key Diagram 480V Auxiliary Building ESF MCC 132X2 & 132X2A (1AP27E & 1AP27EA)	AP
20E-1-4008AA	Key Diagram 480V Auxiliary Building ESF MCC 132X4 (1AP28E) & MCC 132X4A (1AP28EA)	AC
20E-1-4008AC	Key Diagram 480V Auxiliary Building ESF MCC 132X5 (1AP32E)	AF
20E-1-4030AF02	Schematic Diagram Auxiliary Feedwater Pump 1B (Diesel Driven) 1AF01PB	E07
ND-48859-12 Sheet 1 and 2	30” Wafer Sphere Valve 150# ANSI Flangeless w/ Limitorque Electric Actuator	C
M-42 Sheet 1A and 1B	Diagram of Essential Service Water Units 1 & 2	BL and BC
M-195	Recirculating Sump & Test Piping Plan & Section	AK

DRAWINGS

Number	Description or Title	Revision
1A-DO-27	Diesel Oil	O
2A-DO-26	Diesel Fuel Oil System	O
20E-1-4030AF11	Schematic Diagram Auxiliary Feedwater Pump 1A and 1B Essential Water Suction Valves	B
M-126, St 2	Diagram of Essential Service Water – Unit 2	AJ
M-42, St 4	Diagram of Essential Service Water	BA
20E-0-4001	Station One Line Diagram	AD
20E-0-4001A	Station One Line Diagram	S
20E-0-4001C	Station One Line Diagram	T
20E-0-4001D	Station One Line Diagram	V
20E-1-4002F	Single Line Diagram, 125V DC ESF Distribution Center 112.	L
20E-1-4010D	Key Diagram, 125V DC ESF Distribution Center 112 – Part 1	L
20E-1-4010E	Key Diagram, 125V DC ESF Distribution Center 112 - Part 2	I
20E-1-4010F	Key Diagram, 125V DC Non Safety Distribution Panel 114.	J
20E-1-4012D	Key diagram, 120V AC Instrument Bus 114, ESF DIV 12	W
20 E-1-4030AF02	Schematic Diagram, Aux Feedwater Pump (Diesel Driven)	AC
20E-1-4030DC02	Schematic Diagram, 125V DC Battery Charger 112	Q
20E-1-4030DC06	Schematic Diagram, 125V DC ESF Distribution Center Bus 111	0
20E-1-4030DC08	Schematic Diagram 125V DC ESF Distribution Center Bus 112 Part 1 1DC06E	W
20E-1-4030 DC09	Schematic Diagram 125V DC ESF Distribution Center Bus 112 Part 2	0
20E-1-4235B	Int/Ext Wiring Diagram 125 VDC Battery and Battery Charger 112	0
20E-1-4251A	Int/Ext Wiring Diagram 125 VDC ESF Distribution Center Bus 112	AA
20-E-1-4030AF02	1B Diesel-Driven AFW Pump (1AF01PB) Schematic WD	AC
20-E-1-4030AF12	1B Diesel-Driven AFW Pump (1AF01PB) Schematic WD	AE
20-E-1-4030CV202	1B Centrifugal Charging Pump (1CV01PB) Schematic WD	U
20-E-1-4030RH02	1B RHR Pump Schematic WD	N
20-E-1-4030SX06	ESW (SX) Crosstie MOV (1SX005)	L
20-E-1-4030SX14	SX outlet AOV to B AFW Pump Oil Cooler (1SX178)	L
20-E-1-4030AF11	1B D-D AFW Pump Suction Supply MOV (1AF017B)	N
20-E-1-4030CV11	CC Pump Suction from RWST MOV (1CV112D)	R

DRAWINGS

Number	Description or Title	Revision
20-E-1-4030SI09	RHR Discharge Header to SI Pumps MOV (1SI8804B)	S
20-E-1-4030SI14	Containment Recirc Sump Isolation MOV (1SI8811A)	S
20 E-1-4030MS39	Unit 1 SG PORV-A - (LERF related)	S
M-115	ESF and Non-ESF Switchgear, Misc. Elec Room Ventilation	X
20-E-4001	Station One Line Diagram	AD
M-37	Diagram of Auxiliary Feedwater	BK
M-42 Sheet 1B	Diagram of Essential Service Water	BC

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2bWep-0	Reactor Trip or Safety Injection Unit 2	208
MA-BR-773-401	Braidwood Unit 1 – 4KV Safety Related Undervoltage and Degraded Voltage Relay Routine	4
MA-AA-7-0012-8	Analog Instrument Calibration Data Sheet.	0
1BwOA ELEC-3	Loss of 4 Kv Bus Unit 1	102
BwOP AP-60	Bus 142 Outage While in Mode 6 or Defueled	17
MA-MW-773-035	Nuclear Operational Analysis Department Testing of Power Transformers	0
BwHS 4002-084	System Auxiliary Transformer Preventive Maintenance Inspection	11
WC-AA-8003	(Interface agreement with the Transmission System Operator) and the 2016-20017 Grid Stability from ComEd.	12
ER-AA-300-150	Cable Condition Monitoring Program	2
MA-BR-725-515	Preventive Maintenance of Non-Segregated Bus Duct	11
BwOP DG-11	Diesel Generator Startup and Operation	46
BwOP DG-11T2	Diesel Generator Operating Log	31
NES-EIC-10.02	Standard for Thermal Overload Relay Element Selection for Motor Operated Valves	0
MA-AA-723-330	Electrical Testing of AC Motor	4
MA-BR-726-640	Exelon Generation Procedure	7
WC-AA-106	Work Screening and Processing	15
BwAR 1-5-E7	CNMT Recirc Sump Valve Canister Level High	13
1BwFSG-2	Alternate AFW/EFW Suction Source	1
BwOP AF-7	Auxiliary Feedwater Pump _B (Diesel) Startup on Recirc	44
BwOP CC-8	Isolation of CC Between Units 1 and 2	25
BwOP RH-5	RH System Startup for Recirculation	24
BwOP RH-6	Placing the RH System in Shutdown Cooling	55
BwVSR 5.5.2.au1	Leakage Quantification Report for Potentially Radioactive Components Outside Containment	8
CC-AA-10	Configuration Control Process Description	8

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CC-AA-103	Configuration Change Control for Permanent Physical Plant Changes	27
CC-AA-112	Temporary Configuration Changes	23
EDMG-1	Extensive Damage Mitigation Guideline Unit 0 (pg. 6)	6
ER-AA-302-1004	Motor Operated Valve Performance Training	9
MA-AA-723-300	Diagnostic Testing of Motor Operated Valves	10
MA-AA-716-025	Scaffolding Installation, Modification, and Removal Request Process	10
1BwGP 100-1	Plant Heatup	30
1BwGP 100-5	Plant Shutdown and Cooldown	51
1BwOA PRI-8	Essential Service Water Malfunction Unit 1	105
1BwOA S/D-2	Shutdown LOCA Unit 1	106
1BwOSR 290-2-RH	Gaseous Leak Testing of the 1RH01SA/B Valve Containment Assemblies	4
1BwOSR 5.5.8.AF-3B	Group A IST Requirements for Unit One Diesel Driven Auxiliary Feedwater Pump	18
BwISR 3.7.2-001	Main Steam Isolation Valve – Instrument Air Check Valve Leakage Test	3
1Bw0A SEC-4	Loss of Instrument Air – Unit 1	105
1BWOSR 3.7.2.1	Main Steam Isolation Valve – Full Stroke Surveillance	17
BwOP MS-6	Local Operation of the Steam Generator Power Operated Relief Valves	18
1BwOS MS-2	Unit 1 – Local Stroke of the S/G PORVs Periodic Surveillance	7
BwAR 1-6-A3	RH Suction Press High	5
BwAR 1-6-B2	RH Pump 1B Discharge Pressure High	6
1BwOSR 0.1-1,2,3	Unit 1 – Modes 1,2,3 – Shiftily and Daily Operating Surveillance Data Sheet	82
1BwEP ES-0.2	Natural Circulation Cooldown – Unit 1	203
2BwEP ES-0.2	Natural Circulation Cooldown – Unit 2	205
1BwCA-0.0	Loss of All AC Power – Unit 1	208
1BwOSR 3.8.1.2-1	Unit 1 – 1A Diesel Generator Operability Surveillance	40
1BwOSR 3.8.1.2-2	Unit 1 – 1B Diesel Generator Operability Surveillance	39
1BwOSR 5.5.8.CV-5B	VCT Outlet Isolation – Valve Stroke Surveillance	2
1BwOSR 5.5.8.CV-5A	Emergency Boration Flowpath Isolation 1CV112D – Valve Stroke Surveillance	2
1BwOSR 5.5.8.CV-15	Emergency Boration Flowpath Isolation 1CV112E – Valve Stroke Surveillance	2
1BwOSR 3.5.2.5	ECCS Subsystem Automatic Valve Actuation Surveillance	20
1BwFR-C.1	Response to Inadequate Core Cooling – Unit 1	200

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1BwEP ES-3.1	Post-SGTR Cooldown using Backfill – Unit 1	201
1BwEP EP-3	Steam Generator Tube Rupture – Unit 1	208
BwOP CV-1	Startup of the CV System	19
BwOP MS-9	Opening the Main Steam Isolation Valves	9
BwAR 1VE01J-1-B3	Alarm Response Procedure – Misc. Electrical Equipment Room Temperature Low	9
BwOP DC-1-112	125 Vdc ESF BATTERY CHARGER 112 START-UP	3
BwOP DC-5-112	125 Vdc ESF Battery 112 Equalization.	4
BwOP DC-7-112	125 Vdc ESF Bus 112 Cross-tie/Restoration	5
1BwHSR 3.7.5-AA	AF 24 Volt Battery Bank A Capacity Test	0
1BwHSR 3.7.5-AB	AF 24 Volt Battery Bank B Capacity Test	2
1BwHSR 3.8.4.2-112	Unit One 125V ESF Battery Charger Capacity Test	1
1BwHSR 3.8.4.3-112	Unit One 125V ESF Battery 112 Service Test	0
1BwHSR 384-2	Unit One 125V ESF Battery Charger 112 Setpoints and Alarms	1
1BwHS 384-5	Unit One 24V AF Battery BT1 and BT1-A Performance Test	0
1BwHSR 3.8.6.6-112	Unit One 125 V ESF Battery Bank 112 Modified Performance Test	4
BwHS 4002-012	AF Nickel Cadmium Battery Surveillance	10
BwHS 4002-124	125 Vdc Safety Related to Non-Safety Related Bus Circuit Isolation (Fuses) Surveillance	3
1BwHSR 3.7.5-AB	Unit 1 – 1B DAF Battery Bank A Battery B Capacity Test	2
1BwHSR 3.7.5-AA	Unit 1 – 1B DAF Battery Bank A Battery A Capacity Test	0
1BwOSR 3.7.5.4-2	Unit 1 Diesel Driven AFW Pump Surveillance	21
1BwOSR 3.8.6.5-2	Unit One 125 Vdc ESF Battery Bank 112 Operability Surveillance	11
1BwOA PRI-8	Essential Service Water Malfunction Unit 1	105
1BwEP-0	Reactor Trip or Safety Injection Unit 1	207
1BwEP-1	Loss of Reactor or Secondary Coolant Unit 1	205
1BwEP ES-1.3	Transfer to Cold Leg Recirculation Unit 1	203
1BwCA-0.0	Loss of All AC Power Unit 1	208
BwOP DC-7-111	125 Vdc ESF Bus 111 Cross-Tie/Restoration	15
BwOP MS-6	Local Operation of the Steam Generator Power Operated Relief Valves	18
1BwFR-C.1	Response to Inadequate Core Cooling Unit 1	200
1BwFR-C.2	Response to Degraded Core Cooling Unit 1	201
1BwFR-H.1	Response to Loss of Secondary Heat Sink Unit 1	205
1BwOA ELEC-3	Loss of 4 Kv ESF Bus Unit 1	102
1BwOA ELEC-8	Loss of All AC Power While on Shutdown Cooling Unit 1	1

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BwOP DG-11	Diesel Generator Startup and Operation	46
BwOP DG-1	Diesel Generator Alignment to Standby Condition	29
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BwAR 1PL08J-1-A6	Annunciator – High Jacket Water Temp.	7
BwAR 1PL08J-1-D2	Annunciator – High Jacket Water Temperature Off Normal	9
BwAR 1AF01J-1-A2	High Water Temperature 205º	51E1
BwOP FP-100T38	Fire Zone 2.1-0 Main Control Room 1D-75	10
BwOP AF-7	AFW Pump B Startup on Recirc	44

SURVEILLANCES

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1BwOSR5.5.88.DO-1B	Group A 1st Requirements for Testing the Diesel Fuel Oil Transfer System (B-Train)	4
1BwOSR 3.8.1.11-2	1B Diesel Generator Loss of ESF Bus Voltage with no SI Signal	14
1BwOSR 5.5.8.DO-1B	IST-FOR 1D0003B/D-TRN B ASME REQMT Diesel Oil Transfer System	4
1BwOSR 3.8.1.2-2	IST-1B D/G Operability Monthly	38
1BwOSR 3.8.1.19-2	1B D/G 24-Hour Load Test and ECCS Sequence Surveillance	17
1BwOSR 3.8.1.10-2	SI Signal Override of Test Mode for 1B D/G	13
1BwOSR 5.5.8-AF-2B	Unit 1 Train B Auxiliary Feedwater Valves Indication Test Surveillance	17
1BwOSR 3.6.3.5-AF-1B	Unit 1 Train B Auxiliary Feedwater Valve Stroke Surveillance	17
1BwOSR 5.5.8.CV-4B	Group A IST Requirements for 1B CV Pump (1CV01PB) and Check Valve 1CV8480B Stroke Test	12/26/15
1BwOSR 5.5.8.CV-8	Comprehensive IST Requirements for Unit 1 Charging Pumps and SI System Charging Check Valve Stroke Test	04/05/15
MA-AA-723-301	Periodic Inspection of Limitorque Model SMB/SB/SBD-000 through 5 Motor Operated Valves	04/09/15
1BwOSR 3.8.1.2-2	Unit 1 – 1B Diesel Generator Operability Surveillance	08/19/15
01551948-01	1DC02E Battery Service Test	09/22/13
01551948-09	1DC02E Initial Battery Measurements	09/21/13
01678494-01	AF Diesel Prime Mover Performance	08/15/14
01892855-01	DD-AFW Pump Monthly	01/21/16

WORK ORDERS

Number	Description or Title	Revision/Date
01369107 01/02	Bus 142 Bus Pot XFMR Primary Circuit Fuses (4) Replace Fuses As Required	9/10/11 - 9/17/13

WORK ORDERS

Number	Description or Title	Revision/Date
01520738 01	Overhaul Breaker – EM Maintenance On 6kV DHP SWGR Breaker (Reactor Coolant Pump 2C BKR.)	06/17/13
01535763 01	Bus 142 Cub 05 Tech Spec U.V. (Perform Tech Spec Relay Calibration per MA-BR-773-401)	02/07/13
01626079 01	1II-AP085 Bus 142-242 XTIE Ammeter Calibration. Bus 142 U2 Feed. Perform Calibration per MA-AA-7-0012-8	11/21/14
01324851 01	1AP71E Testing of Transformer Windings & Bushing and Lightning Arresters.	04/10/13
01371785 01-14	1AP71E Preventive Maintenance Inspection of SAT 142-2	03/13/12 - 02/18/13
150916 & 150914	Clean and inspect 4kV and 6 kV Non-Segregated Bus Duct 1AP71E	02/18/13
1308136	Bus Duct Hi-Pot Test 1AP71E	02/15/14
ER-AA-300-150	Cable Condition Monitoring Program	2
01821063 02	Diesel Oil Train B Transfer System	06/16/15
00709380	MM – Boric Acid Leakage at Pump 1RH01PB Seal (Clean/Repair)	07/11/07
01327482	1SI8804B MOV Age Related Inspection & T Drain Plug	01/26/13
01385673	1SI8811A Motor Operated Valve Diagnostic Test	09/17/11
01410036	1XS005 Motor Operated Valve Diagnostic Test	09/18/13
01512104	1SI8804B Motor Operated Valve Diagnostic Test	01/26/13
01544212	1AF017B Motor Operated Valve Diagnostic Test	10/23/14
01678863	IST – Unit 1 AF Pumps Comprehensive. Full Flow Test & Equipment Response.	03/27/15
01681727	IST - Comprehensive & Response Time Tests of 1B RH Pump	03/21/15
01699124	SEP-VSL XAM (Leak Test) of RH System Component Outside Containment	03/30/15
01781493	IST-STT-PIT-0SX007/146/147 & 1/2SX005 – Xtie Vlv. Stk. & Indic.	01/13/15
01808426	IST-1RH01PB ASME Group A Test & CC-1SI8958B	04/27/15
01852558	Unit One ECCS Venting and Valve Alignment Surveillance Data Sheet	08/13/15
01853904	IST-1RH01PB ASME Group A Test & CC-1SI8958B	10/28/15
01861851	IST-STT-1SI8920/8804B/8821B-U1 TRN B SI	11/17/15
01866993	Train B AF Valves ASME Quarterly	12/22/15
01882258	IST-STT-PIT-0SX007/146/147 & 1/2SX005 – Cross-Tie Valve Stroke & Indication.	01/11/16
0113248	Unit Two 125V ESF Battery Charger 211 Capacity Test	11/14/09
00972667 01	32 V Battery Performance Test	06/17/09
01521221-01	125 VDC SR Bus to Non-SR Bus Fuse Inspection	02/26/13

WORK ORDERS

Number	Description or Title	Revision/Date
01581167 01	125V Battery Modified Performance Test ESF Battery 112	02/28/14
01603164	DD-AFW Starting Battery Performance Test	02/24/14
01603264-02	24 V AFW Battery Bank 5 Year Capacity Test	08/20/15
01678494-01	AFW Prime Mover Performance Surveillance	04/16/15
01677495 01	125 V Battery Service Test ESF Battery 112	05/16/15
01852233-01	AF Battery Bank A & B Weekly Surveillance	08/14/15
01902780-01	AF Battery Bank A & B Weekly Surveillance	03/04/16
01902780	DD-AF Starting Battery Weekly Surveillance	03/4/16
0185223301	AFP Battery Bank Weekly	01/25/16

MISCELLANEOUS

Number	Description or Title	Revision/Date
V-tip L-0297	4160V DHP Switchgear Manual	04/26/86
V-tip L-0351	480V MCC Manual	03/25/84
Passport Screenshot D033	Model 50DHP350 DHP Switchgear Manual	01/22/86
L-2752	480V Westinghouse Specification DS Switchgear (Sargent & Lundy Engineers) Specifications	09/08/77
CQD 009436	Seismic Qualification Test Report for Nife Ni-Cad Batteries H410	08/17/83
CQD 010806	Seismic Qualification of Engine Emergency Start Battery Racks	11/14/83
DIT-BRW-2015-0048	Transmittal of Tornado Safe Shutdown Equipment List (TSSEL) Related to Tornado Missile Protection (TMP) Project	11/05/15
DRP 9-038	Provide Clarification for Recirculation Sump Guard Pipe Configuration and Boundaries	1
ER-AA-321 Att. 3	IST Valve Evaluation Form – Report AF-2	6
IST-BWD-DBOC-V-9	Braidwood – Inservice Testing Bases Document	03/08/16
LS-AA-104.06	Safety Evaluation Summary Form	12/06/00
MA-AA-716-025 Att. 5	Permanent Scaffold Request Form	9
OP-AA-106-101-1006 Att. B	Issue Resolution Documentation Form – Active Borated Water Leak 1SI8811A and 1SI8811B	09/23/13
OP-AA-108-111 Att. 1	Adverse Condition Monitoring Plan – Monitor Leakage Internal to 1RH01SA Until Repairs can be Performed or no Leakage Confirmed During A1R18, Rev. 4	06/16/14
TP-PA-4	IST Program Plan Pump Technical Position for 1B RH Pump	05/24/12
BRW CV	System Health Report – Chemical and Volume Control	Q4-2015
BRW DG	System Health Report – Diesel Generators	Q4-2015
BRW MS	System Health Report – Main Steam	Q4-2015

MISCELLANEOUS

Number	Description or Title	Revision/Date
L-0520	Charger Technical Manual, Power Conversion Products	07/18/87
L-0810	125 VDC safety Related Batteries and Battery Racks, I & O Instructions, C&D Technologies, Inc.	02/7/14
VTM-0841	10 kVA ESF Inverter Technical Manual, Amertek	10/30/06
152-21081-SBH	Nife NiCad Block Battery Inst. & Maint. Manual,	04/25/05
VTM L-0611,V3	Nife NiCad Block Battery Inst. & Maint. Manual,	10/01/09
VTM L-0476	AF 32 Volt Battery Charger Manual, PCP	04/19/84
VTM-0611, Vol 1-4	DD-AF Pump Diesel	08/19/15
TRM-Appendix U	Battery Maintenance Program	26
Letter 06/09/89	NRC SER Use of Fuses for Electrical Isolation	06/09/89
DRP# 7-118	UFSAR Conformance Review – SX System Discrepancies, Diesel Generator Cooling	07/06/98
BB PRA-005.10	Essential Service Water System Notebook	3
BB PRA-005.04	Auxiliary Feedwater System Notebook	2
BB PRA-005.09	Emergency Diesel Generator System Notebook	2
11-AF-XL-01	Auxiliary Feedwater System Lesson Plan	5e
11-DG-XL-01	Diesel Generator Lesson Plan	6a
1MS-001B-R2	JPM: Local Operation of 1B S/G PORV	2
1DC-007(c)	JPM: 125VDC ESF Bus Cross-Tie (111-211)	1a

LIST OF ACRONYMS USED

ΔCDF	DeltaCore Damage Frequency
ADAMS	Agencywide Documents Access and Management System
AFW	Auxiliary Feedwater
AR	Assignment Report
CAP	Corrective Action Program
CCDP	Conditional Core Damage Probability
CDF	Core Damage Frequency
CFR	*Code of Federal Regulations*
EDG	Emergency Diesel Generator
ESF	Engineered Safety Feature
FSAR	Final Safety Analysis Report
HELB	High Energy Line Break
IEF	Initiating Event Frequency
IEEE	Institute of Electrical and Electronics Engineers
IMC	Inspection Manual Chapter
IN	Information Notice
LERF	Large Early Release Frequency
MCCB	Molded Case Circuit Breaker
MFW	Main Feedwater
MOV	Motor Operated Valve
NCV	Non-Cited Violation
NPSH	Net Positive Suction Head
NRC	U.S. Nuclear Regulatory Commission
PARS	Publicly Available Records System
RHR	Residual Heat Removal
SPAR	Standardized Plant Analysis Risk
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report

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Sincerely,

/RA/

David E. Hills, Acting Chief
Engineering Branch 2
Division of Reactor Safety

Docket Nos. 50–456; 50–457
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