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

May 6, 2010

Mr. Charles G. Pardee
Senior Vice President, Exelon Generation Company, LLC
President and Chief Nuclear Officer (CNO), Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: BRAIDWOOD STATION, UNITS 1 AND 2, NRC COMPONENT DESIGN BASES INSPECTION (CDBI) INSPECTION REPORT 05000456/2010007(DRS); 05000457/2010007(DRS)

Dear Mr. Pardee:

On April 2, 2010, the U.S. Nuclear Regulatory Commission (NRC) completed a component design bases inspection at your Braidwood Station. The enclosed report documents the inspection findings, which were discussed on April 2, 2010, with Mr. A. Shahkarami and 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, six NRC-identified findings of very low safety significance were identified. All of the findings had associated 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 (NCVs) in accordance with Section VI.A.1 of the NRC Enforcement Policy.

If you contest the subject or severity of these NCVs, 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 a copy to the Regional Administrator, U.S. Nuclear Regulatory Commission - Region III, 2443 Warrenville Road, Suite 210, Lisle, IL 60532-4352; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the Resident Inspector Office at the Braidwood Station. In addition, if you disagree with the characterization of any finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region III, and the NRC Resident Inspector at the Braidwood Station. The information that you provide will be considered in accordance with Inspection Manual Chapter 0305.

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

Sincerely,

/RA/

V. Patricia Lougheed, Acting Chief
Engineering Branch 2
Division of Reactor Safety

Docket No. 50-456; 50-457
License No. NPF-72; NPF-77

Enclosure: Inspection Report 05000456/2010007; 05000457/2010007
w/Attachment: Supplemental Information

cc w/encl: Distribution via ListServ

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No:	50-456; 50-457
License No:	NPF-72; NPF-77
Report No:	05000456/2010007(DRS); 05000457/2010007(DRS)
Licensee:	Exelon Generation Company, LLC
Facility:	Braidwood Station, Units 1 and 2
Location:	Braceville, IL
Dates:	March 1 through April 2, 2010
Inspectors:	A. Dahbur, Senior Reactor Engineer, Lead C. Brown, Reactor Engineer, Operations J. Gilliam, Reactor Engineer, Electrical L. Jones, Reactor Engineer, Mechanical C. Edwards, Mechanical Contractor G. Morris, Electrical Contractor
Observers:	S. Edmonds, Reactor Engineer E. Sanchez, Reactor Engineer
Approved by:	V. Patricia Lougheed, Acting Chief Engineering Branch 2 Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000456/2010007; 05000457/2010007; 03/01/2010 – 04/02/2010; Braidwood Station; Component Design Bases Inspection (CDBI)

The inspection was a 3-week onsite baseline inspection that focused on the design of components that are risk-significant and have low design margin. The inspection was conducted by regional engineering inspectors and two consultants. Six findings of very low safety significance were identified with six associated Non-Cited Violations (NCVs) of NRC regulations. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, “Significance Determination Process” (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC’s program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, “Reactor Oversight Process,” Revision 4, dated December 2006.

A. NRC-Identified and Self-Revealed Findings

Cornerstone: Mitigating Systems

- Green. The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion III, “Design Control,” having very low safety significance for the licensee’s failure to restore the Diesel Driven Auxiliary Feedwater (DDAFW) battery racks to their design basis qualification, Seismic Category I. Specifically, although the licensee identified the existence of gaps between the wooden spacer blocks, batteries and end of racks in 2004 the licensee failed to provide adequate justification to demonstrate that the existing condition still met the Seismic Category I Design Basis requirements as specified in their design documents. The gaps between the wooden spacer blocks could affect the reliability of the DDAFW DC safety-related batteries being that this component was outside its design basis for over a period of six years. The licensee subsequently entered the issue into their corrective action program and restored the batteries racks to their design requirements.

  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 DDAFW batteries to perform their safety function in external events to prevent undesirable consequences. Specifically, the licensee did not assure that the wooden spacer blocks including the gap would provide adequate support to ensure that the seismically qualified battery rack will perform its safety function. This finding is of very low safety significance (Green) because the qualification deficiency was confirmed not to result in loss of operability or functionality. The inspectors determined that there was no cross-cutting aspect associated with this finding because the gaps between the wooden spacers and the DDAFW batteries were initially identified in 2004; therefore, the finding was not indicative of the plant’s current performance. (Section 1R21.3.b.(1))

- Green. The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion III, “Design Control,” having very low safety significance related to the licensee’s failure to develop a calculation for the DDAFW pump minimum fuel oil tank level setpoint. Specifically, the licensee failed to perform a calculation specific to the DDAFW pump day tank to verify the 74 percent level indication was equivalent to the 420 gallons of usable fuel volume that was required by the Technical Specifications (TS). The licensee subsequently entered the issue into their corrective action program to develop design basis documentations.

This finding is more than minor because it was associated with the Mitigating Systems cornerstones attribute of design control and affected the cornerstone objective of ensuring the capability of the safety-related system to respond to initiating events to prevent undesirable consequences. Specifically, the licensee failure to verify that 74 percent tank level exceeded the TS value did not assure the pump was capable of performing its safety function for the entire seven hours mission time. This finding is of very low safety significance (Green) because subsequent calculation/evaluation determined the volume of the tank at 74 percent level was slightly above the minimum required TS limit. The inspectors determined there was no cross-cutting aspect associated with this finding because the deficiency was a legacy design issue and, therefore, was not indicative of the plant's current performance. (Section 1R21.3.b.(2))

- Green. The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," having very low safety significance for the licensee's failure to include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished. Specifically, the licensee's procedures for flow balancing Essential Service Water (SX) supply to safety-related pump room coolers did not include any precautionary statements to limit the degree to which branch loop throttle valves could be throttled down without introducing concerns about potential clogging from particulate in the service water and resultant flow reduction. The licensee subsequently entered the issue into their corrective action program and performed immediate corrective actions included, engineering evaluation to determine current operability, repositioned all throttle valves to at least ¾ turns open and revised the valve throttling procedure to prevent any valve from being throttled to less than ¾ turns open in the future.

  The finding was more than minor because it was associated with the Mitigating Systems cornerstone attribute of procedure quality and affected the cornerstone objective of ensuring the capability of the system to respond to initiating events to prevent undesirable consequences. Specifically, under accident conditions, the position of these throttle valves could have led to a potential degradation of the ability of the room coolers to perform their safety-related function of protecting the emergency core cooling system (ECCS) pumps from elevated environmental temperatures. The finding is of very low safety significance (Green) because the design deficiency did not contribute to the likelihood that mitigating equipment or functions would not be available. The inspectors determined there was no cross-cutting aspect associated with this finding because the deficiency was a legacy procedural issue and, therefore, was not indicative of the plant's current performance. (Section 1R21.3.b.(3))

- Green. The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," having very low safety significance for the licensee's failure to fully verify the adequacy of a design modification important to safety. Specifically, the licensee failed to recognize that bag-type strainers back fitted into floor drains in the Auxiliary Building for the purpose of preventing debris from blocking the floor drain piping were designed in such a way that they actually increased the potential for blockage, thus negatively impacting the analysis of record for internal flooding. The licensee subsequently entered the issue into their corrective action program, performed preliminary evaluation of the affected areas and demonstrated operability. Additional action was initiated to revise the internal flooding calculation and safe shutdown analysis to address the impact of the floor drain strainers.

The finding was more than minor because it was associated with the Mitigation Systems Cornerstone attribute of protection against external events such as flooding and affected the cornerstone objective of ensuring the availability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the floor drain strainer bags were inadequately designed such that they would have increased the possibility of drain plugging. The finding is of very low safety significance (Green) because the licensee was able to demonstrate that, in the event the drains became plugged in any room, a flood in the affected room would have not affected the alternate shutdown equipment. The inspectors determined there was no cross-cutting aspect associated with this finding because these bag-type strainers were installed in 1996; therefore, the finding was not reflective of current performance. (Section 1R21.3.b.(4))

- Green. The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion XI, "Test Control," having very low safety significance for the licensee's failure to ensure adequate acceptance limits were incorporated into test procedures. Specifically, the licensee failed to consider instrument loop uncertainties when determining the alert and required action values used in the IST procedure for testing of the containment spray (CS) pumps. Consequently, the acceptance criteria for both the upper and lower limits on total developed head (TDH) were non-conservative. As a result, the licensee subsequently entered the issue into their corrective action program, performed an operability evaluation and concluded equipment were operable. Additional corrective actions were assigned to investigate and correct the cause of the apparent degradation of the 2B CS pump.

  The finding was more than minor because it was associated with the Mitigating Systems cornerstones attribute of equipment performance and affected the cornerstone objective of ensuring the capability of the system to respond to initiating events to prevent undesirable consequences. Specifically, the failure to consider instrument uncertainties in the development of IST acceptance criteria resulted in the creation of acceptance criteria values that did not ensure that the CS pump could meet its intended safety function. This finding is of very low safety significance (Green) because the licensee was able to demonstrate pumps operability; therefore, there was no loss of safety function. This finding had a cross-cutting aspect in the area of Problem Identification and Resolution, Operating Experience, because the licensee failed to implement relevant information relating to failure to appropriately account for instrument uncertainties identified in Information Notice 2008-02 through changes to station procedures. (IMC 0310, Section 06.02b.(2) [P.2(b)]) (Section 1R21.3.b.(5))

- Green. The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," having very low safety significance for the licensee's failure to translate the allowable frequency variations, for the emergency diesel generators (EDGs), into the fuel consumption calculation. Specifically, the fuel oil consumption calculation for the EDGs did not assure that TS minimum required fuel limit of 44,000 gallons was adequate to support the EDGs operating at frequency higher than 60 Hertz (Hz) for the seven days mission time. As a result of the inspectors' questions, the licensee subsequently added an action item to an existing condition report to address frequency variation on fuel consumption.

The finding was more than minor because it was associated with the Mitigating Systems cornerstones attribute of design control and affected the cornerstone objective of ensuring the capability of the system to respond to initiating events to prevent undesirable consequences. Specifically, the licensee failed to ensure that the minimum fuel required by TS of 44,000 gallons was adequate to support the EDGs mission time when operating at higher frequency than 60 Hz. This finding is of very low safety significance (Green) because the licensee was able to demonstrate that adequate fuel oil in the storage tanks would be available to support the EDGs when operating within the frequency variation band established by the administrative limits. This finding had a cross-cutting aspect in the area of Problem Identification and Resolution, Corrective Action Program, because the licensee did not thoroughly evaluate problems associated with safety nuclear safety. (IMC 0310, Section 06.02a.(3)) [P.1(c)] (Section 1R21.3.b.(6))

B. Licensee-Identified Violations

No violations of significance were identified.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstone: Initiating Events, Mitigating Systems, and Barrier Integrity

1R21 Component Design Bases Inspection (71111.21)

.1 Introduction

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

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 PRA and the Braidwood Standardized Plant Analysis Risk (SPAR) Model, Revision 3.51. 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. The operator actions selected for review included actions taken by operators both inside and outside of the control room during postulated accident scenarios. In addition, the inspectors selected operating experience issues 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 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, 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.

This inspection constituted 26 samples as defined in Inspection Procedure 71111.21-05.

.3 Component Design

a. Inspection Scope

The inspectors reviewed the Updated Final Safety Analysis Report (UFSAR), Technical Specifications (TS), design basis documents, drawings, calculations, and other available design basis information, to determine the performance requirements of the selected components. The inspectors used applicable industry standards, such as the American Society of Mechanical Engineers (ASME) Code, Institute of Electrical and Electronics Engineers (IEEE) 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 (GLs), Regulatory Issue Summaries (RISs), and Information Notices (INs). 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, system health reports, operating experience-related information, and licensee corrective action program documents. Field walkdowns were conducted for all accessible components to assess material condition 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 17 components were reviewed:

- Emergency Diesel Generator 2B (2DG01KB): The inspectors reviewed the Emergency Diesel Generator (EDG) loading calculations including voltage, frequency 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. Protective relay setpoint calculations and setpoint calibration test results were reviewed to assess the adequacy of protection during testing and emergency operations and to assure that excessive setpoint drift had not taken place. The inspectors also reviewed electrical drawings and calculations that describe the generator output breaker control logic. Permissives and interlocks were reviewed to determine whether the breaker opening and closing control circuits were consistent with design basis documents. The inspectors also reviewed samples of surveillance test results to verify that applicable test acceptance criteria and test frequency requirements for the EDGs were satisfied. In addition the physical and material condition of the EDG was visually inspected and corrective action document were reviewed to verify identification of adverse trends.

- 2B Emergency Diesel Generator Jacket Water Coolers: The inspectors reviewed calculations associated with operational heat loads and cooling to ensure EDG and associated components remained within their temperature limits.

Surveillance test results, including verification of adequate water flow were reviewed to assess the capability of the cooler to maintain temperature within prescribed limits. In addition the physical and material condition of the EDG strainer was visually inspected and corrective action documents were reviewed to verify identification of adverse trends.

- <u>2B Diesel Oil Storage Tank (2DG01TA)</u>: The inspectors reviewed the system hydraulic calculations including set-point, loading and vortexing to ensure that the diesel fuel transfer pumps were capable of providing sufficient flow such that the day tanks remained filled during diesel operation. The inspectors also reviewed calculations and drawings relating to fuel oil consumption and tanks sizing to ensure that the EDG fuel oil system was adequate to meet license and design basis requirements. EDG fuel oil chemistry test results were reviewed to ensure the quality of the EDG fuel oil supply was being maintained and tested according to facility procedures and license requirements. The inspectors performed a review of system normal operating procedures and surveillance test procedures to ensure component operation and alignments were consistent with design licensing bases assumptions. In addition the physical and material condition of the tanks was visually inspected and corrective action documents were reviewed to verify identification of adverse trends.

- <u>2B Diesel-Driven Auxiliary Feed Water (DDAFW) Pump (2AF01PB)</u>: The inspectors reviewed seismic qualification and electrical calculations relating to the 2B DDAFW pump 24 volt direct current (Vdc) battery sizing, minimum voltage, and battery capacity and battery charger sizing. The review was performed to ascertain the adequacy and appropriateness of design assumptions, and to verify that the battery was adequately sized to support the design basis minimum required five starts. The inspectors also reviewed mechanical analyses and procedures associated with the fuel oil strainers and filters to verify their frequency of inspection, cleaning and replacement. The inspectors reviewed the control circuitry for the batteries including the design information on the fuses and the time delay relays. Various documents concerning the diesel fuel oil day tank were reviewed including the consumption rates calculation, tank capacity, the vortexing calculation, level indicators, alarm setpoint and alarm response procedures. The inspectors also reviewed a sampling of completed preventive maintenance data surveillance tests and inservice testing. In addition the physical and material condition of the batteries was visually inspected and corrective action documents were reviewed to verify identification of adverse trends.

- <u>Containment Spray (CS) Pump (2CS01PB)</u>: The inspectors reviewed the system design basis hydraulic analysis/calculations to verify that required total developed head (TDH), required net positive suction head (NPSH) and potential for vortex formation were properly considered under all design basis accident/event conditions. Inservice test (IST) pump performance test procedures, recent test results, and trends in test data were reviewed to verify that component performance remained consistent with design basis requirements. The IST reference values (i.e., flow rate and developed head) were also reviewed to verify appropriate correlation to accident analyses conditions, taking into account setpoint tolerances and instrument inaccuracies. The inspectors reviewed the pump room cooler, thermal and differential pressure (dP) inspection procedures and inspection results to verify compliance with licensing commitments under the GL 89-13 program plan. The inspectors also reviewed inspection and preventative maintenance procedures, maintenance rule basis documents and recent motor bearing oil sample test results to verify adequacy of the maintenance program in assuring the pump will perform as required under design basis accident/event conditions. In addition, the inspectors performed a visual inspection of the pump to verify material conditions were being maintained within design limits and that configuration is consistent with functional requirements under design basis accident/event conditions, including high energy line break (HELB), internal flooding, and seismic events. Corrective action documents were reviewed to verify identification of adverse trends.

- Centrifugal Charging (CV) Pump (2CV01PB): The inspectors reviewed the system design basis hydraulic analysis/calculations to verify that required NPSH and potential for vortex formation were properly considered under all design basis accident/event conditions. The IST pump performance test procedures, recent test results, and trends in test data were reviewed to verify that component performance remains consistent with design basis requirements. The IST reference values (i.e., flow rate and developed head) were also reviewed to verify appropriate correlation to accident analyses conditions, taking into account setpoint tolerances and instrument inaccuracies. The inspectors reviewed the pump room cooler, pump gear oil cooler and pump lube oil cooler thermal and dP inspection procedures and inspection results to verify compliance with licensing commitments under the GL 89-13 program plan. The inspectors also reviewed inspection and preventative maintenance procedures, maintenance rule basis documents and recent motor bearing, pump bearing and gear reducer oil sample test results to verify adequacy of the maintenance program in assuring the pump will perform as required under design basis accident/event conditions. In addition, the inspectors performed a visual inspection of the pump to verify material conditions were being maintained within design limits and that configuration is consistent with functional requirements under design basis accident/event conditions, including HELB, internal flooding, and seismic events. Corrective action documents were reviewed to verify identification of adverse trends.

- 2B SX Strainer (2SX01FB): The inspectors reviewed the system description and operational installation drawings to ensure the strainer was in conformance with its design basis and was capable of performing its safety function. The inspectors also reviewed the flood analysis calculations to determine adequate protection for this component within the 2B SX pump room. The inspectors reviewed inspection and preventative maintenance procedures to verify adequacy of maintenance program in assuring that the strainer will perform as required under design basis accident/event conditions. In addition the physical and material condition of the strainer was visually inspected and corrective action documents were reviewed to verify identification of adverse trends. Due to the in-progress upgrade of the component, the modification was not fully reviewed.

- 2B SX Pump Suction Valve (2SX001B): The inspectors reviewed the system description to determine design basis characteristics and requirements. The inspectors also reviewed operational installation drawings for conformance with design bases. A review of GL 89-10 information was also reviewed for understanding of why this once-declared GL 89-10 valve had no maintenance test history or regular preventative maintenance information. Due to the location of this component, site drawings and logs were reviewed to assess the material conditions.

- Containment Recirculation Sump Isolation Valves (2SI8811 A/B): The inspectors reviewed motor-operated valve (MOV) calculations and analysis to ensure the valves were capable of performing their design safety functions as defined per the UFSAR and TS. The analysis and calculations were relating to HELB, internal flooding and seismic events; environmental qualification (EQ) documentation to verify the design was consistent with EQ basis for limiting conditions (i.e., loss of coolant accident (LOCA), loss of offsite power (LOOP) and station blackout (SBO) events as applicable); and maximum open or close dP to verify consistency with design basis requirements and analyzed conditions. The inspectors also reviewed electrical calculations relating to actuator minimum terminal voltage under degraded voltage conditions and thermal overload sizing methodology. The inspectors reviewed inspection and preventative maintenance procedures and maintenance rule basis documents to verify adequacy of maintenance program in assuring valve will perform as required under design basis accident/event conditions. In addition the physical and material condition of the valves was visually inspected and corrective action documents were reviewed to verify identification of adverse trends.

- CS Pump Reactor Water Storage Tank (RWST) Suction Valves (2CS001A/B): The inspectors reviewed MOV calculations and analysis to ensure the valves were capable of performing their design safety functions as defined per the UFSAR and TS. The analysis and calculations were relating to HELB, internal flooding and seismic events; EQ documentation to verify the design was consistent with EQ basis for limiting conditions (i.e., LOCA, LOOP and SBO events as applicable); and maximum open and close dP to verify consistency with design basis requirements and analyzed conditions. The inspectors also reviewed electrical calculations relating to actuator minimum terminal voltage under degraded voltage conditions and thermal overload sizing methodology. The inspectors reviewed inspection and preventative maintenance procedures and maintenance rule basis documents to verify adequacy of the maintenance program in assuring that the valve will perform as required under design basis accident/event conditions. In addition the physical and material condition of the batteries was visually inspected and corrective action documents were reviewed to verify identification of adverse trends.

- Component Cooling (CC) Heat Exchanger SX Outlet Isolation Valve (2SX007): The inspectors reviewed electrical calculations relating to MOV control circuitry, actuator minimum terminal voltage and thermal voltage overload sizing methodology to ensure the valve was capable of functioning under degraded voltage design conditions. The inspectors also reviewed the MOV associated electrical drawings to verify adequate separation from other trains and divisions.

- RWST Low-Low-Level Instrumentation (2LT-0930): The inspectors reviewed setpoint and TS requirements to insure that at the low-low-level setpoint the RWST had enough inventory to fulfill its design function. The inspectors also reviewed procedures, operator actions, and surveillances to ensure acceptance criteria were met and performance degradation would be identified.

- Switchgear Bus 242 (2AP06E): The inspectors reviewed one-line diagrams, control schematics and the design basis as defined in the UFSAR. The protective relay trip setpoints for selective loads was reviewed for design basis loading and protective relay setting requirements to evaluate the capability of the 4.16 kilovolt (kV) alternating current (ac) bus to supply the voltage and current requirements to one train of essential safety feature loads. The inspectors reviewed the results of completed preventive maintenance and relay setpoint calibrations to verify that the test results were within their acceptable limits.

  The inspectors also reviewed vendor specifications, nameplate data and calculations relating to the station auxiliary transformers and the unit auxiliary transformers to verify that the loading of the Braidwood switchyard was adequate to provide the capacity and capability required by the 4.16 kVac bus. The inspectors reviewed the corrective actions related to the voltage transient that resulted during the fast bus transient event and affected the reactor coolant pump (RCP) overcurrent relay setpoints.

- Substation Bus 232X (2AP12E): The inspectors reviewed the design basis as defined in the UFSAR, calculations, and drawings to verify that the loading of the unit substation transformer (UST), the UST power supply breaker and the 480 Vac bus was within the corresponding transformer and switchgear ratings. The inspectors reviewed design assumptions and calculations related to voltage drop and protective relay settings associated with UST 232 and breaker trip settings associated with Bus 232X to verify that they were appropriate.

  The inspectors interviewed system engineers, and conducted a field walkdown of the 4160/480 Vac UST 232 and 480Vac Bus 232X to verify that equipment alignment and nameplate data was consistent with design drawings and to assess the material condition of the 4160/480 Vac UST 232 and the 480 Vac Bus 232X switchgear.

- Station Battery 212 (2DC02E): The inspectors reviewed seismic qualification and electrical calculations relating to battery sizing, voltage drop, minimum voltage, and battery capacity. The review was performed to ascertain the adequacy and appropriateness of design assumptions, and to verify that the battery was adequately sized to support the design basis required voltage requirements of the 125 Vdc safety-related loads under design basis accident. The inspectors also reviewed a sampling of completed surveillance tests, service tests, performance discharge tests, and modified performance tests. The review of various discharge tests was to verify that the battery capacity was adequate to support the design basis duty cycle requirements and to verify that the battery capacity meets TS requirements. In addition the physical and material condition of the batteries was visually inspected and corrective action documents were reviewed to verify identification of adverse trends.

- Battery Charger 212 (2DC04E): The inspectors reviewed electrical calculations relating to the 125 Vdc battery charger sizing and its contribution to short circuit fault current. The inspectors also reviewed a sampling of completed surveillance tests to verify it was adequately tested and maintained in accordance with UFSAR design basis and vendor recommendations. In addition the physical and material condition of the batteries was visually inspected and corrective action documents were reviewed to verify identification of adverse trends.

- Bus 212 (2DC06E): The inspectors reviewed seismic qualification and electrical calculations relating voltage drop, minimum voltage required, and bus short circuit current interrupting capability. The calculations were reviewed to verify that adequate voltage would be available for 125 Vdc safety-related components to perform their safety function. The inspectors also reviewed cable separation and the fuses sizing to ensure adequate separation between safety and non-safety loads.

b. Findings

(1) Diesel Driven AFW Pump Battery Racks Were Not Restored to their Design Basis Seismic Category I Condition

Introduction: The inspectors identified a finding having very low safety significance (Green) with an associated Non-Cited Violation (NCV) of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the licensee's failure to ensure that the DDAFW battery racks were in accordance with their design basis qualification for Seismic Category I. Specifically, the licensee failed to restore or provide adequate evaluation to demonstrate that the existing condition, found in 2004, with gaps between the wooden spacer blocks, batteries and end of racks still met the Seismic Category I Design Basis requirements.

Description: While performing a walkdown of the DDAFW pump room, the inspector identified that there were wooden spacer blocks that were fitting very loosely at the end of battery racks 2AF01EA-B and 2AF01EB-B. Per component qualification document CQD-010806 "Seismic Qualification of Engine Emergency Start Battery Racks," the vendor stated that the batteries were assumed rigid; therefore, their inertia loads would primarily be transmitted to the side rail ends. If the batteries were able to transfer force to the end of the side rails in a seismic event, that movement could cause a mechanical failure of internal connections, which could cause the batteries and the system itself to become inoperable. Therefore, the vendor recommendations for the seismic qualification of the battery racks stated, "To avoid over-stressing the end or base units, batteries must be constrained from sliding along the rack. Blocks of wood or metal, firmly fixed to the rack and filling the space between the batteries and rack end are recommended." These wooden blocks were designed and installed to fill the space between the batteries and end of the rack so that they could constrain the batteries from sliding during a postulated seismic event. The seismic qualification of the racks was based on the recommendations by the vendor per the modification that was installed at plant start up.

The licensee, in 2004, found gaps around the wooden spacer blocks in the battery racks. The licensee performed an inspection that indicated these blocks were loose and could be rocked back and forth approximately 0.25 inches. The corrective action request at the time indicated that these loosened wooden blocks would be replaced with properly fitting blocks and five work orders were initiated because of this request. Each of these work orders was closed without work being accomplished. The licensee indicated that the last work order that was issued was actually closed out to another work order that was issued to replace the DDAFW pump batteries in November 2010. The licensee evaluated the gaps and determined that the battery racks, as found, were operable based on engineering judgment that small horizontal acceleration and low momentum would not adversely affect the batteries during a seismic event. However, the inspectors were concerned that the gaps were not in accordance with the design basis qualification of the component for a postulated seismic event where these blocks shall be "firmly fitting" inside the battery racks. The inspectors determined that the licensee failed to provide adequate justification or calculations as to why the existing wooden blocks condition would seismically qualify the mounting of that equipment with the 0.25-inch gap in a postulated seismic event.

Additionally, in 2004 as a result of the degraded condition, the licensee revised the battery surveillance and maintenance procedure to add a step to verify that there were no gaps and cracks of the installed wooden blocks. This revised procedure stated, in part, that operators were to ensure wooden spacer blocks were installed tightly in the battery racks. The inspectors noted that all completed procedures for the last six years indicated the wooden spacer blocks were satisfactory even though gaps existed. The inspectors determined that procedures did not provide adequate acceptance criteria and, therefore, were inadequately implemented by the licensee. In response to the inspectors' concerns, the licensee entered this issue into their corrective action program, restored the racks to their seismic design requirement and initiated an action to revise the affected procedures.

Analysis: The inspectors determined that the failure to ensure that the DDAFW battery rack was in accordance with its Design Basis Seismic Qualification was contrary to 10 CFR Part 50, Appendix B, Criterion III, "Design Control," and was a performance deficiency. Specifically, the gap identified between the wooden blocks and battery racks did not meet the Seismic Category I Design Basis Qualification as specified per evaluation CQD-010806.

The performance deficiency was determined to be more than minor because the finding was associated with the Mitigating Systems cornerstone attribute of equipment performance, and affected the cornerstone objective of ensuring the availability of DDAFW batteries to perform their safety function in external events to prevent undesirable consequences. Specifically, the licensee failed to ensure that batteries were constrained from sliding along the rack to avoid over-stressing the end or base of the racks as specified in the seismic qualification document.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase 1 - Initial Screening and Characterization of findings," Table 4a for the Mitigating Systems cornerstone. The inspectors answered "yes" to Question 1 in Column 2. Therefore, the finding screened as having very low safety significance (Green), because the finding was a qualification deficiency confirmed not to result in loss of operability or functionality of a system safety function.

The inspectors determined there was no cross-cutting aspect associated with this finding because the gaps between the wooden blocks and the battery racks were initially identified in 2004 and were not adequately evaluated then. Therefore, the finding was not reflective of licensee's current performance.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions.

Contrary to the above, from 2004 until March 11, 2010, the licensee failed to assure that Seismic Category 1 requirements were correctly translated into specifications. Specifically, the licensee failed to ensure that the existing condition for the DDAFW batteries, with gaps between the wooden blocks, the batteries and the end of the racks was correctly translated into the Seismic Category I Design Basis qualification document.

Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as AR 1046360 and AR 01046360, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy. (NCV 05000456/2010007-01; 05000457/2010007-01, DDAFW Pump Battery Racks Were Not Restored to their Design Basis Seismic Category I Condition)

(2) Lack of Calculation for the DDAFW Pump Minimum Fuel Oil Tank Setpoint Level

Introduction: The inspectors identified a finding having very low safety significance (Green) with an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the licensee's failure to develop a calculation specific to the DDAFW pump minimum fuel oil day tank level setpoint. Specifically, the licensee failed to verify that the 74 percent level indication was adequate to ensure a minimum usable fuel oil of 420 gallons, the minimum level required by TS.

Description: The design function of the DDAFW pump was to provide adequate cooling water to the steam generators in the event of a loss of offsite power coupled with various occurrences. Technical Specifications Surveillance 3.7.5.2 required the licensee to verify, on monthly basis, that the fuel oil value in the DDAFW pump day tank was greater or equal to 420 gallons. This value was determined by multiplying the maximum engine consumption of 70 gallons-per-hour by the initial engine mission time of six hours. The engine mission time was changed later to seven hours to include one hour for RHR heat up time. As a part of the transition to ultra low sulfur diesel (ULSD) fuel, it was identified that a consumption calculation was not developed for the DDAFW engine. The licensee then developed a calculation using the consumption data provided in the vendor manual for the diesel engine vs. the flow requirements. The consumption requirement for ULSD fuel was determined to be 417 gallons for the revised seven-hour mission time. The licensee determined that this was still bounded by the existing 420 gallons; therefore, there was no need for a TS change.

The TS value of 420 gallons was ensured by the licensee observing the tank level was greater than 74 percent. This value was obtained from a graph that correlated the percent level with the tank volume. In response to inspectors' question, the licensee indicated that the graph was a historical document and were not able to show the parameters and equations used to develop this graph.

At the time of the inspection, the licensee did not have a specific vortex calculation for the DDAFW day tank. A similar calculation was developed for an identically sized tank, the EDG day tank. According to calculation ATD-0196 "Useable Volume in Diesel Oil

Storage Tanks and Day Tanks," the minimum fuel level required to prevent vortex formation was calculated to be three inches above the top of the suction line for the EDG day tank; the calculation also indicated the unusable volume in the day tank was 49.2 gallons.

In response to inspectors' question, the licensee indicated that the 74 percent level represented a total of approximately 465 gallons and the low-level alarm setpoint was 77 percent, which represented a total volume of about 485 gallons and a total volume of 435.8 usable gallons. These values assured the TS value of 420 gallons. However, pump surveillance procedure 2BwOSR 3.7.5.4-2 "Diesel Driven Auxiliary Feedwater Pump Surveillance," indicated that the level must be verified to be greater or equal to 74 percent level as part of the acceptance criteria. The low-level alarm response procedure, BwAR 1-3-D6, also prompted the operator to fill the tank and to verify that the day tank level was greater than 74 percent (420 gal) to ensure the TS minimum tank level value was met. The inspectors determined that, based on the available information, the actual usable fuel value at 74 percent could be calculated by subtracting the unusable value of similar tanks (49.2 gallons) from the total tank available value at the 74 percent level (465.6 gallons). The preliminary calculated value was 416.4 gallons (465.6 - 49.2). The inspectors were concerned that, with the absence of a detailed calculation for the 74 percent level and given the usable value calculated above, the 74 percent did not assure the minimum tank volume of 420 usable gallons and did not ensure adequate fuel oil would be available to support the DDAFW mission time of seven hours. The licensee subsequently entered this issue into their corrective action program as AR 01047532 "AF Day Tank Bases Documentation," and was able to demonstrate that 74 percent tank level was equivalent to 425.2 of usable fuel oil volume. Although this value was above the TS value, it exceeded the TS value by a small margin of only 5.2 gallons. The inspectors performed a rough calculation and determined that this would be about a half inch on the scale that the operators read to determine oil level.

Analysis: The inspectors determined that the failure to develop an engineering evaluation/calculation for the minimum fuel oil value stored in the DDAFW tank was contrary to 10 CFR Part 50, Appendix B, Criterion III, "Design Control," and was a performance deficiency. Specifically, the licensee failed to verify that the 74 percent was adequate to ensure a minimum usable fuel oil of 420 gallons required by TS.

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 capability of systems to respond to initiating events to prevent undesirable consequences. Specifically, the licensee failure to verify that 74 percent tank level was sufficient did not assure that adequate fuel oil existed in the DDAFW day tank to support the DDAFW pump seven-hour mission time. Although, during the inspection, the licensee was able to perform a preliminary calculation and demonstrate that the 74 percent tank level was equal to 425 gallons, giving a small margin above the TS minimum required value of 420 gallons, at the time of discovery there was reasonable doubt on the capability of the system to meet its TS requirements. Therefore, the inspectors determined that the licensee's preliminary evaluation/calculation was necessary to demonstrate that the 74 percent tank level was sufficient to ensure adequate fuel oil in the tank to meet the TS minimum value. The finding was also similar to Example 3.j of IMC 0612, Appendix E.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, Attachment 0609.04, Table 4a for the Mitigating Systems cornerstone. The inspectors answered “No’ to each of the questions in column 2. Therefore, the finding screened as having very low safety significance (Green). The licensee performed a evaluation/calculation that demonstrated that the equivalent volume for 74 percent level was 425 gallons, slightly greater than the required TS limit of 420 gallons.

The inspectors determined there was no cross-cutting aspect associated with this finding because the deficiency was a legacy design issue and, therefore, was not reflective of licensee’s current performance.

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

Contrary to the above, as of March 25, 2010, the licensee’s design control measures failed to verify the adequacy of the design value used to verify the minimum DDAFW fuel oil tank level. Specifically, the licensee failed to have an engineering evaluation or calculation which demonstrated that the actual minimum fuel oil volume stored in the tank at 74 percent level was equal or greater than 420 gallons to ensure that the DDAFW pump was capable of performing its safety function for its seven-hour mission time. Because this violation was of very low safety significance and it was entered into the licensee’s corrective action program as AR 01047532, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy. (NCV 05000456/2010007-02; 05000457/2010007-02, Lack of Calculation for the DDAFW Pump Minimum Fuel Oil Tank Setpoint Level)

(3) Potential Clogging of Essential Service Water (SX) Throttle Valves for Pump Room Coolers

Introduction: The inspectors identified a finding having very low safety significance (Green) with an associated NCV of 10 CFR Part 50, Appendix B, Criterion V, “Instructions, Procedures, and Drawings,” for the licensee’s failure to include appropriate instructions or limits into procedures relating to valve control. Specifically, the licensee’s procedures for flow balancing Essential Service Water (SX) supply to safety-related pump room coolers did not include any precautionary statements to limit the degree to which branch loop throttle valves could be throttled down without introducing concerns about potential clogging from particulates in the service water and resultant flow reduction.

Description: The SX supplied room coolers were installed in the Chemical and Volume Control (CV), Containment Spray (CS), and SX system pump cubicles to ensure the ability of these pumps to perform their safety-related function under elevated room temperature conditions. Periodically, the SX flow to each room cooler was verified and adjusted (as necessary) using a 3-inch diameter globe type throttle valve. This was performed: a) quarterly per the ASME pump and valve surveillance procedure specific to the pump in that room; b) monthly per procedure 1/2BwOSR 3.7.8.1; and c) twice daily per the Unit Operator rounds log. None of these documents limited the degree to which any of these throttle valves could be turned down to achieve the required flow rates. Each train of SX was provided with a back flushable strainer to limit the size of entrained particles downstream to a maximum equivalent diameter of 0.063 inches. All of the room cooler throttle valves were 3-inch diameter Velan globe valves. In response to inspectors' questions, the licensee determined that for this valve size, a ¼ turn open corresponded to a port clearance of 0.025 inches, and that an SX strainer opening size of 0.063 inches corresponded to a valve position of slightly less than ¾ turns open. Thus, a minimum open position of ¾ turns (equivalent to a port clearance of 0.075 inches) was necessary to protect against potential clogging of the throttle valves and a reduction in cooling water flow rate.

During the inspectors' review of IST test data for the 2B CS pump room cooler, the inspectors were concerned that the throttle valve for this cooler had historically been set in the range of ¼ to ½ turn open. Subsequently, the licensee inspected each of the Unit 1 and Unit 2 pump room coolers having 3 inch throttle valves, a total of 12 coolers, and found that the throttle valves for 7 units were less than ¾ turns open and one additional valve was estimated to be at ¾ turns open. The licensee then adjusted each of the valves to at least ¾ turn open to ensure operability. The valves were associated with both trains of the Unit 2 CV pumps, both trains of the Unit 2 CS pumps, and both trains of the Unit 1SX pumps. The most severely throttled valve was the one associated with the 2B CS pump room cooler, which was found ¼ turn open, corresponding to a seat clearance of only 0.025 inches.

During normal plant operation, any actual clogging of the throttle valves would be masked by the fact that on a twice daily basis the throttle valves would be adjusted, as necessary, to obtain the desired flow rate. However, the inspectors were concerned that, following a LOCA, access to some of these rooms would be significantly restricted due to expected high area radiation levels. So if the particulate loading in the lake was high (such as after a heavy rain, a bryozoa infestation or a sudden adverse change in lake water chemistry (as was experienced in 2004), in combination with the throttle valves being in the as-found positions noted above, this could lead to an actual reduction in heat transfer capability for one or more coolers before entry to the pump cubicle(s) could be made to reposition the throttle valves.

As a result of this finding, the licensee performed an operability review and determined that the SX flow rates for all room coolers were adequate and, therefore, the coolers were operable. However, to avoid potential clogging under accident conditions when the room coolers might not be accessible to reposition a clogged valve, the licensee revised the valve positioning procedure (1/2BwOSR 3.7.8.1) to require all throttle valves to be opened a minimum of ¾ turns. Where this could result in branch loop flow rates being higher than current acceptance criteria, the revised procedure required, as necessary, throttle closing the 2 inch diameter room cooler downstream isolation ball valves to not less than 25 percent open.

Analysis: The inspectors determined that the failure to provide procedural instructions or limits on the degree to which SX throttle valves could be closed was contrary to the requirement under 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," and was a performance deficiency. The performance deficiency was determined to be more than minor because the finding was associated with Mitigating Systems cornerstone attribute of procedure quality and affected the cornerstone objective of ensuring the capability of system to respond to initiating events to prevent undesirable consequences. In addition, the finding, if left uncorrected, would become a more significant safety concern. Specifically, under accident conditions the position of these throttle valves could have led to a potential degradation of the ability of the room coolers to perform their safety-related function of protecting the ECCS pumps from elevated environmental temperatures.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, Attachment 04, Table 4a for the Mitigating Systems cornerstone. The inspectors answered "No" to each of the questions in column 2. Therefore, the finding screened as having very low safety significance (Green). The licensee were able to demonstrate that for the relatively short period of time that the affected ECCS pumps are required to operate following a LOCA, they would remain operational at the elevated room temperatures that would occur should the room coolers be degraded.

The inspectors determined there was no cross-cutting aspect associated with this finding because the deficiency was a legacy procedural issue and, therefore, was not reflective of licensee's current performance.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings" requires, in part, that procedures include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished.

Contrary to the above, as of March 05, 2010, procedure 1/2BwOSR 3.7.8.1 failed to include appropriate acceptance criteria. Specifically, the procedure failed to provide limitation on the degree to which throttle valves in the SX supply to safety-related room coolers can be throttled closed without causing potential flow blockage from particulate in the SX supply. Because this violation was of very low safety significance and it was entered into the licensee's corrective program as AR 1039331, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy. (NCV 05000456/2010007-03; 05000457/2010007-03, Potential Clogging of Essential Service Water (SX) Throttle Valves for Pump Room Coolers)

(4) Adverse Impact of Floor Drain Strainer Design Modification on Flooding Analysis

Introduction: The inspectors identified a finding having very low safety significance (Green) with an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the licensee's failure to adequately verify a design modification important to safety. Specifically, bag-type strainers back fitted into floor drains in the Auxiliary Building for the purpose of preventing debris from blocking the floor drain piping were designed in such a way that they actually increased the potential for blockage, thus negatively impacting the analysis of record for internal flooding.

Description: In 1996, most of the 4 inch floor drains in the Auxiliary Building for both units were fitted with removable, 40 mesh, basket style, bag-type nylon strainers as a corrective action in response to NRC observations about housekeeping and the potential for loose material found on the floor of the Auxiliary Building to enter the floor drains and clog the drain piping (Ref. Inspection Report 50-456/457/95010). Each strainer has a metal rim around the opening at the top that was designed to rest on the lip of the floor drain bowl under the floor drain cover plate in a manner intended to allow the bag to hang freely in the bowl. The inspectors observed that, because of the very fine bag mesh size (approx. 0.015 inch diameter opening size), very small particles of dirt, paint chips, corrosion products, grease, etc were collecting in the bottom of the bag rather than passing through the strainer and into the drain line. The inspectors also noted that because the side walls of the bag appeared to be longer than the depth of the floor drain bowl, the flexible bottom of the strainer was in direct contact with the outlet piping at the bottom of the bowl assembly. Thus, the inspectors were concerned that, during an internal flooding event, foreign material washed into the floor drain could quickly build up in the bottom of the bag to the point of completely plugging the floor drain outlet pipe as a result of the clogged nylon mesh being pressed down into the outlet pipe by the hydraulic force of the flood water.

The safety evaluation accompanying the original design package for this modification had correctly concluded that the bottom of the bag would get plugged; however, the evaluation incorrectly assumed that the flood water would bypass this by flowing through the side walls of the bag and then out the drain line at the bottom of the bowl, failing to realize that the design flaw described above would prevent this from happening.

The licensee confirmed the inspectors' concern by measuring a typical floor drain bowl and a spare strainer. As a result of this finding, the licensee performed a preliminary flood re-analysis and was able to show that with the strainers design flaw as described above, safe shutdown was not affected. Specifically, the licensee determined that for all of the critical safe shutdown equipment cubicles/areas, the original analysis had already concluded that the components would either be made inoperable by the lower flood levels calculated with the floor drains functioning properly, or that the components in these critical areas would not be needed for safe shutdown (hot standby).

The inspectors' review of the flooding calculation/safe shutdown analysis also revealed a number of other errors or non-conservatisms that the licensee needed to address as part of a long term corrective action (IR 1043396 and EC 379355) to formally revise the maximum expected flood level calculations for each area serviced by the potentially clogged strainers and to formally revise the flooding analysis with regard to the impact of potentially clogged strainers on safe shutdown capability.

<u>Analysis</u>: The inspectors determined that the failure to fully verify the adequacy of a design modification relating to potential of the strainer bags to plug the floor drains was contrary to the requirement under 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 the finding was associated with the Mitigating Systems cornerstone attribute of design control, and affected the cornerstone objective of ensuring the availability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the floor drain strainer bags were inadequately designed in such a manner that instead of ensuring that the floor drains would be able to function properly to remove flood water and to keep flood levels to a minimum, they would actually increase the possibility that the floor drains would become plugged and be unable to perform this function adequately.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, Attachment 0609.04, Table 4a for the Mitigating Systems cornerstone. The inspectors answered "No" to each of the questions in column 2. Therefore, the finding screened as having very low safety significance (Green). The licensee was able to demonstrate that the potential for higher flood water levels in safe shutdown equipment cubicles did not impact the ability of backup or alternate shutdown equipment to bring the plant to a safe shutdown condition.

The inspectors determined that there was no cross-cutting aspect associated with this finding, because the deficiency was a legacy design issue that occurred during the modification, which installed these strainers in 1996 and, therefore, was not reflective of licensee's current performance.

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

Contrary to the above, as of March 17, 2010, the licensee failed to verify the design adequacy of the basket style bag strainers installed since 1996. Specifically, the licensee failed to adequately ensure that bag-type strainers installed in the auxiliary building per DCR 950045, for the purpose of preventing debris from blocking the floor drain piping, would not negatively impact the analysis of record for internal flooding. Because this violation was of very low safety significance and it was entered into the licensee's corrective program as AR 1044572, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy. (NCV 05000456/2010007-04; 05000457/2010007-04, Adverse Impact of Flood Drain Strainer Design Modification on Flooding Analysis)

(5) Non-Conservative Acceptance Criteria for CS Pump Performance Testing

Introduction: The inspectors identified a finding having very low safety significance (Green) with an associated NCV of 10 CFR Part 50, Appendix B, Criterion XI, "Test Control," for the licensee's failure to include adequate acceptance limits in test procedures. Specifically, when determining the alert and required action values used in the IST procedure for testing of the CS pumps, the licensee failed to consider instrument loop uncertainties. As a result, the acceptance criteria for both the upper and lower limits on total developed head (TDH) were non-conservative.

Description: The following discussion applies to all four CS pumps, but because the 2B pump was the only one performing below its design value at the time of the inspection, the impact of this finding has on remaining margin was only assessed for the 2B CS pump.

The design specification for the 2B pump was to provide 4055 gallons per minute (gpm) at a TDH of 450 feet (Sargent and Lundy Specification. No. F-2758). These design conditions were selected to provide a margin of 5 percent on the minimum TDH required to carry out the design function of the 2B pump, which was to supply 15 gpm of water to each of the spray nozzles in Train B of the CS system under the most limiting set of accident conditions (BRW-DIT-99-088). In 2009 the IST configuration for this pump was revised to allow full flow testing for compliance with ASME OM Code requirements to test within 20 percent of design required flow rate of the pump (previous to 2009 this pump was being tested at a recirculation flow rate of approximately 850 gpm). The IST procedure (2BwOSR 5.5.8CS-3B) acceptance criteria for this pump were then revised as follow:

Flow rate acceptable range:	4100 gpm ≤ Q ≤ 4182.8 gpm
TDH acceptable range:	185.5 psid ≤ dP ≤ 191.5 psid
TDH alert range low:	185.1 psid ≤ dP ≤ 185.5 psid
TDH required action low:	dP < 185.1 psid
TDH required action high:	dP > 191.5.5 psid

Instrument loop uncertainties for the IST instrumentation used for CS pump testing were calculated in BRW-07-0100-1. For flow rate the total uncertainty was 310.5 gpm and for dP it was 1.3 pounds per square inch (psi). The dP reading taken during IST testing also conservatively ignored the increase in velocity head across the pump, which was 1.5 psi at 4100 gpm (per DIT-BRW-99-0088-1, Equation 4). This meant that, for a test reading of 185.1 psi differential (psid) (after correction for velocity head) at 4100 gpm, the pump performance could actually be as low as 183.8 psid at 3789.5 gpm. From the 5 percent degraded vendor curve used in the hydraulic analysis of record for this train of CS, the minimum allowable TDH at 3789.5 gpm was 444 ft, which converts to 193.4 psid for a 2500 ppm borated water solution at 35 degrees Fahrenheit (^{o}F). Thus, when instrument loop uncertainties were considered, the current IST procedure required action limit of 185.1 psi (assuming test value had already been corrected for velocity head) was 9.6 psi below the minimum allowable pump TDH supported by the calculation of record.

The most recent IST readings for the 2B pump (taken on March 19, 2010) were 186.2 psid at 4107.6 gpm. Removing the velocity head conservatism but including maximum instrument uncertainties, current performance of the 2B pump was conservatively 186.5 psid at 3797.1 gpm, which was 6.9 psi below the minimum TDH required for this pump to be able to perform its safety-related function as defined above. In other words, using conservative assumptions regarding instrument uncertainties, the 2B pump was currently degraded 8 percent, while the CS system hydraulic calculation of record only permitted a degradation of 5 percent.

Based on this observation, the licensee performed a prompt operability evaluation (AR 01050763) by applying the A train design basis flow rate of 3285 gpm to the B train as an enveloping case for comparison with the flow rates used in the calculations of record for containment depressurization and iodine removal. The results of this comparison showed that all four CS pumps remained operable with maximum instrument uncertainties applied. In reviewing the results of the initial operability evaluation the inspectors noted that no hydraulic analysis of the containment spray mode of operation for the pump had been done to confirm that a flow rate of at least 3285 gpm could actually be achieved with an 8 percent degraded 2B pump. A hand calculation by the inspectors determined that a flow rate of at least 3600 gpm could be achieved.

The inspectors reviewed the available IST data for the past 16 years which indicated that the 2B pump has routinely been within several psi of the alert setpoint since the earliest recorded data in1994 and that a trend line for this data showed little or no downward trend, if the past 16 years were taken as a whole. At the new higher test flow rates for all four pumps, the 2B pump was performing nearly identical to the 1A and 2A pumps, which were weaker pumps by design. Therefore, in addition to revising the IST procedure acceptance criteria to address instrument uncertainties, the licensee initiated an action (Action Item 8 in AR 01050763) to evaluate the pump performance and determine if any additional actions were required to repair the pump.

Analysis: The inspectors determined that the failure to account for instrument uncertainties in development of the acceptance criteria for IST testing of the 2B CS pump was contrary to 10 CFR Part 50, Appendix B, Criterion XI, “Test Control,” and was a performance deficiency. The performance deficiency was determined to be more than minor because the finding was associated with the Mitigating Systems cornerstone attribute of equipment performance, and affected the cornerstone objective of ensuring the reliability and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, failure to consider instrument uncertainties in the development of IST acceptance criteria resulted in the creation of acceptance criteria values that did not ensure that the CS pump could meet its intended safety function.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, Attachment 0609.04, Table 4a for the Mitigating Systems cornerstone. The inspectors answered “yes” to question 1 in column 2, because the licensee was able to demonstrate that even if 2B pump was actually degraded 8 percent, sufficient water would still be provided to the Train B spray nozzles to enable that train of CS to successfully carry out the containment depressurization and iodine removal functions of the CS system. Therefore, the finding screened as having very low safety significance (Green).

The inspectors determined the primary cause of this finding is related to Problem Identification and Resolution, Operating Experience, which requires the licensee to implement and institutionalize OE through changes to station processes, procedures, equipment and training programs to support plant safety. Specifically, the licensee failed to implement relevant information relating to failure to appropriately account for instrument uncertainties identified in Information Notice 2008-02 “Findings Identified during Component Design Bases Inspections.” (IMC 0310, Section 06.02.b.(2) [P.2(b)])

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion XI, “Test Controls” requires, in part, that a test program 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.

Contrary to the above, from 2009 until March 31, 2010, the licensee failed to incorporate acceptance limits in test procedures. Specifically, the licensee failed to include instrument loop uncertainties when the new acceptance criteria were established in 2BwOSR 5.5.8CS-3B for inservice testing of the 2B CS pump. Because this violation was of very low safety significance and it was entered into the licensee’s corrective action program as AR 01048015 and AR 01050763, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy. (NCV 05000456/2010007-05; 05000457/2010007-05, Non-Conservative Acceptance Criteria for CS Pump Performance Testing)

(6) EDGs Fuel Oil Consumption Calculation Failed to Account for Frequency Variations

Introduction: A finding of very of very low safety significance (Green) and associated Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion III, “Design Control,” for the licensee’s failure to account for frequency variations, frequency limit higher than 60 Hertz (Hz), into the fuel oil consumption calculation for the EDGs to ensure that the TS minimum required fuel limit of 44000 gallons was adequate to support the EDGs mission time.

Description: Calculation 19-T-6, Revision 6A “Diesel Generator Loading during LOOP/LOCA,” documented a minor revision and added a discussion on the consideration given to frequency variations when determining diesel generator loading. The previous revision used a nominal frequency (60 Hz) to determine the equipment loading on the EDG’s. The TS allowed an EDG frequency tolerance of ± 2 percent. This tolerance was based on Regulatory Guide 1.9 “Application and Testing of Safety-Related Diesel Generators in Nuclear Power Plants” requirements that the EDG frequency recover to within ± 2 percent of 60 Hz (i.e. 58.8 – 61.2 Hz) within a specified period during the sequencing of loads on the bus. Therefore, theoretically, the EDGs could operate at a frequency of 61.2 Hz, which could be the worst-case scenario for loading of the EDGs. The EDG loading could increase as a result of operation at a higher frequency depending on the type of load. The higher frequency would result in an increase in motor speed and pump flow, which would then result in an increase in brake-horsepower (BHP) for the pump. The increase in frequency has no impact on static or resistive loads. The calculation concluded that, if the entire EDG load was conservatively considered to be pump load, then the loading on the EDG theoretically could increase by approximately 6 percent at 61.2 Hz. The licensee concluded that this increase would be still less than the 2000-hour rating of the EDG, as long as the calculated load was within the continuous rating of the EDG (i.e., 5500 KW x 1.06 = 5830 KW < 5935 KW (2000-hour rating)). The highest loading for all of the Braidwood EDGs was 4868 KW for the 1A EDG. In addition, the calculation indicated that EDG governor was designed to maintain the steady-state frequency at 60 Hz in the emergency mode and would return to rated frequency following the loading transients. The licensee further indicated that the governor was setup procedurally to operate as close to 60 Hz as practical. Also, the mechanical governor would limit frequency to a maximum of 60.8 Hz with the failure of the normal governor. Therefore, the licensee concluded that a 2 percent variation in frequency was not a concern. The revision was based on a concern identified during the self assessment (FASA) for CDBI inspection during 2007 and was documented in AR 00629351.

While reviewing calculation DGD09301 "Time Dependent Loading and fuel consumption for EDG's following LOOP/LOCA" Rev. 6A, the inspectors noted that there was very little available margin between the calculated fuel consumption of 41,019 gallons and the TS limit of 44,000 gallons. The inspectors noted that this calculation was not revised to address the frequency variation concern identified in AR 00629351. The inspectors also noted that the concern relating to additional actions required addressing EDGs frequency variation was again identified during the self-assessment for CDBI inspection in 2010. Specifically, AR 01018119 indicated that the quantity of diesel fuel supply should account for higher diesel frequency which would cause a higher rate of fuel consumption. Additional actions were initiated as a result of AR 1018119 to establish a reasonable frequency band based on the available indication and governor capability and to incorporate the established frequency band into procedures as necessary. Task 2 of this AR identified that a frequency band of ± 0.5 Hz was reasonable. The licensee also concluded in this task that the frequency variation of ± 0.5 Hz was minor enough and did not require detailed evaluation, as it was bounded by the evaluations that were already completed for the EDG loading and effects on ECCS pumps. Tasks 4 thru 6 were established to ensure that the established frequency band would be incorporated into procedures. Existing procedures indicated that frequency variation was expected between 58.8 – 61.2 Hz; however, some indicated the variation was between 60.5 and 60.8 Hz.

In response to inspectors' question, the licensee performed a preliminary evaluation and determined that, using the mechanical governor frequency band of 60.8 Hz and API 39 fuel oil at 120 degrees Fahrenheit, the calculated fuel consumption for the higher loading EDG (1B) would be 44,171 gallons, exceeding the TS minimum required fuel volume of 44,000 gallons. However, using the new administrative frequency limit of 60.5 Hz, the calculated fuel consumption for EDG 1B was 43,760 gallons. Given the negative margin between the TS minimum fuel consumption limit and the calculated fuel required volume at a frequency variation of 61.2 Hz, the inspectors determined that an evaluation of the frequency variation limit, as low as 60.5 Hz, was required to assure minimum fuel supply was available to support the EDGs mission time. Based on this finding, the licensee added a new task (No. 8) to AR 01018119 to address the frequency variation band established in task 2 in the EDG loading and fuel consumption calculations. The inspectors also questioned whether either the 2 percent frequency variation band or the EDG minimum fuel volume needed to be revised to be compatible with each other.

In addition, the inspectors reviewed the corrective actions related to the EDG frequency variation band and determined that, although there were several ARs initiated to address this concern; these were all missed opportunities by the licensee to ensure that the fuel oil consumption calculation was revised to include the frequency variation. The inspectors concluded that no credit would be given to the licensee for self-identification.

Analysis: The inspectors determined that the failure to ensure sufficient 7-day fuel oil supply to support operation of the EDG's above nominal 60Hz 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 the finding was associated with the Mitigating Systems cornerstone attribute of design control, and affected the cornerstone objective of ensuring the capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the licensee failed to account for the TS allowed EDGs frequency variation above 60 Hz and, therefore, did not ensure that the minimum fuel oil level in the storage tanks, required per TS, was adequate to support the EDGs mission time. The inspectors determined that the finding could be evaluated using SDP in accordance with IMC 0609, Attachment 04, Table 4a for the Mitigating Systems cornerstone. The inspectors answered "No" to each of the questions in column 2. Therefore, the finding screened as having very low safety significance (Green), because the licensee was able to demonstrate that adequate fuel in the storage tanks would be available to support EDGs mission time when operating at the administratively controlled higher frequency limit specified in procedures.

The inspectors determined the primary cause of this issue was related to Problem Identification and Resolution, Corrective Action Program, which requires the licensee to thoroughly evaluate problems to assure nuclear safety. Specifically, licensee failed to thoroughly evaluate the EDG fuel oil consumption to ensure that fuel oil storage tanks had adequate value when considering EDG frequency variation. (IMC 0310, Section 06.02a.(3)) [P1.(c)]

Enforcement: 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that measures be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions.

Contrary to the above, as of March 31, 2010, the licensee failed to translate design basis for the EDGs into calculations. Specifically, the EDGs fuel consumption calculation DGD09301, Revision 6A, failed to account for the TS allowed frequency variation above 60 Hz in ensuring that the minimum TS required fuel oil level was adequate to support EDGs mission time. Because this violation was of very low safety significance and was entered into licensee's corrective action program as AR 1018119, assigned Action 8, this violation is being treated as an NCV consistent with Section VI.A.1 of the NRC Enforcement Policy. (NCV 05000456/2010007-06; 05000457/2010007-06, EDGs Fuel Oil Consumption Calculation Failed to Account for Frequency Variations)

.4 Operating Experience

a. Inspection Scope

The inspectors reviewed three operating experience issues 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:

- IN 1987-61, "Failure of Westinghouse W-2 Type Circuit Breaker Cell Switches";
- IN 2007-34, "Operating Experience Regarding Electrical Circuit Breakers"; and
- IN 2006-03, "Motor Starter Failures due to Mechanical-Interlock Binding."

b. Findings

No findings of significance were identified.

.5 Modifications

a. Inspection Scope

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

- EC 372552, "Remove Flow Restricting & Flow Element Orifice from CS Pump Full Flow Test to RWST and Abandon Flow Instruments";
- EC 379434, "Evaluate the Use of Wooden Shims on the AFW Pump Diesel Battery Racks"; and
- EC 363874, "Change to Ultra Sulfur Diesel Fuel."

b. Findings

No findings of significance were identified.

.6 Risk-Significant Operator Actions

a. Inspection Scope

The inspectors performed a margin assessment and detailed review of six risk-significant, time critical operator actions. These actions were selected from the licensee's PRA rankings of human action importance based on risk achievement worth values. Where possible, margins were determined by the review of the assumed design basis and USAR response times and performance times documented by job performance measures results. For the selected operator actions, the inspectors performed a detailed review and walk through of associated procedures, including observing some actions in the plant with an appropriate plant operator to assess operator knowledge level, adequacy of procedures, and availability of special equipment where required.

The following operator actions were reviewed:

- Locally open AF005 valves (locally fail air);
- Establish a cool suction source for a charging pump;
- Locally throttle essential service water (SX) valve 007 to component cooling heat exchangers;
- Align fire protection seal cooling following an essential service water non-pipe failure,
- Preventing SX pump damage from flooding due to fire protection system leakage; and
- Preventing SX pump damage from flooding due to SX system leakage.

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 corrective action program. 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 corrective action program. The specific corrective action documents that were sampled and reviewed by the inspectors are listed in the Attachment to this report.

b. Findings

No findings of significance were identified.

4OA6 Meeting(s)

.1 Exit Meeting Summary

On April 2, 2010, the inspectors presented the inspection results to Mr. A. Shahkarami, and other members of the licensee staff. The licensee acknowledged the issues presented. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. Several documents reviewed by the inspectors were considered proprietary information and were returned to the licensee.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee
A. Shahkarami, Site Vice President
L. Coyle, Plant Manager
P. Daly, Radiation Protection
M. Foote, Design Engineering
R. Gaston, Regulatory Assurance Manager
G. Golwitzer, Performance Improvement Manager
D. Gustafson, Engineering Manager
D. Ibrahim, Design Engineering
J. Knight, Nuclear Oversight Manager
R. Koenig, Design Engineering
F. Lentine, Design Engineering
M. Marchiodn, Operations Director
T. Mattson, Regulatory Assurance
J. Odeen, Project Management Manager
D. Riedinger, Design Engineering
T. Schuster, Chemistry Manager
B. Seaton, Design Engineering
M. Smith, Engineering Director
M. Trusheim, Work Control
J. Zoeller, Design Engineering

Nuclear Regulatory Commission
V. P. Lougheed, Acting Chief, Engineering Branch 2, DRS
A. Garmoe, Acting Senior Resident Inspector, DRP
C. Scott, Acting Resident Inspector, DRP

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000456/2010007-01; 05000457/2010007-01	NCV	DDAFW Pump Battery Racks were not restored to their Design Basis Seismic Category I
05000456/2010007-02; 05000457/2010007-02	NCV	Lack of Calculation for the DDAFW Minimum Fuel oil Tank Setpoint Level
05000456/2010007-03; 05000457/2010007-03	NCV	Potential Clogging of Essential Service Water (SX) Throttle Valves for Pump Room Coolers
05000456/2010007-04; 05000457/2010007-04	NCV	Adverse Impact of Flood Drain Strainer Design Modification on Flooding Analysis
05000456/2010007-05; 05000457/2010007-05	NCV	Non-Conservative Acceptance Criteria for CS Pump Performance Testing
05000456/2010007-06; 05000457/2010007-06	NCV	EDGs Fuel Oil Consumption Calculation Failed to Account for Frequency Variations

Discussion

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**
19-T-6	Diesel Generator Loading During LOOP/LOCA Pg.4, Pg.20, Pg.24	6A
3C8-0685-002	Auxiliary Building Flood Level Calculations	13
3C8-0685-002	Table 1: Auxiliary Building Flood Level Input Parameters pg.26	03
3C8-0887-001	Confirmation of Safe Shutdown Capability After Auxiliary Building Flooding	03
3C8-0887-001	Confirmation of Safe Shutdown Capability After Auxiliary Building Flooding	03
3C8-1186-001	HELB Location and HELB Zones for Safe Shutdown Analysis	02
BRW-01-0153-E	EQ analysis	01
BRW-07-0085-M/BYR07-055	Determination of the Correlation for the Critical Submergence Height (Vortexing) for the RWST	00
BRW-96-014-E	Refueling Water Storage Tank (RWST) Level Alarm Bi-Stable and Level Indication	00
BRW-97-0340-E	Battery and Duty Cycle Sizing For AFW Pumps	05
BRW-97-0383-E	125V DC Charger Sizing	02
BRW-97-0384-E	125Vdc Battery Sizing Calculation	03
BRW-97-0472-E	125 Vdc Voltage Drop Calculation	01
BRW-97-0475-E	125V DC Fuse Sizing and Coordination	00
BRW-98-0723-E	SI System MOV Actuator Motor Terminal Voltage and Thermal Overload Sizing	00
BRW-98-0724-E	Motor Operated Valves (MOV) Actuator Terminal Voltage and Thermal Voltage Overload Sizing Calculation- Essential Service Water (SX) System	00
BRW-99-0306-M	Diesel Generator Jacket Water Cooler Tube Plugging Evaluation	01
BYR08-033/BRW-08-0007-I	EDG Lube Oil and Jacket Water Heater Switch Uncertainty Calculation	00
CC-AA-309-1001	Useable Volume in Diesel Oil Storage Tanks and Day Tanks	03
EMD-050099 Amendment I	Piping Stress Report for Subsystem 1SX01	05
SITH-1	Refueling Water Storage Tank (RWST) Level Setpoints	07
TID-E/I&C-29	Voltage Drop Calculation for AC Auxiliary Power System	00

CALCULATIONS

Number	Description or Title	Revision
WE M050101	Structural Integrity and Operability Evaluation for Byron Units 1 and 2 Containment Spray Pump/Motor Assemblies	00

CORRECTIVE ACTION PROGRAM DOCUMENTS

Number	Description or Title	Date
AR 195846	Degraded Condition Of Wooden Battery Spacers	January 16, 2004
AR 208578	Unexpected CM – 2B CV Pump Gear Oil Cooler 2CV02SB	March 15, 2004
AR 534749	Potential Issues with the Use of Ultra Low Sulfur In EDG's	September 20, 2006
AR 579892	Repair Cracks on ESF Battery (2DC01EA)	February 16, 2007
AR 629351	CDBI FASA – DG Frequency Variations not address in Calculation	May, 11, 2007
AR 723967	Corrosion on Cells 52/58/50. Cracked Cells 50/52	January 18, 2008
AR 752662	Crack on Cells 1, 36, 44,and 45 on Battery 212	March 21, 2008
AR 767746	2AF01J Time Delay Relay Found Out of Tolerance	April 25, 2008
AR 775470	2B AF Pump Did Not Start While Performing Testing	May 14, 2008
AR 778260	1-20-E9 "DG Fuel Oil STO Tank Level High Low" Below Setpoint	May 21, 2009
AR 791871	2CV01PB, 4th Deferral of Repair of Active Boric Acid Leakage	June 30, 2008
AR 811571	Follow-up IR to 00775470 on 2B AF Pump SDS Valve Malfunction	August 27, 2008
AR 818018	Degrade Gasket Found During Re-Work Activities – 0Do054	September 15, 2008
AR 852602	Battery Cases are Developing Cracks at Terminal Penetrations	December 05, 2008
AR 867237	Review Diesel Oil Storage Tank Vents and DG Crankcase Vent	January 13, 2009
AR 879464	Tornado Missile Protection of DOST Vent Line	February 11, 2009
AR 933926	Replace AF Battery 2AF01EB-B	June 22, 2009
AR 934689	2B DG Tripped During Surveillance Test Start	June 24, 2009
AR 954792	Heater Not Shutting Off in AUTO	August 18, 2009
AR 969556	2B DG JW Heater Not Shutting Off – Identified on Rounds	September 24, 2009
AR 997831	2B DG Jacket Water Temp Off Normal Annunciated Again	November 24, 2009
AR 1036441	Request for Formal OP Evaluation From Engineering for 1CC9412B	February 27, 2010
AR 849208	Operability Evaluation for SX Strainer Questions	November 24, 2008

CORRECTIVE ACTION PROGRAM DOCUMENTS

Number	Description or Title	Date
AR 705189	NER LI-07-034 Rev 1 – HPCI/RCIC Flow Oscillations	November 29, 2007
AR 898238	Lack of Technical Basis for Degraded Voltage 5-Minute Delay	March 26, 2009

CORRECTIVE ACTION PROGRAM DOCUMENTS GENERATED AS A RESULT OF THE INSPECTION

Number	Description or Title	Date
AR 01018119	FASA Added Action Required to Address EDG Frequency Variation	January 19, 2010
AR 01036267	No Aux FW Diesel Oil Day Tank Clean and Inspection PMs	February 26, 2010
AR 01037992	Transformers Drawings are not As-Built	March 01, 2010
AR 01038742	NRC Walkdown and Label Request	March 04, 2010
AR 01038815	2SX168 Valve Does Not Have Insulation Installed	March 04, 2010
AR 01039093	Issue Report Not Written for Past Oil Result in Variance	March 05, 2010
AR 01039274	Conservative Input Used in Calc. BRW-97-0340-E	March 05, 2010
AR 01039331	Potential Incomplete Guidance in 2BWOSR 3.7.8.1	March 05, 2010
AR 01039335	Are Floor Drain Strainers Addressed in the Flood Calc.	March 05, 2010
AR 01041591	Position of the Hoist in the Unit 1 2EDG Room	March 11, 2010
AR 01041640	Loose Wooden Blocks in Battery Racks	March 11, 2010
AR 01042340	Editorial Error in References for EDG Fuel Calc.	March 13, 2010
AR 01043003	Unclear Statement in UFSAR for Single SAT Ops	March 15, 2010
AR 01043392	Clarification to Calculation 19-AN-3, 19-AN-7	March 15, 2010
AR 01043396	Basket Strainer May Adversely Affect Some Floor Drains	March 16, 2010
AR 01043416	Lights Out in 2B AF Diesel Room	March 16, 2010
AR 01043427	UFSAR Change Required	March 16, 2010
AR 01043867	Split Sealtight to 2AF01PB-B Panel	March 17, 2010
AR 01044098	Concern with Timeliness of Maintenance	March 17, 2010
AR 01044196	Potential Records Management Issue	March 17, 2010
AR 01044572	More Actions for Revision to Flood Level Calculation	March 17, 2010
AR 01045018	Rewording of Calc BRW-97-0472-E Methodology for Clarity	March 19, 2010
AR 01046360	Need to Tighten Up AF Batteries In Battery Racks	March 23, 2010
AR 01046665	Change Required to Eliminate UFSAR Discrepancy	March 23, 2010
AR 01047263	SX and OG Butterfly Valve MOV Calcs no Longer Required	March 24, 2010
AR 01047532	AF Day Tank Bases Documentation	March 25, 2010

CORRECTIVE ACTION PROGRAM DOCUMENTS GENERATED AS A RESULT OF THE INSPECTION

Number	Description or Title	Date
AR 01047901	Re-evaluate 2B AF Fuel Solenoid Failure for Part 21	March 25, 2010
AR 01048015	Instrument Uncertainty not Used in CS Surveillance	March 25, 2010
AR 01049869	Incomplete TSR Reference in Procedure	March 30, 2010
AR 01049882	EDG 2-Hour Operation BWOSR 3.8.1.15	March 30, 2010
AR 01050558	2D RCP COM-11 Relay Calibration Data Unclear	March 31, 2010
AR 01050559	As Left Data Documented in as Found Column	March 30, 2010
AR 01050639	Evaluate if ICV Temperature Correction is Required	March 31, 2010
AR 01050690	Evaluate Calculation SITH-1, Revision 2	March 31, 2010
AR 01050763	IDS Instrument Uncertainty not Factored into CS Surveillance	March 31, 2010
AR 01051093	Reference Used in Root Cause Report not a Record	March 31, 2010
AR 01051102	Issues with Vendor Manuals for COM Style Relays	April 01, 2010
AR 01051105	Potential Compensatory Measures for DOST Vent	April 01, 2010

DRAWINGS

Number	Description or Title	Revision
20E-0-3322 D09	Modification of AFW Battery Rack	
20E-24002F	Single Line Diagram 120V AC SEF Instrument Inverter Bus 212 and 214, 125V DC ESF Distribution Center 212	H
20E-2-4010D	125V DC ESF Distribution Center Bus 212 (2DCO6E) Part-1	J
20E-2-4010E	125V DC ESF Distribution Center Bus 212 (2DCO6E) Part-2	H
20E-2-4029 DC02	Control Logic Diagram 125V DC Distribution Centers 211 (2DC05E) and 212 (2DC06E)	E
20E-2-4030AF12	Schematic of AFW pump Engine Start-up Panel	
20E-2-4030CS03	Schematic Diagram Containment Spray Pumps 2A and 2B Suction Valves 2CS001A and 2CS001B	E
20E-2-4030SX27	Schematic of 2SX007 Valve	
20E-2-4031SI01	LOOP Schematic Diagram Refueling Water Storage Tank Level 2LT-0930 Protection Cabinet 1 (2PA01J)	K
20E-2-403SI14	Schematic Sumps 2A and 2B Isolation Valves 2SI8811A and 2SI8811B	R
20E-2-4251A	Int-Ext Wiring Diagram 125V DC ESF Dist. Center Bus 212 Pt.- 1 (2DC06E) Section A&B (Front)	AD
20E-2-4251B	Int-Ext Wiring Diagram 125V DC ESF Dist. Center Bus 212 Pt.- 2 (2DC06E) Section C&D (Front)	W
77920	Borg-Warner, Valve Assembly, Gate, 24 inch, 300 lb (1/2SI8811 A/B)	F

DRAWINGS

Number	**Description or Title**	**Revision**
93-14855	Anchor/Darling, 14'-150 LB, Weld Ends, Stainless Steel, Flex Wedge Gate Valve with SB-00 Limitorque (1/2 CS001 A/B)	C
M-129, Sht 1A	Containment Spray	AP
M-129, Sht 1C	Containment Spray	AO
M-136, Sht 1	Safety Injection, Unit 2	BM
M-136, Sht 3	Safety Injection, Unit 2	AX
M-138, Sht 3A	Chemical and Volume Control and Boron Thermal Regeneration, Unit 2	BC
M-138, Sht 4A	Chemical andVolume Control and Boron Thermal Regeneration, Unit 2	BR
P4-6775-N-1	3" and 6" 150 No. Bolted Bonnet Manual Globe Valve (Cast)	F
S-1404	Refueling Water Storage Tank Section and Details	W

MISCELLANEOUS

Number	**Description or Title**	**Date or Revision**
VTIP Manual L-0810	125 V DC Safety-Related Batteries and Battery Racks	Revision 3
DIT-BRW-99-0088-1	Calc BRW-97-0337-M and SITH-1 Results Related to Containment Spray System ASME Pump Testing	January 21, 2010
S&L Spec F/L-2758	Misc Pumps (Safety Category I)	May 27, 1976
3C8-0887-001	Confirmation of Safe Shutdown Capability after Auxiliary Building Flooding - Braidwood	Revision 3
DCR 950045	10CFR50.59 Evaluation for Inclusion of Nylon Mesh Strainers Baskets in Floor Drain bowls	September 21, 1995
EMD-025038	S&L IOM, Review of Seismic Qualification Report for Containment Spray Pumps	August 12, 1980
L-0059	Vendor Manual for Charging Safety Injection Pump	Revision 3
ER-AA-300	Health Report for MOV Program, 4th Quarter 2009	December 2009
BRW-04411	Failure Analysis of a Solenoid Valve for Braidwood Station	August 21, 2008
DP T9108EL-1	Functional Testing Data Sheet for Parker/Skinner Solenoid Valve	Revision 1
DP 2T104ME-2	Functional Testing Data Sheet for Parker Skinner Solenoid Valve	Revision 11
Vendor Letter	Letter from C&D Technologies, Inc to Exelon Generating Station, Subject "LCUN-33 Jar Cover Hairline Cracks"	November 02, 2006

MISCELLANEOUS

Number	**Description or Title**	**Date or Revision**
Vendor Letter	Letter from C&D Technologies, Inc to Exelon Generating Station, Subject "Battery Cover Cracking"	March 11, 2010

MODIFICATIONS

Number	**Description or Title**	**Date or Revision**
CQD 010806	Seismic Qualification of AFW Battery Rack (MOD)	November 14, 1983
EC 363874	Change to Ultra Low Sulfur Diesel Fuel	00
EC 372552	Remove Flow Restricting and Flow element Orifice from CS Pump Full Flow Test Line to RWST and Abandon Flow Instruments	October 30, 2009
EC379434	Evaluate the Use Of Wooden Shims On The AFW Pump Diesel Battery Racks	March 24, 2010

OPERABILITY EVALUATIONS

Number	**Description or Title**	**Revision**
07-008	Potential Issue with Westinghouse Modeling of S/G PORV Relief Capacity	0
09-003	SI Pumps Discharge Pressure Indicating 1200 psig (Unit 1)	0
10-001	Unit 2 CC Hx Inlet Water Box Flange Face Degradation	0
10-002	Potential Control Power Loss with Valve 1CC9412B	0
10-003	Operability Evaluation for AR 1050763 - Containment Spray Pump	0

PROCEDURES

Number	**Description or Title**	**Revision**
MA-AP-725-101	Preventive Maintenance on 480V Switchgear cubicles	4
MA-AP-725-104	Preventive Maintenance on Reactor Trip and Bypass Circuit Breakers	7
MA-BR-722-210	Calibration of Time Delay Relays	6
BwHP 4006-039K	Replacement of Mechanical Interlocks in 480V MCCs	2
BwOP DC-1-212	125V DC ESF Battery Charger 212 Start-up	2E2
BwOP DC-2-212	125V DC ESF Battery Charger 212 Shutdown	1E3
2BwOA PRI-8	Essential Service Water Malfunction, Unit 2	103
BwOP CV-33	Operation of a Centrifugal Charging Pump in Recirculation	5
BwMP 3315-077	Limitorque Operator Maintenance	2

PROCEDURES

Number	**Description or Title**	**Revision**
MA-AA-723-301	Periodic Inspection of Limitorque SMB/SB/SBD-000 Through 5 Motor Operated Valves	5
ATD-0196	Useable Volume in Diesel Oil Storage Tanks and Day Tanks	04
BRW-96-362-I	Diesel Oil Storage Tank (DOST) Level Setpoints	03
DGD09301	Time Dependent Loading and Fuel Consumption for EDG's following LOOP/LOCA	6A
BwAR 0-31-B2	DG Room 1B TEMP High Low	10
1/2 BwOSR 3.7.8.1	Essential Service Water System Surveillance	15
2BwHSR 3.8.4.2-212	Unit Two 125 Volt ESF Battery Charger 212 Capacity Test	0
1BwOSR 3.6.6.3-1	SX System Flow Balance Surveillance	8
2BwHSR 3.8.4.3-212	Unit Two 125V ESF Battery Bank 212 Service Test	0
2BwOSR 3.7.5.4-2	U2 Diesel-Driven AFW pump surveillance	18
2BwHSR 3.7.5-AA	2B AFW Pump Battery Bank Capacity Test	0
2BwOSR 3.8.6.5-2	Unit 2 125V DC ESF Battery Bank 212 Operability Surveillance	7
2BwOSR 5.5.8.CS-3B	Comprehensive Full Flow Test for 2B Containment Spray Pump (2CS01PB) and Check Valves 2CS003B, 2CS011B	5
BwAR 1-3-D6	AF Pump DO Day Tank Level Low Alarm Response	5E4
2BwOSR 5.5..8.CV-8	Comprehensive IST Requirements for Unit 2 Charging Pumps and Safety Injection System Charging Check Valve Stroke Test	1
2BW0A PRI-8	Essential Service Water Malfunction Unit 2	103
2BWOSR 3.7.8.1	Unit Two Essential Service Water System Surveillance	16
0Bw0A PRI-8	Auxiliary Building Flooding Unit 0	3
2Bw0A ELEC-2	Loss of Instrument Bus Unit 2	105
2BWEP ES-1.3	Transfer to Cold Leg Recirculation Unit 2	200
BwOP DO-12	Filling the Unit 1 Diesel Auxiliary Feedwater Pump Day Tank from a Tanker Truck or from the 50k/125k DOST Through a Hose	12
BwOP DO-13	Filling the Unit 1 Diesel Auxiliary Feedwater Pump Day Tank From the 125,000 or 50,000 Gallon Fuel Oil Storage Tanks	15
BwAP 1100-16	Fire/Hazardous Materials Spill and/or Injury Response	25
BwOP FP-12	Diesel Generator Storage Tank Rooms Foam Systems Actuation	5

SURVEILLANCES (COMPLETED)

Number	**Description or Title**	**Date or Revision**
BwVP 850-15, Att. B	GL 89-13 Hx As-Found Inspection and Work Report	March 15, 2004 July 29, 2003
MA-AA-734-455	Limitorque (SMB-2)Operator Maintenance	Revision 5
2BwOSR 3.8.6.1-2	U2 125V DC Battery Bank and Charger 212 Operability Weekly Surveillance	March 06, 2010
2BwHSR 3.7.5-BA	2B Diesel Aux Feed Pump Battery Bank B Battery A (2AF01EB-A) Capacity Test	July 16, 2009
2BwHSR 3.7.5-BB	2B Diesel Aux Feed Pump Battery Bank B Battery B (2AF01EB-B) Capacity Test	July 16, 2009
2BwHSR 3.8.6.6-212	Unit Two 125V ESF Battery Bank 212 Modified Performance Test	October 13, 2006
BwISR 3.3.2.10	2L-0930 Functional Check of RWST LVL Loop	October 23, 2009
BwHS TRM 3.8.c.4	2DC02E 125Vdc ESF Battery Bank and Rack	November 13, 2008

WORK ORDERS

Number	**Description or Title**	**Date**
WO 01117613	2AF01PB-K 6 Year PM for AF Diesels	October 08, 2009
WO 01287059	Group A IST Requirements for Unit Two Diesel Driven Auxiliary Feedwater Pump	February 12, 2010

LIST OF ACRONYMS USED

ADAMS	Agencywide Document Access Management System
AR	Action Request
ASME	American Society of Mechanical Engineers
CDBI	Component Design Bases Inspection
CFR	Code of Federal Regulations
CQD	Component Qualification Document
CS	Containment Spray
CV	Chemical & Volume Control
DDAFW	Diesel Driven Auxiliary Feedwater
DRP	Division of Reactor Projects
DRS	Division of Reactor Safety
EC	Engineering Change
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
GL	Generic Letter
gpm	gallon per minute
HELB	High Energy Line Break
IEEE	Institute of Electrical and Electronic Engineers
IMC	Inspection Manual Chapter
IN	Information Notice
IR	Inspection Report
IST	Inservice Test
kV	Kilovolt
LC	Load Center
LOCA	Loss of Coolant Accident
LOOP	Loss of Off-site Power
MCC	Motor Control Center
MOV	Motor-Operated Valve
NCV	Non-Cited Violation
NPSH	Net Positive Suction Head
NRC	U.S. Nuclear Regulatory Commission
PARS	Publicly Available Records
PM	Preventative Maintenance
PRA	Probabilistic Risk Assessment
psig	Pounds Per Square Inch Gauge
RCP	Reactor Coolant Pump
RG	Regulatory Guide
RIS	Regulatory Issue Summary
RHR	Residual Heat Removal
RWST	Refueling Water Storage Tank
SBO	Station Blackout
SDP	Significance Determination Process
SER	Safety Evaluation Report
SPAR	Standardized Plant Analysis Risk
SV	Solenoid Valve
SX	Essential Service Water
TDH	Total Developed Head
TOL	Thermal Overload
TS	Technical Specification

ULSD	Ultra Low Sulfur Diesel
UFSAR	Updated Final Safety Analysis Report
UST	Unit Substation Transformer
Vac	Volts Alternating Current
Vdc	Volts Direct Current

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Sincerely,

/RA/
V. Patricia Lougheed, Acting Chief
Engineering Branch 2
Division of Reactor Safety

Docket No. 50-456; 50-457
License No. NPF-72; NPF-77

Enclosure: Inspection Report 05000456/2010007; 05000457/2010007
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