July 3, 2003

Mr. John L. Skolds, President
Exelon Nuclear
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: BYRON STATION, UNITS 1 AND 2
NRC INSPECTION REPORT 50-454/03-04(DRS); 50-455/03-04(DRS)

Dear Mr. Skolds:

On May 23, 2003, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Byron Station, Units 1 and 2. The enclosed report documents the inspection findings, which were discussed on May 23, 2003, with Mr. S. Kuczynski and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel. Specifically, this inspection focused on the design and performance capability of the auxiliary feedwater and DC power systems to ensure that they were capable of performing their required safety-related functions.

Based on the results of this inspection, there were three NRC-identified findings of very low safety significance, of which two involved violations of NRC requirements. However, because these violations were non-willful and non-repetitive and because they were entered into your corrective action program, the NRC is treating the issues as Non-Cited Violations in accordance with Section VI.A.1 of the NRC's Enforcement Policy.

If you contest the subject or severity of a Non-Cited Violation, you should provide a response within 30 days of the date of this inspection report, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with copies to the Regional Administrator, U.S. Nuclear Regulatory Commission, Region III, 801 Warrenville Road, Lisle, IL 60532-4351; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Byron Station.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Dave E. Hills, Chief
Mechanical Engineering Branch
Division of Reactor Safety

Docket Nos. 50-454; 50-455
License Nos. NPF-37; NPF-66

Enclosure: Inspection Report 50-454/03-04(DRS); 50-455/03-04(DRS)
w/Attachment: Supplemental Information

cc w/encl: Site Vice President - Byron
Byron Station Plant Manager
Regulatory Assurance Manager - Byron
Chief Operating Officer
Senior Vice President - Nuclear Services
Senior Vice President - Mid-West Regional
Operating Group
Vice President - Mid-West Operations Support
Vice President - Licensing and Regulatory Affairs
Director Licensing - Mid-West Regional Operating Group
Manager Licensing - Braidwood and Byron
Senior Counsel, Nuclear, Mid-West Regional
Operating Group
Document Control Desk - Licensing
M. Aguilar, Assistant Attorney General
Illinois Department of Nuclear Safety
State Liaison Officer
State Liaison Officer, State of Wisconsin
Chairman, Illinois Commerce Commission

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Senior Counsel, Nuclear, Mid-West Regional Operating Group
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M. Aguilar, Assistant Attorney General
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State Liaison Officer
State Liaison Officer, State of Wisconsin
Chairman, Illinois Commerce Commission

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos:	50-454; 50-455
License Nos:	NPF-37; NPF-66
Report No:	50-454/03-04(DRS); 50-455/03-04(DRS)
Licensee:	Exelon Generation Company, LLC
Facility:	Byron Station, Units 1 and 2
Location:	4450 N. German Church Road Byron, IL 61010
Dates:	May 5-23, 2003
Inspectors:	A. Dunlop, Reactor Engineer S. Sheldon, Reactor Engineer R. Winter, Reactor Engineer M. Shlyamberg, Mechanical Contractor H. Anderson, Mechanical Contractor
Approved by:	David E. Hills, Chief Mechanical Engineering Branch Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000454/03-004(DRS), 05000455/03-004(DRS); Exelon Generation Company, LLC; 05/5-23/2003; Byron Station, Units 1 and 2; Safety System Design and Performance Capability Inspection.

This report covers a 3-week announced baseline inspection of the design and performance capability of the auxiliary feedwater and DC power systems. The inspection was conducted by regional engineering specialists with mechanical consultants' assistance. Three Green findings associated with two non-cited violations were identified. 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 3, dated July 2000.

A. Inspector-Identified and Self-Revealed Findings

Cornerstone: Mitigating Systems

- Green. A finding of very low safety significance was identified involving a Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," that related to the design basis requirement to maintain auxiliary feedwater instrumentation piping water solid, not being correctly translated into specifications, drawings, procedures, or instructions. This resulted in a void developing in the piping to the suction pressure transmitters 1(2)PT-AF055, which perform a safety-related function to sense low suction pressure and initiate a swap over to the essential service water system on loss of the condensate storage tank.

  The finding was more than minor because a lack of coordination between design requirements and procedural guidance affected the mitigating systems cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The finding was of very low safety significance because it did not represent an actual loss of a safety function as the automatic switchover would still have occurred prior to the pumps losing suction pressure. (Section 1R21.2)

- Green. A finding of very low safety significance was identified associated with a Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," that related to the coordination, content, and control of design basis engineering calculations. Specifically, the inspectors identified a number of concerns related to the coordination, content, and control of existing calculations (including the failure to coordinate calculation inputs and assumptions as existing design basis calculations are revised or as additional calculations are originated), the use of incorrect or unsupported inputs or assumptions in design basis calculations, the absence of calculations to support some aspects of the current design basis, the failure to appropriately supercede certain calculations or to denote other calculations as historical documents, and, in certain instances, errors in existing calculations. As a result of these issues, the current

design basis calculations, as well as the existing calculation control processes, may not be adequate to ensure that the design basis will continue to be maintained. Although none of the specific deficiencies identified during the inspection resulted in immediate operability concerns, it was concluded that the auxiliary feedwater system design basis was not being adequately controlled by the existing calculations nor by the licensee's processes for coordination and control of the calculations.

This finding was more than minor based on the potential that the lack of adequate control and quality of design basis calculations could result in the ability of the auxiliary feedwater system to perform its safety functions to be degraded. Design basis calculations were routinely used in support of design changes, operating procedures, test acceptance criteria, and operability determinations. This finding is assessed as Green because it did not represent an actual loss of the auxiliary feedwater system's safety function. (Section 1R21.2)

- Green. A finding of very low safety significance was identified involving not maintaining a commitment to the NRC to have placards on the main control board. The placards provided guidance to operators to ensure the auxiliary feedwater pumps had sufficient recirculation flow prior to reducing flow to the steam generators below 100 gpm [gallons per minute], such that the pumps remained protected from being run at shutoff conditions that would have resulted in pump damage.

  This finding was more than minor because this lack of guidance could have affected the mitigating systems cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The finding was of very low safety significance because it did not represent an actual loss of a safety function. (Section 1R21.2).

B. Licensee-Identified Violations

No findings of significance were identified.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstone: Initiating Events, Mitigating Systems, and Barrier Integrity

1R21 Safety System Design and Performance Capability (71111.21)

Introduction

Inspection of safety system design and performance verifies the initial design and subsequent modifications and provides monitoring of the capability of the selected systems to perform design bases functions. As plants age, the design bases may be lost and important design features may be altered or disabled. The plant risk assessment model is based on the capability of the as-built safety system to perform the intended safety functions successfully. This inspectable area verifies aspects of the mitigating systems cornerstone for which there are no indicators to measure performance.

The objective of the safety system design and performance capability inspection is to assess the adequacy of calculations, analyses, other engineering documents, and operational and testing practices that were used to support the performance of the selected systems during normal, abnormal, and accident conditions. The inspection was performed by a team of inspectors that consisted of a team leader, two Region III inspectors, and two mechanical consultants.

The auxiliary feedwater and DC [direct current] power systems were selected for review during this inspection based upon:

- having a high probabilistic risk analysis ranking;
- being high safety significant maintenance rule systems; and
- not having received recent NRC review.

The criteria used to determine the system's performance included:

- applicable Technical Specifications;
- applicable Updated Final Safety Analysis Report (UFSAR) sections; and
- the system's design documents.

The following system and component attributes were reviewed in detail:

System Requirements

Process Medium - water, electricity
Energy Source - electrical power, air
Control Systems - initiation, control, and shutdown actions

System Condition and Capability

Installed Configuration - elevation and flow path operation
Operation - system alignments and operator actions
Design - calculations and procedures
Testing - flow rate, pressure, temperature, voltage, and levels

Components

The auxiliary feedwater pumps, including the minimum recirculation flow line, and DC batteries were selected for detailed review during the inspection. These components were specifically reviewed for component degradation due to the impact that its failure would have on the plant.

.1 System Requirements

a. Inspection Scope

The inspectors reviewed the UFSAR, Technical Specifications, drawings and available design basis information to determine the performance requirements of the auxiliary feedwater and DC power systems. The reviewed systems attributes included process medium, energy sources, and control systems. The rationale for reviewing each of the attributes was:

Process Medium: This attribute required review to ensure that the auxiliary feedwater pumps would supply the required flow to the steam generators following design basis events. To achieve this function, the inspectors verified that the auxiliary feedwater system would be able to supply the required flow rates to the steam generators from the non-safety-related condensate storage tank and the safety-related essential service water system.

Energy Sources: This attribute required review to ensure that the auxiliary feedwater pumps would start when called upon, and that appropriate valves would have sufficient power to change state when so required. To achieve this function, the inspectors verified that the interactions between the auxiliary feedwater pumps and their support systems were appropriate such that all components would start when needed under normal or standby electrical power. The DC batteries were verified to ensure they could supply the required voltage to safety related components following design basis events.

Controls: This attribute required review to ensure that the automatic controls for starting the auxiliary feedwater pumps, and associated system components, were properly established. Additionally, review of alarms and indicators was necessary to ensure that operator actions would be accomplished in accordance with the design.

b. Findings

No findings of significance were identified.

.2 System Condition and Capability

a. Inspection Scope

The inspectors reviewed design basis documents and plant drawings, abnormal and emergency operating procedures, requirements, and commitments identified in the UFSAR and Technical Specifications. The inspectors compared the information in these documents to applicable electrical, instrumentation and control, and mechanical calculations, setpoint changes, and plant modifications. The inspectors also reviewed operational procedures to verify that instructions to operators were consistent with design assumptions.

The inspectors reviewed information to verify that the actual system condition and tested capability were consistent with the identified design bases. Specifically, the inspectors reviewed the installed configuration, the system operation, the detailed design, and the system testing, as described below.

Installed Configuration: The inspectors confirmed that the installed configuration of the auxiliary feedwater and DC power systems met the design basis by performing detailed system walkdowns. The walkdowns focused on the installation and configuration of piping, components, and instruments; the placement of protective barriers and systems; the susceptibility to flooding, fire, or other environmental concerns; physical separation; provisions for seismic and other pressure transient concerns; and the conformance of the currently installed configuration of the systems with the design and licensing bases.

Design: The inspectors reviewed the mechanical, electrical, and instrumentation design of the auxiliary feedwater and DC power systems to verify that the systems and subsystems would function as required under accident conditions. This included a review of the design bases, design changes, design assumptions, calculations, boundary conditions, and models as well as a review of selected modification packages. Instrumentation was reviewed to verify appropriateness of applications and setpoints based on the required equipment function. Additionally, the inspectors performed limited analyses in several areas to verify the appropriateness of the design values.

Testing: The inspectors reviewed records of selected periodic testing and calibration procedures and results to verify that the design requirements of calculations, drawings, and procedures were incorporated in the system and were adequately demonstrated by test results. Test results were also reviewed to ensure automatic initiations occurred within required times and that testing was consistent with design basis information.

b. Findings

.1 Auxiliary Feedwater (AF) Suction Pressure Instrumentation

Introduction: The inspectors identified a finding of very low safety significance involving a Green Non-Cited Violation (NCV) of 10 CFR Part 50, Appendix B, Criterion III, “Design Control.” Specifically, the inspectors identified that the design bases requirement to

maintain AF instrumentation piping water solid was not correctly translated into specifications, drawings, procedures, and instructions.

Description: The inspectors conducted a walkdown of the AF system on May 6, 2003, and observed that some instrument piping for the diesel driven AF (DDAF) pumps was installed with a large inverted U shaped loop. This piping was to the suction pressure transmitters 1(2)PT-AF055, which perform a safety-related function to sense low suction pressure and initiate a swap over to the essential service water system (SX) on loss of the condensate storage tank (CST) for the AF pumps.

The inspectors observed that there were no high point vents and questioned how these lines were assured to be water solid. The licensee determined that there was no periodic procedure to vent these lines to ensure they remained water solid. The licensee conducted ultrasonic testing and found voids at the high point towards the pump side of the lines on both units. The licensee calculated that the largest void would lower the swap over setpoint by approximately 2.3 psi [pounds per square inch]. The licensee vented the lines to ensure operability of the system.

The licensee subsequently evaluated the effect of the setpoint bias on operability and concluded that the system would have performed its safety function.

Analysis: Evaluation of this issue concluded that it was a design control deficiency resulting in a finding of very low safety significance (Green). The deficiency was due to the licensee's failure to maintain these suction instrument lines in a water solid condition.

This finding was determined to be greater than minor because this lack of coordination between design requirements and procedural guidance affected the mitigating systems cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences.

The finding was assessed through Phase I of the significance determination process. The inspectors agreed with the licensee's position that, despite the loss of margin in the swap over setpoint, the system would perform its safety function. Therefore, the inspectors concluded that the finding was a design deficiency that did not represent an actual loss of a safety function and the issue screened out as having very low safety significance or Green.

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 May 6, 2003, the design basis requirement to maintain safety-related instrument piping water solid was not correctly translated into specifications, drawings, procedures, or instructions for the AF system. Specifically, a void was discovered in safety-related instrument piping that lowered the setpoint for AF suction swap over to the safety-related SX water supply. Because the licensee entered the condition into their corrective action system as condition report (CR) 157954, this

violation is being treated as a Non-Cited Violation consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 50-454, 455/2003004-01).

.2 Calculation Issues

Calculation Coordination, Content, and Control

Introduction: The inspectors identified a finding of very low safety significance involving a Green Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," that related to the coordination, content, and control of design basis engineering calculations. Specifically, the inspectors identified a number of concerns related to the coordination, content, and control of existing calculations including the failure to coordinate calculation inputs and assumptions as existing design basis calculations are revised or as additional calculations are originated, the use of incorrect or unsupported inputs or assumptions in design basis calculations, the absence of calculations to support some aspects of the current design basis, the failure to appropriately supercede certain calculations or to denote other calculations as historical documents, and other minor errors in existing calculations. As a result of these issues, the inspectors determined that the current design basis calculations, as well as the existing calculation coordination and control processes, may not be adequate to ensure that the design basis will continue to be maintained. Although the specific deficiencies identified during the inspection did not result in immediate operability concerns, the inspectors concluded that the AF system design basis was not being adequately controlled by the existing calculations nor by the licensee's processes for coordination and control of the calculations.

Discussion: The inspectors review of the licensee's calculation indices identified 60 calculations addressing the hydraulic design of the AF system. A number of these calculations appeared to be redundant. The inspectors requested the licensee to identify which of these calculations were the design basis hydraulic calculations for the AF system. In the response to this request, the licensee provided a list in excess of 30 calculations. The inspectors noted that the large number of calculations complicated the licensee's ability to maintain the design basis, perform design and modification activities, and perform operability determinations given the fragmented design information.

During the inspection, the inspectors noted a number of calculation deficiencies as well as deficiencies in the licensee's processes for coordination and control of the calculations. The licensee initiated individual CRs, as appropriate, to ensure that each of these conditions will be addressed by the corrective action program. The following discussion includes examples of deficiencies identified during the inspection in individual calculations and in the calculation coordination and control processes.

Calculation Coordination - The inspectors identified a concern related to the control and coordination of existing calculations. As shown in the following examples, conditions were identified where design basis calculations were not based on current input data, were based on assumed inputs in lieu of actual plant conditions, were not consistent with other design basis calculations, or were not revised when appropriate to reflect a change in input data. In response to these concerns, the licensee initiated a number of

CRs to address the individual issues. The number of the fragmented design basis documents, and inconsistent inputs and assumptions, which were not properly linked together, underscored the inspectors' concern about the licensee's acceptance of the results of the hydraulic calculation that were not conservative in respect to the licensing analysis and their ability to perform correct and timely operability determinations. The fragmented design information could result in the implementation of modifications or operational decisions that would have a negative impact on the plant safety and conformance to the licensing basis.

- Calculations PSA-B-97-31, "Auxiliary Feedwater System Operation Analyses for Byron and Braidwood Stations," and PSA-B-98-01, "Auxiliary Feedwater System Design Basis Analyses for Byron and Braidwood," established maximum and minimum design flow rates for the AF system based on the predicted variations in the system resistance and pump performance. These calculations predicted a flow of 146 gpm [gallons per minute] to each of the three intact steam generators for the feed water line break accident. This value was less than the 151 gpm used in the feed water line break analysis and reported in the UFSAR Sections 10.4.9.3.2 and 15.2.8.2. The 146 gpm flow rate was based on the maximum allowable degraded AF pump performance. The licensee initiated CR 19541 to address this issue. At the time of the inspection, no operability issues were associated with this condition since the AF pumps were exhibiting very little degradation.

- The licensee's AF system review performed prior to this inspection identified an over pressurization of the AF discharge piping. This finding was documented in CR 157062. The inspectors's review of this CR identified that the licensee did not consider the allowable pump performance above nominal +7.5% curve developed in calculation PSA-B-97-17, "Byron/Braidwood Maximum and Minimum AFW Pump Curve Development." The results of the unit 2 DDAF pump surveillance, 2BVSR AF-3, "Simultaneous Start of Both AF Pumps with Flow to the Steam Generators," identified that this pump performance at the nominal flow rate was on the +7.5% curve. The licensee initial response attributed this to measurement inaccuracy, since pump developed head cannot be higher than the one shown on the certified vendor curve at the same flow rate. The inspectors, however, determined the certified vendor curve was developed at a pump speed of 3570 rpm, whereas step 4.3.12 of procedure 2BVSR 5.5.8.AF.1-2, "ASME Surveillance Requirements for the Diesel Driven Auxiliary Feedwater Pump," required setting the AF pump speed to 3646-3794 rpm. The licensee determined that although the overpressure value would be higher, the conclusions of the CR 157062 would be still valid, since the final pressure would not exceed the American Society of Mechanical Engineers (ASME) Code over pressurization allowable, hence no detailed evaluation of the pressure boundary components was required. The conclusions of the licensee's evaluation was based on application of the +7.5% pump curve. The inspectors, however, noted the application of the pump affinity laws for the nominal pump speed of 3720 rpm [revolutions per minute] would yield a higher developed head than the one predicted for the +7.5% pump curve (at the same flow rate). The licensee concurred with the inspectors' assessment and initiated CR 160059 to address the overpressure condition. The licensee

concluded that there was no operability concern based on a similar evaluation performed by Braidwood Station which evaluated the effect of the discharge pressure on all components at elevated pump speed. The inspectors' independent verification confirmed that the Byron Station pump discharge pressures would be bounded by the Braidwood Station conditions and was considered acceptable.

- The inspectors' review of the following calculations identified that these calculations were based on the maximum AF flow rate of 990 gpm.

  - SX1-87, "Available NPSH for AF Pump when Supplied from SX System;"
  - SX1-88, "Available NPSH for AF Pump when Supplied from SX System;"
  - PAS-B-91-14, "Evaluation of New CST Technical Specification Levels for Byron and Braidwood Stations;" and
  - PSAG-138, "Available NPSH for AF Pump when Supplied from SX System."

  This flow rate was less than the maximum flow predicted in calculations PSA-B-97-31 and PSA-B-98-01. The higher flow rates result in the increase of the piping suction losses and the pump internal entrance losses. These increases lead to the decrease in the available net positive suction head (NPSH) and the increase of the required NPSH. Hence, for the same suction static pressure, the flow increase could lead to the condition where the required NPSH was less than the available NPSH, which would result in a cavitation condition. The licensee concurred with the inspectors' finding that the NPSH calculation did not address the higher flow rates and initiated CR 159779 to address this issue. The evaluation determined that there was no operability concern, since the maximum flow rate conditions were predicted to exist (by calculations PSA-B-97-31 and PSA-B-98-01) during elevated static suction pressure conditions, thus the available NPSH was greater than the required NPSH. The inspectors noted that the design hydraulic calculations (PSA-B-97-31 and PSA-B-98-01) did not address that the operational controls for AF were based exclusively on the steam generator level without any restrictions on the flow. Additionally, a loss of offsite power event during the final stages of normal plant cooldown could result in the most challenging NPSH condition. The AF pump would receive an automatic initiation signal while the level in the CST would be at a low level, the steam generators would be at a low pressure, and all flow controlled valves would go to the full open position due loss of the non-safety related instrument air. The licensee initiated CR 160098, which agreed that the current operating procedures did not provide the maximum flow limitations and stated that "it might be prudent to include maximum flow limitations in our procedures to provide the operations department with an upper limit on flow." The licensee determined that there was no operability concern based on the operator training, operating procedures, high flow alarms, and indications that exist to provide the operator with various indications of high flow conditions. The inspectors concurred with the licensee's operability assessment. Additionally, the inspectors' independent evaluation of the analytical value for the automatic suction switchover from the CST to the SX determined that there was sufficient

margin to prevent any cavitation potential based on the current value of this setpoint, including accounting for the air void in the instrument sensing line.

Incorrect or Unsupported Inputs and Assumptions - The inspectors identified concerns related to incorrect or unsupported inputs and assumptions in the existing calculations. As shown in the following examples, conditions were identified where design basis calculations were not based on appropriately documented inputs or assumptions.

- Calculation PSAG-138 evaluated the available NPSH to the AF pumps assuming various scenarios of silt blockage of the pump suction piping from the SX system. The inspectors identified that the calculation used non-conservative input values for L/D [length over diameter] of 12 for a 45-degree pipe elbow and L/D of 14 for a 90-degree elbow. The licensee subsequently determined the correct L/D values to be 16 and 30, respectively**,** and that the discrepancy did not affect the conclusions in the calculation, as the postulated silt blockage scenarios would not be realistic based on the results of programs in place to prevent silt buildup in the piping. The licensee documented this discrepancy in CR 158958.

- Calculation PSA-B-97-17 incorrectly indicated the AF005 valve's were non-safety grade in section 2.1. The Passport D031 panel indicated the AF005 valve's were safety-related. UFSAR 10.4.9.1.1 indicates the AF005 valve's were safety category I. The licensee documented these inconsistencies in CR 157904.

- During a plant cooldown following a reactor trip, the AF pumps could be placed in runout flow condition if no flow control actions were taken. Current procedures focused on maintaining steam generator level with minimal reference to pump protection. Design basis hydraulic calculations (e.g. PSA-B-97-31 and PSA-B-98-01) did not consider actual plant operation. The licensee documented this issue in CR 160098.

- The NPSH required values for the DDAF pumps used in design basis hydraulic calculations (e.g., PSA-B-97-31 and PSA-B-98-01) did not include an adjustment for pump speed. The licensee documented this issue in CR 160105.

- Calculation PSA-B-97-14, “Evaluation of New CST Technical Specifications Levels for Byron and Braidwood Stations,” was developed using piping friction losses calculated based on two AF pumps in operation at 990 gpm each, as well as pressure loss values measured with one AF pump in operation at 720 gpm and at 990 gpm. The measured values for one pump operation at 720 and 990 gpm were selected as the more conservative of referenced individual test values for Byron and Braidwood Stations. Referenced measurements for the Braidwood Station were indicated to be the more conservative values and were used in PSA-B-97-14. However, the inspectors identified that the referenced Braidwood information was not available in the calculation's reference materials. Also the measurements for Byron Station were referenced in PSA-B-97-14, but the inspectors identified that the referenced Byron information was not available in the reference materials. The licensee had initiated CR 154658 previously in

relation to this issue and other calculations during the licensee's focused area self assessment.

Lack of Available Calculations to Support Aspects of the Current Design Basis - The inspectors identified the following examples of design basis requirements or information that were not supported by available calculations. These conditions also appear to be related to the deficiencies in calculation coordination and control.

- The inspectors identified there was not an approved calculation supporting the determination of the required minimum volume of 420 gallons of fuel oil in the DDAF pump day tank. The licensee provided an initial simple calculation of the required volume that appeared acceptable, and indicated a formal approved calculation would be developed. The licensee documented this issue in CR 159411.

- The inspectors identified there was no supporting documentation to verify the installer's notes on Stewart & Stevenson Drawing 62242 (Commonwealth Edison Drawing 62240-1, Sheet 2, "Installation Drawing - 16V-149T1, Auxiliary Feedwater Pump Drives, Revision D") were met in relation to the relative installed locations of the day tank and the DDAF pump diesel engine. Note 2 stated, "No point in the fuel system including off skid piping and day tank should exceed fuel pump suction elevation which is 55 inches above the bottom of the skid." The note was not met based on the as-built configuration. The licensee's initial evaluation concluded that existing administrative controls and surveillance requirements to monitor the diesel systems provided adequate compensatory measures to meet the intent of the note. The licensee documented this issue in CR 160119 and indicated an engineering evaluation will be performed to formally document the acceptability of the installed configuration.

- The UFSAR stated that the SX booster pump (1/2SX04P) was capable of providing the required SX flow to the DDAF pump diesel engine in the event the SX pumps were lost. The inspectors questioned how the SX system would be able to provide adequate suction pressure to the booster pump under this condition. The licensee documented in CR 159208 that no formal design calculation existed to document the acceptability of the various operating modes for the booster pumps nor to document the available NPSH to justify the ability of the pump to adequately perform under normal, abnormal, and accident conditions. The licensee's initial evaluation concluded that a margin of approximately 36 feet did exist between the required and available NPSH.

- The inspectors identified there was no specific calculation to address hydrogen generation by the DDAF pump Ni-Cad battery banks. This would verify that the ventilation in the DDAF pump rooms was adequate to maintain hydrogen concentration less than 4%. The licensee documented this issue in CR 157816.

Calculations not Superceded or not Designated as Historical - The inspectors concluded that it was difficult to identify the status of calculations, and to determine if a calculation was a current design basis calculation. Several calculations contained outdated information, but were not superceded or designated as historical. This provided the

potential for incorporating erroneous information into a new calculation. In response to this concern, the licensee initiated the following CRs to capture the individual instances:

- CR 157922 Braidwood calculation ATD-0054 on ESW system cooled lube oil heat exchangers - Not applicable for Byron
- CR 159305 Loop seal criteria calculation AF-91 - Should be historical
- CR 159770 Medium energy line break calculation AFW-KG1 (AF005 valve area) - Not voided
- CR 160022 Calculations AF-TH06 and MAD 89-0175 contain outdated information - Should be historical

Analysis: Evaluation of this issue concluded that it is a design control deficiency resulting in a finding of very low safety significance (Green). The design control deficiency was due to a licensee performance deficiency in that certain design calculations either were not adequately coordinated, contained incorrect or unsupported inputs and assumptions, did not exist, contained errors, or that the current, historical, or superceded status of certain calculations was not maintained accurate and up-to-date. The Mitigating Systems Cornerstone was affected due to the potential for the AF system's capability to provide heat removal function being degraded by this condition. No other cornerstones were degraded as a result of this issue.

The inspectors determined that this finding was associated with design control attributes and affected the objective of the Mitigating Systems Cornerstone to ensure the capability of the AF system to respond to initiating events to prevent undesirable consequences, and is therefore greater than minor. The lack of adequate coordination, control, content, status, and quality of design basis calculations had the potential to result in the ability of the AF system to perform its safety functions or to be degraded. Design basis calculations were routinely used in support of design changes, operating procedures, test acceptance criteria, and operability determinations.

The finding was assessed through Phase I of the significance determination process. A review of the system calculations identified a number of deficiencies, however, they did not result in immediate operability concerns. This provided reasonable assurance that there was not an actual loss of system function due to this condition. Therefore, this issue was screened out of the significance determination process as Green.

Enforcement: 10 CFR Part 50, Appendix B, Criterion III, “Design Control,” states, 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 May 23, 2003, the design basis of the AF system were not correctly translated into plant documents, in that certain design calculations lacked adequate coordination, control, content, or status, and in certain instances the design basis calculations contained errors or were not available to verify that the AF system design basis capability was maintained.

Because of the low safety significance of this issue and because it is in the licensee's corrective action program, the issue is being treated as a Non-Cited Violation, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 50-454, 455/2003004-02).

.3 Auxiliary Feedwater Minimum Recirculation Line

Introduction: The inspectors identified a Green finding of very low safety significance involving not maintaining a commitment to the NRC to have placards on the main control board that provided guidance to operators to ensure the AF pumps had sufficient recirculation flow prior to reducing flow to the steam generators below 100 gpm, such that the pumps remained protected from being operated at shutoff conditions.

Discussion: Based on a review of the AF system and the minimum flow recirculation lines, the inspectors were concerned with the ability of the system and licensee personnel to protect the AF pumps from damage due to deadheading. Although the normal system lineup had normally open valves to both the steam generators and through the recirculation lines to the CST, this would not be the case for all scenarios where the AF system was required to provide a source of water to the steam generators. If the AF suction source automatically switched to the safety-related SX supply, the valves in the recirculation line back to the CST would close and the valves in the recirculation line to the SX would have to open. As discussed in section 1R21.2.b.4 of this report, these valves and their functions were not periodically tested per the inservice testing (IST) program to ensure they would function when called upon. There was also no position indication for air-operated valve AF024 or recirculation flow indication on the main control panel. The emergency operating procedures also did not discuss ensuring there was adequate flow through the AF pumps at all times to prevent damaging the pumps through shutoff conditions. The licensee identified that the alarm response procedure, BAR 1(2)-3-B6, " AF Pump Auto Start," did have directions for the operator to verify recirculation flow after a pump start via a computer point and re-verify this condition every hour the pump continued to run. The procedure also directed the operators to monitor AF pump operation locally. The inspectors were concerned that there still existed ample time between re-verifying recirculation flow that the AF pumps could be damaged if the recirculation flow path closed due to a failure of AF024. Since AF system operation was based on controlling steam generator level, some operators stated to prevent overfilling the steam generators they would probably shutoff flow by closing the control valves rather than securing the AF pumps. This response could lead to subsequent pump failure if the recirculation line and its components did not function as required.

A similar concern arose out of a 1986 NRC inspection where valve AF024 could fail under certain scenarios and the recirculation flow path would no longer be available to protect the AF pumps. In a letter to the NRC, dated December 15, 1986, which stated "To assure this flow [85 gpm minimum required for safe pump operation] is provided, Byron Station will place permanently affixed labeling at the AFW flow central stations on the main control board panels 1PM04J and 2PM04J and each unit's remote shutdown panel. These labels will alert the operators of the minimum flow requirements for the AFW pumps and direct them to verify minimum recirculation flow before reducing pump discharge flow below this limit." The proposed labels read as follows: "VERIFY $\geq$ 85 GPM RECIRC FLOW (A = F2333)/(B = F2334) PRIOR TO

THROTTLING FLOW TO STEAM GENERATORS BELOW 100 GPM." However, several years ago during a process of removing unnecessary operator aids from the main control room, these placards were removed without knowing they had been installed as part of a commitment to the NRC to resolve a previous concern. The placards remained installed at the remote shutdown panels. As a result of this issue, the licensee installed new placards on the main control board to provide guidance to the operators based on the previous commitment to the NRC. In addition, several Byron operating procedures will incorporate additional guidance to the operator in identifying that AF flow to the steam generators is being reduced to less than 85 gpm and ensure adequate recirculation flow discharge and/or recirculation valve realignment similar to the changes made at Braidwood resolving a similar 1998 issue identified by the NRC.

Analysis: Evaluation of this issue concluded that it was a commitment control deficiency resulting in a finding of very low safety significance (Green). The deficiency was due to the licensee's failure to maintain a commitment to the NRC to have placards on the main control board that provided guidance to operators to ensure the AF pumps had sufficient forward or recirculation flow to prevent pump damage at shutoff conditions.

This finding was determined to be greater than minor because this lack of guidance could have affected the mitigating systems cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences.

The finding was assessed through Phase I of the significance determination process. The inspectors determined there were a number actions or controls that would have to fail to result in pump damage. These included; based on operator training, the operators should know that they need to ensure recirculation flow prior to reducing flow to the steam generators below the 100 gpm requirement to protect the pumps; guidance in alarm response procedure to verify recirculation flow and monitor pumps locally; and the control valves to the steam generators and the recirculation valve to the CST, AF022A/B, were fail open air-operated valves, such that on a total loss of instrument air, there should be an adequate flow path for the AF pumps. As such, there was reasonable assurance that the system would perform its safety function. Therefore, the inspectors concluded that the finding did not represent an actual loss of a safety function and the issue screened out as Green.

Enforcement: This issue involved the licensee failure to meet a commitment to the NRC in providing the operators with adequate guidance to ensure the AF pumps would not be damaged due operating them at shutoff conditions. Since this was not a regulatory requirement, no violation of regulatory requirements occurred. The licensee entered the event into its corrective action system as CR 159833.

Because of the low safety significance of this issue and because it is in the licensee's corrective action program, the issue is being treated as a Green Finding (FIN 50-454, 455/2003004-03).

.4 Inservice Testing of Auxiliary Feedwater Minimum Recirculation Line Valves

Introduction: The inspectors identified that the valves in the minimum recirculation lines for the AF pumps were not included in the licensee's IST program although the valves appear to perform a safety function in protecting the pumps from being operated at shutoff conditions. This is an unresolved item (URI) pending further review of the facility's licensing basis with respect to this issue.

Discussion: The valves in the minimum recirculation line perform a safety function to protect the AF pumps from overheating and flow instabilities by providing a minimum flow path either to the CST or the SX discharge pipe when AF flow to the steam generators was throttled to a low or no flow condition. Without an adequate flow path above the minimum required by the pump vendor, damage to the pumps will occur in a short period of time.

The minimum recirculation lines for the pumps were as follows:

- Suction source from CST: The recirculation line tees off the discharge line of each AF pump going through a flow orifice and then normally open (fail open) air-operated valve 1(2)AF-022A/B. The recirculation lines for each train then come together and go through the common non-safety-related check valve 1(2)CD220, before returning to the condensate storage system header, which can either go back to the CST or to the suction of the AF pumps.
- Suction source from SX: The recirculation line tees off the discharge line of each AF pump going through a flow orifice, check valve 1(2)026A/B, and then the recirculation lines for each train come together and go through the common normally closed (fail closed) air-operated valve 1(2)AF-024 (valve opens on the automatic switchover to service water when valves 1(2)AF-022A/B start going closed). The recirculation line then go through the common check valve 1(2)SX194 and goes into the discharge pipe for the SX system.

Based on this design, the following valves perform a function in protecting the safety-related AF pumps, which appear to meet the scoping criteria of the ASME Code, Section XI, which implements OM-10, Section 1.1, "Scope."

- Check valves 1(2)026A/B perform an active open function to provide the minimum flow path when the AF pumps take a suction from the SX water system and valves 1(2)AF-022A/B are closed. Testing requirements for exercising the valves to open position would be OM-10, section 4.3.2, "Exercising Tests for Check Valves."
- Air-operated valves 1(2)AF-024 perform an active open function to provide the minimum flow path when the AF pumps take a suction from the SX water system and valves 1(2)AF-022A/B are closed. Testing requirements for stroke timing the valves to open position would be OM-10, section 4.2.1, "Valve Exercising Testing."
- Check valves 1(2)SX194 perform an active open function to provide the minimum flow path when the AF pumps take a suction from the SX water system and valves 1(2)AF-022A/B are closed. Testing requirements for exercising the valves to open position would be OM-10, Section 4.3.2.

- Air-operated valves 1(2)AF-022A/B perform a passive open function to provide the minimum flow path when the AF pumps take a suction from the CST and an active open function to provide the minimum flow path after the valve is closed upon switchover to SX system and non-safety-related air fails. The loss of air would close valves 1(2)AF-024 and valves 1(2)AF-022A/B would be required to open (fail open on loss of air) to provide a minimum flow path for the AF pumps. Testing requirements for stroke timing and fail safe testing the valves to open position would be OM-10, Section 4.2.1.
- Check valves 1(2)CD220 perform an active open function to provide the minimum flow path when the AF pumps take a suction from the CST. Since these valves are not in ASME Code class piping, they need not be included in the IST program. However, these valve do perform a function and should be included in a testing program to verify the valves will function as required .

The licensee's position on the AF minimum recirculation lines was that they were not part of Byron's design or licensing basis and as such, do not need to be tested. This was based on operators would always maintain forward flow to the steam generators. They depended on operator training to prevent them from fully shutting the AF flow control valves. However, discussions with some operations personnel indicated that they would shut the control valves rather than secure the pumps, which was the only other way to stop flow if the level in the steam generators exceed the prescribed band. There was no guidance in the emergency operating procedures as to how the operators should maintain steam generator level. There was a step in the alarm response procedure to verify there was recirculation flow through the computer point in the control room when the alarm comes in and every hour the pumps were operating. However, if recirculation flow was lost during the one hour time frame, and the flow controls valves were closed, the pumps would fail. One of the actions as a result of the 1986 inspection, as discussed in Section 1R21.2.b.3 of this report, was to make a commitment to the NRC to install placards on the main control board and remote shutdown panel to provide guidance to the operators to maintain adequate flow through the AF pumps. These placards were no longer installed on the main control board as they were removed in an effort to cleanup the clutter on the main control board without recognizing the previous NRC commitment. The placards were reinstalled during the inspection.

The inspectors identified the following references in licensee documents where the recirculation lines are discussed:

- UFSAR 10.4.9.1.1 - These pumps normally take suction from and have a recirculation line back to the condensate storage tank, which are Safety Category II, Quality Group D (not seismic)
- UFSAR 10.4.9.1.2 - The auxiliary feedwater system must be capable of functioning for extended periods...
- UFSAR 10.4.9.2.1 - Delivered capacity (each) 890 gpm exclusive of minimum flow
- UFSAR 10.4.9.3.1 - ... the auxiliary feedwater pumps have a design capability of 990 gpm (including 100 gpm for minimum flow) at 3350 feet net developed head.
- TS Bases B 3.7.5 - The AF System consists of a motor driven AF pump and a diesel driven pump configured into two trains. Each pump provides 100 percent

of the required AF capacity to the steam generators, as assumed in the accident analysis. The pumps are equipped with independent recirculation lines to prevent pump operation against a closed system.

- NRC Bulletin No. 88-04, "Potential Safety-related Pump Loss," required licensee's to review mini-flow lines to ensure flow capacity is adequate to prevent pump damage during operation and testing. The licensee responded to the bulletin, dated July 11, 1988 and February 21, 2989, indicated that the capacity of the mini-flow lines was acceptable to the pump vendor to prevent pump damage and that testing under min-flow conditions has not degraded the pumps or reduced their ability to operate as designed.

Based on some of the statements identified above, it appears that the licensee is taking credit for the recirculation lines and as such, the valves in these lines may need to be tested in accordance with the Code requirements discussed earlier.

Related issues have been raised previously at both Byron and Braidwood, but their resolutions did not address why the valves were not included in the IST program. The first time this issue was raised was in NRC Inspection Report 454/84040. Starting on page 11 of that report, two issues were identified with valve 1AF024. Both scenarios started with a seismic event that required the AF suction supply to switch over to the SX system from the CST. The first scenario would fail the 1AF024 based on a fire in the 1B AF pump room. The second scenario would fail the 1AF024 due to not performing periodic testing. Unresolved items were opened for each scenario, 454/86040-05 and 454/86040-06, respectively. The first item was closed in NRC Inspection Report 454/87038 based on NRC regulations for fire protection not requiring the licensee to design against a fire and concurrent tornado or seismic event. For this scenario, the resolution was appropriate. The second item was closed in NRC Inspection Report 454/88020 based on the valves mitigating a beyond design basis accident. This appeared to be based on the closure of another unresolved item, 454/86040-02, concerning the DDAF pump SX booster pump (1SX04P), where the NRR determined that the loss of all AC [alternating current] power was a beyond design basis accident. The scenario for the second item, however, was the loss of the non-seismic CST and offsite power due to a tornado/seismic event, which will then automatically start AF. This scenario would not be considered a beyond design basis accident. As such, the initial concern that periodic testing was not performed on the 1AF024 valves was still valid.

The close-out of the second item contained a reference to a letter from L. Olshan to H. Bliss, dated September 15, 1988, which was the NRC Safety Evaluation for approval of the licensee's first Ten-Year IST Program. The safety evaluation did not provide any specific mention that it was acceptable to not include the DDAF pump SX booster pump or 1AF024 in the IST program. Safety evaluations for IST programs do not specifically review IST programs to ensure the scope of the program was acceptable. That function has been left to the inspectors reviewing the program at the sites. The function of the safety evaluation was to review the licensee's relief request where the licensee has determined for one reason or another that they can not meet the Code requirements and need to conduct alternative testing. As an aside, the DDAF pump SX booster pumps were now included in the licensee's IST program.

The Braidwood issue was raised in NRC Inspection Report 456/98201, which noted in Inspection Follow-up Item 456/98-201-04 that the failure of 1AF024 could go unnoticed as there was no indication in the control room for this valve and it failed closed on a loss of air. This item was closed in NRC Inspection Report 456/99013 based on the licensee adding guidance to their procedures to not reduce flow to the steam generators to less than 85 gpm without ensuring adequate recirculation flow. There was no mention or review as to whether the recirculation valves needed to be in the IST program.

Based on the previous issues identified in inspection reports, there was no adequate evaluation of whether these valves in the recirculation lines need to be included in the IST program and the conclusion reached in closing the issue appeared to be in error (not a beyond design basis accident). Based on these observations, it appeared that the valves in these lines may need to be tested in accordance with the Code requirements discussed earlier.

Analysis: Although the inspectors concluded that the valves perform a safety function that would appear to require their inclusion in the IST program, the licensee had presented information that based on their evaluation, the recirculation lines were not in their licensing basis, such that testing was not required. In addition, related issues concerning the recirculation lines had been previously identified and resolved in NRC inspection reports. Based on this information, this will be considered an unresolved item (URI 50-454, 455/2003004-04) pending further review to determine if the recirculation lines are within the licensing basis with respect to this issue.

Enforcement: The enforcement aspects of this issue will be determined after the evaluation of the unresolved item.

.3 Components

a. Inspection Scope

The inspectors examined the auxiliary feedwater pumps, valves associated with the minimum recirculation lines, diesel driven auxiliary feedwater pump batteries, and the 125 VDC batteries to ensure that component level attributes were satisfied. The attribute selected for review was component degradation.

Component Degradation: This attribute was verified through review of component repair histories and review of corrective action documents. The inspectors reviewed the attribute to verify the licensee was appropriately maintaining components in the auxiliary feedwater and DC power systems.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES (OA)

4OA2 Identification and Resolution of Problems

a. Inspection Scope

The inspectors reviewed a sample of auxiliary feedwater and DC power systems 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, condition reports initiated on issues identified during the inspection were reviewed to verify adequate problem identification and incorporation of the problem into the corrective action system. 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 Meetings

Exit Meeting

The inspectors presented the inspection results to Mr. S. Kuczynski, and other members of licensee management at the conclusion of the inspection on May 23, 2003. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Exelon Nuclear, LLC
B. Adams, Engineering
E. Blondin, Design Engineering
J. Drowley, Design Engineering (Corporate)
D. Drawbaugh, NRC Coordinator
D. Flowers, Business Operations Manager
B. Grundmann, Regulatory Assurance Manager
K. Hansing, Nuclear Oversight Manager
B. Jacobs, Engineering
S. Kuczynski, Plant Manager
R. Lopriore, Site Vice President
K. Passmore, System Engineering
B. Perchiazzi, Engineering
R. Randels, Design Engineering Manager
D. Sargent, Engineering
M. Shah, Design Engineering
D. Spitzer, PED Manager
S. Stimac, Operations Manager

Nuclear Regulatory Commission
R. Skokowski, Senior Resident Inspector
P. Snyder, Resident Inspector
A. Stone, Chief, Branch 3, Division of Reactor Projects, RIII

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

50-454, 455/03-04-01	NCV	Failure to maintain auxiliary feedwater instrumentation piping water solid (Section 1R21.2)
50-454, 455/03-04-02	NCV	Design basis calculations contained errors or did not exist (Section 1R21.2)
50-454, 455/03-04-03	FIN	Commitment to have placards on the main control board concerning minimum flow for the auxiliary feedwater pumps not maintained (Section 1R21.2)
50-454, 455/03-04-04	URI	Auxiliary feedwater recirculation line valves not in inservice testing program (Section 1R21.2)

Discussed

None.

LIST OF DOCUMENTS REVIEWED

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

1R21 Safety System Design and Performance Capability

Calculations

AF-FP1; Curb Sizing - Diesel Driven Aux. Feed Pump Room; Revision 0
AF-FP2; Curb Sizing - Diesel Driven Aux. Feed Pump Room; Revision 0
AFJM-03; Verification of Tank Level at CST Switchover Setpoint; Revision 0
AF-SSL-01; System Safety Limit for PSL-AF051, 055; Revision 0
AF-SSL-02; Safety System Limit for TSH-AF147; Revision 0
AF-MP-01;Verification of the AF System Overpressure Protection; Revision 1
AF-TH01; Auxiliary Feedwater Pumps NPSH Verification; Revision 0
AF-TH02; Auxiliary Feedwater Pumps Suction Pressure Switch Setpoints; Revision 0
AF-TH03; Auxiliary Feedwater Piping Overpressure Protection; Revision 0
AF-TH05; Effect of Tornado Missile on Aux. Feed Pump Diesel Operation; Revision 0
AF-TH07; Auxiliary Feedwater Pump Suction Modification; Revision 0
AFW-KG1; Impingement from Crack in Aux. FW System; Revision 1
AF 003; Flow Elements to SG's; Revision 0
AF 004; Auxiliary Feedwater System Flow Elements; Revision 0
AF-91; Modification Testing Criteria for Loop Seal Addition Mod.; Revision 3
AQ-73; 4kV Auxiliary Feedwater Pump Breaker; Revision 1
ATD-0054; Performance Analysis for SX System Cooled Lubricating Oil HX, Braidwood ½; Revision 0
BYR97-193; Battery Duty Cycle and Sizing for the Byron Diesel Driven Auxiliary
BYR97-204; 125 VDC Battery Sizing Calculation; Revision 2
BYR97-205/BRW-97-0383-E; 125 VDC Battery Charger Sizing Calculation; Revision 2
BYR97-224/BRW-97-0472-E; 125 VDC Voltage Drop Calculation; Revision 1
BYR98-229; Instrument Accuracy for Auxiliary Feedwater Pump Surveillance Testing; Revision 0
BYR97-273; Condensate Storage Tank Level Error Analysis; Revision 0
BYR97-422; 125VDC Battery Sizing Verification; Revision 0
BYR99-008; Auxiliary Feedwater Flow Indication Loop Accuracy for Use in Determining Emergency Operating Procedure Setpoints; Revision 0
BYR2000-063; Seismic Qualification of 125 Volt DC Batteries and Battery Racks 1/2DC01EC and 1/2DC02EC; Revision 0
BYR2000-136; Voltage Drop Calculation for 4160V Switchgear Breaker Control Circuits; Revision 0
BYR2000-175; Auxiliary Feedwater Flow Controller Loop Accuracy for Use in Evaluating Setpoints; Revision 0
CD-2; Minimum Loop Seal Height; Revision 0

CQP-026077; Spare Part File for Commonwealth Edison Company Byron / Braidwood Units 1 & 2 (Core, Oil Cooler - Engine), (Valve, Fuel Supply Check), & (Air Filter Element); Revision 0
DO-EDS-1; Auxiliary Feedwater Pump Diesel Exhaust Pipe Delta-P; Revision 1
DO-EDS-2; Auxiliary Feedwater Pump Diesel Intake Air Pipe Delta-P; Revision 0
DO-89-01; Diesel Oil Day Tank Level at Tech. Spec. Limit of 450 Gallons; Revision 0
FL-2; Moderate Energy Line Break Locations; Revision 0
NED-H-MSD-17; Verification of Byron 125 VDC Battery Room 111, 112, 211, & 212 Ventilation Requirements and Hydrogen Concentration Evaluation following Loss of Battery Room Ventilation; Revision 2
NED-M-BYR-082; Evaluation of As-found Configuration of Unit 2 Auxiliary Feedwater Pump 2B Diesel Drive Air Intake Assembly Supports; Revision 0
NED-0-PWR-2; Calculation of the Additional Head Loss in the Auxiliary Feedwater Pump Suction Piping Common with the Condensate Make-up System with Operation of the Condensate Make-up System; Revision 0
NED-1-EIC-0186; Auxiliary Feedwater Pump Suction Pressure Setpoint Error Calculation; Revision 1
PSA-B-96-05; Analysis of AFW Pump Suction Transient for Byron and Braidwood Stations using Relap 5M3; Revision 0
PSA-B-97-12; Determination of the Maximum Fluid Volume in the Main Feedwater Piping from the AFW Connection Nozzle to the Replacement Steam Generators for Byron and Braidwood Unit 1; Revision 0
PSA-B-97-13; Evaluation of CST Vortices for Byron/Braidwood Stations; Revision 13
PSA-B-97-14; Evaluation of New CST Technical Specification Levels for Byron and Braidwood Stations; Revision 0
PSA-B-97-17; Byron/Braidwood Maximum and Minimum AFW Pump Curve Development; Revision 0
PSA-B-97-18; Byron/Braidwood AFW Flow for AF005A-H Modification; Revision 4
PSA-B-97-22; Calculation of Limiting Design Information for AF005A-H Valve Trim Replacement; Revision 0
PSA-B-97-31; Auxiliary Feedwater System Operation Analyses for Byron and Braidwood Stations; Revision 0
PSA-B-98-01; Auxiliary Feedwater System Design Basis Analyses for Byron and Braidwood; Revision 0
PSA-B-98-05; Analysis of AFWS Pump Suction Transient using the SX Water Supply for Byron and Braidwood Stations; Revision 0
PSAG-39; Aux. Feed Pump Diesel Intake Plenum Suction Pressure; Revision 0
PSAG-138; Available NPSH for AF Pump when Supplied from SX System; Revision 0
PSAG-192; Addition of Flow Control Valve to the Air Lines on Valve - 2AF004B; Revision 0
SX1-88; Available NPSH for AF Pump when Supplied from SX System; Revision 0
SX1-89; Available NPSH for AF Pump when Supplied from SX System; Revision 0
UHS-02; Tabulation of UHS Heat Loads; Revision 0
3C8-0591-002; DG Room Conditions following Feedwater Line Break in Turbine Building El. 401'; Revision 0
5.6.1-BYR96-233; Evaluation of Main Steam and Aux. Feedwater Tunnels for Revised Accident Pressures and Temperatures associated with Replacement Steam Generators; Revision 0

83-468 / 83-694; Increasing Pipe Pressure for Aux. Feedwater System for 3 Lines; Revision 0
85-745 / 86-227; Determination of Condensate Storage Tank Water Level Needed to Meet Aux. Feed Pump NPSHR; Revision 0
86-470 / 86-545; Aux. Feedpump Startup; Revision 0
86-500; Adding Additional Orifices in Aux. FW Piping; Revision 0
89-146; Aux. Feedwater Pump Suction Pressure & NPSHA; Revision 1
Feedwater Pumps and the Byron Diesel Driven Essential Service Water Makeup Pumps; Revision 1A
DCR 970095; Auxiliary Feedwater Pump Suction Pressure Setpoint Error Calculation, No. NED-I-EIC-0186; Revision 00
NED-I-EIC-0186; Auxiliary Feedwater Pump Suction Pressure Setpoint Error Calculation; Revision 1
SM-AF8002; Diesel Driven Auxiliary Feedwater Pump Engine Speed Switch Setpoint Error Analysis; Revision 1
002-M-009; Byron 2 AF System Operating Conditions and MOV Differential Pressure Calculations; Revision 1
002-M-034; Byron U2 AF System Differential Pressure Calculation; Revision 1
BRW-98-0239-M; Discharge Pressure of the Diesel Driven Auxiliary Feedwater (AF) Pumps at Engine Overspeed Trip Setpoint; Revision 2 (Braidwood calculation)
NED-P-MSD-4; Auxiliary Feed Water Flow Analysis; Revision 0
NEP-12-02; 1/2AF005A - H Trim Sizing Calculation; Revision 0
EQC-GN-002; Degraded Voltage Impact on AC/DC Motor Starting Capability; Revision 00
MSC-GN-001; Study for Degraded Voltage Impact on DC Motor Starting Capability; Revision 01
SBO-1; Diesel Generator Motor Starting Capability; September 6, 1989
004-E-002-AF; MOV Terminal Voltage Calc; Revision 003
004-E-039; Byron Units 1 & 2 MCC Bus Voltage Based on Second Level Degraded Voltage Relay Setpoint; September 16, 1992
19AK-2; Review of CC, CS and AF Pumps Motor Currents; Revision 0
19AQ-72; 125 VDC Voltage Drop Calculation; Revision 5

Condition Reports

CR 0022129; B2000-00138 Voltage Drop for 2A, 2B RH PMP Switchgear Breaker; dated January 12, 2000
CR 0030661; B2000-01721 Inconsistency Between Byron Breaker Testing; dated June 12, 2000
CR 0041662; B2000-03963 ESF Battery Sizing Calculation Needs to Include; dated December 27, 2000
CR 0055362; B2001-02492 Question on Surveillance Applicability; dated May 22, 2001
CR 0054347; B2001-02617 110 Volt Positive DC Ground on DC Bus 111; dated June 14, 2001
CR 0053743; B2001-02500 Inconsistent Acceptance Criteria for New Capacitors; dated May 30, 2001
CR 0070833; B2001-03254 OE12508 - Control Room Supply Damper Inoperable; dated July 25, 2001
CR 0078487; *High Equalize Voltage DC 111; dated October 10, 2002
CR 0082173; Maintaining AF Pump Day Tank Levels > 50%; dated November 08, 2001

CR 0087346; 2AF018B Found Closed, Should Be Throttled 1/4 Turn Open; dated December 19, 2001
CR 0090954; 1B AF Pp “A” Batt Charger Found with Breakers Mispositioned; dated January 16, 2002
CR 095876; 125 DC Ground Checks Actuating Opposite Train Pen Recorder; dated February 20, 2002
CR 0100718; 1AF01PB Gear Box Lube Oil Pump High Vibration; dated March 24, 2002
CR 0102718; Potential Reliability Problem with DC Bus 212; dated April 7, 2002
CR 0103529; Instrument out of Tolerance, Expanded Tolerance Exceeded; dated April 11, 2002
CR 0100825; Valve blocks (1SX173 / 1SX178) Installed Without CCRD Update; dated March 23, 2002
CR 0110787; Battery 223 Problems; dated June 5, 2002
CR 0112705; 212 Charger Trouble Alarm; dated June 20, 2002
CR 0114211; 1FY-AF013A Out of Expanded Tolerance Value; dated July 2, 2002
CR 0114216; 1FY-AF033C Out of Expanded Tolerance Value; dated July 2, 2002
CR 0116930; Equip Drain Line in 2A and 2B AF Pump Rm Plugged; dated July 24, 2002
CR 0119237; AF Diesel Tachometer Cal Tolerance Need to be Examined; dated August 13, 2002
CR 0121511; 2B AF Pump Room Drain Completely Plugged; dated September 4, 2002
CR 0123324; Instrument out of Tolerance; dated September 17, 2002
CR 0124320; Near Invalidation of 125 VDC Bus 212 Load Shed Test; dated September 24, 2002
CR 0130359; “Biddle” Ground Fault Tracer Causes 55VDC Ground on Bus 112; dated October 5, 2002
CR 0133555; Wrong Battery Capacity Table in Procedure; dated November 30, 2002
CR 0135813; DC Battery Charger 212 Failure; dated December 15, 2002
CR 0137254; Low Voltage on DC Bus 211 Found During Performance of Surv; dated December 24, 2002
CR 0140761; CST Level Inadequate Using Current Emergency Procedures; dated January 23, 2003
CR 0141966; Aux Feed Flow Instrumentation Failed Low; dated January 30, 2003
CR 0100799; 1AF004B Local Stroke Time Exceeded Acceptance Criteria; dated March 25, 2002
CR 0123983; Low Lube Oil Temp. Limit on Diesel Aux. Feedwater Pumps; dated December 22, 2002
CR 0133982; Long Standing Equipment Deficiencies (SX Water on the Floor of the AF Pump Rooms Every Time the 2BOSR 0.5.3.AF.1-2 Surveillance Is Performed Due to a Clogged Drain); dated December 4, 2002
CR 0144991; Failed Circuit Card; dated February 17, 2003
CR 0145549; Battery Surveillance Not Performed Due to Lack of Test Equivalence; dated February 20, 2003
CR 0147225; 1B AF Float/Equalize Switch Intermittent; dated March 3, 2003
CR 0147424; 1B AF Level Switch 1LS-DO031; dated March 3, 2003
CR 0147428; 1LS-DO031 Calibration Scheduled During 1AF01EA-1 CHGR INSP; dated March 3, 2003
CR 0149235; Indicated Recirc Flow for 2B AF Pp w/o Running; dated March 15, 2003
CR 0149382; 212 DC Bus Voltage; dated March 17, 2003
CR 0152920; Surveillances Not Sent to SED for Review; dated April 6, 2003

CR 0153963; Pump Curves in AF-3 do Not Match Calc Curves; dated April 15, 2003
CR 0154148; Limitations in Operating Procedure Not Consistent with Calcs; dated April 16, 2003
CR 0154381; Design Flow Req. Not Reflected in Procedures; dated April 17, 2003
CR 0154394; AFW Flow Path Verification After Shutdown; dated April 17, 2003
CR 0154626; Design Inspection Discrepancy; dated April 18, 2003
CR 0154658; Design Inspection Calculation Discrepancies; dated April 18, 2003
CR 0155655; Response to NRC Bulletin 88-04 Incomplete; dated April 24, 2003
CR 0157062; Recirculation Operation of the AFW System Results in the Pressure in Excess of the Design Pressure; dated May 2, 2003
CR 0159869; 4" Floor Drain Shown on Drawing A-230 Does Not Exist in the 2B AFW Room; dated May 2003

Condition Reports Written as a Result of the Inspection

CR 157290; Untimely Corrective Action on CO_2 Storage Tank Issue; dated May 5, 2003
CR 157649; 7300 System NCB Card Drawing Discrepancy; dated May 7, 2003
CR 157720; Emergency Lighting Not Aimed at Equipment; dated May 6, 2003
CR 157811; 2B AF Pump Vibration Reference Value in Error; dated May 8, 2003
CR 157816; No Calculation to Address Hydrogen Generation by DDAF Pump Ni-Cad Battery Banks; dated May 8, 2003
CR 157817; Potential CST Level Transmitter Scaling Error; dated May 8, 2003
CR 157904; Calculation PSA-B-97-17 Incorrectly Indicates the AF005's Are Non-safety Grade; dated May 8, 2003
CR 157922; Calculation Incorrectly Identified as Byron Applicable; dated May 8, 2003
CR 157940; NRC Concern for AF Non-vented Loop-seal (Inverted); dated May 8, 2003
CR 157954; Ultrasonic Tests Reveals Air in ½" Aux Feed Line; dated May 8, 2003
CR 157984; IST Data Base Issues; dated May 9, 2003
CR 158031; AF Pump Minimum Flow in Vendor Manual Is 100 gpm Which Exceeds the UFSAR and the Surveillances Procedure Flow of 85 gpm; dated May 9, 2003
CR 158062; AF005 Valve Positioners Classified Non-safety Related; dated May 9, 2003
CR 158414; Quarterly Pump Surveillance Procedures Have No Expected Flowrate to Ensure the Minimum Flow During Flush of AF to SX; dated May 12, 2003
CR 158958; Errors in Calculation PSAG-138; dated May 15, 2003
CR 158999; Unit 2 Calculation Referenced Unit 1 Calculation; dated May 15, 2003
CR 159149; Numerical Error in Calculation NED-I-EIC-0186 Rev. 1; dated May 15, 2003
CR 159167; Surveillance for Simultaneous Start of Both AF Pumps with Flow to the Steam Generators Does Not Consider Flow Uncertainty; dated May 16, 2003
CR 159208; Lack of NPSH Calc. for AF Cooling Water Pumps; dated May 16, 2003
CR 159251; Typographical Errors Identified in Calculation; dated May 16, 2003
CR 159299; Calculation PSA-B-97-31 Reference Does Not Exist; dated May 17, 2003
CR 159305; Calculation AF-91 contains Outdated Information; dated May 17, 2003
CR 159411; Calc. Require for AF Day Tank Minimum Volume; dated May 19, 2003
CR 159541; The AFW Hydraulic Calculations Predicted Flow of 146 gpm Which Is less than Analyzed Flow to 151 gpm Stated in UFSAR; dated May 19, 2003
CR 159670; Small Diesel Template Hose Inspection; dated May 20, 2003
CR 159689; Inaccurate Alarm Setpoint on Procedure; dated May 20, 2003
CR 159702; Inconsistency in UFSAR Assumptions; dated May 20, 2003
CR 159707; Small Diesel Template Battery Inspection; dated May 20, 2003

CR 159770; Calculation AFW-KG1 Needs to be Voided; dated May 20, 2003
CR 159773; Designate AF005 Valves as Passive in IST Program; dated May 20, 2003
CR 159779; Short Term AF Flows May Exceed Original Max Flows; dated May 20, 2003
CR 159783; UFSAR Section 10.4.9.3.2 Statement Concerning No Operator Action Requires Clarification; dated May 20, 2003
CR 159833; AF Recirc Flow Placards Removed from MCB; dated May 21, 2003
CR 159974; AF013's Not Listed in UFSAR Active Valve Table; dated May 22, 2003
CR 160022; AF-TH06 and MAD 89-0175 Contain Outdated Information; dated May 22, 2003
CR 160059; DDAF Pump Speed Affect on Maximum Pressure; dated May 22, 2003
CR 160098; No Procedural Requirements to Control Max AF Flows; dated May 22, 2003
CR 160105; Diesel AFW Pumps NPSHR Not Adjusted for Speed.; dated May 23, 2003
CR 160119; Installer's notes on AF Pump Fuel Schematic Not Met; dated May 23, 2003
CR 160201; AF Suction Pressure Fluctuations with CC Surge Tank Makeup; dated May 23, 2003
CR 160284; AF Diesel Fuel Oil Pump was on Shelf Without Technical Evaluation; dated May 23, 2003
CR 160296; AF Flow Indication Found Pegged Low; dated May 23, 2003
CR 160391; CAP Program CR Threshold for Equipment Failures; dated May 23, 2003

Correspondence

Exelon Nuclear (Richard P. Lopriore) to USNRC (B. Clayton); Subject: Byron Stations, Units 1 and 2 Response to Request for Evaluation - NRC Tracking No. 02-A-0136 (Operability of the Combustion Air Line for the Diesel That Powers an Auxiliary Feedwater (AFW) pump); dated October 17, 2002
Exelon Nuclear (Keith R. Jury) to USNRC; Subject: RS-02-173, Request for a License Amendment to add a Technical Specification Surveillance Requirement for the Diesel-Driven Auxiliary Feedwater Pump; dated December 12, 2002
Sargent & Lundy Engineers (M. S. Caragher) to Commonwealth Edison Company; Subject: CQD File No. CQD-027658, Classification and Documentation of the following Mobil Oil Lubricant for the Auxiliary Feedwater Pump Diesel and the Diesel Generator, (F-2891 & F02742)
Supplemental Response to NRC Bulletin 88-04; dated February 21, 1989
Response to NRC Bulletin 88-04; dated July 11, 1988
Response to NRC Inspection Report 50-454/455/86040; dated December 15, 1986

Drawings

2PL05J and Aux. Safeguards Rly Cabinets 2PA27J & 2PA28J 125 VDC Voltage Distribution; Revision H
6E-1-4001A; Station One Line Diagram; Revision L
6E-1-4001B; Station Key Diagram; Revision R
6E-1-4001C; Station Key Diagram; Revision T
6E-1-4001D; Station Key Diagram; Revision N
6E-1-4001E; Station Key Diagram; Revision J
6E-1-4010A; Key Diagram 125V DC ESF Distribution Center Bus 111; Revision L
6E-1-4010D; Key Diagram 125V DC ESF Distribution Center Bus 112; Revision L
6E-1-4030AF01; Schematic Diagram Auxiliary Feedwater Pump 1A 1AF01PA; Revision AA

6E-1-4030AF02; Schematic Diagram Auxiliary Feedwater Pump 1B (Diesel Driven) 1AF01PB; Revision AA
6E-1-4030AF03; Schematic Diagram Auxiliary Feedwater Pump 1A, 1B Lube Oil Pumps 1AF01PA-A & 1AF01PB-1; Revision P
6E-1-4030AF04; Schematic Diagram Auxiliary Feedwater Pumps 1A & 1B Essential Service Water Suction Valves 1AF006A & B; Revision R
6E-1-4030AF05; Schematic Diagram Auxiliary Feedwater Regulating Valves 1A, 1B, 1C & 1D; Revision M(second M)
6E-1-4030AF06; Schematic Diagram Auxiliary Feedwater Regulating Valves 1E, 1F, 1G & 1H; Revision M(second M)
6E-1-4030AF07; Sch. Diag. Steam Gen. 1A Aux FW Isolation Valves 1AF013A and 1AF013E; Revision Q
6E-1-4030AF08; Sch. Diag. Steam Gen. 1B Aux FW Isolation Valves 1AF013B and 1AF013F; Revision Q
6E-1-4030AF09; Sch. Diag. Steam Gen. 1C Aux FW Isolation Valves 1AF013C and 1AF013G; Revision Q
6E-1-4030AF10; Sch. Diag. Steam Gen. 1D Aux FW Isolation Valves 1AF013D and 1AF013H; Revision Q
6E-1-4030AF11; Schematic Diagram Auxiliary Feedwater Pumps 1A & 1B Essential Service Water Suction Valves 1AF017A & B; Revision M
6E-1-4030AF12; Schematic Diagram Auxiliary Feedwater Pump 1B (Diesel Driven) Startup Panel 1AF01J; Revision AE
6E-1-4030AF13; Schematic Diagram Aux. Feedwater Pump 1B Startup Panel 1AF01J Annunciator; Revision L
6E-1-4030AF14; Schematic Diagram Auxiliary Feedwater Pump 1A &1B Discharge Test Valves 1AF004A & 1AF004B; Revision N
6E-1-4030AF15; Schematic Diagram Cond. Recirculating Valves 1AF022A & 1AF022B ESS Service Water Recirc. Valve-1AF024; Revision G
6E-1-4030AF16; Schematic Diagram Manual Operated Valves; Revision H
6E-1-4030AF17; Schematic Diagram Auxiliary Feedwater Pump 1B Gear Box Lube Oil Pump 1AF01PB-C; Revision H
6E-1-4030DC05; 125 V DC ESF DIST Center Bus 211 Part 1 & 125 V DC ESF PNL 211; Revision T
6E-1-4030DC05; Schematic Diagram 125VDC ESF Dist Center Bus 111 Part 1; Revision U
6E-1-4030DC06; Schematic Diagram 125VDC ESF Dist Center Bus 111 Part 2; Revision N
6E-1-4030DC08; Schematic Diagram 125VDC ESF Dist Center Bus 112 Part 1; Revision V
6E-1-4030DC09; Schematic Diagram 125VDC ESF Dist Center Bus 112 Part 2; Revision N
6E-1-4030DC15; 125 V DC ESF 11 Fuse Panel 1DC10J Control Power Distribution; Revision L
6E-1-4030DC16; 125 V DC ESF 12 Fuse Panel 1DC10J Control Power Distribution; Revision K
6E-1-4030EF05; Schematic Diagram Safeguards Test Cabinet Train A Test Relays Development Part 2; Revision G
6E-1-4030EF11; Schematic Diagram Reactor Protection System Output Relays Development Tr. A; Revision Y

6E-1-4030EF102; Schematic Diagram Safeguards Test Cabinet 1PA11J Train A Test Circuits; Revision J
6E-1-4031CD01; Loop Schematic Diagram Condensate Storage Tank Level Control; Revision K
6E-1-4031AF01; Loop Schematic Diagram Aux. Feedwater Steam Gen 1A Flow Cont. System ESF-11 PNL 1PA33J; Revision N
6E-1-4031AF02; Loop Schematic Diagram Aux. Feedwater Steam Gen 1A Flow Cont. System ESF-12 PNL 1PA34J; Revision L
6E-1-4031AF03; Loop Schematic Diagram Aux. Feedwater Steam Gen 1B Flow Cont. System ESF-11 PNL 1PA33J; Revision S
6E-1-4031AF04; Loop Schematic Diagram Aux. Feedwater Steam Gen 1B Flow Cont. System ESF-12 PNL 1PA34J; Revision L
6E-1-4031AF05; Loop Schematic Diagram Aux. Feedwater Steam Gen 1C Flow Cont. System ESF-11 PNL 1PA33J; Revision R
6E-1-4031AF06; Loop Schematic Diagram Aux. Feedwater Steam Gen 1C Flow Cont. System ESF-12 PNL 1PA34J; Revision L
6E-1-4031AF07; Loop Schematic Diagram Aux. Feedwater Steam Gen 1D Flow Cont. System ESF-11 PNL 1PA33J; Revision N
6E-1-4031AF08; Loop Schematic Diagram Aux. Feedwater Steam Gen 1D Flow Cont. System ESF-12 PNL 1PA34J; Revision P
6E-1-4031AF09; Loop Schematic Diagram Aux FW Pumps 1A & 1B Discharge Pressure; Revision D
6E-1-4031AF11; Loop Schematic Diagram 48VDC Power Supply; Revision D
6E-1-4031AF12; Loop Schematic Diagram Aux FW Pumps 1A & 1B Recirc Flow and Suction Pressure; Revision B
6E-1-4031AF13; Loop Schematic Diagram Auxiliary Feedwater Pump Suction Pressure Cab 1PA33J; Revision C
6E-1-4031AF14; Loop Schematic Diagram Auxiliary Feedwater Pump Suction Pressure Cab 1PA34J; Revision B
6E-1-4160A; External Wiring Diagram Miscellaneous Control System Cabinet ESF-11 1PA33J; Revision AB
6E-1-4161A; External Wiring Diagram Misc. Control System Cabinet ESF-12 1PA34J; Revision AA
6E-1-4200; Internal & External Wiring Diagram Condensate Storage Tank Heaters; Revision G
6E-1-4458B; External Wiring Diagram Misc. Control System (ESF) Locally Mounted I/P Transducers, Part 1; Revision E
6E-2-4001A; Station One Line Diagram; Revision K
6E-2-4001D; Station Key Diagram; Revision L
6E-2-4001E; Station Key Diagram; Revision K
6E-2-4030AF12; Schematic Diagram Auxiliary Feedwater Pump 2B (Diesel Driven) Startup Panel 2AF01J; Revision AE
6E-2-4030DC22; Schematic Diagram Remote Shutdown Control Panels 2PL04J & M-36, Sheet 1A; Diagram of Feedwater (Main); Revision AV
302-B50090, Sheet 1; Pacific Pumps Division, Dresser Industries, Inc. - Outline; Revision 6
38092A; Pacific Pumps Dresser Test Performance Curve, 1AF01PA; Dated June 24, 1979

38092B; Pacific Pumps Dresser Test Performance Curve, 1AF01PB; Dated June 28, 1979
38092C; Pacific Pumps Dresser Test Performance Curve, 2AF01PA; Dated September 12, 1979
38092D; Pacific Pumps Dresser Test Performance Curve, 2AF01PB; Dated September 12, 1979
62240-1, Sheet 1; Installation Drawing - 16V-149T1; Auxiliary Feedwater Pump Drivers; Revision D
62240-1, Sheet 2; Installation Drawing - 16V-149T1; Auxiliary Feedwater Pump Drivers; Revision D
62241, Stewart & Stevenson Services, 16V-149T1; Auxiliary Feedwater Pump Drive Engine Cooling System; Revision D
M-36, Sheet 1A; Diagram of Feedwater (Main); Revision AV
M-36, Sheet 1B; Diagram of Feedwater (Main); Revision AW
M-36, Sheet 1C; Diagram of Feedwater (Main); Revision AW
M-36, Sheet 1D; Diagram of Feedwater (Main); Revision AV
M-37; Diagram of Auxiliary Feedwater; Revision AV
M-39, Sheet 1; Diagram of Condensate (Make-up & Overflow); Revision AW
M-42, Sheet 3; Diagram of Essential Service Water; Revision AV
M-82, Sheet 12; Diagram of Auxiliary Building Equipment Drains; Revision T
M-95, Sheet 5; Diagram of Auxiliary Building HVAC System (VA); Revision H
M-95, Sheet 15; Diagram of Auxiliary Building HVAC System (VA) Cubicle Cooler; Revision K
M-121, Sheet 1A; Diagram of Feedwater (Main); Revision AL
M-121, Sheet 1B; Diagram of Feedwater (Main); Revision AL
M-121, Sheet 1C; Diagram of Feedwater (Main); Revision AM
M-121, Sheet 1D; Diagram of Feedwater (Main); Revision AD
M-122; Diagram of Auxiliary Feedwater; Revision AW
M-124, Sheet 1; Diagram of Condensate (Make-up & Overflow); Revision AW
M-126, Sheet 1; Diagram of Essential Service Water; Revision AV
M-553, Sheet 10; Turbine Building El. 369’ 0" Condensate Make-up Sys. Byron Sta. Unit 2; Revision M
M-553, Sheet 31; Turbine Building Condensate Make-up System Byron Station Unit-1; Revision B
M-556, Sheet 13; Circ. Wtr. Pump House El. 881’ 0", Auxiliary Bldg. Piping El. 383’ 0"; Revision L
M-556, Sheet 14; Auxiliary Bldg. El. 383’ 0" & 451’ 0", Diesel Oil (D. O.) System; Revision K
M-556, Sheet 22; Turbine Bldg. El. 369’ 0" - 401’ 0", Diesel Fuel Oil System; Revision E
93-14494, Sheet 1; 6" - 150 Weld Ends, Carbon Steel Flex Wedge Gate Valve with 12" Air Cylinder; Revision G
M-841; Instrument Locations Misc. Outdoor Plans; Revision H
M-909; Condensate Tank Pit Piping; Revision J
M-2037 Sh. 1; C&ID Aux. Feedwater System; Revision N
M-2037 Sh. 2; C&ID Aux. Feedwater System; Revision G
M-2037 Sh. 3; C&ID Aux. Feedwater System; Revision H
M-4037-1AF01; Control Logic Diagram Aux. FW. Pumps; Revision M
T289-1PSL-AF055 Sh.1; 1AF055 Piping Isometric; Revision 3
T289-1PSL-AF055 Sh.2; 1AF055 Piping Isometric; Revision 3

T383-1PSL-AF051 Sh.1; 1AF051 Piping Isometric; Revision 12
T383-1PSL-AF051 Sh.2; 1AF051 Piping Isometric; Revision 5
T383-1PSL-AF051 Sh.2; 1AF051 Piping Isometric; Revision 2
T650-2PSL-AF055; 2AF055 Piping Isometric; Revision 4
T681-2PSL-AF051 Sh.1; 2AF051 Piping Isometric; Revision 6
T681-2PSL-AF051 Sh.2; 2AF051 Piping Isometric; Revision 6

Design/Engineering Changes

DCP 9700391; Provide Dampening for Aux Feedwater Lo-Suction Pressure Signal to Prevent Unwanted Alarms & Actuations; dated August 14, 1997
DCP 9700558; Replace Existing Trim Components in AF005A-H with Characterized Disc Stack and Plug; Completed February 18,1998
DCP 9700559; Modify 2AF005 Valves with New Trim; Completed November 16,1999
DCR 990381; Battery Duty Cycle and Sizing for the Byron Diesel Driven Auxiliary Feedwater Pumps and the Byron Diesel Driven Essential Service Water Makeup Pumps; Revision 1
DCP 9900827; Isolate Instrument Air (IA) to Essential Service Water System (SX) Valves 2SX173 and 2SX178 during Normal Operation; Revision 0
DCP 9900828; Isolate Instrument Air (IA) to Essential Service Water System (SX) Valves 1SX173 and 1SX178 during Normal Operation; Revision 0
EC 78974; Install Bypass and Check Valve in Air Supply for Valve 2AF024; Revision 0
EC 79575; Auxiliary Feedwater to Steam Generator Flow Control for Power Uprate; Revision 0
EC 97123; Replace Voltage Regulator DC-DC Isol. Transducers; Revision 0
EC 339308 000; Develop Tube Plugging Criteria for GL 89-13 Heat Exchangers, Work with Harlan Kats to Determine Scope of HX in the Program; dated February 06. 2003
EC 333008; Evaluate DC Bus Crosstie Voltage Drop Concerns; dated April 24, 2002
EC 333054 000; Inspect Valve Internals for Excessive Corrosion / Degradation; dated March 24, 2002
EC 338067; Replace Existing AF System Diesel Fuel Shutoff Valve; Revision 0
EC 339526; New SSV is Being Procured with 18 inch Pigtails and Will Require Bolted Splice for Installation; Revision 1
EC 092620; As Built Revisions to 1/2AF004A/B Inst. Air P&ID's; dated January 18, 2001

Lesson Plan

I1-AF-XL-01; Chapter 26, PWR Initial License Training / Systems - Auxiliary Feedwater System (AF); Revision 3

Miscellaneous

CHRON # 0306210; Operability Determination for the Auxiliary Feedwater Pump Suction Piping; February 10, 1995
NRC Inspection Report 50-454/86040; dated November 25, 1986
NRC Inspection Report 50-454/87038; dated October 13, 1987
NRC Inspection Report 50-454/88020; dated November 23, 1988
NRC Inspection Report 50-456/457/99013; dated September 17, 1999
NRC Inspection Report 50-456/457/98-201; dated June 1, 1998

IST AF Pump Data from May 2000 to Present
Auxiliary Feedwater Monthly SHIP System Report; April 2003
DC Power Storage and Distribution Monthly SHIP System Report; April 2003
AR 126194; SSDI Readiness for AF and DC Systems

Nuclear Design Information Transmittal

BYR-96-028; Turbine Building HELB Affect on Diesel Driven AF Pump; dated February 19, 1996
RSG-97-038; Evaluation of the Use of the CST as the AFW Cooling Water Supply following a SGTR or MSL Break Accident; dated September 25, 1997
RSG-97-056; Transmittal of CST Usable Volume Requirements for the AFW System; dated December 10, 1997
970246; Condensate Storage Tank Technical Specification Levels for Byron and Braidwood; Revision 0

Operability Evaluation

LOG 98-005; Full Flow IST of AF Check Valves; dated January 19, 1998
OE 03-001; Condensate Storage Tank (CST) Level Inadequate using Current Emergency Procedures; Revision 0
OE 03-004; Non-Safety Related Positioners on Safety Related Valves; Revision 0
ER 01-002; Air Intake for the Unit 1 AF Pump Diesel; Revision 1

Procedures

1AF-011; Calibration of Auxiliary Feedwater to Steam Generator 1A Flow Control Loop (AF); dated September 21, 2001
1AF-051; Calibration of Auxiliary Feedwater Pump 1A Suction Pressure Loop (AF); dated December 17, 2002
1-AF-055; Calibration of Auxiliary Feedwater Pump 1B Suction Pressure Loop (AF); dated December 17, 2002
2AF-051; Calibration of Auxiliary Feedwater Pump 2A Suction Pressure Loop (AF); dated December 17, 2002
2-AF-055; Calibration of Auxiliary Feedwater Pump 2B Suction Pressure Loop (AF); dated December 17, 2002
2AF-8002; Calibration of Auxiliary Feedwater Diesel Driven Pump 2B Tachometer and Engine Speed Switch; dated August 16, 2002
BAR 0-37-C1; CST Level High Low; Revision 6
BAR 1(2)-3-B6; AF Pump Auto Start; Revision 4
1-BEP-1; Loss of Reactor or Secondary Coolant; Revision 102
1-BEP-2; Faulted Steam Generator Isolation; Revision 100
0/1/2BHSR AP-2; Preventive Maintenance Inspection of 4kV and 6.9 kV Circuit Breakers; Revision 2
1/2BHSR DC-12; 125 VDC Class 1E to Non-Class 1E Circuit Isolation Devices (Fuses); Revision 1
BMP 3203-1; Preventive Maintenance of Auxiliary Feedwater Pump Diesel Drive Unit; Revision 7
1BOL 7.6; LOCAR Condensate Storage Tank (CST) Tech Spec LCO #3.7.6; Revision 3

2BOL 7.6 LOCAR Condensate Storage Tank (CST) Tech Spec LCO #3.7.6; Revision 3
BOP DC-2; 125VDC Battery Charger Shutdown; Revision 7
BOP DC-E1; DC System Electrical Lineup; Revision 10
BOP DC-E1A; DC System Electrical Lineup; Revision 10
BOP DC-E1B; DC System Electrical Lineup; Revision 10
BOP DC-E1C; DC System Electrical Lineup; Revision 10
0BOSR 0.1-0; Unit Common All Modes/All Times Shiftly and Daily Operating Surveillance; Revision 10
1BOSR 6.6.2-1; Unit One Reactor Containment Fan Cooler Monthly Surveillance; Revision 5
1BOSR 8.6.1-1; 125 DC ESF Battery Bank And Charger 111 Operability Weekly Surveillance Data Sheet; Revision V
2BOSR 6.6.2-1; Unit 2 Reactor Containment Fan Cooler Monthly Surveillance; Revision 6
2BOSR 7.5.2-1; Unit 2 Monthly Aux. Feedwater Diesel Fuel Oil Surveillance; Revision 1
1BVSR AF-3; Simultaneous Start of Both AF Pumps with Flow to the Steam Generators; Revision 10
1BVSR SX-4; Unit 1 Essential Service Water Flow Verification; Revision 2
1BVSR 5.5.8.AF.1-1; ASME Surveillance Requirements for the Motor Driven Auxiliary Feedwater Pump; Revision 6
1BVSR 8.4.6-1; Unit 1, Bus 111 125V Battery Charger Operability; Revision 4
1BVSR 8.4.6-2; Unit 1, Bus 112 125V Battery Charger Operability; Revision 4
1BSVR 8.4.8-1; Battery 111 125 Volt Battery Bank 5 Year Modified Performance Test; Revision 2
2BVSR SX-4; Unit 2 Essential Service Water Flow Verification; Revision 2
2BVSR 5.5.8.AF.1-2; ASME Surveillance Requirements for the Diesel Driven Auxiliary Feedwater Pump; Revision 10
2BVSR 8.4.6-1; Unit 2, Bus 211 125V Battery Charger Operability; Revision 4
2BVSR 8.4.6-2; Unit 2, Bus 212 125V Battery Charger Operability; Revision 4
CC-AA-206; Fuse Control; Revision 3
MA-AA-716-210-1001; Small Diesel Engine Preventive Maintenance Template; dated July 22, 2002
MA-AA-725-102; Preventative Maintenance on Westinghouse Type DHP 4kV, 6.9, and 13.8 kV Circuit Breakers; Revision 0
MA-BY-721-061; 125 Volt Battery Bank Quarterly Surveillance; Revision 3

Root Cause/Effectiveness Review

454-230-97-SCAQ00028; AR 008972 Effectiveness Review; dated September 29, 1999
455-200-97-SCAQ00014; 2B AF Diesel Overcrank Alarm during 2BVS 0.5-3.AF.1-2; Revision 00
455-200-97-SCAQ00014S1; 2B AF Diesel Overcrank Alarm during 2BVS 0.5-3.AF.1-2; Revision 00, Supplement 1

Specifications

Specification F/L-280; for Battery Chargers Byron - Units 1 and 2; July 3, 1986
Standard N-EM-0035; Cable Standards; Revision 6

Surveillances (Date Shown Is Date Surveillance Was Completed)

1BOSR 7.5.4-1; Unit One Train A Auxiliary Feedwater Pump Emergency Actuation Signal Verification Test; March 24, 2002
1BOSR 7.5.4-2; Unit One Train B Auxiliary Feedwater Pump Emergency Actuation Signal Verification Test; February 25, 2002
1BOSR 7.5.5-1; Unit One Train A Auxiliary Feedwater Pump Emergency Actuation Signal Verification Test; March 24, 2002
1BOSR 7.5.5-2; Unit One Train B Auxiliary Feedwater Pump Emergency Actuation Signal Verification Test; March 24, 2002
1BOSR 0.5-3.AF.1-1; Unit 1 1AF017A and 1AF006A Stroke Test; April 4, 2003
1BOSR 0.5-3.AF.1-2; Unit One 1AF017B and 1AF006B Stroke Test; February 10, 2003
2BOSR 7.5.4-2; Unit Two Train B Auxiliary Feedwater Pump Emergency Actuation Signal Verification Test; September 30, 2002
2BOSR 7.5.5-1; Unit Two Train A Auxiliary Feedwater Pump Emergency Actuation Signal Verification Test; September 28, 2002
2BOSR 7.5.5-2; Unit Two Train B Auxiliary Feedwater Pump Emergency Actuation Signal Verification Test; September 30, 2002
2BOSR 0.5-3.AF.1-1; ASME Surveillance Requirements for the A Train Auxiliary Feedwater SX Supply Valves; April 21, 2003
2BOSR 0.5-3.AF.1-2; Unit 2 ASME Surveillance Requirements for the A Train Auxiliary Feedwater SX Supply Valves; March 5, 2003
1BVSR AF-3; Simultaneous Start of Both AF Pumps with Flow to the Steam Generators; March 9, 2002
1BVSR 5.5.8.AF.1-1; ASME Surveillance Requirements for the Motor Driven Auxiliary Feedwater Pump; January 2, 2003, April 2, 2003
1BVSR 5.5.8.AF.1-2; ASME Surveillance Requirements for the Diesel Driven Auxiliary Feedwater Pump; February 12, 2003
1BVSR z.7.a.1; Auxiliary Feedwater Diesel Prime Mover Inspection; March 24, 2002
2BVSR 5.5.8.AF.1-2; ASME Surveillance Requirements for the Diesel Driven Auxiliary Feedwater Pump; December 3, 2002, March 4, 2003
2BVSR z.7.a.1; Auxiliary Feedwater Diesel Prime Mover Inspection; September 29, 2002
MA-BY-721-060; 125 Volt Battery Bank 18 Month Surveillance; March 19, 2002
MA-BY-721-060; 125 Volt Battery Bank 18 Month Surveillance; September 18, 2002
MA-BY-721-061; 125 Volt Battery Quarterly Surveillance; March 31, 2003
MA-BY-721-061; 125 Volt Battery Quarterly Surveillance; April 3, 2003

Technical Specifications

3.7.5; Auxiliary Feedwater (AF) System; Amendment 106
3.7.6; Condensate Storage Tank (CST); Amendment 106
B 3.7.5; Auxiliary Feedwater (AF) System; Revision 21
B 3.7.6; Condensate Storage Tank (CST); Revision 0
B3.8.4; DC Sources-Operating; Revision 31
B3.8.5; DC Sources-Shutdown; Revision 31
B3.8.6; Battery Parameters; Revision 31

Updated Safety Analysis Report

Section 7.3.1.1.6; Auxiliary Feedwater System Operation; Revision 9
Section 8.3.2; D-C Power System; Revision 9
Section 9.2.1.2; Essential Service Water System; Revision 8
Section 9.2.5; Ultimate Heat Sink; Revision 8
Section 9.4.5.1; Auxiliary Building HVAC System; Revision 9
Section 9.4.5.3; Miscellaneous Electric Equipment Room Ventilation System; Revision 9
Section 10.4.9; Auxiliary Feedwater System; Revision 9
Table 3.9-16; Active Valves For Byron - Units 1 & 2; Revision 9
Table 9.2-1; Essential Service Water Heat Loads; Revision 5
Table 9.2-2; Single-Failure Analysis of the Essential Service Water System; Revision 5
Table 9.4-9; Auxiliary Building HVAC System Equipment Parameters, ITEM M. Diesel-Driven Auxiliary Feedwater Pumps 1A, 2A Cubicle Coolers, Original Issue of UFSAR
Table 9.4-13; Miscellaneous Electric Equipment Room Ventilation System Equipment Parameters; Revision 9
Table 9.4-14; Miscellaneous Electric Equipment Room Ventilation System Failure Analysis; Revision 9)
Attachment 10.C; An Evaluation of the Auxiliary Feedwater System Section 10.4.9 of the Standard Review Plans and Branch Technical Position ASB 10-1; Revision 9
Attachment 10.D; An Evaluation of the Auxiliary Feedwater System to the NRC Generic Short-Term and Long-Term Requirements; Revision 8
Section 15.2; Decrease in Heat Removal by the Secondary System; Revision 9

Vendor Manuals

F2348.019; Nickel-cadmium Batteries Technical Data, Block Battery Types; dated May 1, 1994
M120-036S; Model 8005A/8006A Electropneumatic Transducer Instructions; dated December 1996

Work Orders

970119177; Condensate Storage Tank Level Loop 1CD-051; dated August 18, 1999
980072297; U2-2B Diesel/Aux Feed Pump Battery Bank B Battery A (2AF01EB-A) Capacity Test; dated November 2, 2000
980134774; 1B DDAF Pump Battery Bank A Battery A Capacity Test; dated May 17, 2000
980135262; 1B DSL DRV AF PP #2 Batt; dated March 14; 2001
980135267; 1B DSL DRV AF PP #2A Batt; dated July 31, 2001
980135275; 2B DSL DRV AF PP #1A Batt; dated July 31, 2001
980135277; 2B DSL DRV AF PP #2A Batt; dated February 19, 2001
980135278; 0A SX M/U PP Batt #1; dated January 2, 2001
990036384; Condensate Storage Tank Level Loop 2CD-051; dated October 20, 2000
990090135; Condensate Storage Tank Level Loop 1CD-051; dated February 14, 2001
990157073 01; Essential Service Water Flow Verification; dated April 20, 2002
990205525; 1B DD AF Pump Battery Bank A Battery B Capacity Test; dated August 30, 2000

99035645; 4kV BKR Refurbished Breaker Swap; dated June 8, 1999
99178308; 18 Month NICAD Battery Surv Aux Feed; dated February 25, 2002
99199722; 18 Month NICAD Battery Surv Aux Feed Di; dated April 16, 2002
99209930; 1A AF PP Breaker PM Bus 141 Cub 8 ; dated January 25, 2002
99214012; Inspect ESF to Non-ESF Separation; dated November 27, 2001
99215024 01; 2VA085 - HX Inspection per Generic Letter 89-13, 2B Diesel Driven AF Pump Cublcle Cooler; dated September 20, 2002
99217721; Sta Battery Surv 18 Month Check Physical Condition; dated December 3, 2001
99217722; Sta Battery Surv 18 Month Check Physical Condition; dated July 23, 2001
99224991; Condensate Storage Tank Level Loop 2; dated April 16, 2002
99270742; 18 Month NICAD Battery Surv Aux Feed Diesel; dated January 9, 2003
99275589; Inspect ESF to Non-ESF Separation; dated February 28, 2002
99275593 01; 2SX02K - HX Inspection per Generic Letter 89-13, 2B AF Pump Right Angle Lube Oil Cooler; dated September 20, 2002
99275594 01; 2SX01K - HX Inspection per Generic Letter 89-13, 2B AF Pump Engine Closed Cycle HX; dated September 22, 2002
99275648 01; 2AF01AB - HX Inspection per Generic Letter 89-13, 2B Diesel Driven AF Pump Oil Cooler; dated September 20, 2002
99275649 01; 2AF02A - HX Inspection per Generic Letter 89-13, 2B Diesel Driven AF Pump Gear Oil Cooler; dated September 22, 2002
00349198; 18 Month NICAD Battery Surv Aux Feed Diesel; dated February 4, 2003
00355856; Calibration of Auxiliary Feedwater to Steam Generators; dated March 25, 2003
00359473; Calibration of Auxiliary Feedwater to Steam Generators; dated April 18, 2003
00359091; Calibration of Auxiliary Feedwater to Steam Generators; dated April 8, 2003
00361215; Calibration of Auxiliary Feedwater to Steam Generators; dated March 24, 2003
00511948; Bank “B” Batt “A” Quarterly NICAD Battery Surv AF; dated February 11, 2003
00511949; Bank “A” Batt “B” Quarterly NICAD Battery Surv AF; dated February 11, 2003
00511950; Bank “A” Batt “A” Quarterly NICAD Battery Surv AF; dated February 11, 2003
00511951; Bank “B” Batt “B” Quarterly NICAD Battery Surv AF; dated February 11, 2003
00545392; Functional Test of AF Pump Suction Pressure; dated March 26, 2003
00545393; Functional Test of AF Pump Suction Pressure; dated March 12, 2003
00550031; Functional Test of AF Pump Suction Pressure; dated April 2, 2003
00551395; Functional Test of AF Pump Suction Pressure; dated April 9, 2003
00554064; Functional Test of AF Pump Suction Pressure; dated April 16, 2003
00561771; Functional Test of AF Pump Suction Pressure; dated April 30, 2003

Work Requests

00039870; 1AF005H Oscillates 190 to 135 gpm; dated March 9, 2002
00063540; Drain Line Plugged; Dated September 4, 2002
00098927; Aux FW to SG 1A Flow Ind [pegged low]; dated May 19, 2003

10CFR50.59 Safety Evaluations

6G-97-0189; Modification of Byron Unit 1 1AF005 A-H Valves; dated October 23, 1997
6G-99-0263; Modification of Byron Unit 2 2AF005 A-H Valves; dated September 25, 1998

LIST OF ACRONYMS USED

AC	Alternating Current
ADAMS	Agency-wide Document Access and Management System
AF/AFW	Auxiliary Feedwater
ASME	American Society of Mechanical Engineers
CFR	Code of Federal Regulations
CR	Condition Report
CST	Condensate Storage Tank
DDAF	Diesel Driven Auxiliary Feedwater
DC	Direct Current
DRS	Division of Reactor Safety
FIN	Finding
gpm	Gallons per Minute
IMC	Inspection Manual Chapter
IR	Inspection Report
IST	Inservice Testing
L/D	Length over Diameter
LLC	Limited Liability Company
NCV	Non-Cited Violation
NPSH	Net Positive suction Head
NRC	Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
OA	Other Activities
PARS	Publicly Available Records System
psi	Pounds per Square Inch
rpm	Revolutions per Minute
SDP	Significance Determination Process
SX	Essential Service Water
UFSAR	Updated Final Safety Analysis Report