UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
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LISLE, IL 60532-4352

May 18, 2011

Mr. Christopher R. Costanzo
Vice President
NextEra Energy Duane Arnold, LLC
3277 DAEC Road
Palo, IA 52324-9785

SUBJECT: DUANE ARNOLD ENERGY CENTER COMPONENT DESIGN BASES INSPECTION (CDBI) REPORT 05000331/2011009

Dear Mr. Costanzo:

On April 28, 2011, the U.S. Nuclear Regulatory Commission (NRC) completed a Component Design Bases Inspection (CDBI) at your Duane Arnold Energy Center. The enclosed report documents the results of this inspection, which were discussed on March 4, 2011, with you and other members of your staff and on April 28, 2011, with Mr. K. Kleinheinz.

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

Based on the results of this inspection, three NRC-identified findings of very low safety significance were identified. Two of the findings involved violations of NRC requirements. However, because of their very low safety significance, and because the issues were entered into your corrective action program, the NRC is treating the issues as Non-Cited Violations (NCVs) in accordance with Section 2.3.2 of the NRC Enforcement Policy

If you contest the subject or severity of this NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Regional Administrator, U.S. Nuclear Regulatory Commission - Region III, 2443 Warrenville Road, Suite 210, Lisle, IL 60532-4352; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the Resident Inspector Office at the Duane Arnold Energy Center. In addition, if you disagree with the cross-cutting aspect assigned to any finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region III, and the NRC Resident Inspector at the Duane Arnold Energy Center.

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

Sincerely,

/RA/

Ann Marie Stone, Chief
Engineering Branch 2
Division of Reactor Safety

Docket Nos. 50-331
License No. DPR-49

Enclosure: Inspection Report 05000331/2011009
w/Attachment: Supplemental Information

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No:	50-331
License No:	DPR-49
Report No:	05000331/2011009
Licensee:	NextEra Energy Duane Arnold, LLC
Facility:	Duane Arnold Energy Center
Location:	Palo, IA
Dates:	January 31 through April 28, 2011
Inspectors:	Andrew Dunlop, Senior Engineering Inspector, Lead Benny Jose, Senior Engineering Inspector, Electrical Michael Jones, Engineering Inspector, Mechanical Bruce Palagi, Operations Inspector Omar Mazzoni, Electrical Contractor Craig Baron, Mechanical Contractor
Approved by:	Ann Marie Stone, Chief Engineering Branch 2 Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000331/2011009, 01/31/2011 – 04/28/2011; Duane Arnold Energy Center, Component Design Bases Inspection (CDBI).

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

A. NRC-Identified and Self-Revealed Findings

Cornerstone: Mitigating Systems

- Green. The inspectors identified a finding of very low safety significance (Green) and associated Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," involving the licensee's failure to ensure sufficient thrust margins for 480 VAC safety-related motor operated valves (MOVs). Specifically, when the Electrical Transient Analysis Program (ETAP) AC power analysis was made the calculation of record, the results in some cases reduced the safety-related MOV terminal voltages, which were not incorporated into the MOV thrust calculations. The licensee entered this finding into their corrective action program and verified that the safety-related MOVs had positive thrust margins.

  The finding was determined to be more than minor because it was associated with the Mitigating Systems Cornerstone attribute of Equipment Performance, and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, there was reasonable doubt as to whether the subject MOVs would have sufficient thrust margins to perform their safety function during a design basis accident. The finding screened as very low safety significance (Green) because the finding was not a design or qualification deficiency, did not represent a loss of system safety function, and did not screen as potentially risk significant due to a seismic, flooding, or severe weather initiating event. The finding had a cross-cutting aspect in the area of human performance because the licensee did not plan and coordinate work activities consistent with nuclear safety. Specifically, the licensee failed to appropriately coordinate and interface with other departments while performing the ETAP calculation. [H.3(b)] (Section 1R21.3.b.(1))

- Green. The inspectors identified a finding of very low safety significance (Green) and associated Non-Cited Violation of Technical Specification 5.5.6, "Inservice Testing Program," for the failure to perform the required testing in accordance with the American Society of Mechanical Engineers Code for eight valves that had active safety functions. Specifically, these valves were required to operate in Mode 3 to return the residual heat removal system from the shutdown cooling mode to the low pressure coolant injection mode of operation. The licensee entered this finding into their corrective action program

and verified that the valves were operable based on recent exercising of the valves during the last refueling outage.

The finding was determined to be more than minor because it was associated with the Mitigating Systems Cornerstone attribute of Equipment Performance, and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the licensee would be unable to trend the performance of the valves due to inadequate testing, which could result in not identifying degraded valve performance. The finding screened as very low safety significance (Green) because the finding was not a design or qualification deficiency, did not represent a loss of system safety function, and did not screen as potentially risk significant due to a seismic, flooding, or severe weather initiating event. The finding had a cross-cutting aspect in the area of problem identification and resolution because the licensee failed to identify a condition adverse to quality. Specifically, when the licensee identified the concern with additional valves during an extent of condition review, the licensee failed to initiate a new action request to ensure the condition adverse to quality was adequately evaluated. [P.1(a)] (Section 1R21.6.b.(1))

- Green. The inspectors identified a finding of very low safety significance (Green) in that, the licensee did not adequately ensure the operation of the reactor core isolation cooling (RCIC) system was within the capability of the 125 VDC station batteries under station blackout (SBO) conditions. Specifically, the inspectors determined that the station battery design calculation was based on a different number of pump starts and stops and different pump operating times than the extended power uprate project report and the expected operating practices during a postulated SBO event. As a result the battery analysis was non-conservative with regard to the capability of the batteries to cope with an SBO. The licensee entered this finding into their corrective action program and verified that the batteries would still have sufficient capacity to supply the required loads during an SBO event.

  The finding was determined to be more than minor because it was associated with the Mitigating Systems Cornerstone attribute of Design Control, and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the battery design calculation did not ensure that the capability of the 125 VDC station batteries to support operation of the RCIC system under SBO conditions. The finding was screened as very low safety significance (Green) because the finding was not a design or qualification deficiency, did not represent a loss of system safety function, and did not screen as potentially risk significant due to a seismic, flooding, or severe weather initiating event. The finding had a cross-cutting aspect in the area of human performance because the licensee did not have accurate and up-to-date design documentation. Specifically, the licensee included information regarding RCIC system operation from the previous battery design calculation without ensuring it represented the bounding analysis. [H.2(c)]. (Section 1R21.6.b.(2))

B. Licensee-Identified Violations

No violations of significance were identified.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstone: Initiating Events, Mitigating Systems, and Barrier Integrity

1R21 Component Design Bases Inspection (71111.21)

.1 Introduction

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

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

.2 Inspection Sample Selection Process

The inspectors used information contained in the licensee's PRA and the Duane Arnold's Standardized Plant Analysis Risk Model to identify two scenarios to use as the basis for component selection. The scenarios selected were a station blackout event and a loss-of-cooling-accident during shutdown conditions. Based on these scenarios, a number of risk significant components were selected for the inspection.

The inspectors also used additional component information such as a margin assessment in the selection process. This design margin assessment considered original design reductions caused by design modification, power uprates, or reductions due to degraded material condition. Equipment reliability issues were also considered in the selection of components for detailed review. These included items such as performance test results, significant corrective actions, repeated maintenance activities, Maintenance Rule (a)(1) status, components requiring an operability evaluation, NRC resident inspector input of problem areas/equipment, and system health reports. Consideration was also given to the uniqueness and complexity of the design, operating experience, and the available defense in depth margins. A summary of the reviews performed and the specific inspection findings identified are included in the following sections of the report.

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

This inspection constituted 21 samples as defined in IP 71111.21-05.

.3 Component Design

a. Inspection Scope

The inspectors reviewed the Updated Final Safety Analysis Report (UFSAR), Technical Specifications (TS), design basis documents, drawings, calculations and other available design basis information, to determine the performance requirements of the selected components. The inspectors used applicable industry standards, such as the American Society of Mechanical Engineers (ASME) Code, Institute of Electrical and Electronics Engineers (IEEE) Standards and the National Electric Code, to evaluate acceptability of the systems' design. The NRC also evaluated licensee actions, if any, taken in response to NRC issued operating experience, such as Bulletins, Generic Letters (GLs), Regulatory Issue Summaries (RISs), and Information Notices (INs). The review was to verify that the selected components would function as designed when required and support proper operation of the associated systems. The attributes that were needed for a component to perform its required function included process medium, energy sources, control systems, operator actions, and heat removal. The attributes to verify that the component condition and tested capability was consistent with the design bases and was appropriate may include installed configuration, system operation, detailed design, system testing, equipment and environmental qualification, equipment protection, component inputs and outputs, operating experience, and component degradation.

For each of the components selected, the inspectors reviewed the maintenance history, preventive maintenance activities, system health reports, operating experience-related information, vendor manuals, electrical and mechanical drawings, and licensee corrective action program documents. Field walkdowns were conducted for all accessible components to assess material condition and to verify that the as-built condition was consistent with the design. Other attributes reviewed are included as part of the scope for each individual component.

The following 17 components were reviewed:

- 4.16 kV Switchgear (1A4): The inspectors reviewed load flow calculations, short circuit calculations, and protective relay trip setpoints to evaluate the adequacy of the switchgear's voltage, current, and interrupting ratings, as well the adequacy of electrical protection coordination with upstream and downstream breakers. The review included electrical protection settings versus equipment ratings, security against spurious tripping, coordination, and sensitivity to low magnitude faults. Also reviewed were electrical testing and maintenance activities, including the review of test results to ensure acceptance criteria were met and problems were identified and adequately resolved. The degraded voltage relay setting was reviewed to ensure that adequate voltage was maintained at the terminals of the safety loads under the different available plant power sources. The inspectors reviewed the capability and availability of the offsite sources, to ensure that they would deliver adequate voltage to loads connected under loss-of-coolant-accident (LOCA) conditions. The bus tie breakers closing and opening control circuits were reviewed to verify that breaker tripping and closing logic was consistent with design basis description and interlocking requirements.

- 480 VAC Load Center (1B04): The inspectors reviewed load flow calculations, short circuit calculations, and protective relay and breaker trip setpoints to evaluate the adequacy of the switchgear's voltage, current, and interrupting ratings as well the adequacy of electrical protection coordination with upstream and downstream breakers. The review included electrical protection settings versus equipment ratings, security against spurious tripping, coordination, and sensitivity to low magnitude faults. Also reviewed were electrical testing and maintenance activities, including the review of test results to ensure acceptance criteria were met and problems were identified and adequately resolved. The inspectors reviewed the capability and availability of the 480V switchgear bus to ensure the adequacy of voltage to loads connected under LOCA conditions. The bus tie breakers closing and opening control circuits were reviewed to verify that breaker tripping and closing logic was consistent with design basis description and interlocking requirements.

- 125 VDC Battery (1D1): The inspectors reviewed 125 VDC battery and charger sizing calculations, TS surveillance requirements, and completed surveillances to confirm that sufficient capacity existed for the battery and the charger to perform their safety function and were being adequately maintained. Ventilation calculations were reviewed to verify that the temperature rise in the battery and charger rooms during station blackout (SBO) and post-LOCA conditions would not adversely affect the performance of the battery and its charger. In addition, the inspectors reviewed the battery room's hydrogen concentration calculation and mitigation procedures to verify that the battery room's hydrogen concentration would be maintained below 2 percent and that if ventilation was ever lost, there would be adequate time to respond and take compensatory actions (i.e., install temporary ventilation) to preclude reaching the 2 percent concentration level.

- Reactor Core Isolation Cooling (RCIC) Pump/Turbine (1P226): The inspectors reviewed the RCIC system to verify that the pump and associated peripherals could meet the design basis requirements. The inspection included a review of required flows for transients and postulated SBO events, as well as minimum flow provisions. This included the automatic initiation logic and the control of the pump and associated valves. The inspectors also evaluated flow calculations, net positive suction head (NPSH) calculations, and test data to ensure that TS and design basis requirements were met. The inspectors reviewed the modified RCIC flow control design and test results to verify vendor requirements, including power supply requirements, were appropriately implemented and comparable to that of the pre-operational test. The inspectors verified that the system was adequately protected from internal flooding hazards. Inspectors also reviewed licensee's response to IN 2009-09, "Improper Flow Controller Settings," to verify it was appropriate to prevent similar concerns.

- RCIC Exhaust Line Check Valve (V24-0023): The inspectors reviewed the check valve installed in the steam discharge line from the RCIC pump for conformance with design basis requirements. This review included test procedures and results to verify the capability of the valve to perform its required function under

- postulated accident conditions. The inspectors reviewed documentation associated with past disassembly/inspection activities to verify the material condition of the valve. The inspectors reviewed the design of the vacuum breaker and associated isolation valves located downstream of the check valve to verity that the valve would not be subject to a damaging water hammer transient after a RCIC pump trip.

- RCIC Suction from Torus (MO2517): The inspectors reviewed motor-operated valve (MOV) calculations and analysis to ensure the valve was capable of functioning under design conditions. These included calculations for required thrust, maximum differential pressure, control switch settings, 125 VDC power and control voltage drop, thermal overload settings, breaker/fuse coordination, seismic, and valve weak link analysis. Diagnostic testing and inservice testing (IST) surveillance results, including stroke time and available thrust, were reviewed to verify acceptance criteria were met and performance degradation could be identified.

- Residual Heat Removal (RHR) Pump B (1P229B): The inspectors reviewed the RHR pump to verify that it could meet the design basis requirements. The inspection included a review of required flows for accident conditions, as well as minimum flow provisions. The inspectors evaluated flow calculations, NPSH calculations, test data, and test acceptance criteria to ensure that TS and design basis requirements were met and the pump would be capable of operating under limiting design basis conditions. Specifically, the inspectors reviewed the operation of the pump in the event of a postulated LOCA under Mode 3 operating conditions. The inspectors also reviewed the system to ensure it was adequately protected from internal flooding hazards. In order to assess the adequacy of testing, the inspectors reviewed motor testing and inspection procedures for on-line and off-line conditions, including test results. The inspectors also reviewed motor and feeder sizing, to ensure adequacy of ampacity and voltage profile under the most limiting conditions. Electrical separation was reviewed to ensure that redundancy of safety divisions was not compromised. The protective relay setpoint calculations were reviewed to assess the adequacy of the electrical protection, and that trip setpoints would ensure that there would be no unduly interference with the pump motor performing its design function during transients occurring upon motor highest loading conditions.

- Low Pressure Coolant Injection (LPCI) Loop Select Logic: The inspectors reviewed the design and testing of the LPCI system loop select logic to verify its capability to perform the required function under accident conditions. The inspectors reviewed the logic and setpoints to verify that the LPCI flow would be directed to the appropriate loop under accident conditions, as well as the circuit testing procedures to verify that the system would perform its function considering the most limiting single failure. The inspectors reviewed the power supplies to the valves involved in this logic to verify that any potential faults would be appropriately isolated and would not degrade the electrical distribution system.

- RHR Loop A LPCI Inboard Injection Isolation Valve (MO2003): The inspectors reviewed MOV calculations and analysis to ensure the valve was capable of functioning under design conditions. These included calculations for required thrust, maximum differential pressure, 480 VAC power and control voltage drop, thermal overload settings, breaker/fuse coordination, and valve weak link analysis. Diagnostic testing and IST surveillance results, including stroke time and available thrust, were reviewed to verify acceptance criteria were met and performance degradation could be identified.

- RHR Suction from Torus (MO1989): The inspectors reviewed MOV calculations and analysis to ensure the valve was capable of functioning under design conditions. These included calculations for required thrust, maximum differential pressure, control switch settings, 480 VAC power and control voltage drop, thermal overload settings and breaker/fuse coordination, seismic, and valve weak link analysis. Diagnostic testing and IST surveillance results, including stroke time and available thrust, were reviewed to verify acceptance criteria were met and performance degradation could be identified.

- RHR Crosstie (MO2010): The inspectors reviewed motor-operated valve (MOV) calculations and analysis to ensure the valve was capable of functioning under design conditions. These included calculations for required thrust, maximum differential pressure, control switch settings, 480 VAC power and control voltage drop, thermal overload settings and breaker/fuse coordination, seismic, and valve weak link analysis. Diagnostic testing and IST surveillance results, including stroke time and available thrust, were reviewed to verify acceptance criteria were met and performance degradation could be identified. The inspectors performed a follow-up review of a previously identified issue associated pressure locking and/or thermal binding of this valve. The inspectors reviewed the conditions reports and analysis to ensure the issue was adequately evaluated and corrective actions performed and scheduled were appropriate to address the concern.

- Core Spray (CS) Pump B (1P-211B): The inspectors reviewed the CS pump capability to perform its intended design function to provide rated flow and pressure during accident conditions. Specifically, the inspectors reviewed NPSH and system resistance calculations, procedures, and tests to verify that inputs, requirements, and methodologies were accurate, justified, and consistently applied. The inspectors reviewed completed surveillance test results to verify acceptance criteria and test results demonstrated pump operability was being maintained. Inspectors also reviewed Mark 1 seismic analysis for the CS pump suction and discharge piping to ensure piping would be able to withstand design loads. In order to assess the adequacy of testing, the inspectors reviewed motor testing and inspection procedures for on-line and off-line conditions, including test results. The inspectors also reviewed motor and feeder sizing, to ensure adequacy of ampacity and voltage profile under the most limiting conditions. Electrical separation was reviewed to ensure that redundancy of safety divisions was not compromised. The protective relay setpoint calculations were reviewed to assess the adequacy of the electrical protection, and that trip setpoints would

ensure that there would be no unduly interference with the pump motor performing its design function during transients occurring upon motor highest loading conditions.

- Diesel Fire Pump (1P-49): The inspectors reviewed hydraulic calculations and pump curve data to verify that the pump remained capable of performing its intended function as an alternate means of reactor vessel injection when normal systems were unavailable. The inspectors also reviewed pump operability tests and trend data to ensure pump capability and condition were being appropriately maintained by meeting established acceptance criteria.

- Main Steam Isolation Valves (MSIVs) (CV4412/13/15/16/18/19/20/21): The inspectors reviewed calculations associated with actuator thrust and pneumatic supply and the MSIV actuator environmental qualification reports to ensure the valves would function under design basis conditions. Additionally, the inspectors reviewed completed surveillances and trend data to verify actual valve performance was acceptable. Vendor specifications were reviewed to ensure parameters have been correctly translated into calculations. In addition, the inspectors reviewed 125 VDC elementary and schematic diagrams, solenoid vendor specification data, solenoid load voltage drop, and environmental qualification requirements to confirm that the MSIVs' solenoid valves would perform their safety function under design conditions.

- Safety Relief Valves (SRVs) and Associated Nitrogen Supplies (PSV4401/07): The inspectors reviewed the SRVs and the portions of the nitrogen system associated with operation of these valves for conformance with design basis requirements. The inspectors reviewed design basis calculations, leakage tests, and nitrogen capacity to verify that the valves would be capable of performing their function under transient and accident conditions. Specifically, the inspectors reviewed the calculations to verify that the capacity of the nitrogen supply was adequate considering the maximum allowable system leak rate. The inspectors reviewed the design and testing of the control circuits associated with using the valves to control pressure. In addition, the inspectors reviewed 125 VDC elementary and schematic diagrams, solenoid vendor specification data, solenoid load voltage drop, and environmental qualification requirements to confirm that the SRVs' solenoid valves would perform their safety function.

- Torus Vacuum Breakers (CV4327A/G/H): The inspectors reviewed sizing calculations for torus vacuum breaker lines to verify design basis pressurization values were used and that design inputs were properly translated into system procedures and surveillance tests. The inspectors also reviewed completed tests and trend data to verify that the torus vacuum breakers have remained capable of performing their intended safety function.

- Torus Vent Isolation Valve (CV-4300): The inspectors reviewed the torus vent isolation valve to verify conformance with design basis requirements. This review included design analyses of the valve and associated air receiver tank to verify the capability of the valve to perform its required function. The inspectors

reviewed the function of this valve under accident conditions to verify its capability to open and close as required. Specifically, the inspectors reviewed air-operated valve thrust calculations, reviewed the required air pressure to open the valve, and reviewed the capacity and allowable leakage limits of the associated air receiver to verify the capability of the valve to perform its function under the most limiting conditions. The inspectors also performed a walkdown of the component to verify its accessibility under accident conditions.

b. Findings

(1) Failure to Ensure Sufficient Thrust Margins for the 480 VAC Safety-Related MOVs

Introduction: The inspectors identified a finding of very low safety significance (Green) and associated Non-Cited Violation (NCV) of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," involving the licensee's failure to ensure sufficient thrust margins for 480 VAC safety-related MOVs. Specifically, when the Electrical Transient Analysis Program (ETAP) AC power analysis was made the calculation of record, the results in some cases reduced the safety-related MOV terminal voltages, which were not incorporated into the MOV thrust calculations.

Description: While reviewing the ETAP calculation, the inspectors noted that the minimum terminal voltage (349 Volts) for valve MO2003 was less than the voltage (385 volts) used in the MOV thrust calculation. The licensee initiated AR 01621248 and determined that when the ETAP AC power analysis calculation (CAL-E08-004) was made the calculation of record in 2008, the results were not incorporated into the MOV thrust calculations (BECH-E200 series). In some cases, the results reduced the safety-related MOV terminal voltages under degraded voltage conditions. The licensee's initial review of this issue did not identify any valves that would not have a positive thrust margin. The inspectors, however, questioned if actual packing loads were used in this review since the design calculations used an assumed load that were not bounding in all cases. The licensee re-performed the review using actual packing loads and verified that all the valves still had a positive thrust margin. The licensee also initiated AR01625929 to evaluate the potential vulnerability of not having bounding packing loads in the design calculations.

On February 25, 2011, the licensee re-evaluated the issue when it was determined that the degraded voltage used for two of the valves was incorrect. The licensee had used a voltage from actual testing versus the lower voltage calculated by ETAP. The licensee initiated AR1623559 to address this new concern. As a result, the licensee recalculated the thrust margins for approximately 20 MOVs using the ETAP calculated minimum terminal voltages and the results showed two MOVs (MO4627, reactor recirculation pump 1P-201A discharge isolation, and MO2238, HPCI steam supply inboard isolation) with negative thrust margins. Subsequently, the licensee performed a prompt operability determination (POD No. 16235590-01) and concluded that these two valves would have positive thrust margin when the thrust calculation was rerun with more realistic voltages. Specifically, the licensee's research determined that MOV motors were modeled in ETAP with locked rotor currents for the entire duration of the valve stroke. Per the Limitorque Maintenance Update 92-2, MOV motors will be in the locked rotor condition

only for 1 to 5 milliseconds when energized and the stroke times for MO4627 and MO2238 were 30 and 13 seconds respectively. The licensee then re-modeled the MOV motors in ETAP with motor full load currents versus the locked rotor currents, which resulted in improved motor terminal voltages. The licensee recalculated MOV thrust margins using the improved motor terminal voltages and determined that MO4627 and MO2238 had positive thrust margins. The inspectors reviewed the licensee's analysis and had no concerns.

Analysis: The inspectors determined that the failure to incorporate correct minimum terminal voltages in the MOV thrust calculation to ensure positive thrust margin under design basis conditions was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the Mitigating Systems Cornerstone attribute of Equipment Performance, and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, there was reasonable doubt as to whether the subject MOVs would have sufficient thrust margins to perform their safety function during a design basis accident.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase 1 - Initial Screening and Characterization of Findings," Table 4a for the Mitigating System cornerstone. The finding screened as very low safety significance (Green) because the finding was not a design or qualification deficiency, did not represent a loss of system safety function, and did not screen as potentially risk significant due to a seismic, flooding, or severe weather initiating event. In addition, the licensee provided a prompt operability determination that showed that the valves would have positive thrust margin once the thrust calculation was revised using a more realistic analysis.

The inspectors determined that the finding had a cross-cutting aspect in the area of human performance because the licensee did not plan and coordinate work activities consistent with nuclear safety. Specifically, the licensee failed to appropriately coordinate and interface with other departments while performing the ETAP calculation. [H.3(b)]

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

Contrary to the above, as of March 4, 2011, the licensee's design control measures failed to verify the adequacy of the MOV thrust margins. Specifically, the licensee failed to incorporate correct minimum terminal voltages in the MOV thrust calculation when the electrical analysis was revised to ensure positive thrust margins under design basis conditions. Because this violation was of very low safety significance and because the issue was entered into the licensee's corrective action program as ARs 1621248 and 1623559, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy (NCV 05000331/2011009-01; Failure to Ensure Sufficient Thrust Margins for the 480 VAC Safety-Related MOVs).

.4 Operating Experience

a. Inspection Scope

The inspectors reviewed 4 operating experience issues to ensure that NRC generic concerns had been adequately evaluated and addressed by the licensee. The operating experience issues listed below were reviewed as part of this inspection:

- IN 1998-31, “Fire Protection System Design and Common-Mode Flooding of Emergency Core Cooling System Rooms at Washington Nuclear Project Unit 2”;
- IN 2008-20, “Failures of Motor Operated Valve Actuator Motors with Magnesium Alloy Rotors”;
- IN 2009-09, “Improper Flow Controller Settings”; and
- IN 2010-03, “Failures of Motor-Operated Valves Due to Degraded Stem Lubricant.”

b. Findings

No findings of significance were identified.

.5 Modifications

a. Inspection Scope

The inspectors reviewed 2 permanent plant modifications related to selected risk significant components to verify that the design bases, licensing bases, and performance capability of the components had not been degraded through modifications. The modifications listed below were reviewed as part of this inspection effort:

- ECP 1729, “RCIC Flow Controller Replacement with Digital”; and
- A52047, Installation of Pressure Control Valve in Nitrogen Supply Line to Outboard MSIVS.

b. Findings

No findings of significance were identified.

.6 Operating Procedure Accident Scenario Reviews

a. Inspection Scope

The inspectors performed a detailed reviewed of the procedures listed below associated with the two selected scenarios, the station blackout (SBO) event and a loss-of-cooling-accident (LOCA) during shutdown conditions. For the procedures listed time critical operator actions were reviewed for reasonableness, in plant action were walked down

with a licensed operator, and any interfaces with other departments were evaluated. The procedures were compared to UFSAR, design assumptions, and training materials to assure for constancy. In addition, operator actions were observed during the performance of a LOCA during shutdown cooling scenario on the station simulator.

The following operating procedures were reviewed in detail:

- OI 149 5.2, "LPCI Initiation While in Shutdown Cooling";
- OI 513 5.0, "Manual Startup/Initiation of the Fire Protection System";
- AOP 301.1, "Station Blackout";
- AIP 404, "Injection With Fire Water"; and
- SEP 301.3, "Torus Vent Via Hardpipe Vent."

b. Findings

(1) Failure to Test Eight Valves in Accordance with the IST Program

Introduction: The inspectors identified a finding of very low safety significance (Green) and associated Non-Cited Violation of Technical Specification (TS) 5.5.6, "Inservice Testing Program," for the failure to perform the required testing in accordance with the ASME Operation and Maintenance (OM) Code for eight valves that had active safety functions. Specifically, these valves were required to operate in Mode 3 to return the RHR system from the shutdown cooling (SDC) mode to the LPCI mode of operation.

Description: On March 3, 2011, the inspectors observed the licensee perform a LOCA under shutdown conditions on the station simulator using procedure OI 149 Section 5.2, "LPIC Initiation While in Shutdown Cooling." The purpose of the simulation was to demonstrate realignment of the RHR system from SDC mode to LPCI mode under LOCA conditions. The ability to do this realignment was required by TS Limiting Condition for Operation (LCO) 3.5.1. Based on TS, in Mode 3 all four RHR pumps were required to be operable to support LPCI even when the pumps were being used for SDC. The TS allowed for manual realignment of the valves in the system to reestablish the LPCI mode of operation.

The inspectors noted during the LPCI realignment that four RHR pump suction valves were repositioned, two valves for each of the two pumps that had been operating in shutdown cooling. If the "A" loop was in SDC, suction valves MO-2011 and MO-2016 must be closed and the suppression pool suction valves MO-2012 and MO-2015 must be opened. If the "B" loop is in SDC, suction valves MO-1912 and MO-1920 must be closed and the suppression pool suction valves MO-1913 and MO-1921 must be opened. During normal power operations these suction valves would be in their safety-related position such that they would not be required to change position. Because of the need to reposition RHR suction valves was an unusual activity, the inspector attempted to verify that the valves were being tested in accordance with the

IST program. Although the valves were included in the IST program, they were identified as passive valves such that the only testing performed was a remote position indication test on a 2-year frequency. Since these valves were required to reposition when the RHR system was in SDC to meet TS LCO 3.5.1 in Mode 3, the valves had an active safety function and were required to be exercised and stroke time tested on a quarterly frequency. The licensee initiated AR1625868 and verified that the valves were operable based on recent exercising of the valves during the last refueling outage in December 2010. The inspectors did not have a concern with the basis for the licensee's operability determination.

The inspectors noted that based on a pressure locking failure to valve MO2010 in 2003 and subsequent NRC concerns with the corrective actions in March 2010, the licensee had previously identified an active safety function for MO2010 during Mode 3 if the valve was shut when in SDC. During the licensee's extent of condition review for this issue per AR0345031, the licensee also identified that the eight valves (subject of this inspection) also had active safety functions when in Mode 3 with RHR lined up for SDC. However, no new condition report was initiated in March 2010 to address this condition adverse to quality to ensure this new issue was adequately evaluated. This was not in accordance with the licensee's corrective action procedure PI-AA-205, "Condition Evaluation and Corrective Action." As a result, the corrective action addressed items such as whether the valves needed to be included in the MOV program, but did not address the need for inclusion in the IST program, nor was an operability determination performed to verify operability of the affected valves.

The licensee performed their 10-year IST interval update as required by 10 CFR 50.55a in 2006. When the program was updated, the licensee removed the active function of these valves such that all required testing was no longer being performed. In addition, while reviewing TS 5.5.6, the inspectors noted that the TS still referenced Section XI of the ASME Code, which had been the Code of record for the previous 10-year interval. The 2006 update committed the licensee to the 2001 Edition of the OM Code for testing pumps and valves. As such, the reference in TS was no longer correct and should have been revised when the IST program was updated in 2006. The licensee initiated AR1627776 to evaluate the issue. Although the TS required revision to correct the reference, the Preface to Section XI of the ASME Code referenced that testing of pumps and valves were performed in accordance with the OM Code since the release of the 1998 Edition of the Code.

Analysis: The inspectors determined that the failure to perform the required testing in accordance with the IST program for eight valves that had active safety functions was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the Mitigating Systems Cornerstone attribute of Equipment Performance, and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the licensee would be unable to trend the performance of the valves due to inadequate testing, which could result in not identifying degraded valve performance.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase 1 - Initial Screening and Characterization of Findings," Table 4a for the Mitigating System cornerstone. The finding screened as very low safety significance (Green) because the finding was not a design or qualification deficiency, did not represent a loss of system safety function, and did not screen as potentially risk significant due to a seismic, flooding, or severe weather initiating event. In addition, the licensee provided sufficient justification to verify that the valves remained capable of performing their safety-related function.

The inspectors determined that the finding had a cross-cutting aspect in the area of Problem Identification and Resolution, Corrective Action Program, because the licensee failed to identify a condition adverse to quality. Specifically, when the licensee identified the concern with additional valves during an extent of condition review, the licensee failed to initiate a new AR to ensure the condition adverse to quality was adequately evaluated and would have lead the licensee to evaluate the valves for operability since the required testing was not performed. [P.1(a)]

Enforcement: Technical Specification 5.5.6, "Inservice Testing Program," requires testing of Code Class components in accordance with the ASME Boiler and Pressure Vessel Code. ASME OM Code, Section ISTC-3100 requires, in part, exercising valves with active safety functions and Section ISTC-5120 requires, in part, stroke time testing of MOVs.

Contrary to the above, since 2006, the eight RHR pump suction MOVs that had active safety functions were not adequately tested in accordance with the IST program. Specifically, the valves that were required to reposition in Mode 3 to return the RHR system from the SDC mode to the LPCI mode of operation, were not exercised or stroke time tested in accordance with the OM testing requirements. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as AR1625868, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy (NCV 05000331/2011009-02, Failure to Test Eight Valves in Accordance with the IST Program).

(2) Inadequate Evaluation of RCIC Operation During an SBO

Introduction: The inspectors identified a finding (FIN) of very low safety significance in that the licensee did not adequately ensure the operation of the RCIC system was within the capability of the 125 VDC station batteries under SBO conditions. Specifically, the inspectors determined that the station battery design calculation was based on a different number of pump starts and stops and different pump operating times than the extended power uprate (EPU) project report and the expected operating practices during a postulated SBO event. As a result the battery analysis was non-conservative with regard to the capability of the batteries to cope with an SBO.

Description: The inspectors reviewed station battery design calculation (CAL-E08-008); EPU project report GE-NE-A22-00100-61-01, "Task T0903 – Station Blackout;" abnormal operating procedure (AOP) 301.1, "Station Blackout"; and UFSAR Section 15.3.2 with regard to the operation of the RCIC system during a postulated SBO event.

The inspectors determined that the station battery design calculation, dated July 29, 2009, was based on a different number of pump starts and stops and different pump operating times than the EPU project report. In addition, the inspectors noted that AOP 301.1 directed the operators to minimize the number of RCIC starts, which did not agree with the assumptions of either analysis. In addition, the inspectors observed that both the EPU project report and UFSAR Section 15.3.2 stated that since the number of RCIC cycles are decreased at EPU and the other loads remained essentially the same, battery capacity can support the required loads under SBO conditions at EPU. The inspectors questioned if the SBO battery capability was conservatively evaluated by the current battery design calculation.

In response to these questions, the licensee initiated AR01621249 to address this issue. An informal analysis was performed, which determined that the number of RCIC starts and stops would have less effect on the battery capacity than the total operating time of RCIC pump. This was because the cycling of the MOVs consumed significantly less power than the operation of the RCIC system with the condensate and vacuum pumps running. These analyses determined that the battery design calculation did not bound the maximum operating time of RCIC pump. As a result, the analyses determined that operation of the RCIC system as directed by AOP 301.1 would reduce the margin of the battery in its current condition and would result in negative margin based on a fully aged battery.

Corrective actions to be implemented by the licensee included revising the battery design calculation to correctly model RCIC operation during a SBO event, revising AOP 301.1 to employ a strategy that would minimize RCIC runtime during a SBO, and correct the statements in UFSAR Section 15.3.2. The licensee concluded that this issue did not result in RCIC or the battery being inoperable. The inspectors did not have a concern with the licensee's evaluation and proposed corrective actions.

The inspectors also determined that licensee did not verify inputs and references to the battery design calculation as required by plant procedures. Specifically, the previous battery design calculation was still be used as a reference in the new calculation even after the previous calculation was superseded. The licensee initiated AR01621303 to address the procedural compliance aspect of the issue.

Analysis: The inspectors determined that the failure to ensure the operation of the RCIC system was within the capability of the 125 VDC station batteries under SBO conditions was a performance deficiency that was reasonably within the licensee's ability to foresee and prevent. The performance deficiency was more than minor because it was associated with the Mitigating Systems Cornerstone attribute of Design Control and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the battery design calculation was non-conservative with regard to the capability of the batteries to cope with an SBO as it was based on a different number of RCIC pump starts and stops and different pump operating times than the EPU project report and the expected operating practices. Additional analyses were required to verify that the component would be capable of performing its design function under these conditions.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase 1 - Initial Screening and Characterization of Findings," Table 4a for the Mitigating System cornerstone. The finding screened as very low safety significance (Green) because the finding was not a design or qualification deficiency, did not represent a loss of system safety function, and did not screen as potentially risk significant due to a seismic, flooding, or severe weather initiating event. Additional informal analyses, performed during the inspection, demonstrated that RCIC and the battery were operable.

The inspectors determined that the finding had a cross-cutting aspect in the area of Human Performance, Resources because the licensee did not have accurate and up-to-date design documentation. Specifically, the licensee included information regarding RCIC system operation from the previous battery design calculation without ensuring it represented the bounding analysis. [H.2(c)]

Enforcement: The inspectors determined that no violation of regulatory requirements had occurred. The licensee entered this issue into their corrective action program as AR01621249. (FIN 05000331/2011009-03, Inadequate Evaluation of RCIC Operation during an SBO).

(3) Potential Steam Voiding of Residual Heat Removal System

Introduction: The inspectors identified an unresolved issue (URI) related to the expected response of the LPCI/RHR system to a postulated LOCA during Mode 3 operation. Specifically, a portion of the LPCI/RHR system, including two RHR pumps, could be isolated while at elevated pressure and temperature. The concern was that realignment of the LPCI/RHR system for injection following a LOCA could result in steam voiding of the piping and/or pumps when the isolation valves were reopened under lower pressure conditions.

Description: Technical Specification 3.5.1 required the emergency core cooling systems, including LPCI, to be operable during Mode 3. The TS also stated that the LPCI system may be considered operable during alignment and operation for decay heat removal in Mode 3, if it was capable of being manually realigned and not otherwise inoperable.

As part of the scenario review for the postulated LOCA during Mode 3 operation, the inspectors reviewed procedure OI 149, "Residual Heat Removal System," and observed a simulator exercise requiring the operators to transfer a portion of the LPCI/RHR system from decay heat removal mode to LPCI injection mode per OI 149, Section 5.2, "LPIC Initiation While in Shutdown Cooling." Based on this review, the inspectors noted that this operational sequence would involve isolation of the LPCI/RHR pumps being used for decay heat removal followed by the realignment of the LPCI/RHR system for injection. Based on review of the operating instruction and discussions with operations personnel, the inspectors also determined that this isolation and realignment would be performed whether the subject LPCI/RHR pumps were required for injection or not. The inspectors determined that this portion of the LPCI/RHR system, including two RHR pumps, could be isolated while at elevated pressure and temperature (potentially greater than 100 psig and 300°F). The realignment of the LPCI/RHR system for injection

following a LOCA could result in steam voiding of the piping and/or pumps when the isolation valves were reopened under lower pressure conditions. Steam voiding could potentially cause damage to the LPCI system suction and discharge piping, as well as the pumps. At the time of the inspection, the potential impact of steam voiding on the system had not been evaluated.

The inspectors noted that operating experience with this issue, IN 2010-11, "Potential for Steam Voiding Causing Residual Heat Removal System Operability," had recently been issued based on similar concerns at several pressurized water reactors. The licensee's review, however, did not result in a detailed evaluation of this potential issue. This was a missed opportunity for the licensee to evaluate this condition.

As a result, the inspectors questioned if the LPCI system would actually be operable under these conditions. In response to this concern, the licensee performed preliminary analyses and concluded that the trapped fluid could contain sufficient energy to form steam within the system. However, this analysis did not evaluate the potential impact of steam voiding on system operability. The inspectors concluded that additional evaluation would be required to determine if the potential steam voiding could be damaging and/or impact system operability. The licensee initiated condition report AR01625023 to perform additional evaluations. Since the analysis required to resolve this concern was not completed prior to the end of the inspection, this issue is considered an unresolved item (URI 05000331/2011009-04) pending completion of the analysis by the licensee and review by the inspectors.

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems

.1 Review of Items Entered Into the Corrective Action Program

a. Inspection Scope

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

The inspectors also selected 6 issues that were identified during previous CDBIs to verify that the concern was adequately evaluated and corrective actions were identified and implemented to resolve the concern, as necessary. The following issues were reviewed:

- NCV 05000331/2006007-01, Calculation Deficiency for Potential Vortexing in Condensate Storage Tank;

- NCV 05000331/2006007-02, RCIC Pump Suction Valve Automatic Control Logic;
- NCV 05000331/2006007-06, Non-Safety Related Charger Used to Charge a Cell of a 125 VDC Safety-Related Battery Without Electrical Isolation;
- NCV 05000331/2006007-09, Simulation of Operator Response to an SBO Event;
- NCV 05000331/2008006-01, Inadequate Calculations/Analyses for Essential 4160 VAC Circuit Breaker Close/Open Coils; and
- NCV 05000331/2008006-02, Inadequate Calculations/Analyses and Testing for Thermal Overloads on Safety-Related MOVs.

b. Findings

No findings of significance were identified.

4OA6 Meeting(s)

.1 Exit Meeting Summary

On March 4, 2011, the inspectors presented the inspection results to Mr. C. Costanzo, and other members of the licensee staff. On April 28, 2011, the inspectors presented additional inspection results to Mr. K. Kleinheinz. The licensee acknowledged the issues presented. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. Several documents reviewed by the inspectors were considered proprietary information and were either returned to the licensee or handled in accordance with NRC policy on proprietary information.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee
C. Costanzo, Site Vice President
M. Baldwin, Electrical Design Engineer
C. Bauer, Licensing Operator Requalification Supervisor
S. Catron, Licensing Manager
D. Curtland, Plant General Manager
M. Dixon, Electrical I&C Design Supervisor
J. Dubois, Manager, Programs Engineering
G. Hawkins, Supervisor, System Engineering
P. Collinsworth, System Engineering
J. Kalamaja, Operations Department
K. Kleinheinz, Engineering Director
M. Lingenfelter, Design Engineering Manager
R. Mayhugh, Motor-Operated Valve Program Owner
B. Murrell, Licensing Engineer Analyst
D. Pint, Senior Electrical Design Engineer
A. Roderick, Project Engineer
K. Steiner, Systems Engineering Supervisor
J. Swales, Supervisor, Mechanical Design
E. Sorenson, Supervisor, Programs Engineering
M. Wood, Mechanical Design Engineering
G. Young, Nuclear Oversight Manager

Nuclear Regulatory Commission
L. Haeg, Senior Resident Inspector
R. Murray, Resident Inspector

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

05000331/2011009-01	NCV	Failure to Ensure Sufficient Thrust Margins for the 480 VAC Safety-Related MOVs. (Section 1R21.3.b.(1))
05000331/2011009-02	NCV	Failure to Test Eight Valves in Accordance with the IST Program. (Section 1R21.6.b.(1))
05000331/2011009-03	FIN	Inadequate Evaluation of RCIC Operation during an SBO. (Section 1R21.6.b.(2))
05000331/2011009-04	URI	Potential Steam Voiding of Residual Heat Removal System. (Section 1R21.6.b.(3))

Closed

05000331/2011009-01	NCV	Failure to Ensure Sufficient Thrust Margins for the 480 VAC Safety-Related MOVs. (Section 1R21.3.b.(1))
05000331/2011009-02	NCV	Failure to Test Eight Valves in Accordance with the IST Program. (Section 1R21.6.b.(1))
05000331/2011009-03	FIN	Inadequate Evaluation of RCIC Operation during an SBO. (Section 1R21.6.b.(2))

LIST OF DOCUMENTS REVIEWED

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

CALCULATIONS

Number	Description or Title	Revision
	Setting Calculation for DAEC Standby Transformer 1X04 Differential 187/SB2	0
	Setting Calculation for DAEC Standby Transformer 1X04 Differential 187/SB1	0
	MSIV General Performance and sizing Analysis	0
243-001	ADS Accumulator Size Verification	1
702-N-001	ADS SRV Accumulator Allowable Leakage Rate	0
705-N-005	Depletion of Nitrogen Tanks from ADS Valve Actuation	0
CAL-E02-003	Single Standby Diesel Generator Static Loading For a Loss of Coolant Accident plus a Loss of Offsite Power	3
CAL-E08-004	AC Electrical Distribution, PSB-1, Short Circuit, Voltage Drop and Bus Loading Analysis	0
CAL-E08-006	AC coordination	0
CAL-080-323	Core Spray Pump Discharge	0
CAL-466-M-003	ESW Heat Loads	3
CAL-E08-008	125VDC System Battery Sizing, Voltage Drop, Short Circuit, Coordination and Charger Sizing	0
CAL-E88-005	Limiting Power Circuit Current for DC MOVs	5
CAL-E91-002	Motor Operated Valve Control Switch Settings	35
CAL-E93-006	Recirculation Pump Differential Pressure LPCI Loop Select Setpoint	2
CAL-E93-027	Condensate Storage Tank Low Level Setpoint	5
CAL-E95-016	RCIC Minimum Discharge Flow Switch FS2508	1
CAL-M01-041	Historical EPRI PPM Calc CV4300/CV4301/CV4302/CV4303	1
CAL-M01-121	Functional Review and DP Calc for CV	1
CAL-M01-122	Maximum Required Torque for Butterfly AOVs	1
CAL-M01-123	CV4300 Design Information and Capability Calc	1
CAL-M01-147	CV4310 Design Information and Capability	2
CAL-M01-148	CV4310 Setpoint Data	2
CAL-M06-007	Room Heat Up Analysis for DAEC During Station Blackout	1
CAL-M08-005	Acceptance Criteria for Inservice Leakage Testing of Check Valve, V43-0441, Hard Pipe Vent Accumulator Check Valve	0
CAL-M86-038	Stroke Times for Motor Operated Valve in the IST Program	0

CALCULATIONS

Number	Description or Title	Revision
CAL-M86-50	79-14 Deadweight and Thermal Analysis of 8" EBB-18 and 10" GBB-14(Core Spray B)	0
CAL-M91-007	MEDP Pressure, Flow, and Temperature Determination for Residual Heat Removal Motor Op. Valves	4
CAL-M91-029	Accumulator Sizing for CV-4300 and CV-4357	2
CAL-M91-030	Air Supply Sizing for CV-4300 and CV-4357	1
CAL-M92-010	MSIV Nitrogen Supply Pressure & Seating Force	1
CAL-M92-030	MEDP, Pressure, Flow, Temperature Determination for Core Spray System MOVs	1
CAL-M92-032	MEDP, Pressure, Flow, Temperature Determination for RCIC MOVs	0
CAL-M93-027	GL 89-10 Max Thrust Analysis for MOVs MO2500, MO2516, MO2517	2
CAL-M93-054	GL89-10 Maximum Thrust Analysis for MOVs MO2010	3
CAL-M93-058	GL89-10 Max Thrust Analysis for MO1905, MO2003	2
CAL-M93-061	GL 89-10 Maximum Thrust Analysis For MOVs	2
CAL-M93-076	Pressure Drop in Nitrogen Supply Piping From Accumulator to Outboard MSIVs	0
CAL-M97-007	NPSH For Core Spray and RHR Pumps	3
CAL-M97-009	RCIC NPSH Calculation	3
CAL-M97-012	Pressure Locking and Thermal Binding of Safety-Related Power Operated Gate Valves	1
CAL-M98-001	RHR MO1908, MO1909, MO1905, MO2003 of Maximum Closing Times	1
CAL-M98-006	Primary Containment Venting at Design Pressure	1
CAL-M98-058	ADS Accumulator Size Verification	1
CAL-M99-001	Inboard MSIV Nitrogen Accumulator Check Valve Leak Rate	1
CAL-M99-002	Evaluation of RHR Pumps for SIL 151 Conditions	2
CAL-MC-041A	Available NPSH for Core Spray Pumps	2
CAL-MC-146	Small LOCA - Vacuum Breaker Accident	0
CAL-MC-152	Drywell Torus Vacuum Breaker System	1
CAL-MC-164	Core Spray System Resistance	2
EC-12A	IELP DAEC#1 Protective Relay Setting Calculation	2
EC-12B	IELP DAEC#1 Protective Relay Setting Calculation	1
M129-014	Vacuum Breaker Seismic Analysis, CV4327A-D, CV4327F-H	0
M129-016	Flow Calc 18 in Vacuum Breakers	0

CORRECTIVE ACTION DOCUMENTS GENERATED DUE TO THE INSPECTION

Number	Description or Title	Date
AR01615313	Material Condition of 1P049-E	02/01/11
AR01615320	Housekeeping Issues	02/01/11

CORRECTIVE ACTION DOCUMENTS GENERATED DUE TO THE INSPECTION

Number	Description or Title	Date
AR01615341	Missing Clip on Tubing to PT2032	02/01/11
AR01615342	Missing Mounting Bolt for FT1971A	02/01/11
AR01616256	EOP Manual Valves Covered in Dust and Dirt	02/03/11
AR01616558	RPS MG Set Flywheel Failure Analysis	02/04/11
AR01618241	Use of Portable Lighting for AOP 301.1 (SBO)	02/09/11
AR01620087	Use of 3 Ohms in GMP-ELEC-18	02/15/11
AR01620196	Reference 14 to AOP 301.1 Not Found	02/15/11
AR01620270	Complete Review of 125 VDC CAL-E08-008 Coordination	02/15/11
AR01620977	CAL-M86-038 is Not Current (IST stroke time for MOV)	02/17/11
AR01621206	CAL-M08-005 Basis is not Correct (sizing of accumulators)	02/17/11
AR01621218	Evaluate the Need to Reconstruct Setting Calc (coordination)	02/17/11
AR01621248	ETAP MOV Terminal Voltages Lower than MOV Calcs.	02/17/11
AR01621249	Differences in RCIC Operations During SBO	02/17/11
AR01621303	ETAP Calc Uses Superseded Calc as Input	02/18/11
AR01621354	Evaluate Improvement Opportunities for STP 3.8.4-05	02/18/11
AR01622038	CAL-E08-004 Min Grid Voltage Clarification	02/25/11
AR01623559	Negative Thrust Margin on MO4627 and MO2238	02/25/11
AR01624822	Calc CAL-082-323 Should be Set to Historical Status	03/01/11
AR01624823	RHR Steam Voiding in SDC	03/01/11
AR01625104	CAL-E88-005 not Revised to Incorporate ETAP Results	03/01/11
AR01625318	125 VDC Calc – TS Bases Update	03/02/11
AR01625319	Standby Transformer Differential Current Protection	03/02/11
AR01625336	Perform Aggregate Review of ETAP Issues from CDBI	03/02/11
AR01625344	Perform Aggregate Review of Design Issues from CDBI	03/02/11
AR01625538	Revise BECH-200 (1989)	03/03/11
AR01625868	RHR SDC MOV IST Issues – Finding	03/03/11
AR01625929	MO2003 High Packing Load Vulnerability	03/03/11
AR01626334	Potential Impact on RHR Components from Steam Voiding	03/04/11
AR01628296	New Information Related to AR# 01625319	03/10/11

CORRECTIVE ACTION DOCUMENTS REVIEWED DURING THE INSPECTION

Number	Description or Title	Date
AR00333292	Electrical Calculation Indicates Several Issues	12/16/08
AR00335808	INBD MSIV Would Not Open With Handswitch at 1C03	05/14/10
AR00335848	64898 CAQ – CV 4412 and 4420 Wiring Issue	02/22/09
AR00345031	74083 CAQ – NRC Finding – MO 2010 Pressure Locking	03/25/10
AR00346516	DCR 026275 CAR 08-035 Approval Request (Replace CV1064)	12/18/10
AR00393732	HPCI Room Upper Level Ambient Temps Above Calc Assumptions	06/09/10

CORRECTIVE ACTION DOCUMENTS REVIEWED DURING THE INSPECTION

Number	Description or Title	Date
AR01606552	Relays C71A-K003G and C71A-K003H did Not De-Energize as Expected During Performance of STP 3.3.1.1-17	01/07/11
AR01608534	Portion of STP 3.3.1.1-17 Performed Twice	01/13/11
AR01608814	Differences Between UFSAR and AOP301.1	01/17/11
AR01612658	Change AOP301.1 to Make RCIC Preferred for Level Control	01/31/11
CA0393722-01	Calcs for DAEC Owned Switchyard Protection	06/11/10
CA045656	Evaluation of SIL No. 30	08/03/07
CA1608712-02	4160V Switchgear Closing Coil/Testing of Thermal Overloads	01/13/11
CAP002490	SER 3-98 Recurring Event Flooding of ECCS Rooms	09/29/98
CAP041099	Single Cell Charging for 1D1 Issue	03/22/06
CAP071547	Non-Conservative Tech Spec Allowable Level for CST Tank Level – Low	12/01/09

DRAWINGS

Number	Description or Title	Revision
791E421RS	RCIC System	35
APED-B21-018<3A>	Auto Depressurization System Elementary Diagram	2
APED-B21-3379-001	Pilot Operated Relief Valve	5
APED-E11-007<4>	Residual Heat Removal System	41
BECH-E001<1>	Single Line Diagram Station Connections	32
BECH-E004	Single Line Meter & Relay Diagram Generator & 4160V System	28
BECH-E005	Single Line Meter & Relay Diagram 4160V Essential Swgr. 1A3 & 1A4	15
BECH-E104<003G>	4160V & 480V System Control & Protection (Control Scheme 152-401)	0
BECH-E104<004A>	Standby Diesel Generator and Auxiliary Control (4160V Breaker)	5
BECH-E104<011>	4160V & 480V System Control & Protection (Bus 1A4 Incoming Breaker from Standby Transformer)	14
BECH-E104<011A>	4160V & 480V System Control & Protection (Bus 1A4 Incoming Breaker from Standby Transformer)	6
BECH-E104<013>	4160V & 480V System Control & Protection (Bus 1A4 Incoming Breaker from Start Up Transformer)	14
BECH-E104<013A>	4160V & 480V System Control & Protection (Bus 1A4 Incoming Breaker from Start Up Transformer)	5
BECH-E104<016A>	4160V & 480V System Control & Protection (Bus 1A4 Feed to 1B4 Load Center)	3
BECH-E104<016B>	4160V & 480V System Control & Protection (Bus 1A4 Feed to 1B4 Load Center)	14
BECH-E106<004>	Standby Diesel Generator and Auxiliary Control (4160V Breaker)	11

DRAWINGS

Number	Description or Title	Revision
BECH-E121<003A>	Reactor Core Cooling Systems (CS pump B control)	3
BECH-E121<003B>	Reactor Core Cooling Systems (CS pump B control)	2
BECH-E121<005A>	Core Spray MOV MO2137 Control Schematic Diagram	8
BECH-E121<033>	RCIC Pump Suction from Suppression Chamber Valves MO2516 and MO2517 Control Schematic Diagram	10
BECH-E121<041A>	Reactor Core Cooling Systems (RHR pump B control)	3
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BECH-E121<052>	RHR Loop A Discharge to LPCI INBD Valve MO2003 Control Schematic Diagram	11
BECH-E122<011>	Nuclear Steam Supply Shutoff System	23
BECH-M109	P&ID – Condensate & Demineralized Water System	75
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M144D-071	Air Accumulator (IT-429)	2

MISCELLANEOUS

Number	Description or Title	Date or Revision
	DAEC SAG Bases Document – Primary Containment Pressure Limit	3
	PSV4402 Summary	02/23/11
B455CBR	480 V Switchgear Vendor Manual	6
BECH-E200(2290A)	Motor Operated Valve Data List	7
BECH-MRS-E025	Technical Specification For Large Induction Motors 250 Horsepower and Larger for the DAEC	4
BECH-MRS-M144D	Design Specifications for Nuclear Service Steel Butterfly Valves	6
FAI/09-122	Test Plan for CST Potential for Vortex Formation in the Suction Flow	07/01/09
GE-NE-A22-00100-61-01	Task T0903 – Station Blackout	0

MISCELLANEOUS

Number	Description or Title	Date or Revision
NG-82-2582	Review of NRC Information Notices on Check Valve Failures	11/24/82
OE015995	Potential Waterhammer in RCIC Exhaust Line during LOCA	10/27/06
OE39158-01	Response to NRC-IN-2010-11	0
OE-39611	Operating Experience Review, NRC IN-2009-09	08/18/09
OEE395158-01	NRC IN 2010-11 OE Evaluation	0
OG06-0214-003.G	HPCI/RCIC Exhaust Breaker Task	10/20/06
QUAL A613-02E	Tab 'E' of EQR File for Automatic Valve (AV) Solenoid Valve Cluster Assembly (SVCA) for MSIV and Solenoid Valve Assembly for MSRV	03/29/10
RAL-1077	General Performance and Seismic Analysis for a Size 20x16x20 Fig. 1612JMMNY Flite Flow Main Steam Isolation Valve	07/05/90
SAQH-586065-1	Self Assessment, Component Design Basis Inspection	01/20/11
SIL No. 30	HPCI/RCIC Turbine Exhaust Line Vacuum Breakers	10/31/73
SIL No. 31	Warm-Up of HPCI and/or RCIC Steam Supply Lines	09/30/76

MODIFICATIONS

Number	Description or Title	Date or Revision
A52047	Installation Of Pressure Control Valve In Nitrogen Supply Line To Outboard MSIVS	10/04/01
ECP 1711	Removal of Redundant Battery Backed Emergency Lights	0
ECP 1729	RCIC System Flow Controller Replacement	0
ECP 1871	480V MCC Bucket Replacement	3

OPERABILITY EVALUATIONS

Number	Description or Title	Date
POD 00013161	STP NS510001 – Core Spray Check Valve Operability Test	02/01/09
POD 00071547	Non-Conservative Tech Spec Allowable Level for CST Tank Level – Low	12/10/09
POD 00393996	RCIC Room Temperatures are Elevated Above 104F	06/18/10
POD 01607682	MO2010 Pressure Locking/Thermal Binding Concerns	02/08/11
POD 01623559	Negative Thrust Margin on MO4627 and MO2238	03/03/11

PROCEDURES

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ACP 103.10	Control of Time Critical Tasks	3
ACP 1408.9	Control of Transient Equipment	6
AIP 404	Injection With Fire Water	9
AOP 301	Loss of Essential Electrical Power	55
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AOP 304.1	Loss of 4160V Non-Essential Electrical Power	44
AOP 408	Well Water System Abnormal Operation	27
AOP 691	Condenser Backpressure	5
ARP 1C03B A-2	Residual Heat Removal Pump 1P-229A Trip or Motor Overload	37
BATTRY-C173-01	Equipment-Specific Maintenance Procedure for Batteries	48
CKTBKR-1202-01	Equipment-Specific Maintenance Procedure. ITE 480 Volt Load Center Circuit Breakers	37
CKTBKR-1202-04	Equipment-Specific Maintenance Procedure ITE/ABB Corporation 480 Volt Load Center Circuit Breaker Overhaul	14
CKTBKR-G080-02	Equipment-Specific Maintenance Procedure, General Electric Company 4160Volt Circuit Breaker (Magna Blast) Model AM-4.16	39
DGC-E112	Overload Relay Application and Sizing	1
Engine-C742-01	Diesel Semi-Annual Inspection	17
EOP 1	RPV Control	16
EOP 2	Primary Containment Control	15
EOP 3	Secondary Containment Control Guideline	10
GMP-ELEC-18	General Maintenance Procedure Electrical Distribution and Control Panels	15
GMP-ELEC-37	General Maintenance Procedure Motor Off-Line Testing Using Baker AWA IV	1
GNO-TEST-31	Testing Electrical Overloads (Heaters)	10
IO 513 5.0	Manual Startup/Initiation of the Fire Protection System	105
IPOI 4	Shutdown	107
MD-045	Rotating Equipment Master Lube list	11
MOTOR-G080-02	General Electric High Thrust Vertical Induction Motors	30
MOV 3.1	Limitorque Motor Operators Design and Acceptance Criteria	14
OI 149	Residual Heat Removal System	117
OI 150	Reactor Core Isolation Cooling System	72
OI 151	Operating Instruction Core Spray System	61
OI 183.1	Automatic Depressurization System	31
OI 304.2	Operating Instruction, 4160/480V Essential Electrical Distribution System	83

PROCEDURES

Number	Description or Title	Revision
OI 573	Containment Atmosphere Control System	84
OM-AA-101-1000	Shutdown Risk Management	3
PANEL-G080-01	Equipment-Specific Maintenance Procedure General Electric Metal-Clad Switchgear Type M-26 & M-36	9
SAG-1	Primary Containment Flooding	4
SAG-2	RPV, Containment, and Radioactivity Release Control	6
SAG-3	Hydrogen Control	5
SAMP 706	Vent the Primary Containment Following Loss of Pneumatic Supply	2
SEP 301.1	Torus Vent Via SBGT	6
SEP 301.2	Drywell Vent Via SBGT	5
SEP 301.3	Torus Vent Via Hardpipe Vent	6
SEP 303.1	Air Purge for H2 Control in SAGs	2
SEP 303.2	N2 Purge for H2 Control in SAGs	4
SEP 305	ECCS Suction Strainer Blockage	3
STP 3.3.5.1-15	RHR LSFT – Shutdown	16
STP 3.3.5.1-24	Calibration of the Condensate Storage Tank Level (Low) Instrumentation	13
STP 3.3.5.1-37	RHR LSFT – Operating	2
STP 3.3.6.3-05	Low-Low Set Logic System Functional Test	3
STP 3.4.3-02	Reactor Relief Valve Setpoint Check	3
STP 3.4.3-03	Manual Opening and Exercising of the ADS and LLS Relief Valves	9
STP 3.5.1-02A	A LPCI System Operability Tests	4
STP 3.5.1-02B	B LPCI System Operability Tests	5
STP 3.5.3-01	RCIC System Inoperable	1
STP 3.5.3-02	RCIC System Operability Test	30
STP 3.5.3-05	RCIC/HPCI Suction Transfer Interlock	14
STP NS590011	ASME In-Service Check Valve Air Testing	6
STP NS8301011	ADS Accumulator Check Valve Leak Tightness Test	19

SURVEILLANCES (COMPLETED)

Number	Description or Title	Date
GMP-ELEC-09	Electrical Insulation Resistance Testing, Core Spray Pump B	06/02/08 06/07/05
GMP-ELEC-09	Electrical Insulation Resistance Testing, RHR Pump B	01/11/05 010/7/08
GMP-ELEC-38	General Maintenance Procedure Motor On-Line Testing Using EXP 3000, Core Spray Pump B	03/03/10 09/02/10

SURVEILLANCES (COMPLETED)

Number	Description or Title	Date
GMP-ELEC-38	General Maintenance Procedure Motor On-Line Testing Using EXP 3000, RHR Pump B	09/20/10 01/06/11
MO2003, Test 3	VOTES Test Evaluation Package, Static QSS/TST	04/14/05
MO2003, Test 4	VOTES Test Evaluation Package, Static QSS/Limit Switch	04/14/05
NG-94-4066	Closure of Commitment Control Item 940137	11/02/94
NS13B013	Diesel Fire Pump Fuel Test	11/30/10
NS13B015	Diesel Driven Fire Pump Periodic Pump Run	12/26/10
STP 3.3.1.1-17	Main Steam Isolation Valve Functional Test	01/07/11
STP 3.3.1.1-18	MSIV Limit Switch Calibration and Inspection	11/23/10
STP 3.3.5.1-14B	B Core Spray Logic System Functional Test	08/31/09
STP 3.5.1-01B	B Core Spray System Operability Test	12/01/10
STP 3.5.1-02A	A LPCI System Operability Tests	01/12/11
STP 3.5.1-03B	B Core Spray System Simulated Automatic Actuation	08/03/10
STP 3.5.1-12B	B Core Spray System Operability Test and Comprehensive Pump Test	06/02/09
STP 3.6.1.1-05	Drywell to Suppression Chamber Leak Test	10/24/10
STP 3.6.1.3-03	MSIV Trip/Closure Time Check	10/24/10
STP 3.6.1.7-01	Drywell – Suppression Chamber Vacuum Breaker Operability Test	01/11/11
STP 3.8.4-01	Battery Pilot Cell Checks	01/19/11
STP 3.8.4-02	Quarterly Battery Connected Cell Checks	12/15/10
STP 3.8.4-03A	Service Discharge Test of Battery 1D1	02/18/09
STP 3.8.4-04A	Performance Discharge Test of Battery 1D1	10/29/10
STP NS510001	Core Spray Check Valve Operability Test (refueling)	10/26/10
STP NS8301011	ADS Accumulator Check Valve Leak Tightness Test	11/14/10

TRAINING DOCUMENTS

Number	Description or Title	Revision
JPM 205000-02	Initiate LPCI Following Shutdown Cooling Isolation Signal	8
LP 149.0	Residual Heat Removal System	0
SEG 104	Initiate LPIC From SDC	1
SEG 2008D-07	LPCI With SDC	0
SEG 2009A-04	Grid Instability, Station Blackout, Restore Power W/SBDG	0
SEG 2009A-05	Grid Instability, Station Blackout, ED on High D/W Temp	0

WORK DOCUMENTS

Number	Description or Title	Date
1082226	Disassemble, Perform Inspection on V20-01, Reassemble	08/18/94
1134069	"D" Main Steam Line Inboard Isolation	03/02/07
1137660	Diagnostic Test	05/09/07
1141587	Perform External, Limit Switch Compartment, Motor & Main Housing Inspections	02/24/09
1143421	Inspect and Lube Gearbox and Limit Switch	10/06/08
1143425	Inspect and Lube Gearbox and Limit Switch	06/06/08
1143878	Core Spray Pump 1P-211B Suction Pressure Relief	06/01/09
1145154	Inspect and Lube Gearbox and Limit Switch	04/20/09
1286041-01	Perform Visual Video Scope Inspection of the Motor Internals	11/10/10
1378444	MACore Spray System Operability Test – B Side	12/01/10
A34545	1P-229B Suction Header to RW Surge Tank Isolation	06/03/97
A39130	1P-229A Discharge Header to RW Surge Tank Isolation	11/10/98
A76954	Core Spray Pump 1P-211B Discharge HDR Press Relief	03/08/07
A83580	Valve, Chk, Vac Brk, Torus/Drywell VAC Breaker	02/10/09
V10688	Herguth Labs Oil Sample Results – Upper & Lower Bearing	09/27/10
Z08888	1P-229C Discharge Header to RW Surge Tank Isolation	08/16/94
Z09036	Perform Non-Intrusive Check Valve Testing	02/24/10
Z20033	Inspect Check Valve per Check Valve Program	10/01/10

LIST OF ACRONYMS USED

AC	Alternating Current
ADAMS	Agencywide Document Access Management System
AOP	Abnormal Operating Procedure
AR	Action Request
ASME	American Society of Mechanical Engineers
CDBI	Component Design Bases Inspection
CFR	Code of Federal Regulations
CS	Core Spray
DRS	Division of Reactor Safety
ECCS	Emergency Core Cooling System
ECP	Engineering Change Package
EPU	Extended Power Uprate
ETAP	Electrical Transient Analysis Program
°F	Fahrenheit Degrees
FIN	Finding
GL	Generic Letter
IEEE	Institute of Electrical & Electronic Engineers
IMC	Inspection Manual Chapter
IN	Information Notice
IR	Inspection Report
IST	Inservice Testing
kV	Kilovolt
LCO	Limiting Condition for Operation
LER	Licensee Event Report
LOCA	Loss of Coolant Accident
LOOP	Loss of Off-site Power
LPCI	Low Pressure Coolant Injection
MOV	Motor-Operated Valve
MSIV	Main Steam Isolation Valve
NCV	Non-Cited Violation
NPSH	Net Positive Suction Head
NRC	U.S. Nuclear Regulatory Commission
OM	Operation and Maintenance
PARS	Publicly Available Records System
POD	Prompt Operability Determination
psig	Pressure Per Square Inch Gage
RCIC	Reactor Core Isolation Cooling
RHR	Residual Heat Removal
RIS	Regulatory Issue Summary
SBO	Station Blackout
SDC	Shutdown Cooling
SDP	Significance Determination Process
SRV	Safety Relief Valve
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
VAC	Volts Alternating Current
VDC	Volts Direct Current

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/RA/
Ann Marie Stone, Chief
Engineering Branch 2
Division of Reactor Safety

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