January 14, 2008

Mr. Mark B. Bezilla
Site Vice President
FirstEnergy Nuclear Operating Company
Davis-Besse Nuclear Power Station
5501 North State Route 2, Mail Stop A-DB-3080
Oak Harbor, OH 43449-9760

SUBJECT: DAVIS-BESSE NUCLEAR POWER STATION
NRC COMPONENT DESIGN BASIS INSPECTION REPORT
05000346/2007007(DRS)

Dear Mr. Bezilla:

On November 30, 2007, the U. S. Nuclear Regulatory Commission (NRC) completed a biennial component design basis baseline inspection at your Davis-Besse Nuclear Power Station. The enclosed report documents the inspection findings, which were discussed on November 30, 2007, with Mr. V. Kaminskas and other members of your staff.

This inspection examined activities conducted under your license as they relate to safety and to compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected calculations, design bases documents, procedures, and records; observed activities; and interviewed personnel. Specifically, this inspection focused on the design of components that were risk significant and had low margin.

Based on the results of this inspection, five NRC-identified findings of very low safety significance were identified, all of which involved violations of NRC requirements. However, because these violations were of very low safety significance 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 any finding or the subject or severity of any Non-Cited Violation in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to the Regional Administrator, 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 NRC Resident Inspector Office at the Davis-Besse Nuclear Power Station.

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

Sincerely,

/RA/

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

Docket No. 50-346
License No. NPF-3

Enclosure: Inspection Report 05000346/2007007(DRS)
w/Attachment: Supplemental Information

cc w/encl: The Honorable Dennis Kucinich
J. Hagan, President and Chief
Nuclear Officer - FENOC
J. Lash, Senior Vice President of
Operations and Chief Operating Officer - FENOC
Manager - Site Regulatory Compliance - FENOC
D. Pace, Senior Vice President of
Fleet Engineering - FENOC
J. Rinckel, Vice President, Fleet Oversight - FENOC
D. Jenkins, Attorney, FirstEnergy Corp.
Director, Fleet Regulatory Affairs - FENOC
Manager - Fleet Licensing - FENOC
Ohio State Liaison Officer
R. Owen, Administrator, Ohio Department of Health
Public Utilities Commission of Ohio
President, Lucas County Board of Commissioners
President, Ottawa County Board of Commissioners

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Inspection Report to Mr. M. Bezilla from Ms. A. M. Stone dated January 14, 2008

SUBJECT: DAVIS-BESSE NUCLEAR POWER STATION
NRC COMPONENT DESIGN BASIS INSPECTION REPORT
05000346/2007007(DRS)

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos:	50-346
License Nos:	NPF-3
Report No.:	05000346/2007007(DRS)
Licensee:	FirstEnergy Nuclear Operating Company
Facility:	Davis-Besse Nuclear Power Station
Location:	Oak Harbor, OH 43449-9760
Dates:	October 22 through November 30, 2007
Inspectors:	J. Neurauter, Senior Engineering Inspector, Lead A. Dahbur, Senior Engineering Inspector A. Dunlop, Senior Engineering Inspector C. Brown, Operational Inspector C. Baron, Mechanical Contractor N. Della Greca, Electrical Contractor
Approved by:	A.M. Stone, Chief Engineering Branch 2 Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000346/2007007, 10/22/07 - 11/30/07; Davis-Besse Nuclear Power Station; Component Design Basis Inspection.

The inspection was a 3-week onsite baseline inspection that focused on the design of components that are risk significant and have low design margin. The inspection was conducted by regional engineering inspectors and two consultants. Five findings of very low safety significance were identified, all with associated Non-Cited Violations (NCVs). 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. Inspector-Identified and Self-Revealed Findings

Cornerstone: Mitigating Systems

- Green. The inspectors identified a finding having very low safety significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," in that, the licensee's measures for verifying the adequacy of design with respect to the battery voltage drop calculations were inadequate. Specifically, the design inputs used in the battery calculation did not assure that adequate voltage would be available to all safety-related loads during a design basis accident condition. This issue was entered into the licensee's corrective action program.

  This finding was more than minor because the finding affected the design control attribute of the Mitigating Systems Cornerstone and if left uncorrected it would become a more significant safety concern in that the batteries would not provide adequate voltage to ensure the availability, reliability, and capability of safety related components to respond to initiating events to prevent undesirable consequences. The finding was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations," because the batteries were relatively new and aging was not a current concern. This finding has a cross-cutting aspect in the area of Human Performance, Resources, because the licensee failed to maintain long term plant safety by maintenance of design margins (H.2(a)). (Section 1R21.3.b.1)

- Green. The inspectors identified a finding having very low safety significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control." Specifically, the licensee failed to assure and verify, following a design basis accident and degraded voltage condition, the minimum available control voltage at the 480 volts alternating current (Vac) motor control center was adequate to energize (pickup) the starter coils. This issue was entered into the licensee's corrective action program to re-evaluate the schedule for periodic testing to verify the required pickup voltage for starter coils over the life of the devices.

This finding was more than minor because the failure to assure adequate control voltage was available to energize the starter coils to supply 480 Vac power to safety-related equipment would have affected the capability of the equipment to respond to initiating events. The finding was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations." There was not a cross cutting aspect to this finding. (Section 1R21.3.b.2)

- Green. The inspectors identified a finding having very low safety significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control." Specifically, the design bases analyses for the transfer of the emergency core cooling system pumps from the borated water storage tank (BWST) to the containment sump did not address the potential of air entrainment under the most limiting conditions. The calculation failed to consider the potential of additional gravity flow directly from the BWST to the containment sump during the suction transfer. As a result, this design basis calculation did not bound the potential air entrainment due to vortexing in the BWST. This issue was entered into the licensee's corrective action program, and a prompt operability determination was performed to verify system operability.

  This finding was more than minor because the existing design analyses did not fully address the potential of air entrainment during the transfer from the BWST to the containment sump. The finding was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations," because on re-evaluation, the design function was maintained. This finding has a cross-cutting aspect in the area of Human Performance, Resources, because the licensee failed to maintain long term plant safety by maintenance of design margins (H.2(a)). (Section 1R21.3.b.3)

- Green. The inspectors identified a finding having very low safety significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," in that, the design bases analyses for the turbine driven auxiliary feedwater (AFW) pumps suction pressure switch setpoint did not adequately evaluate a postulated failure of the pumps' common suction piping in the turbine building. Specifically, the licensee failed to consider the loss of inventory that could result from this piping failure. As a result, this design basis calculation did not adequately demonstrate that the turbine driven AFW pumps would be protected from the air entrainment due to this postulated event. This issue was entered into the licensee's corrective action program, and a prompt operability determination was performed to verify system operability.

  This finding was more than minor because the existing design did not adequately protect the turbine driven AFW pumps from the postulated failure of non-safety-related piping in the turbine building. The finding was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations," because on re-evaluation, the design function was maintained. This finding has a cross-cutting aspect in the area of Human Performance, Resources, because the licensee failed to maintain long term plant safety by maintenance of design margins (H.2(a)). (Section 1R21.3.b.4)

- Green. The inspectors identified a finding having very low safety significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, “Design Control.” Specifically, the licensee failed to verify and ensure that the 125 Vdc safety related batteries would remain operable if all the inter-cell and terminal connections were at the resistance value (150 micro-ohms) allowed by Technical Specifications (TS) surveillance requirement (SR) 4.8.2.3.2.b.2 and SR 4.8.2.3.2.c.3. This issue was entered into the licensee’s corrective action program.

  The finding was more than minor because if left uncorrected, the finding could become a more significant safety concern. Specifically, the 125 Vdc safety-related batteries would become incapable of meeting their design basis function if the inter-cell and connection resistance were allowed to increase to the TS allowed value. The finding was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, “Determining the Significance of Reactor Inspection Findings for At-Power Situations,” because the batteries were relatively new and the recorded inter-cell and terminal connection resistance are not currently significant. This finding has a cross-cutting aspect in the area of Human Performance, Resources, because the licensee failed to maintain long term plant safety by maintenance of design margins (H.2(a)). (Section 1R21.4.b.1)

B. Licensee-Identified Violations

None

REPORT DETAILS

1. REACTOR SAFETY

Cornerstone: Initiating Events, Mitigating Systems, and Barrier Integrity

1R21 Component Design Bases Inspection (71111.21)

.1 Introduction

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

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

.2 Inspection Sample Selection Process

The inspectors selected risk significant components and operator actions for review using information contained in the licensee's PRA and the Davis-Besse Standardized Plant Analysis Risk (SPAR) Model, Revision 3.21. In general, the selection was based upon the components and operator actions having a risk achievement worth of greater than 2.0 and/or a risk reduction worth greater than 1.005. The operator actions selected for review included actions taken by operators both inside and outside of the control room during postulated accident scenarios.

The inspectors performed a margin assessment and detailed review of the selected risk-significant components to verify that the design bases have been correctly implemented and maintained. This design margin assessment considered original design reductions caused by design modification, or power uprates, or reductions due to degraded material condition. Equipment reliability issues were also considered in the selection of components for detailed review. These included items such as performance test results, significant corrective action, repeated maintenance activities, maintenance rule (a)(1) status, components requiring an operability evaluation, 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.

.3 Component Design

a. Inspection Scope

The inspectors reviewed the Updated Safety Analysis Report (USAR), 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) and Information Notices (INs). The review was to verify that the selected components would function as designed when required and support proper operation of the associated systems. The attributes that were needed for a component to perform its required function included process medium, energy sources, control systems, operator actions, and heat removal. The attributes to verify that the component condition and tested capability was consistent with the design bases and was appropriate may include installed configuration, system operation, detailed design, system testing, equipment and environmental qualification, equipment protection, component inputs and outputs, operating experience, and component degradation.

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

The following 16 components were reviewed (16 inspection samples):

1. <u>125/250 Volt Direct Current (Vdc) Batteries and Battery Chargers</u>: The inspectors reviewed the station battery calculations to verify that the battery sizing would satisfy the requirements of the safety-related and risk significant direct current (DC) loads and that the minimum expected battery voltage was taken into account. Specifically, the inspectors verified that the battery and battery chargers were adequately sized to supply adequate voltage to the DC system during normal and abnormal operating conditions and for the system design duty cycle under postulated events, including loss-of-offsite power/loss-of-coolant accident (LOOP/LOCA) and station blackout (SBO) scenarios, and that adequate voltage would remain available at the individual loads for the duration of the postulated scenarios. The inspectors' review included battery sizing, duty cycle bases, design aspects and operating history for the battery chargers, voltage drop calculations, short circuit current calculation, fuse ratings and electrical coordination, battery charger float and equalizing voltages. In addition, the inspectors evaluated minimum voltage available at selected safety-related DC loads, including control power at the 4160 volts alternating current (Vac) switchgear and 480 Vac motor control center (MCC). The inspectors verified minimum and maximum battery room temperatures to confirm consistency of calculations with design basis requirements and reviewed testing requirements, preventive maintenance, failure history, and

instrumentation/alarms. The inspectors also reviewed the overall battery capacity, recent modified performance discharge test and service test, and quarterly battery surveillance tests required by TS and confirmed that the surveillance test results met the test acceptance criteria and that the test frequency specified in the TS were also met. Lastly, the inspectors performed a walkdown to visually inspect the physical/material condition of the battery and battery chargers, and to confirm that the battery room temperatures were within specified design temperature ranges.

2. D1-ED 125/250 Vdc Motor Control Center: The inspectors reviewed the 125/250 Vdc load center to verify that its loading was within equipment ratings and that the minimum voltage was taken into account. Additionally, the inspectors reviewed the adequacy of design assumptions and calculations related to short circuit analyses, protection coordination, and voltage drop calculations. Bounding loads were sampled to verify the adequacy of the equipment. The inspectors also verified electrical separation between class 1E and non-1E loads met design requirements.

3. 480 Vac Motor Control Center BF-12A: The inspectors reviewed calculations and schematic drawings to determine the adequacy and appropriateness of design assumptions and calculations related the power and control voltage values for selected loads supplied by MCC BF-12A. The inspectors reviewed a sample of maintenance and test procedures and overload sizing calculations to verify that the 480 Vac MCC 12A was capable of supplying power necessary to ensure proper operation of connected equipment during normal and accident conditions.

4. 4160 Vac Switchgear Bus D1: The inspectors reviewed selected calculations for electrical distribution system load flow, degraded voltage protection, short-circuit, and electrical protection and coordination. The inspectors reviewed the adequacy and appropriateness of design assumptions and calculations related to motor starting and loading voltages to determine if the voltages, under worse case motor starting and loading conditions, would remain above the minimum acceptable values. The inspectors reviewed the adequacy of protective relay settings and coordination for a selected sample of equipment supplied by Bus D1-EA to ensure that selective coordination was adequate for protection of connected equipment during worst-case short-circuit conditions. The breaker closure and tripping control circuit logic drawings and the 125 Vdc voltage calculations for incoming breaker and selected load breakers were reviewed to ensure adequate voltage would be available for the control circuit components. To ensure that breakers were appropriately maintained in accordance with industry and vendor recommendations, the inspectors reviewed the acceptance criteria specified in the preventive maintenance inspection and surveillance testing procedures. The inspectors reviewed the adequacy of instrumentation/alarms available.

5. Emergency Diesel Generator (EDG) No. K5-1: The inspectors reviewed the EDG loading calculation including the loading sequence during LOOP and LOCA. The inspectors reviewed electrical diagrams, the USAR, system operating and test procedures, protective relay settings, and the electrical distribution system calculations to verify the adequacy of protective relaying scheme and to verify that operator actions were consistent with the USAR and TS. The inspectors reviewed

the starting circuit logic diagrams to ensure that all components required for starting the EDG during accident conditions will have adequate voltage.

The inspectors also reviewed design calculations to ensure that the air starting and room ventilation system design requirements were properly determined. The inspectors ensured that design basis requirements were correctly translated into test acceptance criteria. The inspectors reviewed completed tests to ensure the tests demonstrated the systems' capability to perform their design basis required functions. The inspectors reviewed the systems' normal and abnormal operating procedures to ensure component operation and alignments were consistent with the design bases.

6. YV2 125 Vdc/120 Vac Channel 2 Inverter: The inspectors reviewed sources of power, available DC voltage during the entire station battery duty cycle, inverter shutdown set-point, and normal and emergency loading. The inspectors also reviewed selected portions of applicable calculations, design changes, testing criteria and results, vendor manuals, maintenance history, work packages and condition reports. The inspectors interviewed responsible engineers to evaluate recent margin and performance issues and the overall reliability of the inverter.

7. Component Cooling Heat Exchangers E22-1/2/3: The inspectors reviewed various calculations related to the thermal performance of the heat exchangers under design basis accident and transient conditions, including conditions with maximum system heat load, maximum service water system supply temperature and minimum service water flow to the heat exchangers. The inspectors also reviewed performance test results and analysis of the test result data to verify the analyzed performance would be bounded by the as-found conditions. The inspectors reviewed condition reports and corrective maintenance associated with the equipment as well as the component cooling water system health report. The inspectors also reviewed an engineering change request, ECR 04-0216-01, associated with replacing service water flow instruments for these heat exchangers.

8. Emergency Diesel Generator Room Fans C25-1/2/3/4: The inspectors reviewed calculations and baseline test data associated with the capacity of the fans to maintain the required operating temperature in the EDG rooms with either one or two fans in service. The inspectors also reviewed condition reports and corrective maintenance associated with the equipment as well as the heating, ventilation, and air conditioning (HVAC) system health report, and performed a walkdown of the area.

9. Turbine Driven Auxiliary Feedwater (AFW) Pumps P14-1/2: The inspectors reviewed AFW system hydraulic calculations to verify the performance and the net positive suction head (NPSH) of the pumps. The inspectors also reviewed the surveillance test acceptance criteria bases and test results to verify that the pumps would have sufficient capability at their minimum allowable performance. In addition, the inspectors reviewed the potential of the pumps causing an over-pressure condition in the downstream piping due to a postulated over-speed condition and verified that the pumps had adequate protection for potential minimum flow and runout conditions. The inspectors reviewed the design of the pumps and associated rooms with regard to a postulated high energy line break (HELB) and internal missile hazards, and reviewed condition reports and corrective

maintenance associated with the equipment. The inspectors also reviewed the control logic associated with the pumps and associated equipment.

The inspectors reviewed the design of the alternate water supply from the service water (SW) system to verify its capability to provide adequate suction flow if the supply from the condensate storage tank (CST) was not available. This review included the potential effects of debris from the service water system on auxiliary feedwater strainers and equipment. In addition, the inspectors reviewed the setpoint bases for the pump suction low pressure switches to verify that they were appropriate to protect the pumps from the loss of the common suction piping from the CST.

10. Decay Heat Pumps P42-1/2: The inspectors reviewed decay heat system hydraulic calculations to verify the performance and the NPSH of the pumps under accident and transient conditions. This review included the injection mode of operation, with the suction aligned to the borated water storage tank (BWST), and the recirculation mode of operation, with the suction aligned to the containment sump. The inspectors also reviewed the performance of the pumps during the transition from the BWST to the containment sump. The inspectors reviewed the surveillance test acceptance criteria bases and test results to verify that the pumps would have sufficient capability at their minimum allowable performance limits and verified that the pumps had adequate protection for potential minimum flow and runout conditions. The inspectors also reviewed condition reports and corrective maintenance associated with the equipment and the control logic associated with the pumps.

11. Service Water Pumps: The inspectors reviewed calculations to verify intake structure levels were maintained above SW pump suction submergence and NPSH requirements to ensure the pump was capable of performing its safety functions. Hydraulic calculations were reviewed to ensure design requirements for flow and pressure were appropriately translated as acceptance criteria for pump inservice test (IST) and to verify the pump would perform under worst case design conditions. Calculations and test results were reviewed to verify the SW system was properly balanced such that the flow rates would be adequate to cool components under design basis conditions. Selected operating procedures were reviewed to ensure the pumps were operated in accordance with design analysis. Design change history and IST results were reviewed to assess potential component degradation and impact on design margins.

12. Decay Heat Containment Emergency Sump Outlet Valve (DH 9B): The inspectors reviewed the alternating current (AC) motor-operated valve (MOV) calculations including required thrust, degraded voltage calculations, weak link, and maximum differential pressure, to ensure the valve was capable of functioning under design conditions. Diagnostic and IST test results were reviewed to verify acceptance criteria were met and performance degradation would be identified.

13. Service Water Discharge to Intake Structure Isolation Valve (SW 2929): The inspectors reviewed the AC MOV calculations including required torque, degraded voltage calculations, weak link, and maximum differential pressure, to ensure the valve was capable of functioning under design conditions. Diagnostic and IST test

results were reviewed to verify acceptance criteria were met and performance degradation would be identified.

14. Auxiliary Feedwater Pump Discharge Line Isolation Valve (AF 3870): The inspectors reviewed the DC MOV calculations including required thrust, degraded voltage calculations, weak link, and maximum differential pressure, to ensure the valve was capable of functioning under design conditions. Diagnostic and IST test results were reviewed to verify acceptance criteria were met and performance degradation would be identified. Operating experience was reviewed to assess the licensee's evaluation of Regulatory Issue Summary (RIS) 2001-15, "Performance of DC-Powered Motor-Operated Valve Actuators".

15. Main Steam Line to Auxiliary Feedwater Turbine Isolation Valve (MS 106): The inspectors reviewed the DC MOV calculations including required thrust, degraded voltage calculations, weak link, and maximum differential pressure, to ensure the valve was capable of functioning under design conditions. Diagnostic and IST test results were reviewed to verify acceptance criteria were met and performance degradation would be identified. Operating experience was reviewed to assess the licensee's evaluation of RIS 2001-15.

16. Auxiliary Feed Pump Turbine Steam Admission Valve (MS 5889A): The inspectors reviewed the air-operated valve calculations, including required torque and maximum differential pressure, to ensure the valve was capable of functioning under design conditions. Design change history and IST test results were reviewed to verify acceptance criteria were met and performance degradation would be identified.

b. Findings

1. Inadequate Battery Voltage Drop and Sizing Design Calculation

Introduction: The inspectors identified a Non-Cited Violation (NCV) of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," having very low safety significance (Green), in that, the licensee's measures for verifying the adequacy of design with respect to the batteries voltage drop and sizing calculations were inadequate.

Description: During the review of the DC voltage drop calculation, C-EE-002.01-010, the inspectors identified a number of anomalies that potentially could reduce the calculated minimum available voltage at the individual loads, hence impacting the margin of safety currently available in the design of the DC system. The most significant of these issues were:

- Section 2.6.01 of calculation C-EE-002.01-010 assumed that the EDG was already running and with voltage greater than 75 percent of the rated voltage at the onset of a LOCA. Therefore, the current required for the generator field flashing was not considered in the first minute of the battery load cycle. During a LOCA concurrent with a LOOP, the EDG would receive a start signal at the same time the battery charger was lost due to the LOOP. Therefore, the inspectors determined that the generator field flashing current and EDG fuel pump starting current should have been included in the first minute of the battery load cycle.

- The load on the batteries due to non-safety-related inverters YVA and YVB were determined from field surveys taken during the 1991 to 1993 period. The loads on the batteries from the safety-related inverters YV1 through 4 were obtained similarly from more recent field surveys. The inspectors were concerned that calculation C-EE-002.01-010 did not specifically address why the loads obtained through surveys were conservative and why they were representative of the loads expected during a postulated event.

- The DC system supplies power to safety-related as well as non-safety-related loads. The inspectors' review of the DC calculation identified that no specific assessment or estimate had been made of the potential additional loads on the batteries due to multiple grounds. While fuses were properly coordinated, there was no indication of the amount of fault current that would have been sufficient to blow such fuses and prevent an overloading of the batteries and hence, a reduction of their duty cycle. In addition, discussions with the licensee indicated that no provision had been made to environmentally qualify such components to prevent their vulnerability to high resistance grounds. Lastly, although the DC system was equipped with a ground detection alarm and the ground detection meter was regularly monitored, the alarm was often ignored because of the high sensitivity of the ground detection system and difficulty in identifying and correcting such grounds. The licensee had in place plans to improve the ground detection and identification system.

- Calculation C-EE-002.01-010 showed that the minimum available voltage at cabinet C3621, during the first minute of a LOOP condition, was 103.6 Vdc; the motor driven fuel oil pump on EDG 1-1 was rated for 105 to 140 Vdc. The licensee did not demonstrate the lower voltage was acceptable.

  In addition, the voltage drop calculation did not account for the inrush current of the motor (37 amperes); the calculation used a value of 13.5 amperes that was based on the average running load required by the EDG. The inspectors determined that the inrush current from the pump would result in reducing the minimum available voltage at cabinet C3621 below the calculated value of 103.6 Vdc.

  Following discovery, the licensee issued condition report (CR) 07-29925 and its associated prompt operability determination (POD) 2007-04. The licensee also performed a preliminary voltage drop evaluation, in support of POD 2007-04, using the total inrush current value for the fuel oil pump motors. The evaluation concluded that there was adequate voltage margin available at the EDG cabinet C3621 to supply power for the most limiting component required to start the EDG (i.e. air start solenoid valves). The evaluation showed that the DC fuel oil pump motor would not have the required minimum nameplate voltage. However, the vendor confirmed that the motor could be expected to run below the rated range for a short duration with no degradation.

- Calculation C-EE-002.01-010, Section 1.3.07 indicated that a minimum battery terminal voltage value of 105 Vdc was used based on 1.75 volts/cell. However, the inspector noted that the calculation also showed that for battery 1P, a minimum battery terminal voltage of 106.97 Vdc was required to assure adequate terminal voltage for the individual connected DC loads.

Using the minimum voltage required for battery 1P with a temperature factor of 1.11 and an aging factor of 1.25; the inspectors determined by a preliminary calculation that the minimum required plates would be larger than 10 plates per cell where calculation C-EE-002.01-010 determined 9 minimum plates per cell. Therefore; the inspectors were concerned that the size of the existing battery 1P was not adequate. In particular, the battery sizing calculation did not assure that the battery would still meet its design function of supplying a minimum voltage of 106.97 while the battery was above but close to the 80 percent of its rated capacity.

Appendices D, E and F of calculation C-EE-002.01-010 showed that the required plates for batteries 1N, 2P and 2N were a minimum of 8 plates. Therefore, the existing batteries (10 plates) were not a concern.

In addition to the licensee's operability determination and evaluation, the inspectors' review of the latest battery test results indicated that margin was available not only from the test results themselves, but also from the fact that the amount of loads used for the tests was higher than the amount used in the voltage drop calculation. Regarding the reduction of margin due to aging and potential multiple ground fault loads, the inspectors recognized that appropriate load reductions, fuse coordination to limit ground fault burden on the batteries, and/or earlier replacement of the batteries would provide reasonable assurance that there was sufficient capacity to demonstrate operability going for all the applicable events the batteries are credited. The licensee initiated CRs 07-09502, 07-29177, 07-29874, 07-29917, 07-29924, 07-29925, 07-30090, 07-30271, 07-30479, and 07-30673 during the inspection in order to address these and other minor issues.

Analysis: The inspectors determined that the failure to assure the battery sizing was adequate to provide the minimum DC power to all safety-related components during accident conditions was a performance deficiency.

The inspectors determined that the finding was more than minor in accordance with Inspection Manual Chapter (IMC) 0612, Appendix B, "Issue Disposition Screening," because the finding was associated with the design control attribute of the Mitigating System Cornerstone and affected the cornerstone objective of ensuring the availability, reliability, and capability of the batteries for their entire specified lifetime to respond to initiating events to prevent undesirable consequences and also because if the finding was left uncorrected, it would become a more significant safety concern. Specifically, the batteries would not have met their design function of supplying minimum required voltage during accident conditions to all safety-related components, including the electrical driven fuel oil pump, and the batteries would not have met their design function when above but close to 80 percent of rated capacity as the batteries aged.

The inspectors evaluated the finding using IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations," Significance Determination Process (SDP) Phase 1 screening. The inspectors answered "No" to all the screening questions in the Mitigating Systems Cornerstone column because the finding did not result in a loss of any safety system function. Specifically, while the life of the batteries was reduced and the margin of safety pertaining to available voltage at safety-related components was also reduced, the batteries and components were still found to be currently operable because the batteries are relatively new, and the licensee's preliminary evaluation confirmed the operability of the electrical driven fuel oil pump and the remaining EDG starting circuit at the minimum available voltage. Therefore, the finding screened as having very low safety significance (Green).

This finding has a cross-cutting aspect in the area of Human Performance, Resources, because the licensee failed to maintain long term plant safety by maintenance of design margins (H.2(a)). Specifically, the actual battery design margin pertaining to available voltage at safety-related components was less than the margin indicated in the design basis calculation and the licensing basis.

Enforcement: Title 10 CFR 50 Appendix B, Criterion III, "Design Control," requires, in part, that design control measures shall be established to assure that applicable regulatory requirements and the design basis, as defined in Section 50.2 are correctly translated into specification, drawings, procedures and instructions. The design control measures shall provide for verifying or checking the adequacy of design such as by the performance of design reviews, by the use of alternate or simplified calculation methods, or by the performance of a suitable testing program. Design bases means that information which identifies the specific functions to be performed by a structure, system, or component (SSC) of a facility, and the specific values chosen for controlling parameters as reference bounds for design. These values may be requirements derived from analysis (based on calculations or experiments) of the effects of a postulated accident for which a SSC must meet the functional goals.

Contrary to the above, prior to November 30, 2007, the licensee had not established effective measures to ensure that the design basis for battery voltage drop and battery sizing was correctly translated into procedures and instructions. Specifically, design basis calculation C-EE-002.01-010: 1) had not included all the loads on the batteries during a postulated accident; 2) did not use the minimum battery terminal voltage; and 3) had not assured the ability of the electrical driven fuel oil pump to operate at a voltage below the vendor minimum rated voltage and failed to verify that the reduced voltage as a result of inrush current to the pump did not affect the operability of the remaining EDG starting circuit. Because the finding was of very low safety significance and the licensee has entered the issues into their corrective action program (CR 07-30673 and others), this violation is being treated as an NCV, consistent with Section VI.A of the NRC Enforcement Policy. (NCV 05000346/2007007-01)

2. Periodic Testing of 480 Vac Starter Coils Not Implemented

Introduction: The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," having very low safety significance (Green) involving the licensee's failure to assure that adequate control voltage was available to energize the starter coils for 480 Vac equipment. Specifically, the licensee failed to assure that the minimum available control voltage at the starter coils met the minimum rated voltage value, instead the licensee credited an onsite/in-the-shop test performed during 2003 for selected samples, but did not perform periodic testing to ensure the starter coils would function as required.

Description: The licensee's AC system analysis calculated MCC bus voltages for various plant conditions, including design basis accident conditions and degraded voltage conditions. Calculation C-EE-006.01-027, "Safety-Related Motor Contactor Control Circuit Voltage Drop," determined the minimum MCC bus voltages required to pickup/energize motor starters for safety related loads. The calculation also determined the minimum MCC voltages required to hold-in control circuit contactors and relays for these loads. The voltages documented in calculation C-EE-006.01-027 were determined using AC circuit analysis (i.e. voltage drop analysis) of the actual circuit components (contactors, relays, and lights), circuit configurations, and control circuit cables.

The licensee determined that the results of calculation C-EE-006.01-027 were considered very conservative. For example, there were a number of circuits with a calculated minimum pickup voltage that was greater than 480 Vac. The licensee concluded that some of the voltage and current data used in the calculation for component pickup and holding were based on manufacturer's catalog data, which tend to be conservative.

The licensee conducted tests to gain an understanding of the degree of conservatism included in the minimum pickup voltages calculated in C-EE-006.01-027. In 2003, the licensee performed the tests under Inspection Plan IP-E-011 "Test Plan for Motor Starter and Pickup Voltages," to establish a more realistic minimum pickup voltage for the 480 Vac contactors used at Davis-Besse. The tests were performed in the shop at Davis-Besse for four (4) generic control circuits that depict the actual circuit configurations for the loads in the plant. The tests used mixed samples of original plant contactors and new (off the shelf) contactors. Based on the results of the tests, the licensee confirmed their conclusion that the values calculated for the minimum pickup voltage in C-EE-006.01-027 were conservative. The results showed that the highest pickup voltage measured during testing, including a standard deviation value with a 95/95 percent confidence level, was 418 volts. Accordingly, the licensee established more realistic yet bounding values using the test results for the minimum pickup voltage for the contactors.

Condition report CR 03-10130, dated November 23, 2003, was initiated for lack of periodic surveillance testing of contactors and interposing relays to verify that the lower pickup voltages, obtained during testing per test report for IP-E-011, remained valid over the life of the devices. Corrective action was issued to establish criteria for periodic testing of existing contactors as well as replacement contactors to maintain the design basis for the minimum pickup voltage established by testing per IP-E-011, as performed for calculation C-EE-006.01-027. The corrective action was closed to Notification 600295059. The inspectors noted that prior to November 30, 2007, the licensee had not established periodic testing for plant's installed equipment. The inspectors were concerned that the licensee did not verify that the contactors in the plant pickup at a lower voltage value than the manufacturer's rating. Upon discovery, the licensee initiated CR 07-30718 to re-evaluate the schedule and periodicity for performing the testing.

<u>Analysis</u>: The inspectors determined that the licensee's failure to assure adequate control voltage was available to energize the starter coils for 480 Vac safety-related equipment was a performance deficiency and a finding because the operability of safety-related equipment could not be assured and could have resulted in a loss of function during a design basis accident concurrent with degraded system voltage.

The inspectors determined that the finding was more than minor in accordance with IMC 0612, Appendix B, "Issue Disposition Screening," because the finding was associated with the Mitigating Systems Cornerstone attribute of design control and affected the cornerstone objective of ensuring the availability, reliability and capability of safety-related equipment to respond to initiating events to prevent undesirable consequences.

Specifically, the failure to assure adequate control voltage was available to energize the starter coils to supply 480 Vac power for safety-related equipment would have affected the availability of the equipment to respond to initiating events.

The inspectors evaluated the finding using IMC 0609, Appendix A, “Determining the Significance of Reactor Inspection Findings for At-Power Situations,” SDP Phase 1 screening. The inspectors answered “No” to all the screening questions in the Mitigating Systems Cornerstone column because the failure to perform periodic testing did not impact current operability of the starter coils. Specifically, the purpose of the periodic testing was to assure the minimum voltage remained acceptable as the components aged. Therefore, the finding screened as having very low safety significance (Green).

There was not a cross cutting aspect to this finding.

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 this requirement, prior to November 30, 2007, the licensee’s design control measures failed to verify the adequacy of design control voltage for safety related starter coils. Specifically, the licensee failed to assure by periodic testing that a voltage value lower than the vendor rated minimum voltage used as the design control voltage for safety-related starter coils remained acceptable as the components aged. However, because this violation was of very low safety significance and because the issue was entered into the licensee’s corrective action program (CR 07-30718), this violation is being treated as an NCV consistent with Section VI.A.1 of the NRC Enforcement Policy. (NCV 05000346/2007007-02)

3. Failure to Adequately Consider Potential Air Entrainment to ECCS during Suction Transfer

Introduction: The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion III, “Design Control,” having very low safety significance (Green), in that, the design bases analyses for the transfer of the emergency core cooling system (ECCS) pumps from the BWST to the containment sump did not address the potential of air entrainment under the most limiting conditions. Specifically, the calculation failed to consider the potential of additional gravity flow directly from the BWST to the containment sump during the suction transfer. As a result, this design basis calculation did not bound the potential air entrainment due to vortexing in the BWST.

Description: The inspectors reviewed calculation C-NSA-049.01-004, “Vortex Formation with ECCS Pump Suction from the BWST,” which determined the BWST level that provided an acceptable analytical limit for the ECCS transfer permissive. The calculation considered the timing of the transfer from the BWST and accounted for the maximum ECCS pump flowrate during the time period when both the BWST isolation valves and the containment sump isolation valve would be partially open. Based on this analysis, the calculation verified that the minimum level in the BWST would not result in unacceptable air entrainment due to vortexing.

The inspectors noted that the plant design did not include check valves in the header from the containment sump to the ECCS pump suction, and questioned if water from the BWST could drain directly to the containment sump during the time period when both the BWST isolation valves and the containment sump isolation valve would be partially open. The inspectors further questioned if a postulated single failure of one of the BWST isolation valves to close would be the most limiting condition.

In response to this concern, the licensee initiated CR 07-29188 on October 25, 2007. The licensee's initial operability evaluation determined that an additional flow of approximately 1500 gallons per minute could occur and that this additional flow could increase the amount of air potentially entering the ECCS system. This initial evaluation predicted that the void fraction could approach 15 percent for approximately 75 seconds. This evaluation concluded that the transient was not expected to affect the operational readiness of these pumps.

The inspectors questioned the conclusion of the initial operability evaluation and asked for its basis. In response to this concern, the licensee performed POD No. 2007-003 on November 8, 2007. The POD included informal analyses, based on the existing computer model, to verify that the void fraction would not exceed 2 percent, considering the most limiting single failure of a valve to close. Obtaining an acceptable result required the removal of other conservatisms from the existing analysis. The inspectors reviewed this POD during the inspection and determined the results to be reasonable.

In addition to the potential air entrainment issue, the inspectors questioned if calculation C-NSA-049.02-0126, "NPSH Licensing Basis Analysis for Davis-Besse LPI & CS Pumps," correctly evaluated the available NPSH during the transition from the BWST to the containment sump. This calculation addressed the NPSH from the sump with the isolation valves fully open but did not address the available NPSH with the valves partially open. In response to this concern the licensee initiated CR 07-29174 on October 25, 2007. The condition report concluded that this issue was not an operability concern. The inspectors reviewed this CR during the inspection and determined this issue was not an operability concern.

<u>Analysis</u>: The inspectors determined that failure to fully evaluate the potential of ECCS air entrainment during accident conditions was a performance deficiency warranting a significance evaluation in accordance with IMC 0612, "Power Reactor Inspection Reports," Appendix B, "Issue Disposition Screening." This issue was more than minor because the finding was associated with the initial design attribute of the Mitigating System Cornerstone and affected the cornerstone objective of ensuring the availability, reliability, and capability of the ECCS to respond to initiating events to prevent undesirable consequences. Specifically, the existing design analyses did not fully address the potential of air entrainment during the transfer from the BWST to the containment sump.

The inspectors evaluated the finding using IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations," SDP Phase 1 screening. The inspectors answered "No" to all the screening questions in the Mitigating Systems Cornerstone column because re-evaluation confirmed the operability of the system. Therefore, the finding screened as having very low safety significance (Green).

This finding has a cross-cutting aspect in the area of Human Performance, Resources, because the licensee failed to maintain long term plant safety by maintenance of design margins (H.2(a)). Specifically, the actual margin, in both BWST level and ECCS flowrate, to prevent significant air entrainment due to vortexing was less than the margin indicated in the design basis analyses.

Enforcement: Title 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, as defined in Section 50.2, are correctly translated into procedures and instructions. Design bases means that information which identifies the specific functions to be performed by an SSC of a facility, and the specific values or ranges of values chosen for controlling parameters as reference bounds for design. These values may be requirements derived from analysis (based on calculations or experiments) of a postulated accident for which an SSC must meet its functional goals.

Contrary to this requirement, from June 1997 (original revision of subject calculation) until November 8, 2007, the licensee had not established effective measures to ensure that the design basis to prevent unacceptable ECCS air entrainment was correctly translated into procedures and instructions. Specifically, design basis calculation C-NSA-049.01-004 did not verify that the BWST level setpoint provided an acceptable analytical limit for the ECCS transfer permissive. However, because this violation was of very low safety significance and because the issue was entered into the licensee's corrective action program (CR 07-29188), this violation is being treated as an NCV consistent with Section VI.A.1 of the NRC Enforcement Policy. (NCV 05000346/2007007-03)

4. Failure to Adequately Evaluate Postulated Failure of AFW Suction Piping

Introduction: The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," having very low safety significance (Green), in that, the design bases analyses for the turbine driven AFW pumps suction pressure switch setpoint did not adequately evaluate a postulated failure of the pumps' common suction piping in the turbine building. Specifically, the calculation failed to consider the loss of inventory that could result from this piping failure. As a result, this design basis calculation did not adequately demonstrate that the turbine driven AFW pumps would be protected from the air entrainment due to this postulated event.

Description: The inspectors reviewed calculation C-ME-050.03-129, "Auxiliary Feedwater System (AFW) Low Suction Pressure Switches Setpoint," Revision 0 (dated September 12, 2007) during the inspection. This calculation determined the setpoint of the AFW pump suction pressure switches that would automatically transfer the pump suctions from the CST to the SW system. The calculation considered the pressure switch setpoint and time delays, the time required for the AFW pumps to start after a loss of AC power event, the time required for AC electrical power to be restored, the time required for the SW suction valves to open, and the time required for the SW pumps to restart. Based on this analysis, the calculation concluded that the AFW header inside the AFW pump rooms would contain sufficient inventory to prevent air entrainment in the AFW pumps prior to transfer from the CST to the SW system.

The inspectors noted that a portion of the common 10-inch AFW suction header in the turbine building was located at the same elevation as the header inside the AFW pump rooms, and noted that water would drain from that header in the event of a postulated piping failure in the turbine building (calculation C-ME-050.03-129 assumed that the entire inventory of the header, inside the pump rooms, would remain available during this event). The inspectors further questioned the assumption that the SW system header pressure differential across the SW suction valves would remain above 50 pounds per square inch differential (psid) without the SW pumps operating after a loss of AC power event (calculation C-ME-050.03-129 assumed that residual SW pressure would begin to supply the AFW pumps prior to the SW pumps restarting).

In response to these concerns, the licensee initiated CR 07-29941 on November 9, 2007. This condition report stated that the 50 psid assumption was non-conservative based on actual plant data, and that the actual pressure differential would be 18 psid. The licensee's initial operability evaluation stated that this assumption did not affect the conclusion of the calculation because a break of this turbine building piping did not require consideration in the plant design/licensing basis. This statement was based on a seismic analysis and hazards study of the turbine building piping performed in support of the non-safety-related motor driven AFW pump. The initial operability evaluation concluded that this issue did not impact the ability of the AFW pumps to perform their design function.

The inspectors questioned the conclusion of the initial operability evaluation and requested the licensee to provide a basis that a break of the turbine building suction header did not require consideration in the plant design/licensing basis. The inspectors pointed out that the Davis-Besse Restart Safety Evaluation Report (NUREG-1177, Section 3.3.1.2) stated that, "The suction line from the CST to the AFWS passes through the turbine building and, therefore, could fail as a result of a safe shutdown earthquake…"

On November 20, 2007, the licensee initiated CR 07-30437 to address the postulated failure or the AFW turbine building suction header from the CST. In addition, the licensee issued both POD 2007-05 and Revision 1 of calculation C-ME-050.03-129 on November 26, 2007. POD 2007-05 referred to calculation C-ME-050.03-129, Revision 1 and concluded that the AFW pumps wound not run out of water prior to the completion of the suction transfer from the CST to the SW system with a double-ended shear break of the piping in the turbine building.

The inspectors reviewed Revision 1 of calculation C-ME-050.03-129 and questioned the method used to calculate the available inventory in the AFW piping. The calculation assumed that the water in the branch connection between the closed SW suction supply valves and the AFW pump suction header would be available prior to the SW valves opening. The inspectors concluded that this additional inventory would not be available until the SW valves began to open, and that the AFW pumps could be exposed to air entrainment in the event of a pipe break in the turbine building.

In response to the additional concerns, the licensee initiated CR 07-30698 on November 28, 2007. This condition report stated that calculation C-ME-050.03-129, Revision 1 and POD 2007-05 required alteration to address these issues, and Revision 1 of POD 2007-05 was issued. The POD addressed the potential hazards to the turbine building piping and concluded that there was a reasonable expectation that the AFW system would be protected from running out of water prior to the completion of the transfer of the suction source to SW. POD 2007-05 addressed potential hazards due to seismic events, high energy line breaks, internal missiles, and tornados. In addition, the licensee installed a temporary missile barrier to protect the turbine building piping. This compensatory measure was completed on November 29, 2007. The inspectors reviewed Revision 1 of POD 2007-05 during the inspection and concluded the AFW system remained operable during transfer of the suction source to SW.

Analysis: The inspectors determined that failure to adequately protect the turbine driven AFW pumps from the potential of air entrainment due to a failure of the turbine building CST header was a performance deficiency warranting a significance evaluation in accordance with IMC 0612, "Power Reactor Inspection Reports," Appendix B, "Issue Disposition Screening." This issue was more than minor because the finding was associated with the initial design attribute of the Mitigating System Cornerstone and affected the cornerstone objective of ensuring the availability, reliability, and capability of the AFW system to respond to initiating events to prevent undesirable consequences. Specifically, the existing design did not adequately protect the turbine driven AFW pumps from the postulated failure of non-safety related piping in the turbine building.

The inspectors evaluated the finding using IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations," SDP Phase 1 screening. The inspectors answered "No" to all the screening questions in the Mitigating Systems Cornerstone column because the licensee's prompt operability determination (POD 2007-05, Revision 1) confirmed the operability of the AFW system. Therefore, the finding screened as having very low safety significance (Green).

This finding has a cross-cutting aspect in the area of Human Performance, Resources, because the licensee failed to maintain long term plant safety by maintenance of design margins (H.2(a)). Specifically, the actual design margin to protect the AFW pumps from the loss of non-safety related piping was less than the margin indicated in the design basis analyses and the licensing basis.

Enforcement: Title 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, as defined in Section 50.2, are correctly translated into procedures and instructions. Design bases means that information which identifies the specific functions to be performed by an SSC of a facility, and the specific values or ranges of values chosen for controlling parameters as reference bounds for design. These values may be requirements derived from analysis (based on calculations or experiments) of a postulated accident for which an SSC must meet its functional goals.

Contrary to this requirement, until November 29, 2007, the licensee had not established effective measures to ensure that the design basis to protect the turbine driven AFW pumps from non-safety-related piping failures was correctly translated into procedures and instructions. Specifically, design basis calculation C-ME-050.03-129 did not verify that the AFW pump low suction pressure setpoint and time delay provided an acceptable analytical limit to protect pumps from air entrainment due to a postulated piping failure. However, because this violation was of very low safety significance and because the issue was entered into the licensee's corrective action program (CR 07-30698), this violation is being treated as an NCV consistent with Section VI.A.1 of the NRC Enforcement Policy.
(NCV 05000346/2007007-04)

5. Concern Regarding Safety-Related Battery Electrical Isolation

Introduction: The inspectors identified an unresolved issue (URI) related to the safety-related battery design bases.

Description: During a review of the 125/250 Vdc safety-related distribution system, the inspectors determined that the safety-related buses supplied power to non-safety-related loads. In particular, the inspectors observed that some of the loads, such as the reactor coolant pump back-up oil lift pumps and lighting panel L49E1, were potentially subject to HELB/LOCA environments. The inspectors expressed a concern that, under such environments, the non-safety-related loads could become grounded and impose added loads on the DC buses from which they were powered.

This concern was also expressed by the licensee in CR 05-01849. This CR addressed the automatic transfer of emergency lighting panel L49E1, an in-containment panel, from its non-safety-related AC source to the safety-related DC system. Among others, the CR expressed the concern that the transfer might result in unintentional grounds being placed on the DC system. In their evaluation of this CR, the licensee performed a root cause analysis, but concentrated primarily on the impact that such faults would have on the containment penetration. Issues associated with multiple grounds were also addressed by CR 04-07150. In this CR, the licensee recognized that their earlier evaluation of IN 88-86, "Operating with Multiple Grounds in Direct Current Distribution Systems," and Supplement 1 to IN 88-86 may have not considered the impact of the multiple grounds issues. Therefore, the licensee recommended that such an evaluation be made, but also indicated that the condition was within the design bases of the plant. The recommended evaluation was performed, and each non-safety-related load on the DC system was reviewed; however, the evaluation was primarily focused on the affected components rather than on the impact of grounded non-safety-related components on the power supplying battery. As a result, no penalty for multiple grounds was taken in the DC calculation, C-EE-002.01-010.

The inspectors' review also determined that five automatic transfer switches transfer their non-safety-related loads between non-safety-related inverters YVA and YVB. The loads in question included the station annunciator, the plant computer, the non-nuclear instrumentation channels X and Y, and the integrated control system channels X and Y. Although these inverters are not safety-related and, hence, power other non-safety-related loads, they are in turn powered by the safety-related station batteries. Therefore, faults on the five automatic transfer switches and their loads could be transferred from one DC power source to its redundant DC power source, thereby, potentially impacting the ability of the safety-related batteries of both divisions to perform their safety function.

The use of the automatic transfer switches and their compliance with Safety Guide 6 was discussed in CR 04-07151 and again in CR 04-07761. In CR 04-07151, the licensee recognized that an analysis of the automatic transfer of loads between divisions had not been performed and that the transfer might not meet the intent of Safety Guide 6. In their investigation of this CR, however, the licensee concluded that, because the applicability section of the USAR pertaining to Safety Guide 6 had not specifically referenced the DC system, the design met the licensing bases. Therefore, the licensee proposed to revise the USAR and clarify their position. In CR 04-07761, the licensee concluded that Regulatory Positions 4.b. and 4.c. of Safety Guide 6 were applicable to Davis-Besse and that the use of the automatic transfer switches was inconsistent with the USAR text. Therefore, CR 04-07761 proposed that the review of the condition described in CR 04-07151 be performed using "NG-NS-00808 and NOP-LP-4003, Evaluation of Changes, Tests, and Experiments."

In the Introduction section, Safety Guide 6 states: "General Design Criterion 17 requires that onsite electrical power systems have sufficient independence to perform their safety functions assuming a single failure. This safety guide describes an acceptable degree of independence between redundant standby (onsite) power sources and between their distribution systems." That the Safety Guide was applicable to both AC and DC was evident in several sections of Safety Guide 6. For instance, Position 1 of the Guide states: "The electrically powered safety loads (a-c and d-c) should be separated into redundant groups…" Regarding the specific concern addressed in the licensee's CR, Safety Guide 6 Positions 4.b. and 4.c. state, respectively that, "No provisions should exist for automatically connecting one load group to another load group" and "No provisions should exist for automatically transferring loads between redundant power sources." Therefore, the inspectors concluded that Safety Guide 6 was applicable to the DC loads as well as the AC loads and that the use of automatic transfer switches to transfer loads between redundant power sources did not meet the intent of Safety Guide 6 or General Design Criterion XVII.

As indicated previously, the inspectors' concern was that the indiscriminate addition of non-safety-related loads to the safety-related 125 Vdc buses, i.e. without a detailed analysis of the impact of multiple grounds on the non-safety-related components and system, could induce faults on the safety-related buses and either reduce the margin of safety on the design of the safety-related system or prevent the safety-related system from performing its intended safety function. Furthermore, the use of automatic transfers of non-safety-related loads from one Division to the redundant Division could cause the same faults to impact both safety-related DC sources at the same time. This item is unresolved pending further review by the NRC of the documentation to be provided by the licensee pertaining to the design and licensing bases of the plant (URI 05000346/2007007-05).

.4 Operating Experience

a. Inspection Scope

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

- NRC RIS 2001-15, Performance of DC-Powered Motor-Operated Valve Actuators;
- NRC Bulletin 88-04, Potential Safety-Related Pump Loss;
- NRC IN 2004-01, Auxiliary Feedwater Pump Recirculation Line Orifice Fouling – Potential Common Cause Failure; and
- CR 07-28821, CDBI Preparations Revealed an Error with DC Calc.

b. Findings

1. Battery Connection Resistance Limit Specified in Technical Specifications Surveillance Requirement (SR) Insufficient to Ensure Battery Functionality

Introduction: The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion III, “Design Control,” having very low safety significance (Green) involving the failure to verify and ensure that the 125 Vdc safety-related batteries would remain operable if all the inter-cell and terminal connections were at the resistance value (150 micro-ohms) allowed by TS SR 4.8.2.3.2.b.2 and SR 4.8.2.3.2.c.3.

Description: When reviewing operability evaluations on recent CRs and operating experience from previous NRC Component Design Basis Inspections, the inspectors noted that CR 07-28821 assessed whether the TS allowed 150 micro-ohms was an acceptable resistance value for inter-cell connections in the 125 Vdc batteries. Procedure DB-ME-09200, Station Battery Maintenance Guidelines,” Section 7.0, referenced the same acceptance criteria when the battery is in service. The licensee performed an unofficial calculation with the DC CALC computer software used for calculation C-EE-002.01-010 which concluded: 1) there was no impact on battery sizing; 2) terminal voltage on the batteries was potentially reduced by 0.02 Vdc; 3) battery charger sizing was not impacted; and 4) available short-circuit current was greatly reduced. Based on the results of this informal calculation and a calculated 0.02 Vdc impact, the licensee determined the battery to be operable if all connections were at the TS allowed maximum of 150 micro-ohms. The inspectors noted that the normal connection resistance was about 35 micro-ohms; therefore, increasing the connection resistance to 150 micro-ohms constituted a total change of about 7000 micro-ohms (61 connections X 115 micro-ohms change each). Using Ohm’s Law and the battery discharge profile, the inspectors calculated the voltage drop at the DC system input connections to be roughly 2.5 to 6.0 Vdc, which was significantly greater than the licensee’s calculated 0.02 Vdc.

The inspectors discussed their concern with the licensee and the concern was documented in CR 07-29385, “CR 07-28821 150MICROOHMS not Properly Understood/Communicated to OPS.” In resolving this CR, the licensee addressed difficulties with using the DC CALC computer software but did not address the technical issue related to the TS value. After the inspectors demonstrated the 150 micro-ohm TS limit would have resulted in a voltage drop larger than the margin available on the last battery performance test, the licensee generated CR 07-29924, “Negative Margin on Station Batteries.” This CR noted that if the battery connections were allowed to degrade to the TS allowed value, the batteries would not pass surveillance tests and would not support the design basis accident (DBA). However, the licensee determined that the station batteries remained operable because licensee records showed that the actual recorded inter-cell resistance values ranged from 18 to 32 micro-ohms.

The licensee acknowledged that the current TS allowed resistance value for each connection was too high and could result in an inoperable battery. The licensee established a preliminary total resistance limit of 2330 micro-ohms for all battery connections. The licensee intends to change the current allowed value and to incorporate an appropriate value into maintenance procedures when they change to standardized TS.

Analysis: The inspectors determined that licensee's failure to verify that the resistance value (150 micro-ohms) specified in TS SR 4.8.2.3.2.b.2 and SR 4.8.2.3.2.c.3 was sufficient to ensure safety-related battery operability was a performance deficiency and a finding. The inspectors determined that the finding was more than minor in accordance with IMC 0612, Appendix B, "Issue Screening," because if left uncorrected, the finding could become a more significant safety concern. Specifically, the 125 Vdc safety-related batteries would become incapable of meeting their design basis if the inter-cell and connection resistance were allowed to increase to the TS allowed value.

The inspectors evaluated the finding using IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations," SDP Phase 1 screening. The inspectors answered "No" to all the screening questions in the Mitigating Systems Cornerstone column because the batteries were relatively new and current recorded inter-cell and terminal connection resistance values were not currently significant. Therefore, the finding screened as having very low safety significance (Green).

The inspectors determined that the licensee followed their corrective action program when evaluating CR 07-28821; therefore, a cross-cutting aspect in the area of problem identification and resolution was not appropriate. This finding has a cross-cutting aspect in the area of Human Performance, Resources, because the licensee failed to maintain long term plant safety by maintenance of design margins (H.2(a)). Specifically, the TS allowed resistance limit had not been revised because of an error in the licensee's calculation that evaluated the effects of inter-cell resistance changes.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions. It further states that design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program.

Contrary to the above, from the beginning of plant operations until November 8, 2007, the licensee failed to verify by calculation or design review that the TS SR 4.8.2.3.2.b.2 and SR 4.8.2.3.2.c.3 specified limit for battery inter-cell and terminal connection resistance was sufficient to ensure plant safety. Specifically, the licensee failed to verify that the use of 150 micro-ohms would ensure safety-related battery operability in accordance with the design basis. However, because this violation was of very low safety significance and it was entered into the licensee's corrective action program, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy. (NCV 05000346/2007007-06) The licensee entered the finding into their corrective action program as CRs 07-28821, 07-29385, and 07-29924.

.5 Modifications

a. Inspection Scope

The inspectors reviewed seven 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:

- MOD 94-0005 Replace AF3870 and AF3872 Operators;
- MOD 96-0001-00 Increase Motor Thrust Capability for RC-11;
- MOD 96-0005-00 Delete CCW Pump Low Flow and High Temperature Trip Functions;
- MOD 98-0061-00 Replacement of Temperature Controllers for EDG Rooms;
- ECP 05-0212-0 Component Cooling Water Temperature Increase;
- ECR 04-0216-01 Service Water 18”-HBC-42 Return Header from CCW Heat Exchangers Annubat Flowmeters; and
- EWR 01-0096-00 Replacement of Level Transmitter for the EDG Day Tank 1-2 Level Transmitter LT2788.

b. Findings

No findings of significance were identified.

.6 Risk Significant Operator Actions

a. Inspection Scope

The inspectors performed a margin assessment and detailed review of five risk significant, time critical operator actions (5 samples). These actions were selected from the licensee’s PRA rankings of human action importance based on risk achievement worth values. Where possible, margins were determined by the review of the assumed design basis and USAR response times and performance times documented by job performance measures results. For the selected operator actions, the inspectors performed a detailed review and walk through of associated procedures, including observing the performance of some actions in the station’s simulator and in the plant for other actions, with an appropriate plant operator to assess operator knowledge level, adequacy of procedures, and availability of special equipment where required.

The following operator actions were reviewed:

- Operator Fails to Recover Failed EDGs or Recover Failed Offsite Power;
- Operator Fails to Isolate Faulted Steam Generator;

- Operator Fails to Initiate Decay Heat Removal System;
- Operator Fails to initiate RCS Cooldown below SDC Pressure; and
- Operator Fails to Recover Failed Component Cooling Water System.

b. Findings

No findings of significance were identified.

4OA6 Meeting(s)

Exit Meeting

The inspectors presented the inspection results to Mr. V. Kaminskas and other members of licensee management at the conclusion of the inspection on November 30, 2007. The inspectors asked the licensee whether any of the material examined during the inspection should be considered proprietary. All proprietary documents were returned to the licensee.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

M. Bezilla, Site Vice President
N. Barron, Engineer, Nuclear
K. Byrd, Manager, Design Engineering
R. Carrite, Engineer, Electrical
J. Chowdhardy, Engineer, Electrical
T. Chowdhardy, Staff Engineer, Regulatory Compliance
J. Grabnar, Director, Engineering
V. Kaminskas, Director, Plant Operation
R. Lakis, Supervisor, Nuclear
D. Nassar, Engineer, Nuclear
W. Patchett, Engineer, Electrical
C. Rupp, Engineer, Electrical
G. Wolf, Staff Engineer, Regulatory Compliance
D. Wuokko, Acting Manager, Regulatory Affairs
K. Zellers, Supervisor, Analysis Group and Design

Nuclear Regulatory Commission

A. M. Stone, Chief, Engineering Branch 2
J. Rutkowski, Senior Resident Inspector

LIST OF ITEMS OPENED, DISCUSSED, AND CLOSED

Opened and Closed

05000346/2007007-01	NCV	Inadequate Battery Voltage Drop and Sizing Design Calculation (Section 1R21.3.b.3)
05000346/2007007-02	NCV	Periodic Testing of 480V Starter Coils Not Implemented (Section 1R21.3.b.4)
05000346/2007007-03	NCV	Failure to Adequately Consider Potential Air Entrainment to ECCS during Suction Transfer (Section 1R21.3.b.5)
05000346/2007007-04	NCV	Failure to Adequately Evaluate Postulated Failure of AFW Suction Piping (Section 1R21.3.b.6)
05000346/2007007-06	NCV	Battery Connection Resistance Limit Specified in Technical Specifications Surveillance Requirements Insufficient to Ensure Battery Functionality (Section 1R21.4.b.1)

Opened

05000346/2007007-05	URI	Concern Regarding Safety-Related Battery Electrical Isolation (Section 1R21.3.b.7)

Discussed

None

LIST OF DOCUMENTS REVIEWED

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

CALCULATIONS

Number	Description or Title	Date or Revision
25.9	Emergency Diesel Generator Room Ventilation System	0
35.035	Decay Heat Removal Pumps Continuous Recirculation Flow (NRC Bulletin No. 88-04)	0
50A	Condensate System, Start-Feed Pump Suction and Discharge	C2
69.036	Auxiliary Feedwater Pump Recirculation Flow – NRC Bulletin No. 88-04	A01
C-EE-002.001-009	High and Low Voltage Setpoints for DCMCC Meter Relays	1
C-EE-002.001-010	DC Calc – Battery & Charger Sizing, Short Circuit, and Voltage Drop	30
C-EE-002.001-010 Addendum A01	DC Calc – Battery & Charger Sizing, Short Circuit, and Voltage Drop	30
C-EE-002.001-010 Addendum A02	DC Calc – Battery & Charger Sizing, Short Circuit, and Voltage Drop	30
C-EE-002.001-010 Addendum A02	DC Calc – Battery & Charger Sizing, Short Circuit, and Voltage Drop	29
C-EE-002.001-010 Addendum A03	DC Calc – Battery & Charger Sizing, Short Circuit, and Voltage Drop	30
C-EE-002.001-010 Addendum A03	DC Calc – Battery & Charger Sizing, Short Circuit, and Voltage Drop	29
C-EE-002.001-010 Addendum A04	DC Calc – Battery & Charger Sizing, Short Circuit, and Voltage Drop	30
C-EE-002.001-010 Addendum A04	DC Calc – Battery & Charger Sizing, Short Circuit, and Voltage Drop	29
C-EE-002.001-010 Addendum A05	DC Calc – Battery & Charger Sizing, Short Circuit, and Voltage Drop	29
C-EE-002.001-011	Low Voltage Coordination Calculation	6
C-EE-002.001-011 Addendum A01	Low Voltage Coordination Calculation	6
C-EE-002.001-011 Addendum A02	Low Voltage Coordination Calculation	6
C-EE-002.001-011	Low Voltage Coordination Calculation	6

CALCULATIONS

Number	Description or Title	Date or Revision
Addendum A03		
C-EE-002.001-013	125/250 VDC Distribution System Ground Detection	0
C-EE-002.001-013 Addendum A01	125/250 VDC Distribution System Ground Detection	0
C-EE-002.001-015	250/125 VDC Battery Discharge Relay Setting	0
C-EE-002.001-015 Addendum A01	250/125 VDC Battery Discharge Relay Setting	0
C-EE-006.001-01 Addendum A01	Protective Relay Setpoint for Battery Charger	1
C-EE-006.001-019	Protective Relay Setpoint for Battery Charger	1
C-EE-006.001-022	Protective Relay Setpoint for Battery Charger	1
C-EE-006.001-022 Addendum A01	Protective Relay Setpoint for Battery Charger	1
C-EE-006.001-022 Addendum A02	Protective Relay Setpoint for Battery Charger	1
C-EE-006.01-027	Safety-Related Motor Contactor Control Circuit Voltage Drop	3
C-EE-006.01-029	Motor Thermal Overload Relay Heater Selection	03
C-EE-015.03-008	AC Power System Analysis	4
C-EE-017.01-006	Adequacy of 120 VAC Essential Instrumentation System	3
C-EE-017.01-007	Essential Inverter Undervoltage Dropout Setpoint	1
C-EE-024.01-002	Protective Relay Setpoint for Emergency Diesel Generator 1-1 (AC101)	4
C-EE-024.01-010	Emergency Diesel Generator Room Electrical Equipment Temp. Evaluation	0
C-EE-024.01-010 Addendum A01	Emergency Diesel Generator Room Electrical Equipment Temp. Evaluation	0
C-EE-024.01-010 Addendum A02	Emergency Diesel Generator Room Electrical Equipment Temp. Evaluation	0
C-EE-050.01-004	Cable Resistance for MV38700 and MV01060	0
C-ME-011.01-126	Differential Pressure Calculation for SW2929	1
C-ME-011.01-127	Required Torque for SW2929	2
C-ME-011.01-141	Service Water System NPSH Analysis	1
C-ME-016.04-041	Evaluation of the Temperature Increase of the CCW System	0

CALCULATIONS

Number	Description or Title	Date or Revision
C-ME-024.02-001	HVAC Diesel Generator Room	3
C-ME-037.01-003	Tank Level Curve Calculation – Condensate Storage Tanks (T-31-1.2)	2
C-ME-049.02-109	EN-DP-01092 D/P Calc. for DH9A and DH9B	1
C-ME-049.02-124	Target Thrust Calculation for DH9A/DH9B	4
C-ME-050.01-004	Component Level Review Calculation for AOV MS5889A/B	3
C-ME-050.01-006	Maximum Expected Differential Pressure for Valves MS5889A and MS5889B	0
C-ME-050.03-117	Limiting Differential Pressure for AF3870 and AF3872	0
C-ME-050.03-120	EN-DP-01082 Calculation of Target Thrust for AF3870	5
C-ME-050.03-120	EN-DP-01082 Calculation of Target Thrust for AF3870	5
C-ME-050.03-123	AFW Pump discharge Piping Pressure	3
C-ME-050.03-129	Auxiliary Feedwater System (AFW) Low Suction Pressure Switches Setpoint	0 & 1
C-ME-083.01-222	EN-DP-01092 Calculation of Limiting D/P for MS106/MS107	4
C-ME-083.01-229	EN-DP-01082 Calculation of Target Thrust for MS106	7 Addendum 1
C-ME-083.01-229	EN-DP-01082 Calculation of Target Thrust for MS106	7
C-ME-11.01-127	Required Torque for SW2929	2
C-NSA-002.02-001	Station Battery Room Hydrogen Concentration	0
C-NSA-011.01-003	Allowable Service Water Flow Diversion During Cold Weather	2
C-NSA-011.01-016	Service Water System Design Basis Flowrate Analysis And Testing Requirements	1 Addendums 1 and 2
C-NSA-011.01-017	Pump Curve Acceptance Criteria For Service Water Pump 2	1
C-NSA-011.01-018	Analysis Of Service Water System Online Flow Balance Test Data For Train 1	0
C-NSA-011.01-019	Analysis Of Service Water System Online Flow Balance Test Data For Train 2	0

CALCULATIONS

Number	Description or Title	Date or Revision
C-NSA-016.04-006	CCW Maximum Temperature Analysis	1
C-NSA-037.01-001	Condensate Storage Tank Capacity for Decay Heat Removal and Sensible Heat Removal	0
C-NSA-049.01-004	Vortex Formation with ECCS Pump Suction from the BWST	1
C-NSA-050.03-028	Auxiliary Feedwater (AFW) Minimum Performance	1
ISTB1	Pump And Valve Basis Document, Volume I, Valve Basis	5
ISTB2	Pump And Valve Basis Document, Volume II, Pump Basis	7
ISTB3	Pump And Valve Basis Document, Volume III, Stroke Time Basis	29

CORRECTIVE ACTION PROGRAM DOCUMENTS ISSUED DURING INSPECTION

Number	Description or Title	Date or Revision
CR 07-29134	Coordination of Control Circuits for EDG 1-1 at C3621	October 24, 2007
CR 07-29174	Calculation C-NSA-049.02-026 Deficiency	October 25, 2007
CR 07-29177	Lack of Calc for Min. Required Voltage for EDG Motor Driven FU	October 25, 2007
CR 07-29178	Non-Compliance with NOP-SS-3001 During Update of DB-SC-03070/7	October 25, 2007
CR 07-29188	Calculation C-NSA-049.01-004 Deficiency	October 25, 2007
CR 07-29269	Incorrect Value Use in DC Calc	October 26, 2007
CR 07-29385	CR 07-28821 150MICROOHMS not Properly Understood/communicated to OPS	October 25, 2007
CR 07-29502	Incorrect Modeling of EDG Fuel Oil Pump Motors in C-EE-002.01-01	November 1, 2007
CR 07-29513	Filenet Calculation Files Not Properly Scanned	November 1, 2007
CR 07-29668	Incorrect Statement Identified in Calculation Results	November 11, 2007
CR 07-29742	NRC Concern with CR 07-29188 Statements	November 6, 2007
CR 07-29793	DB-SP-03208 Does Not Ensure DH7B is Open for Venting	November 7, 2007
CR 07-29874	Errors Found in Calculation C-EE-002.01-	November 8, 2007

CORRECTIVE ACTION PROGRAM DOCUMENTS ISSUED DURING INSPECTION

Number	Description or Title	Date or Revision
	010, DC Calc	
CR 07-29917	DC Calc Lists Incorrect Room Temperature	November 8, 2007
CR 07-29924	Negative Margin on Station Batteries	November 8, 2007
CR 07-29925	Inadequate Voltage For EDG Motor Driven Fuel Pumps	November 8, 2007
CR 07-29927	DC Calc C-EE-002.01-010 SV4608A Operating Voltage	November 8, 2007
CR 07-29941	Calculation C-ME-050.03-129 Deficiency	November 9, 2007
CR 07-30042	Calculation C-ME-050.03-123 Deficiency	November 12, 2007
CR 07-30090	Enhancement to Calculation C-EE-002.01-010 for Worst Case Scenario	November 14, 2007
CR 07-30196	DB-SC-03076(7) Acceptance Criteria Reference	November 15, 2007
CR 07-30235	MEMO NSS-03-00060, R. 0, ATT. 1 Not Officially Documented in Record	November 15, 2007
CR 07-30271	DC Calc Attachment 54	November 16, 2007
CR 07-30283	Relay Setting Manual Discrepancy	November 16, 2007
CR 07-30361	Calc Conflict in Reference Standard Revision Year	November 19, 2007
CR 07-30409	EDG 1 Monthly Test of 4/27/06 Recorded Inadequate Frequency	November 20, 2007
CR 07-30437	Unclear Licensing Basis fir the AFW Suction from CST	November 20, 2007
CR 07-30479	Incorrect Resistance Values in DC Calc	November 21, 2007
CR 07-30599	Incorrect Reference in Step 5.1.22 of Procedure DB-SC-03114	November 27, 2007
CR 07-30632	MS5889A/B Air Regulator Set point Discrepancy	November 27, 2007
CR 07-30634	Calculation C-EE-044.01-009 Discrepancies	November 27, 2007
CR 07-30673	Potential for Insufficient Battery Margin and Surveillance Test	November 28, 2007
CR 07-30679	Calc C-ME-11.01-127 Requires Update to Change Application Factor	November 28, 2007
CR 07-30698	Calculation C-ME-050.03-129 Rev. 01 Discrepancy	November 28, 2007
CR 07-30718	CR 03-10130 Close to a Notification Without Due Date	November 29, 2007
CR 07-30763	Steam Admission Valve Open Stroke Basis Documentation	November 28, 2007
CR 07-31093	NRC Observation on Timeliness of Condition Reports	December 6, 2007
CR 07-31120	Potential Human Performance Issues and	December 6, 2007

CORRECTIVE ACTION PROGRAM DOCUMENTS ISSUED DURING INSPECTION

Number	Description or Title	Date or Revision
	NCVS Noted by the NR	
CR 07-31840	Averaging Pump Data Is Not Permitted With Respect to Code Com	December 20, 2007
NOT 600421191	Revise Calculation C-ME-011.01-141	October 29, 2007
NOT 600423146	DB-OP-06261 Correction	November 2, 2007
NOT 600428916	Alter DB-PF-03216 to Include Data Gathering Steps Based on Comprehensive Test Flowrate	November 30, 2007
NOT 600428917	Alter DB-PF-03218 to Include Data Gathering Steps Based on Comprehensive Test Flowrate	November 30, 2007
NOT 600428918	Alter DB-PF-03224 to Include Data Gathering Steps Based on Comprehensive Test Flowrate	November 30, 2007
NOT 600428919	Alter DB-PF-03233 to Include Data Gathering Steps Based on Comprehensive Test Flowrate	November 30, 2007
NOT 600428920	Alter DB-PF-03214 to Include Data Gathering Steps Based on Comprehensive Test Flowrate	November 30, 2007
NOT 600428921	Alter DB-PF-03215 to Include Data Gathering Steps Based on Comprehensive Test Flowrate	November 30, 2007
PIN	Add Clarifying Note to C-ME-083.01-222	November 5, 2007
POD 2007-003	Calculation C-NSA-049.01-004 Did Not Describe the Most Limiting Condition	November 8, 2007
POD 2007-005	Calculation C-NSA-050.03-129 Did Not Evaluate Double-Ended Shear Break of Piping	November 26, 2007 & November 29, 2007

CORRECTIVE ACTION PROGRAM DOCUMENTS REVIEWED

Number	Description or Title	Date or Revision
CR 01-02192	RIS 2001-15, DC Powered MOV Actuator Performance Prediction	August 23, 2001
CR 02-02941	Procedure Guidance for Ground Hunting	July 16, 2002
CR 03-05808	E-2014 Fuse Report for RC3706 Discrepancies	July 19, 2003
CR 03-06803	MC25-3 and MC25-4 Operating at Greater than 100% Full Load Current	August 21, 2003
CR 03-06944	CATI: Fuse Sizing for MV0106 and MV38700	August 25, 2003
CR 03-08893	Reduction in MOV Output Thrust/Torque Capability	October 16, 2003

CORRECTIVE ACTION PROGRAM DOCUMENTS REVIEWED

Number	Description or Title	Date or Revision
CR 03-10130	Surveillance Testing of Pickup Voltage for Contactors and Interposing Relays	November 23, 2003
CR 03-10856	Non-Coordinated Appendix R Circuits	December 13, 2003
CR 04-00589	IN 2004-01: Aux FW Pump Recirc Line Orifice Fouling – Potential Common Cause Failure	January 22, 2004
CR 04-07102	DC LIR - Fuse Labeling Inside Essential 125 VDC Panel D2P Incorrect	November 17, 2004
CR 04-07109	DC LIR - DC System Margin	November 17, 2004
CR 04-07121	DC LIR – No Firm Basis for Ground Detection Alarm	November 18, 2004
CR 04-07150	DC LIR – Potential for Multiple DC Grounds Due to Harsh Environment	November 19, 2004
CR 04-07150-01	Corrective Action No.1 to CR 04-07150 Attachment 1 – Flow Chart & Analysis	August 18, 2006
CR 04-07328	DC-LIR – Non-Conservative Error in Battery Sizing Calculation	November 30, 2004
CR 04-07388	DC-LIR – Regulatory Guide 1,75 and Electrical Isolation of Non-1E DC Circuits	December 2, 2004
CR 04-07391	DC-LIR – Procurement Specifications for DC-Powered Components	December 2, 2004
CR 04-07761	CR-RFA to Regulatory Affairs Regarding Isolation/Separation of the DC System	December 20, 2004
CR 05-00818	RFA : Specification M385Q Voltage Range	January 27, 2005
CR 05-02551	NRC-SSDPC – Aux Feedwater Target Rock Solenoid Inlet Orifice	May 3, 2005
CR 05-03339	Topical Report TR5-43 Review of Circuit Card/Board Related Failures	May 18, 2005
CR 05-04946	Service Water Pump #2 Quarterly Test Results Report Pump Is Nearly Inoperable	September 13, 2006
CR 06-00309	Evaluate Acceptability of SWP #3 Baseline Test Data	February 6, 2006
CR 06-01336	Boric Acid Accumulation in DH9B Upstream Piping	March 26, 2006
CR 06-01518	Service Water Piping at SW261 Found 50% Full of Small Debris and Silt	March 31, 2006
CR 06-02010	Low Service Water Flow to CREVS #1	April 21, 2006
CR 06-02010	Low Service Water Flow to CREVS #1	April 21, 2006
CR 06-02066	Steam Admission Valve (MS5889A) Outside Expected Stroke Time	April 24, 2006
CR 06-03004	Inoperability of MS5889B Not Documented Following Stroke Time Failure	August 10, 2006
CR 06-03232	Follow-up CA (#1) to CR 04-07150 – DC Circuits in Harsh Environment	August 17, 2006

CORRECTIVE ACTION PROGRAM DOCUMENTS REVIEWED

Number	Description or Title	Date or Revision
CR 06-03233	Follow-up CA (#1) to CR 04-07150 – DC Circuits in Harsh Environment	August 17, 2006
CR 06-03367	Service Water Pump Design Requirements Not Up to Date	August 31, 2006
CR 06-10799	AFW Low Suction Pressure Transfer Setpoint Adequacy	December 1, 2006
CR 06-11361	CDBI Self Assessment – BAAT Minimum Level Requirement Deficiencies	December 13, 2006
CR 07-16934	Suspect Motor Pinion Key Material in AF3870	March 26, 2007
CR 07-23568	CDBI – Battery Charger Float Charge/Equalize Charge Adjustable Voltage	July 16, 2007
CR 07-23683	CDBI – Battery Charger Circuit Boards not Included in PMS	July 18, 2007
CR 07-23781	Scaffolding and 50.59 Requirements	July 19, 2007
CR 07-24704	CDBI/AFW – Calc C-NSA-50.03-123 Speed Criteria not Applied to all AFW Procedures	August 6, 2007
CR 07-24705	CDBI/AFW – Strainers S503/504 and S203/204, AFP/AFPT Cooling Line Strainers	August 6, 2007
CR 07-28242	CDBI Self Assessment: C-EE-002.01-011 Not Addresses in DC Calc Rev 30	October 10, 2007
CR 07-28296	CDBI – Self Assessment: Calculation EC118B Not Addressed by DC Calc Rev 30	October 11, 2007
CR 07-28821	CDBI Preparations Revealed an Error with DC Calc	October 18, 2007
CR04-07151	DC LIR – Independence Between Load Groups	November 19, 2004
NOT 600352155	System Description Updates	December 6, 2006

DRAWINGS

Number	Description or Title	Date or Revision
12501-M-180Q-13 Sheet 2	Schematic Diagram Engine Control 1-1	P
E-1 Sheet 1	A. C. Electrical System One Line Diagram	26
E-1042 Sheet 1	Emergency Diesel Generator 1-1 Loading Table	16
E-1042 Sheet 2	Emergency Diesel Generator 1-1 Loading Table	18
E-44B Sh. 20	Elementary Wiring Diagrams – Feedwater System AFP Discharge to SG	11
E-46B Sh. 54A	Elementary Wiring Diagram – Steam &	12

DRAWINGS

Number	Description or Title	Date or Revision
	Condensate AUX FD PMP TURB MN STM IN ISO VLV	
E-46B Sh. 54B	Elementary Wiring Diagram – Steam & Condensate AUX FD PMP TURB MN STM IN ISO VLV	17
E-48B Sheet 28A	Elementary Wiring Diagram – Lake Water System Service Water Intake Structure Valve	0
E-6 Sh. 3	125/250 V.D.C. MCC No. 1 (Essential) Single Line Diagram	34
E-6 Sh. 4	125/250 V.D.C. MCC No. 2 (Essential) Single Line Diagram	28
E-7	250/125V DC and Instrumentation AC One Line Diagram	37
HL-206K	Hanger Location Drawing – Condensate System	5
M-006C	P&ID - Main Feedwater System	29
M-006D	P&ID - Auxiliary Feedwater System	52
M-006E	P&ID - Condensate System	26
M-041A	Service Water Pumps and Secondary Service Water System (P&ID)	30
M-041B	Primary Service Water System (P&ID)	62
M-041C	Service Water System for Containment Air Coolers (P&ID)	35
M-233B	Emergency Core Cooling System – Pump Suction Piping Isometric	22
M-233B	Emergency Core Cooling System Pump Suction Piping	22
M-236Q-0006	Conical Strainer	B1
M-268D	Piping System Composite – Auxiliary building Sections	10
M-309AQ-7, Sheet 1	Solenoid Operated Valve	E
M-309AQ-7, Sheet 2	Solenoid Operated Valve	H
OS-017A, Sheet 1	Operational Schematic – Auxiliary Feedwater System	22
OS-017A, Sheet 2	Operational Schematic – Auxiliary Feedwater System	2
OS-017B, Sheet 1	Operational Schematic – Auxiliary Feedwater Pumps and Turbines	24
OS-017B, Sheet 2	Operational Schematic – Auxiliary Feedwater Pumps and Turbines	7
OS-020, SH 1	Operational Schematic Service Water System	75

DRAWINGS

Number	Description or Title	Date or Revision
OS-020, SH 2	Operational Schematic Service Water System	40
SF-003B Sh. 13	SFRCS Internal Schematic Diagram – AFPT-1 MN STM-1 IN ISO Valve MS 106	2
SF-003B Sh. 5	SFRCS Internal Schematic Diagram – AFP1 Disch, To SG-1 Valve AF-3870	1

MODIFICATIONS

Number	Description or Title	Date or Revision
ECP 05-0212	Component Cooling Water Temperature Increase	0
ECR 04-0216	Service Water 18”-HBC-42 Return Header from CCW Heat Exchanger Annubar Flowmeters	1
EWR 01-0096	Replacement Level Transmitter Emergency Diesel Generator Day Tank 1-2 LT2788	0
MOD 94-0005	Replace Motor Operators on AF3870 an AF3872	0
MOD 96-0001	Increase Motor Thrust Capability for RC-11	0
MOD 96-0005	Delete CCW Pump Low Flow and High Temperature Trip Functions	0
MOD 98-0061	High Temperatures in Emergency Diesel Generators Rooms	0

PROCEDURES

Number	Description or Title	Date or Revision
DBBP-TRAN-0034	Davis-Besse Operator Fundamentals Memory List	0
DB-ME-03002	Station Battery Service and Performance Discharge Test	9
DB-ME-09114	Molded Case Breaker Inspection and Test	10
DB-ME-09114	Molded Case Breaker Inspection & Test	10
DB-ME-09200	Station Battery Maintenance Guidelines	10
DB-ME-09202	Maintenance of SCI Essential UPS	10
DB-OP-02000	RPS, SFAS, SFRCS TRIP, or SG Tube Rupture	20
DB-OP-02001	Electrical Distribution Alarm Panel 1 Annunciators	17
DB-OP-02012	STM GEN/SFRCS Alarm Panel 12 Annunciator	5
DB-OP-02504	Rapid Shutdown	10

PROCEDURES

Number	Description or Title	Date or Revision
DB-OP-02521	Loss of AC Power Sources	12
DB-OP-02523	Component Cooling Water System Malfunctions	5
DB-OP-02525	Steam Leaks	5
DB-OP-02526	Steam Generator Overfill	01
DB-OP-02543	Rapid Cooldown	4
DB-OP-06011	High Pressure Injection System	19
DB-OP-06233	Auxiliary Feedwater System	17
DB-OP-06261	Service Water System Operating Procedure	31
DB-OP-06316	Diesel Generator Operating Procedure	34
DB-OP-06322	Locating Grounds on the Station 250/125 VDC System	0
DB-OP-06334	Station Blackout Diesel Generator Operating Procedure	12
DB-PF-03017	Attachment 4: Pump Design Curves	22
DB-PF-03117	Service Water Pump 1 Shutdown Testing	8
DB-PF-05005	Air Balancing/Testing of Ventilation Systems	0 & 2
DB-SC-03070	Emergency Diesel Generator 1 Monthly Test	14
DB-SC-03077	Emergency Diesel Generator 2 184 day Test	13
DB-SC-03114	DFAS Integrated Response Time Test	April 14, 2006
DB-SP-03208	DH7B/DH9B and CS1530 Valve Test	7
NOBP-OP-1009	Prompt Operability Determination Preparation Guide	1
NOP-OP-1009	Immediate and Prompt Operability Determination	0
OPS-GOP-S304	Subcooling Margin Loss Quick Hitter Drill	2
ORQ-SIM-S186	Steam Leak in CTMT, SFRCS Auto & Manual Failure, CRD Cooling Loss, AFPT Steam Leak, CCW Pump Trip	0

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Number	Description or Title	Date or Revision
600278179	Notification – DC LIR – Regulatory Guide 1.75	January 31, 2006
600310908	Notification – USAR Clarification of Safety Guide 6	June 26, 2006
CDBI-238	Various Licensing Documents Associated with Question 238	November 27,2007
IEEE-485-1983	IEEE Recommended Practice for Sizing Large Lead Storage Batteries for	1983

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Number	Description or Title	Date or Revision
	Generating Stations and Substations	
IP-E-011	Test Report – Motor Starter and Relay Pickup Voltages	0
N/A	Hazard Study for the Motor Driven Feedwater Pump System for Davis-Besse Nuclear Power Plant	March 1998
NED-89930211	Information Notice 88-86, Supplement 1	November 14, 1989
NEO-88-01838	Closeout of Information Notice 88-86	November 18,1988
NOP-LP-2001	Corrective Action Program	17
NOP-OP-1009	Immediate and Prompt Operability Determination	0
QAD-70095	Closeout of IN 94-80 (Terms A17861)	March 24, 1995
SD-007	System Description for 125/250 VDC and 120 V Instrumentation AC System	5
SD-015	System Description - Auxiliary Feedwater System	3
SD-016	System Description - Component Cooling Water System	5
SD-028B	System Description - Auxiliary Building Non-Radioactive Areas Heating and Ventilation System	3
SD-042	System Description – Decay Heat Removal System	3
SD-31B	System Description – Condensate Storage System	3

VENDOR DOCUMENTS

Number	Description or Title	Date or Revision
ACT 03-0482	Flowserve Specification for Valve MS5889A	April 8, 2003
JM00810080	Ashcroft Operating Instructions for Types 2084 & 2089 Digital Test Gauges	October 1, 2001

WORK DOCUMENTS

Number	Description or Title	Date or Revision
200000616	Replace All Electrolytic Capacitors for Filter and Circuit	January 16, 2006
200008585	Station Battery 2P Service Test	January 25, 2005
200008602	Station Battery 2N Service Test	January 26, 2005
200038843	Station Battery 2P Modified Performance Test	April 3, 2006
200038866	Station Battery 2N Modified Performance	April 3, 2006

WORK DOCUMENTS

Number	Description or Title	Date or Revision
	Test	
200072787	Station Battery 1P Modified Performance Test	November 29, 2003
200072789	Station Battery 1N Modified Performance Test	November 28, 2003
200073532	YV2 Essential Instrument AC Panel – Voltage Oscillations	June 13, 2004
200079552	YV2 Essential Instrument AC Panel – Running Frequency Drift	June 25, 2004
200083108	ECR 04-0095-00 Replace AC Input Breaker for Battery Charger DBC2P	July 11, 2007
200083338	Replace DC Bus 1 Meter Relay	April 24, 2004
200102399	YV2 Essential Instrument AC Panel – Replace Manual Switch on YV2 Inverter	March 25, 2006
200116859	PM 0699 YV2 *CK* Inverter Rectifier	March 29, 2006
200117134	Station Battery 2P PM 0712 *Cln Btry*	April 5, 2006
200117135	Station Battery 2N PM 0712 *Cln Btry*	April 5, 2006
200117182	PM 0700 YV3 *CK* Inverter/Rectifier	
200140696	Station Battery 1P Service Test	March 21, 2006
200158781	Molded Case Breaker BR 1222 Testing	October 26, 2007
200173776	Take Voltage and Current Readings for 24 Hour Period	January 24, 2006
DB-PF-03017	Service Water Pump 1 Testing	August 2, 2007 October 25, 2007
DB-PF-03023	Service Water Pump 2 Testing	September 14, 2007
DB-PF-03030	Service Water Pump 3 Testing	September 24, 2007
DB-PF-03214	Baseline Testing of Service Water Pump 1 in Modes 1-4	June 3, 2007
DB-PF-03215	Baseline Testing of Service Water Pump 2 in Modes 1-4	April 3, 2007
DB-PF-03216	Baseline Testing of Service Water Pump 3 in Modes 1-4	February 8, 2006
DB-SP-03151	AFP 1 Quarterly Test	April 24, 2006
DB-SP-03157	AFP 1 Response Time Test	April 24, 2006
E-18Q-17-04	GNB Station Battery Install. & OP Instructions	
E-20-89-7	Cyberex Inverters, Regulated Rectifiers & Battery Chargers Installation, Operation, and Servicing	
E-854Q-118-04	Solid State Controls, Inc. Instructions and Operating Manual for UPS Systems for Computer and Industrial Applications	
N/A	Motor Operated Valve Data Package – AF3870	December 9, 2002

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Number	Description or Title	Date or Revision
N/A	Motor Operated Valve Data Package – DH9B	January 17, 2003
N/A	Motor Operated Valve Data Package – MS106	March 3, 2002
N/A	Motor Operated Valve Data Package – SW2929	March 31, 2006
N/A	IST Test Data for AF33870, DH9B, SW2929, MS106, MS5889A, and SW Pumps	
QR 52600-5940-2	Valcor Solenoid Valves Qualification Test Report	
S/O N18874	Valcor Engineering Corp SOV Certificate of Compliance	
WO 200162373	PM 6592 SW2929 Repair/Rebuild	November 23, 2006

LIST OF ACRONYMS USED

°F	degrees Fahrenheit
AC	Alternating Current
ADAMS	Agencywide Documents Access and Management System
AFW	Auxiliary Feedwater
ASME	American Society of Mechanical Engineers
BWST	Borated Water Storage Tank
CDBI	Component Design Basis Inspection
CFR	Code of Federal Regulations
CR	Condition Report
CST	Condensate Storage Tank
DBA	Design Basis Accident
DC	Direct Current
DRS	Division of Reactor Safety
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
GL	Generic Letter
HELB	High Energy Line Break
HVAC	Heating, Ventilation and Air Conditioning
IEEE	Institute of Electrical & Electronic Engineers
IMC	Inspection Manual Chapter
IN	Information Notice
IST	Inservice Test
LOCA	Loss of Coolant Accident
LOOP	Loss of Off-site Power
MCC	Motor Control Center
MOV	Motor-Operated Valve
NCV	Non-Cited Violation
NPSH	Net Positive Suction Head
NRC	U.S. Nuclear Regulatory Commission
PARS	Publicly Available Records System
POD	Prompt Operability Determination
PRA	Probabilistic Risk Assessment
psid	Pounds Per Square Inch Differential
RIS	Regulatory Issue Summary
SBO	Station Blackout
SDP	Significance Determination Process
SPAR	Standardized Plant Analysis Risk
SR	Surveillance Requirement
SSC	System, Structure, and Component
SW	Service Water
TS	Technical Specifications
USAR	Updated Safety Analysis Report
URI	Unresolved Item
Vac	Volts Alternating Current
Vdc	Volts Direct Curren