UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
612 EAST LAMAR BLVD, SUITE 400
ARLINGTON, TEXAS 76011-4125

December 3, 2010

Brian J. O'Grady, Vice President-Nuclear
and Chief Nuclear Officer
Nebraska Public Power District
Cooper Nuclear Station
72676 648A Avenue
Brownville, NE 68321

SUBJECT: COOPER NUCLEAR STATION- NRC COMPONENT DESIGN BASES INSPECTION REPORT 05000298/2010007

Dear Mr. O'Grady:

On October 20, 2010, the US Nuclear Regulatory Commission (NRC) completed a component design bases inspection at Cooper Nuclear Station. The enclosed report documents our inspection findings. The preliminary findings were discussed on August 12, 2010, with Mr. Brian O'Grady, Vice President and Chief Nuclear Officer, and other members of your staff. After additional in office inspection, a final telephonic exit meeting was conducted on October 20, 2010, with Mr. Deet Willis, General Manager Plant Operations, and other members of your staff.

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

Based on the results of this inspection, the NRC has identified eight findings that were evaluated under the risk significance determination process. Violations were associated with all of the findings. All eight of the findings were found to have very low safety significance (Green) and the violations associated with these findings are being treated as noncited violations, consistent with the NRC Enforcement Policy. If you contest any of the noncited violations, or the significance of the violations you should provide a response within 30 days of the date of this inspection report, with the bases for your denial, to the US Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with copies to the Regional Administrator, U.S. Nuclear Regulatory Commission, Region IV, 612 East Lamar Blvd., Suite 400, Arlington, Texas 76011; the Director, Office of Enforcement, US Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Cooper Nuclear Station. In addition, if you disagree with the characterization of the crosscutting aspect assigned to any finding in this report, you should provide a response within 30 days of the date of this inspection report, with the bases for your disagreement, to the Regional Administrator, Region IV, and the NRC Resident Inspector at Cooper Nuclear Station. The information you provide will be considered in accordance with Inspection Manual Chapter 0305.

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

Sincerely,

/RA/ Wayne Sifre for

Thomas R. Farnholtz, Chief
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Division of Reactor Safety

Dockets: 50-298
License DPR-46

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Inspection Report 050002982010007
w/Attachments: Supplemental Information

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ADAMS: ☐ No x Yes	x SUNSI Review Complete	Reviewer Initials: JFD
	x Publicly Available	x Non-Sensitive
	☐ Non-publicly Available	☐ Sensitive

SRI:PSB2	C:EB1	SOE:OB	RI:EB1
JDrake	WSifre (Acting)	SGarchow	MYoung
/RA/	***/RA/***	***/RA/***	***/RA/***
12/2/2010	12/3/2010	12/2/2010	12/2/2010
RI:EB2	C:DRP/C	C:EB1	
NOkonkwo	VGaddy	WSifre (Acting)	
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12/3/2010	12/3/2010	12/3/2010	

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U.S. NUCLEAR REGULATORY COMMISSION

REGION IV

Docket:	50-298
License:	DPR-46
Report Nos.:	05000298/2010007
Licensee:	Nebraska Public Power District
Facility:	Cooper Nuclear Station
Location:	P.O. Box 98 Brownville, Nebraska
Dates:	July 21, 2010, through October 20, 2010
Team Leader:	J. Drake, Senior Reactor Inspector
Inspectors:	S. Garchow, Senior Operations Engineer M. Young, Reactor Inspector N. Okonkwo, Reactor Inspector
Accompanying Personnel:	M. Yeminy, Mechanical Contractor, Beckman and Associates N. Della Greca, Electrical Contractor, Beckman and Associates
Approved By:	Thomas R. Farnholtz, Chief Engineering Branch 1 Division of Reactor Safety

SUMMARY OF FINDINGS

IR 050002982010007; July 21, 2010, to October 20, 2010; Cooper Nuclear Station: Baseline Inspection, NRC Inspection Procedure 71111.21, "Component Design Bases Inspection."

The report covers an announced inspection by a team of four regional inspectors and two contractors. Eight findings were identified. All of the findings were of very low safety significance. The final significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process." Findings for which the significance determination process does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

A. NRC-Identified Findings

Cornerstone: Mitigating Systems

- Green. The team identified four examples of a Green noncited violation of Technical Specification 5.4.1.a, which states in part that, "Written procedures shall be established, implemented, and maintained, covering the procedures recommended in Regulatory Guide 1.33, Revision 2, Appendix A.9.b," for the failure to establish adequate procedures. Specifically, as of August 12, 2010, the licensee failed to establish adequate procedures involving 4160 V breaker maintenance, safety-related check valve maintenance, and the operation of residual heat removal pumps. This finding was entered into the licensee's corrective action program as Condition Reports CNS- 2010-05611, CNS-2010-05635, CNS-2010-05556, CNS-2010-05586, CNS-2010-05590, and CNS-2010-05342.

  The failure to establish adequate procedures for 4160 V breaker maintenance, safety-related check valve maintenance, and the operation of residual heat removal pumps was a performance deficiency. This finding was more than minor because it was associated with the procedure quality attribute of the mitigating systems cornerstone, and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of the 4160 Vac systems, core spray system and the residual heat removal system to respond to events and prevent undesirable consequences. Using the Manual Chapter 0609, Attachment 4, "Phase 1 – Initial Screening and Characterization of Findings," the issue screened as having very low safety significance (Green) because it was not a design or qualification deficiency and did not represent a loss of safety function. The licensee placed the 4160 V breaker procedures on administrative hold, performed an evaluation of the affected check valves which determined that they would be able to perform their required functions, and revised the procedures related to residual heat removal pump operations. This finding had a crosscutting aspect in the area of human performance resources because the licensee did not provide complete, accurate, and up-to-date design documentation to plant personnel [H.2 (c)]. (Section 1R21.2.2.b and 1R21.2.7.b.2)

- Green. The team identified three examples of a Green noncited violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," for the failure to ensure conditions adverse to quality were promptly corrected. Specifically, as of August 12, 2010, the licensee failed to promptly correct conditions adverse to quality involving the installation and testing of safety-related station batteries and the design control process. This finding was entered into the licensee's corrective action program as Condition Reports CNS-2010-05674, CNS-2010-05647, and CNS-2010-5950

  The failure to promptly correct conditions adverse to quality was a performance deficiency. This finding was more than minor because it was associated with the corrective actions attribute of the mitigating systems cornerstone and if left uncorrected would have the potential to lead to more significant safety concerns. Using the Manual Chapter 0609, Attachment 4, "Phase 1 – Initial Screening and Characterization of Findings," the issue screened as having very low safety significance (Green) because it was not a design or qualification deficiency and did not represent a loss of safety function. This finding had a crosscutting aspect in the human performance decision-making because the licensee failed to use conservative assumptions in decision-making to correct the underlying cause of the many conditions adverse to quality [H.1(b)]. (Section 1R21.2.5.b.1 and 4AO2)

- Green. The team identified three examples of a Green noncited violation of 10 CFR 50, Appendix B, Criterion XI, "Test Control," for failure to ensure that design information was correctly translated into station test procedures. Specifically, as of August 12, 2010, the licensee failed to ensure that design information was correctly translated into station procedures involving capacity testing, service testing, and maintenance of safety-related station batteries. This finding was entered into the licensee's corrective action program as Condition Reports CNS-2010-5445, CNS-2010-5564, CNS-2010-5674, and CNS-2010-5759.

  The failure to correctly translate design requirements into station procedures involving capacity testing, service testing, and maintenance of safety-related station batteries was a performance deficiency. This finding was more than minor because it was associated with the test control attribute of the mitigating systems cornerstone and impacted the cornerstone objective to ensure the availability, reliability, and capability of the affected system to respond to initiating events and prevent undesirable consequences. Using the Manual Chapter 0609, Attachment 4, "Phase 1 – Initial Screening and Characterization of Findings," the issue screened as having very low safety significance (Green) because it was not a design or qualification deficiency and did not represent a loss of safety function. The licensee performed an evaluation and determined that the station batteries were capable of performing their safety functions. This finding had a crosscutting aspect in the area of human performance resources because the licensee did not provide complete, accurate and up-to-date design documentation to plant personnel [H.2(c)]. (Section 1R21.2.5.b.2)

- Green. The team identified seven examples of a Green noncited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for failure to establish measures to ensure that applicable regulatory requirements and the design bases were correctly translated into specifications, drawings, procedures, and instructions. These measures shall include provisions to ensure that appropriate quality standards are specified and included in design documents and that deviations from such standards are controlled." Specifically, as of August 12, 2010, the licensee failed to correctly translate regulatory requirements and design bases information into specifications, drawings, procedures, and instructions involving emergency diesel generator frequency, service water pump, electrical cables for the residual heat removal pumps, seismic supports, the emergency diesel generator air start system testing, tornado and high wind impact on the emergency diesel generator fuel oil storage facilities and safety-related Agast relay service life evaluations. This finding was entered into the licensee's corrective action program as Condition Reports CNS-2010-05301, CNS-2010-5763, CNS-2010-05222, CNS-2010-05281, CNS-2010-5294, CNS-2010-5350, and CNS-2010-5438.

The failure to correctly translate regulatory requirements and design bases information into specifications, drawings, procedures, and instructions for the emergency diesel generator frequency, service water pump, electrical cables for the residual heat removal pumps, emergency diesel generator room ventilation seismic supports, emergency diesel generator air start system testing, tornado and high wind impact on the emergency diesel generator fuel oil storage facilities and safety-related Agast relay service life evaluations was a performance deficiency. This finding was more than minor because it was associated with the design control attribute of the mitigating systems cornerstone and impacted the cornerstone objective to ensure the availability, reliability, and capability of the affected system to respond to events and prevent undesirable consequences. Using the Manual Chapter 0609, Attachment 4, "Phase 1 – Initial Screening and Characterization of Findings," the issue screened as having very low safety significance (Green) because it was not a design or qualification deficiency and did not represent a loss of safety function. The licensee performed evaluations which determined that the affected components and systems were capable of meeting their design functions. The finding had a crosscutting aspect in the area of problem identification and resolution, associated with operating experience because the licensee failed to properly evaluate and apply various industry events associated with the above systems and incorporate the information into plant procedures and training [P.2(b)]. (Sections 1R21.2.7.b1, 1R21.2.8.b.1, 1R21.2.11.b, 1R21.2.13.b, 1R21.3.4.b, and 1R21.3.5.b)

- Green. The team identified a Green noncited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the failure to verify the adequacy of design for the service water system. Specifically, prior to August 10, 2010, the licensee did not have a calculation to support storage of an ice deflector pontoon barge in the service water discharge canal during design tornado or high wind conditions. This finding was entered into the licensee's corrective action program under Condition Report CNS-2010-5763.

  The failure to establish appropriate design controls by having a calculation for storage of a pontoon barge in the safety-related service water discharge canal is a performance deficiency. The finding is more than minor because it is associated with the design control attribute of the mitigating systems cornerstone, and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of the service water system to respond to events to prevent undesirable consequences. Using the Manual Chapter 0609, Attachment 4, "Phase 1 – Initial Screening and Characterization of Findings," the issue screened as having very low safety significance (Green) because it was not a design or qualification deficiency and did not represent a loss of safety function. The licensee performed a calculation (NEDC 10-057) which demonstrated the current storage of the pontoon barge in the service water discharge was sufficient, such that it will not to adversely affect the service water system. The finding had a crosscutting aspect in the area of human performance decision making because the licensee failed to use conservative assumptions in decision making and adopt a requirement to demonstrate that the proposed action is safe in order to proceed rather than a requirement to demonstrate that it is unsafe in order to disapprove the action because the licensee failed conduct an effective review of safety-significant decisions associated with the ice deflector barge storage to verify the validity of the underlying assumptions, identify possible unintended consequences, and determine how to improve future decisions [H.1(b)]. (Section 1R21.2.8.b.2)

- SLIV. The team identified a severity level IV noncited violation of 10 CFR Part 21, "Notification of Failure to Comply or Existence of a Defect and its Evaluation," for the failure of the licensee to evaluate the deviations in 13 of 23 safety-related switches within 60 days. Specifically, prior to August 10, 2010, the licensee failed to submit a report as required by paragraph 21.21 (a)(1) of 10 CFR Part 21 when 13 of 23 General Electric control switches purchased to support a station modification to the safety-related 4160 kV switchgear were discovered to have a defect that was later determined to create a substantial safety hazard. The defective switches were discovered and documented on Condition Report CNS-2009-09985 dated November 25, 2009 and the evaluation was not completed until August 10, 2010. After the evaluation determined the defect did create a substantial safety hazard, the NRC was notified via an event notification on August 10, 2010. Using the Traditional Enforcement Policy and Manual, this was determined to be a Severity Level IV noncited violation. This finding was entered into the licensee's corrective action program as Condition Report CNS-2010-5629. The finding had a crosscutting aspect of problem identification and resolution, alternative process, because the licensee failed to ensure appropriate and timely resolution of identified problems [P.1(e)] (Section 4OA2)

- Green. The team identified a Green noncited violation of CFR Part 50, Appendix B, Criterion III, "Design Control," for the failure of the licensee to verify the adequacy of design for the diesel fuel oil transfer system. Specifically, the licensee failed to demonstrate an adequate supply of fuel oil was available in the tanks to support the safety function of the emergency diesel generators because the licensee failed to consider the potential for vortex formation in the two diesel fuel oil storage tanks and the two day tanks and net positive suction head of the associated pumps. This finding was entered into the licensee's corrective action program under Condition Report CNS-2010-5763.

  The failure to establish appropriate design controls for the safety-related diesel fuel oil transfer pump net positive suction head calculation was a performance deficiency. The finding was more than minor because it was associated with the design control attribute of the mitigating systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of the diesel fuel oil transfer system to respond to events and prevent undesirable consequences. Using the Manual Chapter 0609, Attachment 4, “Phase 1 – Initial Screening and Characterization of Findings,” the issue screened as having very low safety significance (Green) because it was not a design or qualification deficiency and did not represent a loss of safety function. The licensee performed an evaluation which determined that the system was capable of meeting its design function. This finding did not have a crosscutting aspect because the most significant contributor did not reflect current licensee performance. (Section 4OA5)

- Green. The team identified a Green noncited violation of 10 CFR Part 50, Appendix B, Criterion III, “Design Control,” for the failure of the licensee to verify the adequacy of design for the high pressure coolant injection system. Specifically, prior to December 2007, the licensee did not have vortex calculations for the high pressure coolant injection system during swap-over from the emergency condensate storage tank to the torus. The calculation was required to establish that the high pressure coolant injection pumps have adequate net positive suction head to operate in accordance with design. This finding was entered into the licensee’s corrective action program under Condition Report CNS-2010-5763.

  The failure to establish appropriate design controls for the safety-related high pressure coolant injection pump net positive suction head calculation was a performance deficiency. The finding was more than minor because it was associated with the design control attribute of the mitigating systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of the high pressure coolant injection system to respond to events and prevent undesirable consequences. Using the Manual Chapter 0609, Attachment 4, “Phase 1 – Initial Screening and Characterization of Findings,” the issue screened as having very low safety significance (Green) because it was not a design or qualification deficiency and did not represent a loss of safety function. The licensee performed an evaluation which determined that the system was capable of meeting its design function. This finding did not have a crosscutting aspect because the most significant contributor did not reflect current licensee performance. (Section 4OA5)

B. Licensee-Identified Violations.

None

REPORT DETAILS

1 REACTOR SAFETY

Inspection of component design bases verifies the initial design and subsequent modifications and provides monitoring of the capability of the selected components and operator actions to perform their design bases functions. As plants age, their design bases may be difficult to determine and important design features may be altered or disabled during modifications. The plant risk assessment model assumes the capability of safety systems and components to perform their intended safety function successfully. This inspection area verifies aspects of the Initiating Events, Mitigating Systems and Barrier Integrity cornerstones for which there are no indicators to measure performance.

1R21 Component Design Bases Inspection (71111.21)

The team selected risk-significant components and operator actions for review using information contained in the licensee's probabilistic risk assessment. In general, this included components and operator actions that had a risk achievement worth factor greater than two or a Birnbaum value greater than 1E-6.

a. Inspection Scope:

To verify that the selected components would function as required, the team reviewed design bases assumptions, calculations, and procedures. In some instances, the team performed calculations to independently verify the licensee's conclusions. The team also verified that the condition of the components was consistent with the design bases and that the tested capabilities met the required criteria.

The team reviewed maintenance work records, corrective action documents, and industry operating experience records to verify that licensee personnel considered degraded conditions and their impact on the components. For the review of operator actions, the team observed operators during simulator scenarios, as well as during simulated actions in the plant.

The team 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 issues, margin reductions because of modifications, and margin reductions identified as a result of material condition issues. Equipment reliability issues were also considered in the selection of components for detailed review. These included items such as failed performance test results; significant corrective actions; repeated maintenance; 10 CFR 50.65(a)1 status; operable, but degraded conditions; NRC resident inspector input of problem equipment; system health reports; industry operating experience; and licensee problem equipment lists. Consideration was also given to the uniqueness and complexity of the design, operating experience, and the available defense in-depth margins.

The inspection procedure requires a review of 20 to 30 total samples, including 10 to 20 risk-significant and low design margin components, 3 to 5 relatively high-risk operator actions, and 4 to 6 operating experience issues. The sample selection for this inspection was 13 components, 4 operator actions, and 5 operating experience items.

The selected inspection items supported risk significant functions as follows:

1) High Pressure Injection:

   a) The reactor core isolation cooling system is designed to provide makeup water to the reactor vessel when the main steam lines are isolated or the condensate and feedwater system is not available. The reactor core isolation cooling system is designed to operate using steam and direct current power. As such the team selected:

      - The electrical aspects of the reactor core isolation cooling system pump and the associated reactor core isolation cooling system power sources.

      - The mechanical aspects of motor-operated valves and check valves, including the injection valve needed to open and allow flow to the reactor coolant system and the suppression pool suction valve, which needs to open when condensate storage tank level is depleted to supply adequate flow to the pump.

2) Electrical power to mitigation systems. The team selected several components in the electrical power distribution systems to verify operability to supply alternating current and direct current power to risk significant and safety-related loads in support of safety system operation in response to initiating events such as loss of offsite power, station blackout, and a loss-of-coolant accident with offsite power available. As such the team selected:

   a) The electrical aspects of the Division 1 emergency diesel generator.

   b) The mechanical aspects of the Division 1 emergency diesel generator.

   c) Essential 4160 Vac switchgear bus 1F which supports safety-related loads.

   d) Essential 480 Vac switchgear bus 1F which supports safety-related loads.

   e) For station blackout response: the Division 1, 250 V battery 1A, needed to supply control power to the in-plant safety equipment, and the operator actions needed to align and operate the portable 186 kilowatt station blackout diesel generator, which could support the reactor core isolation cooling system.

f) Recent operating experience with offsite power capability related to the timing of secondary grid protection relays with respect to a loss-of-coolant accident with offsite power available.

3) Decay heat removal:

a) Service water pump and Zurn strainers, which provide cooling water flow to remove decay heat.

4) Low pressure injection:

a) Operating experience issues concerning residual heat removal system safety functions of low pressure injection, suppression pool cooling, and shutdown cooling. The team also reviewed data concerning previous water hammer events to evaluate for potential damage to the residual heat removal system.

5) Safety system actuation and control. Recent operating experience issues concerning:

a) Agastat relays failures, which could lead to system failures.

b) Motor-operated valve stem lubrication issues, which could lead to motor operated valve failures.

.2 **Results of Detailed Reviews for Components:**

.2.1 Division 1 Emergency Diesel Generator DG1

a. Inspection Scope:

The team reviewed the Updated Final Safety Analysis Report, design bases documents, calculations, corrective and preventative maintenance, and testing of the Division 1 emergency diesel generator, performed a walk down of the emergency diesel generator, observing material condition of the equipment, local instrumentation and alarms, fuel oil supply and air supply receiver volume and pressure, and interviewed the system engineer. Specifically, the team reviewed:

- Electrical design of the Division 1 emergency diesel generator, to confirm that it met the system design bases requirement
- Emergency diesel generator starting and loading sequence. This was accomplished by evaluating starting logic as well as the control logic of the emergency diesel generator output breaker and major loads
- Emergency diesel generator loading calculation
- Steady-state loading and operation at technical specification limits
- Instrumentation

- Relay protection, relay coordination, and short-circuit calculations.
- System health reports
- Completed surveillance tests
- Test performance records and the diesel generator transient analysis
- Selected recent condition reports

b. Findings:

No findings were identified.

.2.2 Essential 4160 Vac Switchgear Bus 1F

a. Inspection Scope:

The team reviewed the Updated Final Safety Analysis Report, design bases documents, calculations, corrective and preventative maintenance, and testing of the essential 4160 Vac switchgear bus 1F. Finally, the team performed a visual nonintrusive inspection to assess the installation configuration, material condition, and potential vulnerability to hazards, performed a walk down of the switchgear, observing material condition of the equipment, local instrumentation, and alarms, and interviewed the system engineer. Specifically, the team reviewed:

- System health reports, component maintenance history, and corrective action program reports to verify the monitoring and correction of potential degradation
- Calculations for electrical distribution system load flow/voltage drop, short-circuit, and electrical protection and coordination to assess the adequacy and appropriateness of design assumptions, to verify that bus capacity was not exceeded and bus voltages remained above minimum acceptable values to support transmission of power to downstream safety-related 4160 Vac
- The protective device settings and circuit breaker rating; to ensure adequate selective protection coordination of connected equipment during worst-case short-circuit conditions to ensure continuity of power to downstream safety-related buses
- Circuit breaker preventive maintenance inspection and testing procedures to determine adequacy relative to industry and vendor recommendations
- Offsite power degraded and loss of voltage relay protection scheme and circuit breaker control logics that initiate automatic bus transfers between the normal generation supply and the preferred offsite power supplies and between offsite power supplies and the associated emergency diesel generator
- Portions of the licensee response to NRC Generic Letter (GL) 2006 02, “Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power,” dated February 1, 2006
- Selected recent condition reports

b. Findings:

Failure to Translate Design and Operating Requirements into Procedures.

Introduction. The team identified four examples of a Green noncited violation of Technical Specification 5.4.1.a, "Written procedures shall be established, implemented, and maintained, covering the procedures recommended in Regulatory Guide 1.33, Revision 2, Appendix A.9.b," for the failure to establish adequate procedures. Specifically:

Example 1 The licensee did not establish adequate procedures for 4160 V breakers. Specifically, maintenance procedure 7.3.17, "4160 V Breaker Maintenance," Revision 29, was found to be inadequate in that it could not be performed as written. Step 8.2 of this procedure stated, "If the AS-FOUND trip coil minimum voltage pick-up test is satisfactory, then step 8.3 is N/A." However, there are no prior steps to check for the "AS-FOUND" Trip Coil minimum voltage pick-up test. Condition Report 2010-05611 was written to place the procedure on administrative hold until revised.

Example 2 The licensee did not establish adequate procedures for 4160 V breakers. Specifically, maintenance procedure 7.3.17.1, "4160 V Breaker Examination," Revision 29, was found to be inadequate in that it preconditioned the breaker by multiple cycling before performing the minimum voltage pickup test.

Example 3 Refer to Section 1R21.2.7.b.2

Example 4 Refer to Section 1R21.2.7.b.2

Description:

Example 1 During document review, the team identified that the licensee's maintenance and testing procedures established a methodology which tested various safety-related breakers in a manner which could not be performed as written. Specifically, as of August 11, 2010, Maintenance Procedure 7.3.17, "4160 V Breaker Maintenance," Step 8.2 could not be performed as written for minimum voltage pickup test. Step 8.2 stated, in part, "If the AS-FOUND trip coil minimum voltage pick-up test is satisfactory, then step 8.3 is N/A." However, there were no prior steps to check for the "AS-FOUND" trip coil minimum voltage pick-up test." This finding was entered into the licensee's corrective action program as Condition Report CNS-2010-5611.

Example 2 During document review, the team identified that the licensee's maintenance and testing procedures established a methodology which tested various safety-related breakers in a manner which was deemed unacceptable preconditioning by the NRC. Specifically, as of August 11, 2010, Maintenance Procedure 7.3.17.1, "4160 V Breaker Examination," Revision 29 was found to be inadequate because it preconditioned the breaker by multiple cycling before performing the minimum voltage pickup test. This testing methodology preconditioned the breakers prior to obtaining the as-found trip coil minimum voltage. The existing testing methodology potentially masked existing conditions; such as sticking contacts, mechanical binding, and setpoint drift; and could mask existing operability concerns. Inspection Manual Chapter 9900 states, in part, that unacceptable preconditioning is defined as the alteration, variation, manipulation or adjustment of the physical condition of a system, structure or component before or during technical specification surveillance or American Society of Mechanical Engineers code testing that will alter one or more of the system, structure or component's operational parameters, which results in acceptable test results. Such changes could mask the actual as-found condition of the system, structure or component and possibly result in an inability to verify the operability of the system, structure or component. In addition, unacceptable preconditioning could make it difficult to determine whether the system, structure or component would perform its intended function during an event in which the system, structure or component might be needed. Therefore, the team concluded that since the licensee had not performed an evaluation which justified that the preconditioning of the breakers was acceptable, the licensee's surveillance testing methodology constituted unacceptable preconditioning of the breaker.

As a result of these issues, the finding was entered into the licensee's corrective action program as Condition Report CNS-2010-5612 and the procedure was placed on administrative hold.

Analysis: The team determined that the failure to establish adequate maintenance, testing, and operating procedures associated with safety-related breakers, safety-related check valves, and residual heat removal pump operation was a performance deficiency. This finding was more than minor because it was associated with the procedure quality attribute of the reactor safety mitigating systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to events to prevent undesirable consequences. Using the Manual Chapter 0609, Attachment 4, "Phase 1 – Initial Screening and Characterization of Findings," the issue screened as having very low safety significance (Green) because it was not a design or qualification deficiency and did not represent a loss of safety function. The licensee performed an evaluation and determined that the affected systems and components were capable of performing their safety function, and the procedures pertaining to operation of the residual heat removal pumps were revised. This finding had a crosscutting aspect in the area of human performance resources because the licensee did not provide complete, accurate and up-to-date design documentation to plant personnel. H.2(c)

Enforcement: The team identified four examples of a Green noncited violation of Technical Specification 5.4.1.a, which states, in part, "Written procedures shall be established, implemented, and maintained, covering the procedures recommended in Regulatory Guide 1.33, Revision 2, Appendix A.9.b." Contrary to the above, as of August 12, 2010, the licensee failed to establish adequate procedures for preventive maintenance of safety-related 4160 Vac breakers, maintenance of safety-related check valves, and operation of residual heat removal pumps. Because this finding was of very low safety significance (Green) and was entered into the licensee's corrective action program as Condition Reports CNS-2010-5611, CNS-2010-5612, CNS-2010-05586,

CNS-2010-05590, CNS-2010-05556, CNS-2010-05635, and CNS-2010-05342, it is being treated as a noncited violation, consistent with the NRC Enforcement Policy: NCV 05000298/2010007-001, "Failure to Translate Design and Operating Requirements into Procedures."

.2.3 Essential 480 Vac Switchgear Critical Bus 1F

a. Inspection Scope:

The team reviewed the Updated Final Safety Analysis Report, design bases documents, calculations, corrective and preventative maintenance, and testing of the essential 480 Vac switchgear bus 1F. Finally, the team performed a visual non-intrusive inspection to assess the installation configuration, material condition, and potential vulnerability to hazards, observed material condition of the equipment, local instrumentation and alarms, and interviewed the system engineer. Specifically, the team reviewed:

- System health reports, component maintenance history and licensee's corrective action program reports to verify the monitoring and correction of potential degradation
- Calculations for electrical distribution system load flow/voltage drop, short-circuit, and electrical protection and coordination to assess the adequacy and appropriateness of design assumptions and to verify that bus capacity was not exceeded and bus voltages remained above minimum acceptable values to support transmission of power to downstream safety-related 480 Vac
- The protective device settings and circuit breaker ratings to ensure adequate selective protection coordination of connected equipment during worst-case short-circuit conditions to ensure continuity of power to downstream safety-related buses
- Circuit breaker preventive maintenance inspection and testing procedures to determine adequacy relative to industry and vendor recommendations
- Selected recent condition reports

b. Findings:

No findings were identified.

.2.4 Essential 480 Vac Motor Control Center LX

a. Inspection Scope:

The team reviewed the Updated Final Safety Analysis Report, design bases documents, calculations, corrective and preventative maintenance, and testing of the essential 480 Vac motor control center LX. Finally, the team performed a visual non-intrusive inspection to assess the installation configuration, material condition, and potential vulnerability to hazards, observed material condition of the equipment, local instrumentation and alarms, and interviewed the system engineer. Specifically, the team reviewed:

- System health reports, component maintenance history and licensee's corrective action program reports to verify the monitoring and correction of potential degradation
- Calculations for electrical distribution system load flow/voltage drop, short-circuit, and electrical protection and coordination to assess the adequacy and appropriateness of design assumptions and to verify that bus capacity was not exceeded and bus voltages remained above minimum acceptable values to support transmission of power to downstream safety-related 480 Vac
- The protective device settings and circuit breaker ratings; to ensure adequate selective protection coordination of connected equipment during worst-case, short-circuit conditions to ensure continuity of power to downstream safety-related buses
- Circuit breaker preventive maintenance inspection and testing procedures; to determine adequacy relative to industry and vendor recommendations
- Selected recent condition reports

b. Findings:

No findings were identified.

.2.5 Division 1 - 250 Vdc Battery

a. Inspection Scope:

The team reviewed the Updated Final Safety Analysis Report, design bases documents, calculations, corrective and preventative maintenance, and testing of the safety-related, Division 1 250 V battery 1A, performed a walk down of the battery and associated components, and interviewed the system engineer. Specifically, the team reviewed:

- Updated safety analysis report
- Technical specification
- Design bases documents
- Battery sizing calculation
- Voltage drop calculations
- Short circuit calculations
- Electrical schematics
- Ground detection system
- Alarm setpoints
- Circuit protection, including coordination between upstream and downstream fuses
- Float and equalizing charge procedures
- Service and performance discharge testing
- Selected recent condition reports

b. Findings:

The team identified the following findings of very low safety significance (Green) b.1 Failure to promptly correct conditions adverse to quality

Introduction: The team identified three examples of a Green noncited violation of 10 CFR Part 50, Appendix B, Criterion XVI, “Corrective Action,” for failure to ensure that conditions adverse to quality are promptly corrected. Specifically, as of August 12, 2010, the licensee failed to promptly correct conditions adverse to quality involving the installation and testing of safety-related station batteries and the design control process. Specifically,

Example 1 The licensee failed to perform a battery capacity test within the first two years of service as specified by IEEE 450, “Recommended Practices for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications.”

Example 2 The licensee failed to correct the inter-cell resistance to within the vendor-recommended values following the initial installation, or prove adequate engineering justification. During a subsequent surveillance test performed with the battery on line, the measurements taken indicated that the resistance had uncharacteristically decreased from the original measurements. No engineering evaluation of the anomalous readings was performed.

Example 3 Refer to Section 4AO2

Description:

Example 1 The 250 V station battery 1A was installed in 2006 during refueling outage RE-23. A battery capacity test should have been performed during refueling outage RE-24, but was not performed. In 2009, a condition report was issued to document this deficiency. An opportunity existed to perform the test during the subsequent (2009) refueling outage (RE-25). However, no test was performed because the condition report was closed based on the interpretation that the IEEE statement was a recommendation not a requirement, and improperly recommended a procedure enhancement to delete the statement indicating that the test should be performed within two years. The test is required to confirm that the battery meets specifications and manufacturer’s ratings and to establish a baseline against which subsequent test results can be compared to ensure that the technical specification surveillance requirements are met. Section 6 of IEEE Standard 450, “Recommended Practices for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications,” 1995, includes a list of tests that should be performed on a battery during its service life.

One of the tests identified by the IEEE standard is the performance test. This test is made on the battery “after it has been in service, to detect any change in capacity.” Regarding this test, the IEEE standard states that, “A performance test of the battery capacity should be made within the first two years of service. It is desirable for comparison purposes that the performance tests be similar in duration to the battery duty cycle. Batteries should undergo additional performance tests periodically.”

Technical specification surveillance requirement 3.8.4.7 requires that the licensee "Verify battery capacity is ≥ 90% of the manufacturer's rating when subject to a performance discharge test or a modified performance discharge test." The periodicity of this test as established by the technical specification is "60 months AND 18 months when the battery shows degradation or has reached 85% of expected life with capacity < 100% of manufacturer's rating AND 24 months when the battery has reached 85% of the expected life with capacity ≥ 100% of the manufacturer's rating."

The team requested copies of the last two battery performance tests. The team determined that the licensee had not performed the tests, despite the fact that more than four years had passed since the installation of the new battery. As indicated above, the battery was installed during refueling outage RE-23. At that time, the licensee opted to accept the vendor factory test in lieu of performing an acceptance test. No bases were provided for not performing a performance test 18 months later, during the subsequent refueling outage, RE-24. However, on September 9, 2009, the licensee recognized the failure to perform such a test and issued Condition Report CNS-2009-06745. In the operability evaluation, the licensee stated, "Failure to meet recommended action of IEEE 450, "Recommended Practices for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications," 1995 is considered to be a nonconforming condition. The safety function of the battery is to supply dc loads on loss of ac voltage to the battery charger. These loads include control power for various 4160 V and 480 V circuit breakers, and motive power for fans and motors. Per discussion with the system engineer, this condition report discusses a recommended practice for battery testing which was not implemented for station battery EE-BAT-250A. Review of the technical specification surveillance requirement 3.8.4.7 and surveillance requirement 3.8.4.8 indicate that the performance test conducted at the manufacturer prior to shipment to CNS would satisfy the surveillance requirements. The test surveillance requirement 3.8.4.7 is less stringent than a 90% capacity test, as the battery only has to meet the battery discharge envelope. The test in surveillance requirement 3.8.4.8 is not required prior to 60 months unless the battery shows degradation or has reached 85% of life expectancy. Per system engineer, the battery has shown no degradation and has not reached 85% of life expectancy." To address degradation, the condition report included records of battery and cell voltage and charging current since the battery installation.

The team did not question the ability of the battery to perform its intended function. This was demonstrated by technical specification surveillance requirement 3.8.4.7. This test, however, does not establish the capacity of the battery since it is stopped before the voltage drops to the minimum acceptable level (210V). Therefore, the technical specification-specified 90% minimum capacity could only be inferred because the capacity of batteries tends to increase when first placed in service. When delivered, the capacity of the battery, based on the manufacturer factory test, was only 90.2%. Furthermore, the capacity of the battery cannot be established from the battery voltage or the charging current that is drawn while the battery is on float voltage, since the true voltage of the battery is masked by the charger output voltage and the charging current results from the charge status of the battery. Additionally, the individual cell voltages taken monthly provide an indication of the degradation status of individual cells, but not the capacity of the individual cells or the entire battery. As indicated, in the IEEE standard, the performance test is made on the battery, after it has been in service, to detect any change in capacity. Negative changes in capacity are addressed with appropriate corrective actions. For instance, surveillance procedure 6-EE-608, “250V Station Battery Performance Discharge Test” establishes an administrative limit of 10% capacity drop.

The failure to conduct a performance test within the IEEE recommended two year period and subsequently, during RE-25, prevented the licensee from establishing a valid baseline battery capacity against which future battery performance could be compared. Without this baseline information, the licensee was unable to ensure compliance with the technical specification requirements and the procedure administrative limits.

Example 2 The team reviewed a completed surveillance for 250 V station battery 1B, which had been installed during refueling outage RE-25, surveillance procedure 6-EE-609, dated February 23, 2009, and observed that most of the resistance values measured were greater than 30 micro-ohms, with some connections at the 50 micro-ohm limit or slightly below it. The team determined that the measurements had been taken following the installation of a new battery. This indicated that the vendor’s recommendations for acceptable connection resistance values had not been followed. The team discussed the observation with the licensee to determine whether any corrective actions had been taken to address the higher resistance cells. The team’s concern was that, during the subsequent months, terminal corrosion could result in the total battery resistance exceeding the technical specification limit of 6500 micro-ohms. No corrective actions had been taken nor had the abnormal values been discussed with the vendor to determine whether follow-up action was required. To address the above concern, the team requested a copy of the 2010 surveillance of the same battery (dated February 10, 2010) and determined that the resistance of most connections dropped by several micro-ohms; the resistance of the connections of most concern had dropped from 50 or high 40’s micro-ohms to approximately 25 micro-ohms; and the total resistance had dropped from 4376.5 to 3701.25 micro-ohms. No evaluation of the difference between the first and the second surveillance test measurements was performed. During initial discussions, the licensee implied that heating due to the current flowing through the connection might have tightened the connection and resulted in lower resistance. This explanation, however, did not seem reasonable because a very low charging current usually flows into the battery. Additionally, small ambient temperature changes (no temperature measurements were taken at the time of the resistance measurements) could not account for 20-25 micro-ohms in the connections of concern and less than five in most of the others. Also, it was later determined that the temperature coefficient of expansion was greater for the bolt material than the lead terminal plates, so the heating of a connection would not result in a tighter connection. Heating due to the current flowing through the connections tends to increase the resistance and increase the voltage drop across the connection, hence the importance of connection integrity discussed by C&D. Accurate measurement of the inter-cell resistance is required to ensure that adequate voltage will be available at the battery terminals during a design bases event with loss of offsite power or loss of all AC. In a memorandum to the licensee, dated May 1, 1997, C&D, the battery manufacturer, stated that the installed inter-cell connection resistance for the LCR-25 is typically 20 micro-ohms, ±5 micro-ohms. This is also reflected in their battery discharge characteristic curve. Section 9 of the C&D installation and maintenance manual No. VM-1188, stated: “The importance of connection integrity cannot be over emphasized.” Also, under the heading “Measuring Connection Resistance,” it is stated, “Be sure that all connections are clean and torqued to the values specified in Table 3 in Section 5,” and “Starting at one end of the string, work your way toward the other end, recording micro-ohm resistances and noting those connections with unacceptable resistance and resistance values that exceed the average by 20%.”

The IEEE Standard 450, “IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications,” echoes the Vendor statement and in Section D2 states, “It is very important that the procedure be consistent so as to detect upward changes that could be caused by corrosion or loose connections. Increased resistance is a cause for concern and may require corrective action.” Regarding resistance measurements, IEEE 450, “Recommended Practices For Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries For Stationary Applications,” recommends yearly measurements with an acceptance criterion that no connection resistance should be more than 20% above the baseline (installation value) usually provided by the manufacturer.

In the same memorandum mentioned above, C&D also states, “As a maintenance limit, your [licensee’s] proposal to employ a limitation of a +20% from the baseline value, plus 10 micro-ohms would be acceptable… as it would be less than the ceiling value [50 micro-ohm, also established by the manufacturer].” This statement implies that, at the time of the purchase of the C&D batteries, the licensee intended to establish an action to correct an inter-cell connection if a subsequent measurement showed that the resistance exceeded approximately 34 (20+20%+10) micro-ohms. However, this proposal was not included in the surveillance procedure 6-EE-609, “125V/250V Station Battery Intercell Connection Testing,” which shows only the acceptance value of 50 micro-ohms.”

Example 3 Refer to Section 4AO2

Analysis: The failure to ensure conditions adverse to quality were promptly corrected was a performance deficiency. This finding was more than minor because it was associated with the corrective action attribute of the mitigating system cornerstone and adversely affected the cornerstone objective to ensure the reliability and capability of the equipment needed to respond to events to prevent undesirable consequences. Using the Manual Chapter 0609, Attachment 4, “Phase 1 – Initial Screening and Characterization of Findings,” the issue screened as having very low safety significance (Green) because it was not a design or qualification deficiency and did not represent a loss of safety function. The licensee performed evaluations which demonstrated that the affected systems and components were capable of performing their safety functions. This finding had a crosscutting aspect in the human performance decision making because the licensee failed to use conservative assumptions in decision making to evaluate and promptly correct conditions adverse to quality. H.1(b)

Enforcement: The team identified three examples of a Green noncited violation of Part 50 of Title 10 of the Code of Federal Regulations, Appendix B, Criterion XVI, which requires, in part, that measures be established to ensure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. Contrary to the above, as of August 12, 2010, the licensee failed to correct conditions adverse to quality. Specifically, the licensee did not to perform a capacity performance test within the 18-month period specified by IEEE Standard 405, failed to correct this non-conformance, when discovered in 2009, failed to recognized that the inter-cell connection resistance measurements taken in February 2009 and February 2010 were inadequate in that those taken in 2009 did not meet the vendor-specified acceptance criteria and those taken in 2010 were anomalous with respect to the earlier measurements, and failed to correct deficiencies with the design change process. Because the violation is of very low safety significance (Green) and has been entered into the licensee's corrective action program as Condition Reports CNS-2010-05674, CNS-2010-05647, and CNS-2010-5950, this violation is being treated as a noncited violation, consistent with the NRC Enforcement Policy: NCV 05000298/2010007-02, "Failure to promptly Correct Conditions Adverse to Quality."

b.2 Failure to correctly translate design bases into test procedures

Introduction: The team identified three examples of a Green noncited violation of 10 CFR Part 50, Appendix B, Criterion XI, "Test Control," for failure to ensure that design information was correctly translated into station test procedures. Specifically,

Example 1 The licensee failed to ensure that all prerequisites for a battery capacity test were met.

Example 2 The licensee failed to ensure that the latest service test profile was included in the battery service test procedure.

Example 3 The licensee failed to ensure that the acceptance limits for battery inter-cell resistance were consistent with the requirements of the design and licensing bases.

Description:

Example 1 During a review of documents associated with the station 250 V battery 1A, the team identified that the prerequisites for the capacity test had not been met. In 2001, in accordance with the requirements of technical specification surveillance requirement 3.8.4.8, the licensee conducted a capacity performance test of the station battery 1A. A failure of equipment prevented the licensee from completing the original test. When the test was restarted approximately two days later, the battery had not undergone appropriate pretest conditioning in accordance with the vendor specifications.

Surveillance requirement 3.8.4.8 of the technical specifications requires that every 60 months the licensee "verify that the battery capacity is ≥ 90% of the manufacturer's rating when subject to a performance discharge test or a modified performance discharge test." The periodicity drops to "18 months when the battery shows degradation or has reached 85% of expected life with capacity < 100% of manufacturer's rating and 24 months when the battery has reached 85% of the expected life with capacity ≥ 100% of the manufacturer's rating." Based on this requirement, on November 14, 2001, the licensee initiated a test of 250 V Station Battery 1A in accordance with surveillance procedure 6-EE-608, "250 V Station Battery Performance Discharge Test." As indicated in a note in the work order, approximately 4 hours into the test, "with no operator action, the laptop screen went black and load cart relays audibly changed state, apparently self-aborting test." On November 18, 2001, the test was restarted, but it was once again terminated "because the three lowest cells' ICV's [individual cell voltages] were determined to be unacceptable to proceed with this surveillance." The three cells were replaced with new ones. On November 19, 2001, the test was started again and completed. The resulting calculation showed that the capacity of the battery had dropped from 97.5%, in 1997, to 92.5% in 2001.

During the inspection, the team verified that the licensee had complied with technical specification surveillance requirement 3.8.4.8. The team's review of the performance discharge test completed on October 23, 2006, observed that the calculated battery capacity had increased from 92.5%, in 2001, to 97.4%, in 2006. Because the battery was not new it was not reasonable to expect an increase in capacity. Therefore, the observation was discussed with the licensee, who provided further details regarding the 2001 surveillance. Apparently, following the computer failure during the first 2001 test, the battery was placed on an equalize charge for 14 hours, but there was no indication of any additional preconditioning in preparation of the second and third test. Section 9 of the C&D maintenance manual states, in part, that "To be valid, a capacity test must assume the following: a) A fully charged battery and balanced cell potentials. In some cases, this may require an equalize charge or, in cases of sulfation, other action…; and b) at least 72 hours on float charge. This is especially important following an equalize charge to clear excessive gases developed at the surface of the plates." These requirements were not included in the test procedure; therefore, as indicated above, it was not evident that the preconditioning required by the battery manufacturer's instructions was performed, except for the equalizing charge. Given the dates of the tests, it is unlikely that the battery was placed on a float charge for at least 72 hours. Based on the results of the test, proper preconditioning was not performed.

Example 2 Surveillance Requirement 3.8.4.7 of the technical specifications requires that every 18 months the licensee verify that the "battery capacity is adequate to supply, and maintain in operable status, the required emergency loads for the design duty cycle when subjected to a battery service test." The team's review of the voltage drop calculation for the 250V station battery 1A, Calculation No. NEDC 87-131A, "250 VDC Division 1 Load and Voltage Study," Revision 11, dated April 22, 2010, noted that the load profile (duty cycle) developed under this calculation did not coincide with the load test profile included in surveillance procedure 6-EE-605, "250V Battery Service Test," Revision 17, dated August 19, 2009. Discussions with the licensee indicated that some security loads had been added to battery 1A and that an evaluation had been performed in 2009, which found the addition acceptable, and that the calculation revision had not been completed until after the 2009 service test had been performed. Further review by the team determined that a discrepancy between the 250V Battery 1A connected loads and the battery load calculation had been identified and reflected in Condition Report CNS-2009-04643, dated June 17, 2009. The discovery resulted in Engineering Evaluation No. 09-042, "Evaluation of Security Loads on 250 VDC Division 1 when Transferred at Time 0," Revision 0, dated June 17, 2009. The evaluation clearly showed an increase in the load profile, but concluded that "Including the Security loads for the entire load profile does not cause any voltage to drop below the minimum voltage values specified in NEDC 87-131A, Revision 9. Therefore, constantly powering the security loads from NBPP (normal battery power panel) is acceptable."

The team determined that the loads had been on the battery bus for 18 months. The team also observed that the condition report recommended actions included a validation of the conclusion for the increased load and a review of the last battery load test to determine if it bounded the revised calculation load profile. Despite these recommendations, no corrective actions were developed to verify whether the battery load test bounded the revised calculation load profile. As a result, when the procedure was revised two months later, on August 19, 2009, the profile was not updated and, on October 4, when the test was performed, the profile used did not reflect the higher loads resulting from the addition of the security loads. While the voltage drop calculation used to develop the load profile was not updated until after the test was performed, the licensee had developed a detailed evaluation of the impact of the constant load addition and a program input load profile and had ample opportunity in the subsequent months to use the input load profile in the voltage drop calculation program and develop the required test profile.

Example 3: To address non-conservative values for inter-cell resistance in the technical specification, the licensee submitted a technical specification amendment. This amendment maintained the original resistance values (150 micro-ohms) for individual inter-cell connection, but added a limiting value total resistance of 3300 micro-ohms for the 125 Vdc station batteries and 6500 micro-ohms for the 250 V station batteries. The team's review of surveillance procedure 6-EE-609, "125/250V Station Battery Intercell Connection Testing," Revision 13, dated August 20, 2009, observed that the "acceptable value" for total battery inter-cell resistance was 3295 micro-ohms for the 125V station batteries, 6495 micro-ohms for 250V station battery 1A and 6675 micro-ohms for 250V station battery 1B. These "acceptable values" are slightly below or exceed the technical specification limits.

Discussions with the licensee pertaining to allowable total resistance indicated that an administrative limit of 6400 micro-ohms was in place for the 250 V batteries; however, this value did not appear in Revision 13 and earlier revisions of surveillance procedure 6-EE-609. Nonetheless, even if this limit existed, the 100 micro-ohm delta between the test acceptable value and the technical specification value was not sufficient to ensure that the technical specification limit was not exceeded when measurement tolerances were taken into consideration. The resistance values of inter-cell connections were measured individually with the same instrument and the readings were added together without the benefit of the square root of the sum of the measurement uncertainties.

Maintaining total inter-cell resistance below the design and licensing bases of the plant is required to ensure that adequate voltage is available at the battery terminals, during a design bases event with loss of offsite power or station blackout. Current acceptable values of total inter-cell connection resistance used in the surveillance procedure do not ensure that the technical specification limits will not exceeded.

Analysis: Failure to correctly translate design requirements into station procedures involving capacity testing, service testing, and maintenance of safety-related station batteries was a performance deficiency. This finding was more than minor because it was associated with the test control attribute of the mitigating system cornerstone objective and adversely impacted the cornerstone objective to ensure the availability, reliability, and capability of system needed to respond to events to prevent undesirable consequences. Using the Manual Chapter 0609, Attachment 4, "Phase 1 – Initial Screening and Characterization of Findings," the issue screened as having very low safety significance (Green) because it was not a design or qualification deficiency and did not represent a loss of safety function. The licensee performed an evaluation and determined that the station batteries were capable of performing their safety functions. This finding had a crosscutting aspect in the area of human performance resources because the licensee did not provide complete, accurate and up-to-date design documentation to plant personnel [H.2(c)].

Enforcement: The team identified three examples of a Green noncited violation of Part 50 of Title 10 of the Code of Federal Regulations, Appendix B, Criterion XI, which requires, in part that, "A test program shall be established to ensure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents." Contrary to the above, as of August 12, 2010, the licensee failed to ensure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service was identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents. Specifically, the licensee failed to include vendor prerequisites for the performance discharge test procedure, failed to revise the service test procedure for the 250 V station battery 1A following the addition of the security loads, and failed to evaluate instrument errors related to inter-cell connection resistance measurements and establish acceptance criteria such that the technical specification limits would not be exceeded. Because the violation is of very low safety significance (Green) and has been entered into the licensee's corrective action program as Cooper Condition Reports CNS-2010-05759, CNS-2010-05564, and CNS-2010-05674, this violation is being treated as a noncited violation, consistent with the NRC Enforcement Policy: NCV 05000298/2010007-03, "Inadequate Test Control."

.2.6 Division 1 - 240/120 VAC inverter

a. Inspection Scope:

The team reviewed the Updated Final Safety Analysis Report, design bases documents, calculations, corrective and preventative maintenance, and testing of the division 1 240/120 Vac inverter, performed a walk down of the inverter and associated components, and interviewed the system engineer. Specifically, the team reviewed:

- Short circuit and inverter sizing calculations
- Circuit breaker coordination studies
- Voltage drop calculations
- Technical specifications
- Design bases documents
- Electrical schematics
- Ground detection system design documentation
- Alarm setpoints
- Circuit protection, including coordination between upstream and downstream fuses.
- Selected recent condition reports

b. Findings:

No findings were identified.

.2.7 Residual Heat Removal Pumps:

a. Inspection Scope:

The team reviewed the Updated Final Safety Analysis Report, design bases documents, calculations, corrective and preventative maintenance, and testing of the Residual Heat Removal Pumps, performed a walk down of the residual heat removal pumps as well as associated valves and instrumentation, and interviewed the system engineer. Specifically, the team reviewed:

- Piping and instrumentation diagrams
- Pump alignment requirements
- Pump capacity specifications
- Number of pumps required for accident mitigation, as well as the correlation between calculated requirements, inservice inspection, test acceptance criteria, and test results
- Calculations related to pump flow rate, head, net positive suction head, and vortex formation, and compared them to the parameters required to ensure that the pumps were capable of functioning as required.
- Minimum flow limitations of these emergency core cooling system (ECCS) pumps with respect to flow rate and time. The team reviewed these parameters especially

under loss of offsite power with electrical power supplied by the emergency diesel generators
- Pressure rating of the piping system (suction and discharge) and whether the piping could have been damaged by the pressure spikes resulting from the water hammer events.
- Emergency Operating Procedures (EOP) and the special procedures supporting the EOPs.
- Selected recent condition reports

b. Findings:

The team identified the following findings of very low safety significance (Green)

b.1. Inadequate Design Control

Introduction: The team identified seven examples of a Green noncited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for failure to establish measures to ensure that applicable regulatory requirements and the design bases are correctly translated into specifications, drawings, procedures, and instructions. These measures shall include provisions to ensure that appropriate quality standards are specified and included in design documents and that deviations from such standards are controlled." Specifically:

Example 1 As of August 12, 2010, the licensee failed to correctly translate regulatory requirements and design bases information into specifications, drawings, procedures, and instructions involving emergency diesel generator frequency operating range in the safety analysis for all safety-related pumps.

Example 2 Refer to Section 1R21.2.8.b.1

Example 3 As of August 13, 2100, the licensee failed to revise the original Burns & Row Calc 2.05.01, which recommended the use of 4/0 cable for the 1250 HP, 4KV RHR pump motors, nor was an engineering evaluation available to justify the replacement of the 4/0 cable with 2/0 cable.

Example 4 Refer to Section 1R21.2.11.b

Example 5 Refer to Section 1R21.2.13.b

Example 6 Refer to Section 1R21.3.4.b

Example 7 Refer to Section 1R21.3.5.b

Description:

Example 1 The licensee failed to perform plant safety analysis calculations analyzing the performance some safety-related pumps for operation at the technical specification allowed range of emergency diesel generator frequency, 58.8 to 60.2 Hertz. This entire range was not always accounted for in the safety analysis. The performance of motor-operated pumps varies with the angular speed of the pump which is directly affected by the frequency of the emergency diesel generator's alternating current. Low frequency will result in a lower flow rate and lower developed head while high frequency will result in a greater flow rate and a higher developed head. The licensee accounted for some pumps' performance at the lower range of operation, but did not account for all safety-related pumps (e.g., service water and reactor equipment coolant pumps). Furthermore, the licensee did not account for either the emergency core cooling systems or other safety-related pumps operating at the high frequency range (up to 61.2 Hertz) of the emergency diesel generators.

The failure to account for an allowable diesel frequency of 58.8 Hz for some safety-related pumps was an engineering deficiency because the pumps will be operating at a two percent lower flow rate and a lower developed head of about four percent. The overall effect is equivalent to a pump degradation of about 4.5 percent. The failure to account for an allowable diesel frequency of 61.2 Hz for all safety-related pumps is a deficiency because the pumps will be operating at a higher flow rate and pressure. A two percent higher flow rate renders net positive suction head calculations nonconservative because centrifugal pumps require greater net positive suction head at a higher flow rate. Operating at a higher frequency will also render the vortex calculations nonconservative because vortex formation will occur earlier (at a higher tank water level). This also means that the water supply was available for a shorter duration. In addition, diesel fuel will be consumed by the emergency diesel generator at a greater rate, depleting the available fuel oil in a shorter period.

Example 2 Refer to Section 1R21.2.8.b.1

Example 3 During the review of design documents associated the residual heat removal pumps, it was noted that a modification replaced the 4/0 feeder cables for the 1250 HP residual heat removal pump 1B & 1C motor with 2/0 feeder cable. However, the licensee had not revised the original Burns & Row Calc 2.05.01, which recommended the use of 4/0 cable for the 1250 HP, 4KV RHR pump motors, nor was an engineering evaluation available to justify the replacement of the 4/0 cable with 2/0 cable. This calculation was required to establish that adequate design margins existed such that the feeder cables for 1250 HP pump motor would accommodate all feeder cable de-rating and routing conditions.

Example 4 Refer to Section 1R21.2.11.b

Example 5 Refer to Section 1R21.2.13.b

Example 6 Refer to Section 1R21.3.4.b

Example 7 Refer to Section 1R21.3.5.b

Analysis: Failure to correctly translate regulatory requirements and design bases information into specifications, drawings, procedures, and instructions for the emergency diesel generator frequency, service water pump, electrical cables for the residual heat removal pumps, emergency diesel generator room ventilation seismic supports, emergency diesel generator air start system testing, tornado and high wind impact on the emergency diesel generator fuel oil storage facilities and safety-related Agast relay service life evaluations was a performance deficiency. This finding was more than minor because it was associated with the design control attribute of the mitigating systems cornerstone and impacted the cornerstone objective to ensure the availability, reliability, and capability of the affected system to respond to events and prevent undesirable consequences. Using the Manual Chapter 0609, Attachment 4, "Phase 1 – Initial Screening and Characterization of Findings," the issue screened as having very low safety significance (Green) because it was not a design or qualification deficiency and did not represent a loss of safety function. The licensee performed evaluations which determined that the affected components and systems were capable of meeting their design functions. The finding had a crosscutting aspect in the area of problem identification and resolution, associated with operating experience because the licensee failed to properly evaluate and apply various industry events associated with the above systems and incorporate the information into plant procedures and training [P.2(b)].

Enforcement: The team identified seven examples of a Green noncited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control" which requires that "measures shall be established to ensure that applicable regulatory requirements and the design bases are correctly translated into specifications, drawings, procedures, and instructions. Contrary to this requirement, as of August 12, 2010, the licensee failed to properly translate the design parameters to design documents. Specifically, the licensee failed to correctly translate regulatory requirements and design bases information into specifications, drawings, procedures, and instructions involving emergency diesel generator frequency, service water pump calculations, calculations associated with electrical cables for the residual heat removal pumps, seismic supports, the emergency diesel generator air start system testing, tornado and high wind impact on the emergency diesel generator fuel oil storage facilities and safety-related Agast relay service life evaluations. Because this finding is of very low safety significance (Green) and was entered into the licensee's corrective action program as Condition Reports CNS-2010-05301, CNS-2010-5763, CNS-2010-05222, CNS-2010-05281, CNS-2010-5294, CNS-2010-5350, and CNS-2010-5438., this violation is being treated as a noncited violation, consistent with the NRC Enforcement Policy: NCV 05000298/2010007-04, "Inadequate Design Control."

b.2. Failure to Translate Design and Operating Requirements into Procedures.

Introduction: The team identified four examples of a Green noncited violation of Technical Specification 5.4.1.a, "Written procedures shall be established, implemented, and maintained, covering the procedures recommended in Regulatory Guide 1.33, Revision 2, Appendix A.9.b", for the failure to establish adequate procedures. Specifically:

Example 1   Refer to Section 1R21.2.2.b

Example 2   Refer to Section 1R21.2.2.b

Example 3   As of August 12, 2010, the licensee failed to establish adequate procedures for preventative maintenance on the safety-related check valves.

Example 4   As of August 10, 2010, the licensee failed to establish adequate procedures for the operation of the residual heat removal pumps.

<u>Description</u>:

Example 1   Refer to Section 1R21.2.2.b

Example 2   Refer to Section 1R21.2.2.b

Example 3   The licensee failed to establish adequate procedures for preventative maintenance on the safety-related station check valves. The team identified several errors in the "Kalsi report" (Document No. 1757C) which was, in part, the bases for the establishment of the check valve program. The errors in the Kalsi Report included: (1) The Kalsi Report states that the residual heat removal discharge check valve temperatures were 80 degrees Fahrenheit and 125 degrees Fahrenheit, but the actual temperature should be 281 degrees Fahrenheit. (2) The Kalsi report showed that the core spray pump discharge check valve, CS-CV-10CV, was located 12 inches from the upstream elbow, but the actual distance is 0 inches (it is welded directly to the elbow). (3) The Kalsi report showed core spray pump discharge check valve, CS-CV-10CV, installed in a piping segment inclined 45 degrees, but the correct angle is 90 degrees. (4) A review of the analysis performed for the residual heat removal discharge check valves, as well as the suction check valve and residual heat removal containment check valve, RHR-CV-19CV, showed that no consideration was given to the valves' location with respect to water hammer events although these valves were subjected to water hammer events. One water hammer event actually over-pressurized and damaged RHR-CV-19CV. Still, RHR-CV-19CV was rated 1 in the Kalsi report, indicating most favorable conditions, and no inspections (no preventive maintenance). This was contrary to the purpose (objectives) of the Kalsi Report which states that a limited failure modes and effects analysis was to be performed. Additionally, the team noted that standby liquid control and feedwater containment isolation check valves which failed local leak rate testing and should be subjected to some preventive maintenance measures were not part of the preventive maintenance program and therefore will not be inspected other than as a result of failure.

Example 4   The licensee failed to establish adequate procedures for securing the residual heat removal pumps after 15 minutes of operating at minimum flow conditions.

The four residual heat removal pumps start on a safety injection signal, but when the reactor coolant system pressure remains high (small break loss of coolant accident), the residual heat removal pumps will remain operating in a minimum flow condition until the pressure decreases. The pump manufacturer specifically stated that the pumps are not designed to operate in a minimum flow condition (1,100 gallons per minute) for more than 15 minutes without incurring damage. The procedures that failed to establish the required caution are: (1) 2.2.69, "Residual Heat Removal System," Revision 88; (2) 2.2.69.1, "RHR LPCI Mode," Revision 25; (3) 2.2.69.3, "RHR Suppression Pool Cooling and Containment Spray," Revision 43; (4) 2.4FPC, "Fuel Pool Cooling Trouble," Revision 22; (5) 5.1ASD, "Alternate Shutdown," Revision 11; (6) 5.4FIRE-S/D, "Fire Induced Shutdown from Outside Control Room," Revision 38; (7) 5.8.13, "Outside Shroud Injection Systems," Revision 19; (8) 5.8.16, "Outside Shroud Flooding Systems," Revision 17; (9) 5.8.6, "RPV Flooding Systems," Revision 26; and (10) 5.8.7, "Primary Containment Flooding/Spray Systems." Revision 24.

Analysis: Refer to Section 1R21.2.2.b

Enforcement: Refer to Section 1R21.2.2.b

.2.8 Service Water Pump 1A

a. Inspection Scope:

The team reviewed the Updated Final Safety Analysis Report, design bases documents, calculations, corrective and preventative maintenance, and testing of the service water pump 1A, performed a walk down of the service water pumps as well as associated valves and instrumentation, and interviewed the system engineer.. Specifically, the team reviewed:

- Net positive suction head and pump submergence calculations to ensure that the pump requirements were met during all conditions
- System flow balance tests and calculations.
- In-service and post maintenance testing
- A modification which increased gland seal water by obtaining flow from the discharge of the service water pump in lieu of the river well system.
- Piping and instrumentation diagrams and vendor manual for the pump.
- Selected recent condition reports

b. Findings:

b.1 Inadequate Design Control

Introduction: The team identified seven examples of a Green noncited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for failure to establish measures to ensure that applicable regulatory requirements and the design bases are correctly translated into specifications, drawings, procedures, and instructions. These measures shall include provisions to ensure that appropriate quality standards are specified and included in design documents and that deviations from such standards are controlled." Specifically:

Example 1 Refer to Section 1R21.2.7.b.1

Example 2 As of August 12, 2010, the licensee did not properly incorporate the licensing bases service water temperature into the design bases and associated calculations. As such, design calculations failed to adequately evaluate the potential effects on the net positive suction head required for the service water pumps during the design bases service water temperature of 95 degrees Fahrenheit.

Example 3 Refer to Section 1R21.2.7.b.1

Example 4 Refer to Section 1R21.2.11.b

Example 5 Refer to Section 1R21.2.13.b

Example 6 Refer to Section 1R21.3.4.b

Example 7 Refer to Section 1R21.3.5.b

Description:

Example 1 Refer to Section 1R21.2.7.b.1

Example 2 The team reviewed calculation NEDC "Service Water Flow Rate at Low River Water level" and determined that the original service water pump submergence of 3 foot 6 inches was calculated at a service water temperature of 85 degrees Fahrenheit. Subsequently, the team found that an analysis for the increased design service water temperature of 95 degrees Fahrenheit was not performed.

The technical specification bases established a river level of 863.2 feet required to maintain pump submergence of 3 feet 6 inches described in NEDC 94-255, "Hydraulic Evaluation of Opening in Intake Structure Guide Wall." The assumptions used low river level (865 feet), maximum ice thickness (3 feet) and a flow rate of 8000 gallons per minute.

In response to the team's questioning, the licensee reperformed calculation NEDC 10-056, "Pump Submergence Requirements for the SW Pump Low River Level," and found that the pump submergence margin decreased. The calculation determined the required pump submergence at high river temperature (95 degrees Fahrenheit) and low river level (865 feet) is 863.59 feet. The available pump submergence is 863.67 feet. The new margin is 0.08 feet based on the increased service water temperature of 95 degrees Fahrenheit. This calculation determined that the available water level exceeds the required pump submergence and in the "worst" case scenario, the service water pumps would be able to provide the necessary post-loss-of-coolant-accident flow rate. The technical specification surveillance requirement of a river level of 865 feet or greater still ensures that the service water pumps will maintain the required pump submergence for net positive suction head to fulfill their safety function.

Example 3 Refer to Section 1R21.2.7.b.1

Example 4 Refer to Section 1R21.2.11.b

Example 5 Refer to Section 1R21.2.13.b

Example 6 Refer to Section 1R21.3.4.b

Example 7 Refer to Section 1R21.3.5.b

Analysis: Refer to Section 1R21.2.7.b.1

Enforcement: Refer to Section 1R21.2.7.b.1

b.2 Failure to evaluate storage of an Ice Deflector Pontoon Barge Storage in Service Water Discharge Canal

Introduction: The team identified a finding of very low safety significance (Green) involving a noncited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," because the licensee did not properly incorporate the storage of an ice deflector pontoon barge in the service water discharge canal into the design bases and associated calculations. As such, design calculations failed to adequately evaluate the potential effects of storing the ice deflector pontoon barge in the service water discharge canal.

Description: The team identified a pontoon barge stored in the service water discharge canal and found that there was no calculation to show that the barge would not cause damage to the service water discharge piping under design wind conditions. In Condition Report CNS-2010-02347, the operability bases stated, in part, "the orientation of the discharge canal to the Missouri River makes it very unlikely that a runaway barge would move upstream into the canal and sink directly onto the two cooling water discharges." Storage of a barge in the discharge canal removes the orientation making it more likely for this event to occur. The barge is an ice deflector barge that is used during cold weather operations to deflect ice from impacting the service water intake structure. Once the cold weather operations are completed, the licensee moves and stores the ice deflector barge in the service water discharge canal.

The ice deflector barge was tied off with a 1.25 inch nylon rope from two points in the front of the barge and connected to a concrete deadman mooring anchor on one side and a fence on the other. The licensee performed calculation NEDC 10-057, "Qualification of Barges Stored in the Discharge Canal," using conservative assumptions. The calculation determined that under design high wind or tornado conditions one mooring line has the capacity to withstand the wind loading and prevent the ice deflector barge from breaking loose and traveling upstream to impact the service water discharge piping. Subsequently, the ice deflector barge was moved and stored downstream of the service water discharge canal.

Analysis: The team determined that failing to properly incorporate the licensing bases into evaluations of the potential effects of storing the ice deflector pontoon barge in the service water discharge canal was a performance deficiency. The finding was more than minor because it was associated with the design control attribute of the mitigating systems cornerstone and affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to events to prevent undesirable consequences. The licensee performed a calculation (NEDC 10-057) that demonstrated ice deflector pontoon barge under design conditions would not break free from its restraints and travel upstream over the service water discharge piping. Using the Manual Chapter 0609, Attachment 4, "Phase 1 – Initial Screening and Characterization of Findings," the issue screened as having very low safety significance (Green) because it was not a design or qualification deficiency and did not represent a loss of safety function. The finding has a crosscutting aspect in the area of human performance decision-making because the licensee failed to use conservative assumptions in decision-making and adopt a requirement to demonstrate that the proposed action is safe in order to proceed rather than a requirement to demonstrate that it is unsafe in order to disapprove the action. The licensee failed to conduct an effectiveness review of a safety-significant decision associated with the ice deflector barge storage to verify the validity of the underlying assumptions, identify possible unintended consequences, and determine how to improve future decisions. [H.1 (b)].

Enforcement: The team identified a noncited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," which requires, in part, 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, the licensee failed to establish measures to ensure that applicable regulatory requirements and design bases were correctly translated into specifications, drawings, procedures, and instructions. Specifically, prior to August 2, 2010, the licensee's design control measures failed to verify the adequacy of design for the potential effects of storing an ice deflector pontoon barge in the service water discharge by the use of alternate or simplified calculational methods. This finding was entered into the licensee's corrective action program under Condition Report CNS-2010-5764. Because this finding was determined to be of very low safety significance (Green) and was entered into the licensee's corrective action program, this violation is being treated as a noncited violation consistent with the NRC Enforcement Policy: NCV 05000298/2010007-05, "Failure to evaluate storage of an Ice Deflector Pontoon Barge in Service Water Discharge Canal."

.2.9 Reactor Core Isolation Cooling Pump and associated valves

a. Inspection Scope:

The team reviewed the Updated Final Safety Analysis Report, design bases documents, calculations, corrective and preventative maintenance, and testing of the Reactor Core Isolation Pump, performed a walkdown of the pump and associated valves and instrumentation, and interviewed the system engineer. Specifically, the team reviewed:

- Piping and instrumentation diagrams
- Specifications, drawings and calculations documenting and supporting the design bases of the RCIC pump
- Steam supply for the pump, pump capacity and head, net positive suction head required and available
- Emergency condensate storage tank and Torus water levels and instrument uncertainty,
- Vortex limits,
- Pressure and flow indications and flow alarms
- Inservice Testing Data
- Maintenance history and corrective action documentation
- Selected recent condition reports

The team reviewed whether the pump was capable of supplying the required flow rate at required pressure under the most limiting conditions, analyzed net positive suction head available under the most limiting conditions, compared test results to the original pump specification, verified the pump's capability to operate at the maximum ambient temperature, and assessed the material condition of the pump. Finally, the team reviewed the adequacy of design documents postulating the transfer of suction from the emergency condensate storage tank to the Suppression Pool (Torus), including the application of vortex limit and valve opening and closing times.

b. Findings:

No findings were identified.

.2.10 Main Steam System Hangers (H2A & H74A)

a. Inspection Scope:

The team reviewed the Updated Final Safety Analysis Report, design bases documents, calculations, corrective and preventative maintenance, and visual inspections of the main steam system hangers (H2A & H74A), and interviewed the system engineer. Specifically, the team reviewed:

- Main steam system support study that was conducted by the licensee
- Water hammer effect evaluation on main steam line piping to ensure pipe design limits were not exceeded
- Welder certification and welding processes used to repair failed hangers
- Piping and instrumentation diagrams
- Selected recent condition reports

b. Findings:

No findings were identified.

.2.11 Diesel Generator Room Coolers HV-DG-1C

a. Inspection Scope:

The team reviewed the Updated Final Safety Analysis Report, design bases documents, calculations, corrective and preventative maintenance, and testing of the diesel generator room cooler HV-DG-1C, performed a walkdown of the system and associated components, and interviewed the system engineer. Specifically, the team reviewed:

- Heat load and heat removal calculation
- Procedures for utilizing the steam supply during cold weather operations
- Seismic analysis for the room cooler to ensure that integrity would not be compromised during a seismic event
- Piping and instrumentation diagrams and the vendor manual for the cooler
- Selected recent condition reports

b. Findings:

b.1 Inadequate Design Control

Introduction: The team identified seven examples of a Green noncited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for failure to establish measures to ensure that applicable regulatory requirements and the design bases are correctly translated into specifications, drawings, procedures, and instructions. These measures shall include provisions to ensure that appropriate quality standards are specified and included in design documents and that deviations from such standards are controlled." Specifically:

Example 1 Refer to Section 1R21.2.7.b.1

Example 2 Refer to Section 1R21.2.8.b.1

Example 3 Refer to Section 1R21.2.7.b.1

Example 4 As of August 10, 2010, the licensee had not established design control measures that verified the adequacy of the design of the seismic supports for the diesel generator building HVAC system. The diesel generator HVAC duct was classified Seismic Category 1S, however its supports (knee braces) were only approved for Seismic Category 2S classification.

Example 5 Refer to Section 1R21.2.13.b

Example 6 Refer to Section 1R21.3.4.b

Example 7 Refer to Section 1R21.3.5.b

Description:

Example 1 Refer to Section 1R21.2.7.b.1

Example 2 Refer to Section 1R21.2.8.b.1

Example 3 Refer to Section 1R21.2.7.b.1

Example 4 The team identified, during a walkdown of the diesel generator rooms, that the heating, ventilation and air conditioning inlet air ducts were not supported by a Seismic Category 1S design. The vertical air ducts were supported by knee braces built out of 2"x2"x1/4" angle iron, which were approved for Seismic Category 2S classification only. The team reviewed the design criteria and calculation associated with the vertical air ducts and determined that the supports installed on the ducting did not utilize the correct seismic category 1S supports. The seismic category 1S supports were designed for horizontal control room air ducts, and later extrapolated to qualify the air ducts in the diesel generator rooms. However, the air ducts in question were in a vertical position preventing the use of the seismic category 1S supports, so the licensee used a knee brace design approved for seismic category 2S classification systems. No upgrade design calculations were completed to justify the use of the seismic category 2S design in a seismic category 1S system. Subsequently, the licensee performed an alternate calculation to qualify the duct supports to the correct seismic criterion

Example 5 Refer to Section 1R21.2.13.b

Example 6 Refer to Section 1R21.3.4.b

Example 7 Refer to Section 1R21.3.5.b

Analysis: Refer to Section 1R21.2.7.b.1

Enforcement: Refer to Section 1R21.2.7.b.1

.2.12 Emergency Diesel Generator 1 heat exchangers

a. Inspection Scope:

The team reviewed the Updated Final Safety Analysis Report, design bases documents, calculations, corrective and preventative maintenance, and testing of the emergency diesel generator 1 heat exchanger. Specifically, the team reviewed:

- Design bases heat load sizing analysis for the heat exchanger
- Heat exchanger data sheet and the limiting fouling factor
- Heat load and heat removal calculation
- Seismic analysis for the system to ensure that integrity would not be compromised during a seismic event
- Piping and instrumentation diagrams and the vendor manual for the heat exchanger
- System health reports, trending, component maintenance history and licensee's corrective action program reports, to verify the monitoring and correction of potential degradation
- Tube plugging limits with respect to service water flow rate and temperature
- Operation of the temperature control valve and its capability to maintain the design temperature range adequately
- Inspection frequency, applicable operating experience, as well as significant corrective action documents and their impact on design bases margin
- System walkdowns
- Interviews with system engineer
- Selected recent condition reports

b. Findings:

No findings were identified.

.2.13 Emergency Diesel Generator Starting Air

a. Inspection Scope:

The team reviewed the Updated Final Safety Analysis Report, design bases documents, calculations, corrective and preventative maintenance, and testing of the emergency diesel generator starting air system. Specifically, the team reviewed:

- Piping, tank and instrumentation diagrams
- Recent photos of the condition of the receivers' internals
- Records of startup testing with respect to the technical specifications (and Bases) requirements for the emergency diesel generator air starting receivers
- System setpoints and alarms
- Recent emergency diesel generator tests to verify that the air receivers are regularly capable of starting the emergency diesel generators

- The inspectors evaluated the temperature range the air receivers will be subjected to and how the temperature range affected the pressure in the air receiver
- Walkdowns of the air receivers, associated components with them, and observed other components in the emergency diesel generator rooms such as the room HVAC ducts
- Interviews with the system engineer
- Selected recent condition reports

b. Findings:

Inadequate Design Control

Introduction: The team identified seven examples of a Green noncited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for failure to establish measures to ensure that applicable regulatory requirements and the design bases are correctly translated into specifications, drawings, procedures, and instructions. These measures shall include provisions to ensure that appropriate quality standards are specified and included in design documents and that deviations from such standards are controlled." Specifically:

Example 1 Refer to Section 1R21.2.7.b.1

Example 2 Refer to Section 1R21.2.8.b.1

Example 3 Refer to Section 1R21.2.7.b.1

Example 4 Refer to Section 1R21.2.11.b.1

Example 5 As of August 12, 2010, the licensee failed to perform suitable pre-operational testing to ensure each starting air receiver was capable of multiple starts of the emergency diesel generator as required by the system design.

Example 6 Refer to Section 1R21.3.4.b

Example 7 Refer to Section 1R21.3.5.b

Description:

Example 1 Refer to Section 1R21.2.7.b.1

Example 2 Refer to Section 1R21.2.8.b.1

Example 3 Refer to Section 1R21.2.7.b.1

Example 4 Refer to Section 1R21.2.11.b.1

Example 5 The licensee failed to perform suitable pre-operational testing to ensure each starting air receiver was capable of multiple starts of the emergency diesel generator as required by the system design. The pre-operational testing performed at Cooper Nuclear Station used both air start accumulators to demonstrate the capability for multiple air starts. The original and current technical specification bases states in part that, “Each diesel generator has an air start subsystem that includes two starting air receivers, each with adequate capacity for multiple start attempts on the diesel generator without recharging the air start receiver(s).” Also, the test started when the receivers’ pressure was 245 psig, rather than 200 psig, the low pressure point when the air compressors start recharging the air receivers.

Example 6 Refer to Section 1R21.3.4.b

Example 7 Refer to Section 1R21.3.5.b

Analysis: Refer to Section 1R21.2.7.b.1

Enforcement: Refer to Section 1R21.2.7.b.1

.3 **Results of Reviews for Operating Experience:**

.3.1 Inspection of IN2010-02, “Failures of Motor-Operated Valves due to Degraded Stem Lubricant

a. Inspection Scope:

The team reviewed the licensee’s response to NRC Information Notice 2010-03 to verify that the licensee reviewed industry operating experience in accordance with procedures. The team verified that the licensee was performing preventative maintenance and measuring stem nut wear on critical valves. The preventative maintenance includes cleaning and replacing stem lubricant at a maximum frequency of 2 years or 156 weeks for rising stem valves. The team also verified that the licensee was using motor-operated valve long life lubricant, as specified in the information notice. The team reviewed two diagnostic tests for critical valves, which were used for trending stem nut wear.

b. Findings:

No findings were identified.

.3.2 Inspection of Information Notice 2006-017, Service Water

a. Inspection Scope:

The team reviewed the licensee's response to NRC Information Notice 2006-017 to verify that the licensee reviewed industry operating experience in accordance with procedures. Specifically the team reviewed:

- Surveillance and control techniques to reduce the incidence of flow blockage problems as a result of biofouling
- Test program for verifying the heat transfer capability of all safety-related heat exchangers cooled by service water
- Initial test program and periodic retest program data
- Instrumentation used in testing
- Baseline data used for future monitoring of heat exchanger performance
- Routine inspection and maintenance program for open-cycle service water system piping and components
- Service water system licensing bases for the plant
- Maintenance practices, operating and emergency procedures, and training

b. Findings:

No findings were identified.

.3.3 Inspection of Information Notice 2002-12, Submerged Cables

a. Inspection Scope:

The team reviewed the licensee's response to NRC Information Notice 2002-12 to verify that the licensee reviewed industry operating experience in accordance with procedures and inspected five electrical vaults via manhole covers removed by licensee staff. Specifically the team reviewed:

- Drawings
- Cable design and testing specifications
- Work instructions for sump pumps
- Megger test data

b. Findings:

No findings were identified.

.3.4 Inspection of Information Notice, 2008-002, Findings Identified During Component Design Bases Inspections

a. Inspection Scope:

The team reviewed the licensee's response to NRC Information Notice 2008-002 to verify that the licensee reviewed industry operating experience in accordance with procedures. Specifically the team reviewed:

- Potential air entrainment and vortexing of safety-related fluid systems
- emergency diesel generators
- Testing
- Cooling water systems
- Station blackout
- Motor operated valves
- Operability evaluations
- Standby batteries and direct current electrical distribution systems
- Alternating current auxiliary power systems
- Circuit breakers

b. Findings:

Inadequate Design Control

Introduction: The team identified seven examples of a Green noncited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for failure to establish measures to ensure that applicable regulatory requirements and the design bases are correctly translated into specifications, drawings, procedures, and instructions. These measures shall include provisions to ensure that appropriate quality standards are specified and included in design documents and that deviations from such standards are controlled." Specifically:

Example 1 Refer to Section 1R21.2.7.b.1

Example 2 Refer to Section 1R21.2.8.b.1

Example 3 Refer to Section 1R21.2.7.b.1

Example 4 Refer to Section 1R21.2.11.b

Example 5 Refer to Section 1R21.2.13.b

Example 6 As of August 12, 2010, the licensee failed to verify that the emergency diesel generator fuel oil storage and day tank vent lines had adequate tornado missile protection.

Example 7 Refer to Section 1R21.3.5.b

Description:

Example 1 Refer to Section 1R21.2.7.b.1

Example 2 Refer to Section 1R21.2.8.b.1

Example 3 Refer to Section 1R21.2.7.b.1

Example 4 Refer to Section 1R21.2.11.b

Example 5 Refer to Section 1R21.2.13.b

Example 6 During a walkdown of the emergency diesel generator system, the team questioned if the emergency diesel generator fuel oil storage and day tank vent lines had adequate tornado missile protection. Sections 3.5.1.4 and 3.5.2 of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" contain the current acceptance criteria governing tornado missile protection. These criteria generally specify that structures, systems and components that are important to safety be provided with sufficient, positive tornado missile protection. (i.e. barriers) to withstand the maximum credible tornado threat. The appendix to Regulatory Guide1.117, "Tornado Design Classification," Revision 1, issued April 1978, lists the types of structures, systems, and components that should be protected from design bases tornadoes. The NRC evaluated plants licensed before promulgation of the general design criteria for tornado missile protection on a plant-specific bases. Section 3.5, Missile Protection Criteria of the Safety Evaluation Report for Cooper Nuclear Station, dated February 14, 1973, states, in part, "Class I structures were designed to withstand the effects of a spectrum of tornado generated missiles of low level origin, including a 35 foot long utility pole with a 14 inch butt, with an impact velocity of 200mph." The team reviewed the Chapter XII, section 2.3.3.2.1, of the Updated Final Safety Analysis Report, which stated, in part, "Class I structures are also designed to provide protection against tornado generated missiles." The concern was crimping or collapse of the vent could result in loss of venting capability causing a vacuum in the emergency diesel generator fuel oil storage or day tanks. This would lead to a loss of fuel to the emergency diesel generators causing a loss of electrical power and eventual core damage. During a design bases event, the emergency diesel generators are postulated to start and continue operating as required for as long as 7 days. During emergency diesel generator operation, the fuel oil storage and day tanks would be significantly depleted and air would be required to enter the tanks in order to maintain the tanks at atmospheric pressure. Failure to maintain the tanks at or near atmospheric pressure could result in the failure of the fuel oil transfer pumps to maintain suction and/or could result in structural failure of the storage tanks. The emergency diesel generator fuel oil storage and day tank vents are required in order for the emergency diesel generators to perform their required safety-related functions. The team requested the documented technical bases showing that the installed vent piping met the Updated Final Safety Analysis Report description. The licensee was unable to verify that the fuel oil and day tank vents had been evaluated for tornado and high wind missile hazards. The licensee completed an operability determination and concluded that tornado missiles could cause complete crimping of the pipe such that the venting function would be degraded, but not lost. Specifically, the licensee performed an operability determination and concluded that even with the vent lines significantly degraded (crimped) or in the event that the lines failed completely, sufficient air would enter the tanks to replace the approximately one cubic foot per minute of fuel that would be used.

Example 7 Refer to Section 1R21.3.5.b

Analysis: Refer to Section 1R21.2.7.b.1.

Enforcement: Refer to Section 1R21.2.7.b.1.

.3.5 Inspection of Information Notice, 1984-20 Service Life of Relays in Safety-Related Systems

a. Inspection Scope:

The team reviewed the licensee's response to NRC Information Notice 2010-03 to verify that the licensee reviewed industry operating experience in accordance with procedures. Specifically the team reviewed:

- The qualified service life of Agastat and Sylvania relays and timers in safety-related applications at Cooper.
- The replacement program for such components
- The applicable analyses of the components
- The review addressed both normally energized and normally deenergized relays, in harsh and mild environments.
- The review included an evaluation of the analyses performed to establish the qualified service life, the replacement program and the plant-specific operating experience.

b. Findings:

Inadequate Design Control

Introduction: The team identified seven examples of a Green noncited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for failure to establish measures to ensure that applicable regulatory requirements and the design bases are correctly translated into specifications, drawings, procedures, and instructions. These measures shall include provisions to ensure that appropriate quality standards are specified and included in design documents and that deviations from such standards are controlled." Specifically:

Example 1 Refer to Section 1R21.2.7.b.1

Example 2 Refer to Section 1R21.2.8.b.1

Example 3 Refer to Section 1R21.2.7.b.1

Example 4 Refer to Section 1R21.2.11.b

Example 5 Refer to Section 1R21.2.13.b

Example 6 Refer to Section 1R21.3.4.b

Example 7 As of August 12, 2010, licensee failed to provide adequate engineering justification for exceeding the vendor recommended service life of safety-related Agastat EGP series relays and ETR series timers.

Description:

Example 1 Refer to Section 1R21.2.7.b.1

Example 2 Refer to Section 1R21.2.8.b.1

Example 3 Refer to Section 1R21.2.7.b.1

Example 4 Refer to Section 1R21.2.11.b

Example 5 Refer to Section 1R21.2.13.b

Example 6 Refer to Section 1R21.3.4.b

Example 7 The licensee failed to provide adequate engineering justification for exceeding the vendor-recommended service life of safety-related Agastat EGP series relays and ETR series timers. NRC Information Notice 84-20, Service Life of Relays in Safety-Related Systems, advised that the service life of normally-energized Agastat EGP series relays was 4.5 years, but that Amerace Corporation was in the process of developing a test program to extend the service life of the relays beyond the 4.5 years. The licensee used a test performed by Grand Gulf to calculate the service life of the Cooper EGP series relays in a mild environment, using Cooper-specific environmental conditions. The evaluation by the licensee used degradation of a component other than the one specified by Amerace and Grand Gulf to incorrectly extend the service life beyond the tested capabilities of the relays. Establishing an appropriate service life of control relays and timers is important to ensure that systems and components that utilize such relays and timer are not affected by common mode failures and, hence, are not able to perform their intended safety functions.

The NRC Information Notice 84-20 provided licensees the following information concerning the service life of relays, "in the normally energized state is significantly shorter than when used in a cycled or normally de-energized state." Regarding the Agastat EGP series relays, the information notice states that "The current qualified service life, on the bases of General Electric test data, for all Agastat EGP series relays… operated in the energized state is stated to be 4.5 years. The service life for all Agastat EGP series relays operated in the de-energized state is currently stated by Amerace to be 10 years." The information notice also informed that Amerace Corporation was in the process of developing a test program to extend the service life of the relays beyond the 4.5 years. The licensee addressed the information notice in Condition Report CNS-1994-0709. Corrective actions resulting from this information notice included, 1) "Establish a PM program to periodically replace relays addressed by IN 84-20 and IEB 84-02;" 2) "Replace all energized Agastat model EGP [series] relays not evaluated by an OE [operating experience] prior to startup;" and 3) "Replacement of Agastat series E7000 relay EE-REL-(27X3-1F) prior to startup." The licensee also addressed other relays in Condition Report CNS-1994-0762.

The qualified service life of safety-related Agastat EGP, ETR, and E7000 series relays and timers in a mild environment is addressed in Engineering Evaluation No. 03-020, "Non-EQ Agastat EGP, ETR, and E7000 Relays," Revision 0. This evaluation used the Arrhenius methodology in conjunction with Grand Gulf test data and Cooper Nuclear Station specific environmental data to calculate the qualified service life of EGP and ETR series relays at Cooper. The Grand Gulf test data were included in Calculation EC-Q1111-88002, "Thermal Life of Agastat Relays, Revision 1, dated June 7, 1989. To address the service qualified life of normally de-energized E7000 series timers, the licensee used the "EQ Data Bank (EQDB)/EGS Materials data base and the System 1000 materials data base in conjunction with the Arrhenius methodology and plant specific environmental data. Regarding the EGP and ETR relays the licensee determined that the qualified service life of normally energized relays located in the Control Building was 12.6 years and recommended a replacement schedule of 12 years. For the normally de-energized relays the licensee calculated service lives ranging between 81 and 151 years and recommended a replacement schedule of 20 years.

A review by the team of the bases for the calculation observed that the licensee assumed the limiting component to be the coil wrap with an activation energy of 1.03 eV (electron volts). This is not consistent with the bases of the Grand Gulf test and calculation which in section 3.1 states, "The weak link material for these relays was determined per reference 2.2 to be the Zytel material used for the Coil Bobbin. The activation energy for this material is 0.84 eV." Reference 2.2 is "Amerace Specification EGP, Rev H, 4/3/80." Amerace is the relay manufacturer. Regarding the coil bobbin, the licensee stated, "it does not perform a safety function. It is only used for fabrication of the coil during manufacture. Once the coil is formed, the bobbin does not have a function. It will not fail since there is no stress placed on the material." While it is true that the primary purpose of the bobbin is to support the relay coil, the team did not agree that it has no function, since it provides a guide through which the relay core moves. Therefore, its degradation could result in added friction to the relay core and prevent the contacts from changing state when called upon. Furthermore, it was the manufacturer of the relay that included the bobbin in the list of materials to be evaluated for aging purposes and it was the manufacturer that determined the bobbin to be the limiting component. The licensee was incorrect in discounting the function of the bobbin unilaterally and without the approval of the manufacturer. The statements made regarding the bobbin were more appropriate for the coil wrap used to calculate the service life of the relay. Calculations performed by the team using the licensee's data and methodology, but the activation energy of the bobbin material, resulted in a qualified service life of approximately 7.7 years for the normally energized relays. No calculation was performed for the normally de-energized relays, however, the 20 years service life stipulated by the licensee appeared to be reasonable based on the results for the normally energized relays and the values obtained by the licensee using an activation energy of 1.03 eV.

Analysis: Refer to Section 1R21.2.7.b.1.

Enforcement: Refer to Section 1R21.2.7.b.1.

.3.6 Inspection of Generic Letter 89-13, Service Water System Problems Affecting Safety-Related Equipment

a. Inspection Scope:

The team reviewed the licensee's response to NRC Generic Letter 89-13 to verify that the licensee reviewed industry operating experience in accordance with procedures. Specifically the team reviewed:

- Surveillance and control techniques to reduce the incidence of flow blockage problems as a result of biofouling
- Test program for verifying the heat transfer capability of all safety-related heat exchangers cooled by service water
- Initial test program and periodic retest program data.
- Instrumentation used in testing
- Baseline data used for future monitoring of heat exchanger performance.
- Routine inspection and maintenance program for open-cycle service water system piping and components
- Service water system licensing bases for the plant
- Maintenance practices, operating and emergency procedures, and training

b. Findings:

No findings were identified.

.4 **Results of Reviews for Operator Actions:**

The team selected risk-significant components and operator actions for review using information contained in the licensee's probabilistic risk assessment. This included components and operator actions that had a risk achievement worth factor greater than two or Birnbaum value greater than 1E-6.

a. Inspection Scope:

For the review of operator actions, the team observed operators during simulator scenarios associated with the selected components as well as observing simulated actions in the plant.

Inspection procedure 71111.21 requires a review of three to five relatively high-risk operator actions. The sample selection for this inspection was four operator actions.

The selected operator actions were:

- Verify/establish service water cooling to the running emergency diesel generators within 5 minutes of the emergency diesel generators starting.
- Establish reactor pressure vessel level and pressure monitoring and control of high pressure core injection at the alternate shutdown panel within 10 minutes of the control room evacuation order. This was performed per Attachment 1 of procedure 5.4,"Fire S/D" [Shutdown]
- Position breakers 1GS, 1GB, 1GE, SS1G, and feeder breakers for MCC-TX and MCC-S within 18.1 minutes of the order to evacuate the control room. (Note: The NLO was cued there was a stuck open SRV at the beginning of the task.) This was performed per Attachment 3 of procedure 5.4 FIRE-S/D, "Fire Induced Shutdown from Outside Control Room," Revision 38
- Position Non-Safe Shutdown breakers to reduce load on emergency diesel generator 1 to less than 4000 kW within 18.1 minutes of the order to evacuate the control room. This was performed per Attachment 3 of procedure 5.4 FIRE-S/D, "Fire Induced Shutdown from Outside Control Room," Revision 38

b. Findings:

No findings were identified.

4 OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems

a. Inspection Scope:

The team reviewed action requests associated with the selected components, operator actions, and operating experience notifications. In addition, this report contains the following issue that has problem identification crosscutting aspects.

b. Findings:

b.1 Inadequate design control processes

Introduction: The team identified three examples of a Green noncited violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," for failure to ensure that conditions adverse to quality are promptly corrected. Specifically:

Example 1 Refer to Section 1R21.2.5.b.1

Example 2 Refer to Section 1R21.2.5.b.1

Example 3 As of August 9, 2010, the licensee failed to promptly correct conditions adverse to quality involving the installation design control process.

Description:

Example 1 Refer to Section 1R21.2.5.b.1

Example 2 Refer to Section 1R21.2.5.b.1

Example 3 During the inspection, the team observed that over the last two years there were multiple examples of noncited violations involving design control. The team performed a follow-up search of the corrective action program using the design control trend code. While this search was not all inclusive, it did reveal approximately 750 condition reports during the last three years coded as design control. The team reviewed the identified design control condition reports and eliminated those that were legacy conditions, involved non-safety-related systems, or which the team determined were not applicable to the current issue. This left approximately 175 condition reports identified by the team which involved safety-related components or generic issues that could potentially affect safety-related components. The team noted that while each of the individual identified conditions adverse to quality were corrected, the recurring nature of these deficiencies was not evaluated in any of the condition reports and, consequently was not corrected. For example, there were 27 condition reports identifying an inadequate bases for a calculation, new design, or modification. In each case, the bases was revised to address the deficiency, however, the repetitive nature of these deficiencies was not addressed in any of the condition reports reviewed and continued to recur.

In addition, over the last three years, the team identified six "adverse trend" condition reports written that documented design control as having an adverse trend. These trend condition reports were individually reviewed by the licensee with a final determination in each case that there was no adverse design control trend.

Analysis: Refer to Section 1R21.2.5.b.1

Enforcement: Refer to Section 1R21.2.5.b.1

b.2 Faulty General Electric Switches

Introduction: The team identified a Severity Level IV noncited violation of 10 CFR Part 21 which requires in part, that an identified deviation or failure to comply be evaluated within 60 days of discovery to determine if there is a substantial safety hazard.

Description: In November, 2009, 13 of 23 safety-related control switches were determined to have a common defect and were not evaluated as required. These control switches were to be used as part of a modification on the safety-related 4160 V circuit breakers and, if installed, would have rendered them inoperable. The control switches were tested in preparation for installation as part of a station modification to the safety-related 4160 V switchgear. These control switches were to be used to allow local opening and closing of the associated circuit breaker. The testing revealed that 13 of the 23 had a common defect that would have prevented the remote and/or automatic opening and closing of the associated circuit breakers. The failure of the switches was documented in Condition Report CNS- 2009-09985. Corrective action number one associated with this condition report was to "Provide to Licensing the results of vendor evaluation…" This corrective action is supported by procedure 0.11, "10CFR21 Evaluations", in that step 4.3 states, "…an action item shall be assigned and tracked in PCRS (paperless condition reporting system) to ensure the Part 21 evaluation is completed or a written interim report is submitted to the NRC within 60 days of the discovery date." The vendor was contacted and the responsibility for performing the substantial safety hazard evaluation was transferred from the licensee to the vendor. Following the evaluation transfer, there was no follow-up by the licensee to ensure the evaluation was performed as required. In March, 2010, the vendor sent a letter stating they could not perform the substantial safety hazard evaluation since the purchase order did not specifically state what the application of the control switch would be. No actions were taken in response to the notification. On August 5, 2010, the failure to perform the evaluation was identified by the NRC and documented in Condition Report CNS-2010-05629. The defect was then evaluated and a Part 21 Event Notification (EN-46165) was made to the NRC on August 9, 2010.

Analysis: The failure to perform the substantial safety hazard evaluation within 60 days as required by 10 CFR 21 (a)(1) was a performance deficiency. This performance deficiency was evaluated in accordance with the Enforcement Manual and determined to be a Severity Level IV noncited violation because (a) there was no failure to restore compliance, (b) it was placed in the corrective action program, (c) it was not repetitive and NRC identified, and (d) it was not willful. The team concluded that the cause of the finding was related to the crosscutting element of problem identification and resolution, alternative process, because the licensee failed to ensure appropriate and timely resolution of identified problems. (IMC 0310, Section 06.02.b.(1) P.1(e)

Enforcement: The team identified a Severity Level IV noncited violation of 10 CFR Part 21(a)(1), which states, in part "Evaluate deviations and failures to comply to identify defects and failures to comply associated with substantial safety hazards as soon as practicable, and except as provided in paragraph (a)(2) of this section, in all cases within 60 days of discovery." Contrary to the above, the licensee failed to evaluate deviations and failures to comply which had the potential for substantial safety hazards within 60 days of discovery. Specifically, the licensee took 267 days to perform the required evaluation. Because the violation is of very low safety significance (Green) and has been entered into the licensee's corrective action program as Condition Report CNS-2010-05629, this violation is being treated as a noncited violation, consistent with the NRC Enforcement Policy: NCV 05000298/2010007-06.

4OA5 Other

(Closed)

Unresolved Item (URI 05000298/2007011-08) Fuel Oil Storage Tank Required Submergence to Prevent Vortexing and Available Volume Are Marginal without Accounting for Instrument Uncertainties

Introduction: The team identified a Green noncited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for failure to establish measures to ensure that applicable regulatory requirements and the design bases were correctly translated into specifications, drawings, procedures and instructions. Specifically, the licensee failed to demonstrate an adequate supply of fuel oil was available in the tanks to support the safety function of the emergency diesel generators because the licensee failed to consider the potential for vortex formation in the two diesel fuel oil storage tanks and the two day tanks and net positive suction head of the associated pumps. Depending on the magnitude of air entrainment, such vortex formation could be detrimental to the operation of the diesel fuel transfer pumps and booster pumps and could lead to their malfunction.

Description: The 2007 Component Design Bases Inspection team identified an unresolved issue regarding the available net positive suction head and vortexing potential in the diesel fuel oil systems. The licensee had prepared Calculation NEDC 07-090, which was approved December 4, 2007 (subsequent to the team's departure from the site). The final results of Calculation NEDC 07-090 concluded that there was adequate available net positive suction head and vortexing would not occur in both the fuel oil storage and the day tanks. The team reviewed the calculation and did not identify any significant issues with respect to the calculation of net positive suction head since there was ample margin between the available and required net positive suction head. The team, however, found that the margin to avoid vortexing for the fuel oil storage tanks was approximately 0.323 inches. This was a concern with the team since this amount of margin is very low and may not have considered instrument uncertainties. The 2007 Component Design Bases Inspection team documented this as an unresolved item. Following the telephone exit on December 12, 2007, the licensee identified two additional issues concerning the diesel fuel oil day tanks and the storage tanks, which were documented in Condition Reports CNS-2007-08590 and CNS-2007-8682, respectively. These issues are related to the licensee's failure to account for vortexing impact on available fuel oil volume, and not considering the impact of instrument uncertainties on measuring the fuel oil storage tank volumes. The 2010

Component Design Bases Inspection team reviewed the design calculations and modeling performed by the licensee to demonstrate the available net positive suction head and vortexing potential in the diesel fuel oil systems. The licensee's revised calculations and modeling demonstrated that adequate margin existed to ensure usable volume remains above the minimum submergence limits in the emergency diesel generator system fuel oil storage tanks.

Analysis: The 2010 Component Design Bases Inspection team determined that failing to adequately apply instrument uncertainties and substantiating assumptions associated with the evaluation of vortexing and available volume in the emergency diesel generator fuel oil system was a performance deficiency. The finding was more than minor because it was associated with the design control attribute of the mitigating systems cornerstone and affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to events to prevent undesirable consequences. Using the Manual Chapter 0609, Attachment 4, "Phase 1 – Initial Screening and Characterization of Findings," the issue screened as having very low safety significance (Green) because it was not a design or qualification deficiency and did not represent a loss of safety function. Specifically, the licensee's revised calculation demonstrated that adequate margin exists to ensure usable volume remains above the minimum submergence limits in the emergency diesel generator system fuel oil storage tanks. This finding did not have a crosscutting aspect because the most significant contributor did not reflect current licensee performance.

Enforcement: The team identified a noncited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," which requires, in part, 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 initial construction until December 2008, the licensee failed to establish measures to ensure that applicable regulatory requirements and design bases were correctly translated into specifications, drawings, procedures, and instructions. Specifically, the licensee's design control measures failed to verify the adequacy of design for the potential effects of instrument uncertainties and substantiating assumptions associated with the evaluation of vortexing and available volume in the emergency diesel generator fuel oil system by the use of alternate or simplified calculational methods, or by the performance of a suitable test program. This finding was entered into the corrective action program under Condition Report CNS-2007-08482. Because this finding was determined to be of very low safety significance (Green) and was entered into the licensee's corrective action program, this violation is being treated as a noncited violation consistent with the NRC Enforcement Policy: NCV 05000298/2010007-07, "Unresolved Item Regarding The Fuel Oil Storage Tank Required Submergence To Prevent Vortexing And Available Volume Are Marginal Without Accounting For Instrument Uncertainties."

URI Closure: High Pressure Coolant Pump Swap-Over from Emergency Condensate Storage Tank to Torus Vortex Calculation

Introduction: The team identified a Green noncited violation of 10 CFR Part 50, Appendix B, Criterion III, “Design Control,” for failure to ensure that important design bases information remained consistent within affected design documents. Specifically, the licensee failed to identify that Calculation NEDC 91 078 “System Level Design Bases Review of High Pressure Coolant Injection (HPCI) System Program MOVs,” and Design Calculation NEDC 98-001, “Vortex Limit for the Emergency Condensate Storage Tanks A & B,” were documents that affected each other.

Description: The 2007 Component Design Bases Inspection identified an unresolved issue regarding the design bases stroke times established in Revision 1 to Design Calculation NEDC 98-001, dated May 1, 2001, for Motor-Operated Valves HPCI-MOV-MO17 and -M058. The design stroke times had not been incorporated into Revision 3 to Calculation NEDC 91-078 dated September 10, 2002. Calculation NEDC 98-001 evaluated the emergency condensate storage tanks as viable water supply sources for high pressure coolant injection and reactor core isolation cooling systems, and to ensure that no vortexing/air entrainment conditions will exist. Assumptions were made for stroke times of motor-operated valves HPCI-MOV-MO17 and -MO58 (the high pressure coolant injection pump suction from the emergency condensate storage tank and suppression pool, respectively) and these assumptions are correlated to necessary emergency condensate storage tank water levels to avoid vortexing. The assumptions established a design bases stroke time (Motor-Operated Valves HPCI-MOV-MO17 ≤ to 78 seconds and HPCI-MOV-MO58 ≤ to 82 seconds) that must be controlled and incorporated in all other affected lower-tier design documents. During review of Calculation NEDC 91-078, the team noted that Section 4.4 stated that there was a passive open safety function and an active close safety function for motor-operated valve HPCI-MOV-MO17. Further, Sections 4.4.2.5 and 4.4.3.5 stated, respectively, that there was no specified design bases opening or closing stroke times for motor-operated valve HPCI-MOV-MO17. Similarly, for motor-operated valve HPCI-MOV-MO58, Section 4.10 stated that there were active safety functions to both open and close. Sections 4.10.2.5 and 4.10.3.5, respectively, stated that there was no specified design bases opening or closing stroke times for motor-operated valve HPCI-MOV-MO58. The issue was documented in the licensee’s corrective action program as Condition Report CNS-2007-07459.

Analysis: The team determined that failing to adequately apply instrument uncertainties and substantiating assumptions associated with the evaluation of vortexing and available volume in the emergency condensate storage tanks was a performance deficiency. The finding was more than minor because it was associated with the design control attribute of the mitigating systems cornerstone and adversely impacted the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to events to prevent undesirable consequences. Specifically, inclusion of the inaccurate design bases information into the affected design documents could have resulted in a failure to establish appropriate in-service test acceptance criteria, thus, allowing a component to not meet its design requirements. Using the Manual Chapter 0609, Attachment 4, "Phase 1 – Initial Screening and Characterization of Findings," the issue screened as having very low safety significance (Green) because it was not a design or qualification deficiency and did not represent a loss of safety function. This finding did not have a crosscutting aspect because the most significant contributor did not reflect current licensee performance.

Enforcement: The team identified a noncited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," which requires, in part, 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, the licensee failed to establish design control measures to 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. Specifically, the licensee's design control measures failed to correctly identify an affected document in the cross-reference index of a design calculation, thus, important design information regarding opening and closing stroke times of motor-operated valves for the high pressure coolant injection pump suction from the emergency condensate storage tank and suppression pool, HPCI-MOV-MO17 and -MO58 respectively, was not being maintained consistent within applicable design documents. The assumptions that established the stroke times were correlated to necessary emergency condensate storage tank water levels to avoid vortexing. Because this finding was of very low safety significance (Green) and was entered into the licensee's corrective action program as Condition Report CNS-2007-08482 and CNS-2010-5763, this violation is being treated as a noncited violation, consistent the NRC Enforcement Policy: NCV 05000298/2010007-08, High Pressure Coolant Pump Swap-Over from Emergency Condensate Storage Tank to Torus Vortex Calculation.

4OA6 Meetings, Including Exit

On August 12, 2010, the team leader presented the preliminary inspection results to Mr. Brian O'Grady, Vice President and Chief Nuclear Officer and other members of the licensee's staff. On October 20, 2010, the team leader conducted a telephonic final exit meeting with Mr. Deet Willis, General Manager Plant Operations, and other members of the licensee's staff. The licensee acknowledged the findings during each meeting. While some proprietary information was reviewed during this inspection, no proprietary information was included in this report.

4OA7 Licensee Identified Violations

None

Attachments: 1 – SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee personnel

B. O'Grady, Vice President and Chief Nuclear Officer
D. Willis-General Manager Plant Operations
D. Buman- Director of Engineering
J.Flaherty- Senior Staff Licensing Engineering
A. Able, Instrument & Control Engineering Supervisor, Design Engineering Department
D. Anderson, Supervisor, ALARA
J. Austin, Manager, Emergency Preparedness
B. Chapin, Manager, Outage
R. Estrada, Manager, Design Engineering
K. Fike, Plant Chemist, Chemistry Department
S. Freborg, ESD Mechanical Programs Supervisor
G. Gardner, NSSS Supervisor, System Engineering Department
K. Gehring-Ohrablo, Chem Tech, Chemistry Department
T. Hough, Maintenance Rule Coordinator
N. Joergensen, Design Engineer
L. Keiser, SW and RHR System Engineer
P. Leininger, Erosion/Corrosion Program Engineer
D. McMahon, REC System Engineer
A. Meinke, Chemistry Engineer, Chemistry Department
M. Metzger, System Engineer
D. Madsen, Licensing
D. Parker, Manager, Maintenance
R. Penfield, Manager, Operations
A. Sarver, BOP/Elect/I&C Supervisor, System Engineering Department
K. Tanner, Supervisor, Radiation Protection
J. Teten, Chemistry Supervisor
D. VanDerKamp, Licensing Manager
J. Webster, Director of Projects, Project Department
R. Wulf, SED Manager
A. Zaremba, Director Nuclear Safety Assurance

NRC personnel

V. Gaddy, Chief, Project Branch C
N. Taylor, Senior Resident Inspector
M. Chambers, Resident Inspector
R. Hagar, Senior Project Engineer
R. Kumana, Project Engineer

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000298/2010007-01	NCV	Failure to Translate Design and Operating Requirements into Procedures
05000298/2010007-02	NCV	Failure to promptly Correct Conditions Adverse to Quality
05000298/2010007-03	NCV	Inadequate Test Control
05000298/2010007-04	NCV	Inadequate Design Control
05000298/2010007-05	NCV	Ice Deflector Pontoon Barge Storage in Service Water Discharge Canal
05000298/2010007-06	NCV	Faulty General Electric Switches

Closed

05000298/2010007-07	NCV	URI 05000298/2007011-07, Fuel Oil Storage Tank Required Submergence To Prevent Vortexing And Available Volume Are Marginal Without Accounting For Instrument Uncertainties
05000298/2010007-08	NCV	URI 05000298/2007011-08, High Pressure Coolant Pump Swap-Over from Emergency Condensate Storage Tank to Torus Vortex Calculation

LIST OF DOCUMENTS REVIEWED

CONDITION REPORTS

1994-00762	2001-05549	2001-06033	2005-00765
2006-02213	2006-09585	2006-03901	2006-07807
2006-09590	2006-09597	2006-10484	2007-00221
2007-00327	2007-00411	2007-00459	2007-00768
2007-00919	2007-01444	2007-01488	2007-01665
2007-01812	2007-01948	2007-02036	2007-02102
2007-02325	2007-02355	2007-02395	2007-02620
2007-03185	2007-03520	2007-03734	2007-03764
2007-03860	2007-03941	2007-04166	2007-04348
2007-04771	2007-04783	2007-04921	2007-05065
2007-05214	2007-05373	2007-05510	2007-05658
2007-05700	2007-05733	2007-05907	2007-06268
2007-06482	2007-06828	2007-06861	2007-07325
2007-07340	2007-07352	2007-07388	2007-07407
2007-07459	2007-07478	2007-07504	2007-07572
2007-07708	2007-07887	2007-07945	2007-08482
2007-02516	2007-07402	2007-01883	2007-01884
2007-01919	2008-00196	2008-00204	2008-00238
2008-00521	2008-00636	2008-00845	2008-00904
2008-00905	2008-00906	2008-00913	2008-00915
2008-00933	2008-01405	2008-01420	2008-01472
2008-01610	2008-01706	2008-01707	2008-01810
2008-03066	2008-03540	2008-03878	2008-04306
2008-04810	2008-04811	2008-04891	2008-05110
2008-05332	2008-05624	2008-05699	2008-05703
2008-05761	2008-05812	2008-06135	2008-06136
2008-06137	2008-06142	2008-06316	2008-06466
2008-06476	2008-06622	2008-07153	2008-07207
2008-07345	2008-07422	2008-07441	2008-07717
2008-07757	2008-07968	2008-08030	2008-08032
2008-08033	2008-08034	2008-08570	2008-08583
2008-08695	2008-08882	2008-09018	2008-09613
2008-09615	2008-07095	2008-00819	2008-06519
2008-07238	2008-07238	2008-02785	2008-03119
2008-09468	2009-00288	2009-00410	2009-00544
2009-00590	2009-00713	2009-00744	2009-00794
2009-00812	2009-01069	2009-01137	2009-01213
2009-01419	2009-01463	2009-01465	2009-01480
2009-01482	2009-01486	2009-01506	2009-01535
2009-01686	2009-02190	2009-02213	2009-02495
2009-02556	2009-02921	2009-02936	2009-02947
2009-02970	2009-03052	2009-03093	2009-03219
2009-03714	2009-03717	2009-03718	2009-03720

2009-03721	2009-04140	2009-04241	2009-04520
2009-04594	2009-04598	2009-04605	2009-04613
2009-04643	2009-04841	2009-05168	2009-05246
2009-05397	2009-05418	2009-05449	2009-05792
2009-05958	2009-05961	2009-05962	2009-06096
2009-06139	2009-06220	2009-06349	2009-06471
2009-06716	2009-06778	2009-06792	2009-06878
2009-06883	2009-06929	2009-07003	2009-07008
2009-07051	2009-07191	2009-07385	2009-07485
2009-07517	2009-07602	2009-07618	2009-07716
2009-07838	2009-07854	2009-07912	2009-08061
2009-08158	2009-08218	2009-08890	2009-09138
2009-09243	2009-09486	2009-09537	2009-09562
2009-09563	2009-09564	2009-09565	2009-10389
2009-10750	2009-06536	2009-09756	2009-06439
2009-09746	2009-06903	2009-06676	2009-06562
2009-09985	2009-04643	2009-05397	2009-05718
2009-06512	2009-06744	2009-06745	2009-07003
2009-07026	2009-08513	2009-09486	2009-05527
2009-07003	2009-01813	2009-01821	2009-08848
2009-09526	2009-03414	2010-00009	2010-00072
2010-00139	2010-00361	2010-00364	2010-00513
2010-00560	2010-00658	2010-00899	2010-01183
2010-01277	2010-01323	2010-01518	2010-01554
2010-01556	2010-01558	2010-01563	2010-01574
2010-01577	2010-01578	2010-01579	2010-01584
2010-01588	2010-01590	2010-01592	2010-01593
2010-01594	2010-01596	2010-01634	2010-01644
2010-01656	2010-01658	2010-01684	2010-01719
2010-01748	2010-01796	2010-01811	2010-02109
2010-02111	2010-02112	2010-02113	2010-02176
2010-02213	2010-02324	2010-02522	2010-02532
2010-02640	2010-02812	2010-02836	2010-02888
2010-02931	2010-02932	2010-03093	2010-03187
2010-03239	2010-03482	2010-03594	2010-03595
2010-03902	2010-04041	2010-04234	2010-04548
2010-04720	2010-04890	2010-04947	2010-05182
2010-05392	2010-05460	2010-05564	2010-05619
2010-00268	2010-01861	2010-01866	2010-04709
2010-04962	2010-05522	2010-05611	2010-05818
2010-05667	2010-05745	2010-05825	2010-05820
2010-05257	2010-05438	2010-05175	2010-05246
2010-05276	2010-05281	2010-05282	2010-05292
2010-05294	2010-05299	2010-05301	2010-05342
2010-05556	2010-05586	2010-05590	2010-05635
2010-05662	2010-05686	2010-05246	2010-05276
2010-05281	2010-05763	2010-05767	2010-05808

2010-00897	2010-00958	2010-02045	2010-02213
2010-02347	2010-02859	2010-04232	

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0.10	Operating Experience Program	24
2.3_A-4	Panel A – Annunciator A-4	31
7.2.30	Service Water Zurn Strainer Maintenance	14
7.2.30	Service Water Zurn Strainer Maintenance	12
7.7.10.4	P1-G Welding Procedure Specification	4
2.3_R-1	Panel R – Annunciator R-1	10
6.1HV.602	Air Flow Test of Fan Coil Unit HV-DG-1C (Div 1)	6
6.2HV.602	Air Flow Test of Fan Coil Unit HV-DG-1D (Div 2)	7
2.1.14	Seasonal Weather Preparations	15
2.2.39	HVAC Diesel Generator Building	25
2.3 B-3	Panel B – Annunciator B-3	24
7.2.57.2	Main Steam System Pipe Support Visual Examination and Adjustments	0
6.SW.102	Service Water System Post LOCA Flow Verification Surveillance Test	23
5.2SW	Service Water Casualties	21
2.2.71	Service Water System	107
7.5.12	SMB-0 Through SMB-4 MOV Refurbishment	10
2.2.69.2	Residual Heat Removal System Shutdown Operation	72
14.17.3	Instrument Calibration data Sheet	15
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6.PC.501	, Primary Containment LLRT Test Results, Attachment 4	37
6.1CS.301	CS Loop Flow Instrument Surveillance	7
6.CSCS.403	Injection Check valve position Indicator Verification	5
6.CSCS.402	ECCS Injection Check valve Operating IST Torque Test	15
6.PC.519	Reactor Core Isolation Coolant Local Leak Rate Tests	11
6.2RHR.101	RHR Test Mode Surveillance Operation	22\
6.1CS.101	Core Spray Test Mode Surveillance	21
7.2.42.3	Heat Exchanger tube Plugging	11
8.3	Chemistry Procedure 8.3, Control Parameters and Limits	60
6.MISC.503	Day Venting of ECCS and RCIC Injection/Spray Subsystem Piping	11
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0-CNS-12	CNS Technical Program Administration	20
0-CNS-12C	Component Programs	3
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2.2.25.2	125 VDC Electrical System (Div 2)	17

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5.3AC480	480 VAC Bus Failure	25
6.EE.609	125V/250V Station Battery Intercell Connection Testing	13
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6.1DG.302	Undervoltage Logic Functional, Load Shedding, and Sequential Loading Test (Div 1)	46
6.1EE.304	Diesel Generators Automatic Start Circuits Integrity Test (Div 1)	10
6.1REC.302	REC Pumps Time Delay Relay Testing and Setting (Div 1)	13
6.1SW.301	Service Water Time Delay Relay Testing and Setting (Div 1)	10
6.EE.601	125/250V Station and Diesel Fire Pump Battery 7 Day Check	18
6.EE.602	Div I 125/250V Station and Diesel Fire Pump Battery 92 Day Check	3
6.EE.605	250V Battery Service Test	15
6.EE.607	125V Station Battery Performance Discharge Test	13
6.EE.608	250V Station Battery Performance Discharge Test	13
7.3.27	250V Station Battery Equalizing Charge	16
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2.2.20	Standby AC Power System (Diesel Generators)	
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	Time Critical Operator Actions	7/9/2010
0.41	Seismic House Keeping	7
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2.2.25.1	125 VDC Electrical System(Div. 1)	14
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6.1EE.302	Surveillance procedure 4160V Bus 1F under voltage Relay and Relay Timer Functional Test (Div.1)	26
6.1EE.303	Emergency Bus Undervoltage (27) Relays Testing and Calibration (Div.1)	08
6.1RHR.101	RHR Test Mode Surveillance Operations (IST) (Div.1)	23

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EDP-16	Design Criteria Document Maintenance and Control	4
EOP 1A	RPV Control	12
EOP 2B	RPV Flooding	12
EOP 3A	Primary Containment Control	12
EOP 5A	Secondary Containment Control	12
EOP 6A	Reactor Power (Failure to Scram)	12
EOP 7A	RPV Level (Failure to Scram)	12
EOP 7B	RPV Flooding (Failure to Scram)	

DESIGN CRITERIA DOCUMENTS

NUMBER	TITLE	REVISION/ DATE
DCD-1	Diesel Generator (DG)	May 5, 2010
DCD-3	Service Water (SW) and Residual Heat Removal Service Water Booster System (RHRSW)	February 2, 2009
DCD-36	High Energy Line Break (HELB)/Moderate Energy Line Break (MELB)	February 15, 2010
DCD-37	Piping and Pipe Supports	January 24, 2003

CALCULATIONS

NUMBER	TITLE	REVISION/ DATE
	Calculation by the Waldinger Corporation for the design of duct supports	
10-056	Pump Submergence Requirements for the SW Pump Low River Level	0
4107-14-23-003	Calculation of Response Spectra for the Diesel Generator Building	0
89-1967	Service Water Flow Rate at Low River Water Temperature	
92-050K	HPCI-LS074A/B and HPCI-LS-75A/B Setpoints	2
94-244	Channel Depth Required Around Intake Structure Guide Wall	2
94-255	Hydraulic Evaluation of Opening in Intake Structure Guide Wall	1
97-0900	PSTG/SATG NPSH Limits	2
CED 6020704	CNS Auxiliary Power System AC Loads	4C33
CED 6031202	CNS Auxiliary Power System AC Loads	6C14
EE 03-020	Agastat Relays Service Life	0
EE 09-068	Specific Gravity Derating of Station Batteries	0
EE 92-019	250 VDC Overvoltage Study	3
EQDP.2.151DOR	Environmental Qualification Data Package Sylvania-Clark Control Relays	0
EQDP.2.152	Environmental Qualification Data Package Agastat E7012 Series Timers	1
NEDC 00-111	CNS Auxiliary Power System AC Loads	6

CALCULATIONS

NUMBER	TITLE	REVISION/ DATE
NEDC 01-064	8-Hour ECST Volume Requirements for an Isolated Reactor	1
NEDC 01-072	ECCS Pump NPSH / Vortex Limit with Suction from CST	1
NEDC 05-021	3 PSI Tornado Pressure Effect on DG Building HVAC	2
NEDC 07-075	RCIC Pump Flow Acceptance Criteria for Low Reactor Pressure Conditions	0
NEDC 09-042	Evaluation of Security Loads on 250 VDC Division 1 When Transferred at Time 0	0
NEDC 09-076	Fatigue Assessment of the 24” Main Steam Lines in the Heater Bay	0
NEDC 10-055	Class 1S Qualification of the Knee Brace Ductwork Supports in DG Rooms 1 and 2	0
NEDC 10-055	Class 1S Qualification of the Knee Brace Ductwork Supports in DG Rooms 1 and 2	1
NEDC 10-057	Qualification of Barges Stored in the Discharge Canal	0
NEDC 86-105C	CNS DC Short Circuit Study	4
NEDC 86-105D	CNS Critical DC Bus Coordination Study	6
NEDC 86-214	Removal of RHR Orifices	0
NEDC 87-131A	250 VDC Division 1 Load and Voltage Study	11
NEDC 87-131C	125 VDC Division 1 Load and Voltage Study	12
NEDC 87-251	NED Review of Sargent & LundybReport SL-7076	1 and 4
NEDC 88-209	250 Volt Battery Rack Mounting, Charger Mounting, & Test Reviews	2

CALCULATIONS

NUMBER	TITLE	REVISION/ DATE
NEDC 89-1886	CNS Station Blackout Condensate Inventory	2
NEDC 89-1974	Design and Analysis of Control Building Essential Ductwork and Supp	3
NEDC 90-068	Diesel Gen Rooms 1 & 2 Internal Heat Loads	February 15, 1993
NEDC 90-388	HPCI Room and CS &RHR Quad Heat Load Tabulation for REC	3
NEDC 91-044	Cable Resistance Calculation for 125 VDC & 250 VDC Buses & Loads	4
NEDC 91-069	Moderate-Energy Line Break Flooding & Door Gap Calculation	7
NEDC 91-103	Cooling of the Diesel Generator Rooms without HVAC Cooling Coils	October 16, 1991
NEDC 91-123	Isolation of Service Water to DG H&V Units	April 16, 1992
NEDC 91-157	DG Transient Voltage Analysis, DG1 & DG2	1
NEDC 91-191	DC Equipment and Cable Short Circuit Withstand Ratings	2
NEDC 91-228	DG HVAC Seismic Qualification	July 30, 1991
NEDC 91-239	DGLO/DGJW/DG Intercooler Heat Exchanger Evaluation	3
NEDC 92-090	Seismic Qualification of DG HVAC Motor Mount	0
NEDC 92-151	Code Qualification of Pipe Supports for the Turbine Building Main Steam System	4C3
NEDC 92-188	Review of Failure Prevention Root Cause Analysis of Main Steam Line Vibration	December 10, 1992
NEDC 93-022	NED Review of Erin MOV Calc C12-89-10,039	5

CALCULATIONS

NUMBER	TITLE	REVISION/ DATE
NEDC 93-125	Stem Nut Thread Wear Evaluation	0
NEDC 94-021	REC-HX-A & REC-HX-B Maximum Allowable Accident Case Fouling	6
NEDC 94-110	Operability of DG1 with additional loads	0
NEDC 94-114	Plant Electrical Load Study	0
NEDC 94-142	Core Spray Flows with Minimum Flow Valve Open	3
NEDC 94-258	Tech Spec Acceptance Criteria LPCI Pumps Flowing at 7800 gpm	2
NEDC 94-271	Method for Determining Surveillance Procedure 6.SW.102 Acceptance Criteria	1
NEDC 95-036	SW Sequential Start Timer Setting Change	October 25, 1996
NEDC 96-029	Post LOCA Service Water System Flow Variations with River Level	4
NEDC 98-001	Vortex Limit for the Emergency Condensate Storage Tanks A & B	2
NEDC 98-005	Minimum Flow Line Capacity for RHR Pumps During Single and Parallel Pump Operation	0

DRAWINGS

NUMBER	TITLE	REVISION/ DATE
	River Bottom Elevation Data Inspection Drawings 1-5	May 10, 2010
	Anchor Darling Valve Company Maintenance Manual for Tilting Disc Check Valves	
	Anchor Darling Maintenance Manual for Swing Disc Check Valves	

DRAWINGS

NUMBER	TITLE	REVISION/ DATE
	Check Valve Analysis and Prioritization	0
0223R0558 SH 25A	Under Voltage Circuits, 4160V Bus 1F	N08
0223R0558 SH 7	Under Voltage Circuits, 4160V Bus 1F	N13
150D646	Miscellaneous Diagrams, Low Voltage Metal Enclosed Switchgear	N05
2004 SH 2	Flow Diagram Condensate & Feedwater Systems	N49
2006 SH 1	Flow Diagram Circulating, Screen Wash & Service Water Systems	N76
2006 SH 3	Flow Diagram Circulating, Screen Wash & Service Water Systems	N53
2006 SH 4	Flow Diagram Control Building Service Water System	N46
2018	Flow Diagram Turbine Generator Bldg. & Control Bldg Heating & Ventilating	N36
2024 SH 2	Flow Diagram HVAC Misc. Service Bldg.	N38
2036 SH 1	Flow Diagram Reactor Building Service Water System	N98
2040 SH 1	Residual Heat Removal System	N80
2040 SH 2	Residual Heat Removal System Loop “B”	N17
2040 SH 1	Flow Diagram Residual Heat Removal System	N80
2040 SH 2	Flow Diagram Residual Heat Removal System	N17
2041	Flow Diagram Main Steam System	N85
2043	Reactor Core isolation Coolant and Reactor Feed Systems	N54
2043	Flow Diagram Reactor Core Isolation Coolant and Reactor Feed Systems	N54

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NUMBER	TITLE	REVISION/ DATE
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2056	General Arrangement Intake Structure Plan & Sections	N14
2118	Intake Structure Composite Piping Arrangement Plans and Sections	10/13/1969
2221	HVAC – Plan & Sections Diesel Generator Bldg Heating Boiler Room	N03
2852-13	4”-SW-2 Service Water Intake Structure	04/29/1970
3001	Main one line Diagram	N17
3002 SH 1	Auxiliary one line Diagram, MCC Z, SWGR Bus 1A, 1B, 1E, & Critical SWGR Bus 1F, IG	N44
3003 SH 2	Auxiliary one line Diagram, Motor Control Center A, B, F, & G	N42
3004 SH 3	Auxiliary one line Diagram, MCC C, D, H, J, DG1 & DG1	N22
3006 SH 5	Auxiliary one line Diagram, Starter Racks LZ, and TZ MCC’s K, L, LX, RA, RX, S, T, TX, X	N73
3012 SH 2	Main Three line Diagram	N06
3012 SH 3	Main Three line Diagram	N19
3017 SH 1	4160V Switchgear Elementary Diagram	N06
3019 SH 3	4160V Switchgear Elementary Diagram	N34
3020 SH 4	4160 V Switchgear Elementary Diagram	N20
3023 SH 7	4160 V Switchgear Elementary Diagram	N22
3024 SH 8	4160V Switchgear Elementary Diagram	N32
3025 SH 9	4160V Switchgear Elementary Diagram	N22

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3028 SH 2	480 V Switchgear Elementary Diagram	N21
3050 SH 25A	Cable & Conduit Schedule	11
3050 SH 25B	Cable & Conduit Schedule	09
3050 SH 26A	Cable & Conduit Schedule	13
3050 SH 26B	Cable & Conduit Schedule	06
3050 SH 32D	Cable & Conduit Schedule	02
3059 SH 10	EE-PNL-AA5, 125 VDC Load & Fuse Schedule	N01
3059 SH 2	EE-PNL-AA1, 125 VDC Load & Fuse Schedule	N05
3059 SH 4	EE-PNL-AA2, 125 VDC Load & Fuse Schedule	N12
3059 SH 6	EE-PNL-AA3, 125 VDC Load & Fuse Schedule	N09
3059 SH 8	EE-PNL-AA4, 125 VDC Load & Fuse Schedule	N01
3065	Elementary Diagrams Sheet No. 17	N44
3137	Conduit Plan & Details Below Elev. 882’-6”	N02
3180	Duct Banks Plan, Sections & Details, SH 1	N08
3189	Duct Banks Profiles & Sections	N01
3190	Underground Duct Banks, Plan	N01
3191 SH 1	Underground Duct Banks, Plans, Sections & Details	N01

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3193	Underground Duct bank Sections & Detail	4
3194	Duct Bank Cable Schedule	N07
3256 SH 8	Connection Wiring Diagram Relay Panels	N26
3401	Auxiliary one line Diagram, MCC CA, CB, MR, OG1 & OG2	N31
454012471	4”RF-1 Class IIN P – Reactor Building	8
781E261 SH 8	Elem. Diag. Residual Heat Removal System	N21
781E261 SH 9	Residual Heat Removal System	N06
791E261 SH 13	Elem Diag. Residual Heat Removal System	N08
791E261 SH 5	Elem. Diag. Residual Heat Removal System	N20
791E261 SH 14	Residual Heat Removal System, Elementary Diagram	N20
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791E261 SH 7	Elem. Diag. Residual Heat Removal System	N19
791E577	Connection Diagram, Panel 9-41	N39
811-3	16”-300# Tilting Disc Check Valve	B
818-3	3”-300# Swing Check Valve	B
818-3	12”-300# Swing Check Valve	C
921D135	PCIS Inboard Relay Cabinet (9-41)	
D-C9092A-01	Emergency Condensate Storage Tanks	1
E150 SH 16	Diesel Generator #1 Relay Settings	N30
E150 SH 7	Relay Settings for 4160V Bus “1F”	N33

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E150 SH 8	Diesel Generator #1 Relay Settings	N16
E150 SH17	Timer settings for Diesel Generators	N05
E150 SH1A	Critical 480VAC SWGR 1F & 1G and MISC MCC Breaker Settings	N17
MS-H74A SH 1, 2	Pipe Support MS System	N06

SURVEILLANCE TEST

NUMBER	TITLE	DATE
3.1SW.101	Service Water Surveillance Operation (DIV 1) (IST)	02/11/2010
3.1SW.101	Service Water Surveillance Operation (DIV 1) (IST)	08/13/2009
3.1SW.101	Service Water Surveillance Operation (DIV 1) (IST)	10/15/2009
3.1SW.101	Service Water Surveillance Operation (DIV 1) (IST)	12/03/2009
3.1SW.101	Service Water Surveillance Operation (DIV 1) (IST)	03/08/2010
3.1SW.101	Service Water Surveillance Operation (DIV 1) (IST)	04/05/2010
3.1SW.101	Service Water Surveillance Operation (DIV 1) (IST)	05/19/2010
6.SW.102	Service Water Post LOCA Flow Verification	10/26/2009

MISCELLANEOUS

NUMBER	TITLE	REVISION/ DATE
	Zurn Strainer Purchase Order	March 26, 1975
	Method for Determining Stem Nut Wear (Crane Nuclear & TXU) PowerPoint presentation	
	Diesel Room Extreme Ambient Conditions Memo	October 15, 2991
	Seismic Evaluation Worksheet (HV-DG-1C & 1D)	0
NECD 91-043	Cable Impendence Calculation for 4160VAC &	4

MISCELLANEOUS

NUMBER	TITLE	REVISION/ DATE
	480VAS Buses and Essential Loads	
	Nuclear Logistic Inc NLI Breaker Refurbishment Report per P.O. # 4500116266	June 16, 2010
07C4718	Main Steam Line Vibration Mitigation Study Report	0
2.05.02	Cable Sizing-Main Motor & feeder cables	N/A
4431588	Maintenance Procedure 7.3.16 – Low Voltage Relay Removal and Installation	October 24, 2006
6.1DG.302	Division 1 Sequential Load Test Data	
6.1DG.302 Attachment 1	Division 1 Sequential Loading Test Data	
7.5.3	Diagnostic Testing for stem nut wear RCIC-MOV-MO18	December 2, 2008
7.5.3	Diagnostic Testing for stem nut wear HPCI-MOV-MO58	October 8, 2009
8000000031391	Discharge Canal Maintenance	
90-190	AC equipment and Short circuit Calculation	
91-192	Review of Burns & Row Calculation 2.09.06 4160 Volt Relay settings and calculation date Nov 11, 1991	
93-022	NED Review of Erin MOV Calc C122-89-10.039	5
B 3.8	Technical Specification Bases, Electrical Power Systems	December 18, 2003
BR-74	Standby Diesel Generator, Preoperational Test	0
CED 6005426	Diesel Generator Cooling	September 18, 2002
CED 6006511	Repair of Main Steam Pipe Support MS-H2A	December 2001

MISCELLANEOUS

NUMBER	TITLE	REVISION/ DATE
CED 6008700	Service Water Pump Performance Improvements	November 18, 2002
CED 6017142	Repair and Modification of Pipe Support MS-H74A	January 2005
Contract No. E-69-21	Diesel Engine – Generators	0
Curve Number 27953	Pump Curve Sheet for RHR Pump No. 280007	
Curve Number 28147	Pump Curve Sheet for RHR Pump No. 280005	
Curve Number 28148	Pump Curve Sheet for RHR Pump No. 280006	
Curve Number 28149	Pump Curve Sheet for RHR Pump No. 280008	
DC 87-133	Replacement of over current Relay 51/1FE and 51/1GE	
DCD-04	AC Electrical Distribution System	February 2, 2009
DCD-34	Electrical Separation - Topical Design Criteria Document	February 2, 2009
DCD-5	Appendix B - Component Design Information	April 12, 2004
E-70-19	Request for Contract Change, Heating Ventilating and Air Conditioning	May 20, 1972
EE 02-014	Evaluation for the use of either Service Water pump discharge or River Well Pump discharge as the normal supply for the Gland Water System for the Service Water Pumps	3
EPN: 1-DGJW-HX-JW1	Eddy Current Examination Final Report	August 2007

MISCELLANEOUS

NUMBER	TITLE	REVISION/ DATE
GE letter RSV9116	Cooper Nuclear Station Design Bases Questions	August 8, 1991
GEK41905	Magne-Blast Circuit Breaker Instruction & Recommendation for Maintenance	
General Electric Document No. 22A1259	Standby AC Power System	0
Letter GE NCR 94-048	Evaluation of Void Collapse Pressure Transient	April 29, 1994
Letter NLS2008074	Request for Extension to Generic Letter 2008-01	May 2008
Letter NLS2008081	Nine Month Response to NRC Generic Letter 2008-01	October 10, 2008
Letter NLS2009016	Commitment Due Date Change for Two Commitments Referenced in Nine Month Response to NRC Generic Letter 2008-01	March 2, 2009
Letter NLS2009035	Revision to Commitment Made in Nine Month Response to NRC Generic Letter 2008-01	May 7, 2009
Letter NLS2010008	Nine Month Supplemental Response to NRC Generic Letter 2008-01	February 2, 2010
Letter NRC to NPPD	NRC Inspection Report 50-298/94-12	May 25,, 1994
Letter OMB Control No.: 3150-0011	Managing gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems	January 11, 2008
Letter Stone and Webster to NPPD	D2.49, Engineering Evaluation of RHR System Water hammer Occurrence of October 22, 1992	
MP 800000008537	Walkdown & Examination of Main Steam Lines	

MISCELLANEOUS

NUMBER	TITLE	REVISION/ DATE
NEDC 86-105B	CNS Critical AC Bus Coordination Study	8
NEDC 86-105F	CNS Non-Critical AC Bus Coordination Study	6
NEDC 87-47C	MCC C Load Summary	2
NEDC 87-47CA	MCC CA Load Summary	3
NEDC 91-157	DG Transient Analysis	1
NEDC 91-197	Low Voltage Drywell Penetration Short Circuit Withstand Calculation dated 5/8/92	
NEDC 91-2199	Torque Test results HV-DG-1C & 1D Seismic Support	July 31, 1991
NLS2007029	CNS Response to Generic Letter 2007-01	May 7, 2007
Report FPI-94-515	Evaluation of Bounding Forces for water hammer of October 22, 1992	April 12, 1994
STP 82-10	HPCI/RCIC Steam Flow Differential Pressure measurements	June 22, 1982
STP-88-225	Diesel Generator Rooms Temperature Profile	6
TR-112814	EPRI Report on Reduced Control Voltage Testing of Low and Medium Voltage Circuit Breakers	July 1999
VM-0180	Service Water Pumps – Vendor Manual	26
VM-0320	Honeywell Transmitters – Composite Manual	1
VM-0396	Vent & Air Conditioner Units for OG, I, DG Bldg, Turbine Office Radiochem & Control Room	4
VM-0520	Service Water Strainer – Vendor Manual	11
VM-1763	GE Power circuit breaker Composite Manual dated 10/1/02	5

MISCELLANEOUS

NUMBER	TITLE	REVISION/ DATE
W.O. 2520-02	Reactor Core Isolation Coolant System Piping Calculations	N/A
White Paper	Main Steam Line Pipe Support Discrepancies	1

WORK ORDERS

4234793	4301428	4397761	4446639
4515780	4532087	4532646	4538019
4541697	4593261	4596265	4599386
4625167	4632722	4636833	4636836
4664047	4665025	4697402	4697702
4697799	4623966	4623969	4639727
4623971	4662932	4706000	4706190
4706277	4735764	4735794	6024460