June 1, 2007

Mr. David A. Christian
Senior Vice President and
Chief Nuclear Officer
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: KEWAUNEE POWER STATION - NRC COMPONENT DESIGN BASES INSPECTION (CDBI) REPORT 05000305/2007006 (DRS)

Dear Mr. Christian:

On April 17, 2007,, the U. S. Nuclear Regulatory Commission (NRC) completed an inspection at your Kewaunee Power Station. The enclosed report documents the inspection findings which were discussed on March 2, 2007 and April 17, 2007, with Ms. L. Hartz and other members of your staff.

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

Based on the results of this inspection, 18 NRC-identified findings of very low safety significance were identified which involved violations of NRC requirements. However, because these violations were of very low safety significance and because they were entered into your corrective action program, the NRC is treating the issues as Non-Cited Violations (NCVs) in accordance with Section VI.A.1 of the NRC's Enforcement Policy.

If you contest the subject or severity of an NCV, you should provide a response with a basis for your denial, within 30 days of the date of this inspection report, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Regional Administrator, U.S. Nuclear Regulatory Commission – Region III, 2443 Warrenville Road, Suite 210, Lisle, IL 60532-4352; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Kewaunee Power Station.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure, and your response (if any), will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records 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/

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

Docket No. 50-305
License No. DPR-43

Enclosure: Inspection Report 05000305/2007006
w/Attachment: Supplemental Information

cc w/encl: L. Hartz, Site Vice President
C. Funderburk, Director, Nuclear Licensing
and Operations Support
T. Breene, Manager, Nuclear Licensing
L. Cuoco, Esq., Senior Counsel
D. Zellner, Chairman, Town of Carlton
J. Kitsembel, Public Service Commission of Wisconsin
State Liaison Officer, State of Wisconsin

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No:	50-305
License No:	DPR-43
Report No:	05000305/2007006
Licensee:	Dominion Energy Kewaunee, Inc.
Facility:	Kewaunee Power Station
Location:	Kewaunee, Wisconsin
Dates:	January 29 through March 2, 2007 April 17, 2007
Inspectors:	Z. Falevits, Senior Engineering Inspector (lead) C. Brown, Senior Operations Inspector R. Langstaff, Senior Engineering Inspector A. Daubur, Engineering Inspector S. Burgess, Senior Reactor Analyst G. Skinner, Electrical Contractor M. Yeminy, Mechanical Contractor F. Trap, Engineering Inspector (Training)
Approved by:	A. M. Stone, Chief Engineering Branch 2 Division of Reactor Safety (DRS)

Attachment

SUMMARY OF FINDINGS

IR 05000305/2007006 (DRS); 01/29/2007 – 03/02/2007; Kewaunee Power Station; Component Design Basis Inspection (CDBI)

The inspection was a 3-week onsite baseline inspection that focused on the design of components that are risk significant and have low design margin. The inspection was conducted by regional engineering inspectors and two consultants. Eighteen findings of very low safety significance associated Non-Cited Violations (NCVs) were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter 0609, "Significance Determination Process (SDP)." Findings for which the SDP does not apply may be Green, or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3; dated July 2000.

A. NRC-Identified and Self-Revealed Findings

Cornerstone: Initiating Events

- Green. The inspectors identified a finding having very low significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control." Specifically, the licensee failed to evaluate the capability of the 345 kV offsite power supply when isolated from the 138 kV switchyard and to translate this criteria into procedures.

  This issue was more than minor because procedures allowed operation of the station in unanalyzed configurations for which operability of one offsite source could not be assured and new calculations were needed to ensure that the design basis was met. The issue was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations." (Section 1R21.3.1.1)

- Green. The inspectors identified a finding having very low significance and an associated NCV of 10 CFR 50.65(a)(3) for the failure to incorporate external and internal operating experience into preventive maintenance activities for the reactor trip breakers. This finding has a cross-cutting aspect in the area of Problem Identification and Resolution, Corrective Action Program because the licensee did not thoroughly evaluate previous breaker issues and did not perform adequate extent of condition reviews. Specifically, the licensee initiated several corrective action documents in response to identified issues; however, did not perform adequate evaluations of the conditions to address the cause or resolve the identified issue. (P.1.(c))

  This issue was more than minor because the licensee failed to ensure that the RTBs, and their associated cell assemblies, had been maintained in a continuous state of operational readiness by performing effective maintenance and surveillance activities in accordance with relevant vendor specifications and available operating experience. The issue was of very low safety significance based on a Phase 1 screening because the finding did not contribute to both the likelihood of a reactor trip and the likelihood that mitigation equipment or functions will not be available. (Section 1R21.3.6.1)

- Green. The inspectors identified a finding having very low significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings." Specifically, on May 22, 2006 during the performance of PMP-47-01, maintenance technician recorded a trip bar force of 32 ounces when testing RTB S/N 850-027-1, which exceeded the acceptance criteria; however, no further actions were taken as required by the test. This finding has a cross-cutting aspect in the area of Human Performance, Work Practices because the licensee did not perform an adequate peer check of the surveillance results. Specifically, several individuals including the person performing the task did not identify that the RTB trip bar force exceeded the acceptance criteria. (H.4.(c))

  This issue was more than minor because not meeting the acceptance for the trip bar force impacted the reliability of the RBTs because excessive force could result in a failure to trip the breaker. The issue was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations." (Section 1R21.3.6.2)

Cornerstone: Mitigating Systems

- Green. The inspectors identified a finding having very low significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control." Specifically, the licensee failed to perform motor starting studies to demonstrate that motors would successfully start when connected to the offsite power supply. Upon discovery, the licensee provided additional data and compensatory measures to justify operability.

  The inspectors determined that the performance deficiency was more than minor because the lack of a formal motor starting calculations resulted in the adequacy of important aspects of the design not being demonstrated, such that further evaluation needed to be performed in order to demonstrate that the equipment could perform its safety function. Although, by the end of the inspection, the licensee was able to demonstrate operability, at the time of discovery there was reasonable doubt on the operability of motors. The issue was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations." (Section 1R21.3.1.2)

- Green. The inspectors identified a finding having very low significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control." Specifically, the licensee failed to consider the effects of accident temperatures on cable resistance in voltage drop calculations. Upon discovery, the licensee performed preliminary calculations to verify operability of the circuits.

  This issue was more than minor because the calculational errors had more than a minimal effect on the outcome of the calculation, considerably impacting the available margin of the system such that further evaluation needed to be performed in order to demonstrate that the equipment could perform its safety function. Although, by the end of the inspection, the licensee was able to demonstrate operability; at the time of discovery there was reasonable doubt on the operability of the circuits. The issue was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, “Significance Determination of Reactor Inspection Findings for At-Power Situations.” (Section 1R21.3.2.1)

- Green. The inspectors identified a finding having very low safety significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, “Design Control.” Specifically, the licensee failed to ensure that four of the 125 VDC circuit breakers had adequate interrupting short circuit fault current capability. Upon discovery, the licensee performed a preliminary evaluation, and verified that the most likely fault would result in a lower short circuit fault current than the breakers rating.

  This issue was more than minor because the failure could have affected the operability of the breaker/DC Bus and could have resulted in the loss of DC power to safe shutdown equipment in the event of short circuit faults. The issue was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, “Significance Determination of Reactor Inspection Findings for At-Power Situations.” (Section 1R21.3.3.1)

- Green. The inspectors identified a finding having very low safety significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, “Design Control.” Specifically, the licensee failed to use correct design input data into the 125 VDC safeguard battery calculation. The licensee used a battery terminal voltage value of 117.49 volts for BRA-101 and 118.95 volts for BRB-101, for the first minute, and did not compensate for worse case conditions. Upon discovery, the licensee performed preliminary evaluation and verified that safe shutdown equipment have adequate voltage using the battery terminal voltage value of 113.87 volts.

  This issue was more than minor because the failure to use correct design input had more than a minimal effect on the outcome of the voltage drop calculation, considerably impacting the available margin of the system such that further evaluation needed to be performed in order to demonstrate that equipment could perform its safety function. Although, during the inspection, the licensee was able to demonstrate operability; at the time of discovery there was reasonable doubt on the operability of circuits. The issue was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, “Significance Determination of Reactor Inspection Findings for At-Power Situations.” (Section 1R21.3.3.2).

- Green. The inspectors identified a finding having very low safety significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion V, “Instructions, Procedures and Drawings.” Specifically, the licensee failed to include the acceptable minimum battery terminal voltage, during the first minute, into the acceptance criteria for battery load test procedures SP-38-102A/B “Station Battery Load Test.” Upon discovery, the licensee entered the issue into its corrective action program to revise the acceptance criteria of procedures SP-38-102A/B to include this requirement.

This issue was more than minor because the failure to ensure that the battery terminal voltage during the first minute battery discharge did not drop below the design input value could have affected the operability of safety related equipments in the event of a design basis accident and or station blackout conditions. The issue was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations." (Section 1R21.3.3.3).

- Green. The inspectors identified a finding having very low safety significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control." Specifically, the licensee failed to assure that the minimum available control voltage at the 4160V breakers was adequate to energize the closing coils during all conditions. Upon discovery, the licensee performed preliminary calculation and verified operability of the emergency diesel generators 4160V breakers following loss of all AC power conditions.

  This finding was more than minor because the failure to assure adequate control voltage was available to close the 4160V breakers would have affected the capability of emergency diesel generators and other safety related equipments to respond to initiating events. The issue was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations." (Section 1R21.3.3.4)

- Green. The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control" having very low safety significance for the licensee's failure to assure that safeguard battery loads profile was adequate to meet all USAR requirements. Specifically, the licensee failed to verify that the battery loading profile for loss of coolant accident (LOCA) coincide with loss of all AC power condition was bounded by the station blackout condition loading to ensure adequate battery sizing and testing. Upon discovery, the licensee was able to show that the charger will be available upon the start of the emergency diesel generator and will provide additional support. This issue was entered into the licensee's corrective action program to revise the battery calculation to include the LOCA loads.

  This finding was more than minor because the failure to include the LOCA loads in the battery sizing and testing did not ensure the capability of the battery to provide adequate DC power in accordance with USAR requirements. The issue was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations." (Section 1R21.3.3.5)

- Green. The inspectors identified a finding having very low safety significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action." Specifically, the licensee failed to incorporate previously identified vendor recommendation to periodically energize the spare 125 VDC safeguard battery charger for at least a half-hour every 18 months to ensure the operability of the electrolytic capacitor in the charger. The licensee has previously entered the vendor recommendation into their corrective action in 2002, however, all actions were closed but the recommendation was never implemented. Following discovery, the licensee entered the issue into its corrective action program and declared the spare charger inoperable. The primary cause of this violation was related to the cross-cutting area of problem identification and resolution because the licensee failed to take appropriate corrective actions to address a previously failed charger. Specifically, the licensee developed corrective actions which included incorporating pertinent vendor recommendation into the preventive maintenance program but closed the action without ensuring completion (P.1.d)

This issue was more than minor because the failure to periodically energize the spare charger did not ensure the operability and reliability of the spare charger when needed. The issue was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations." (Section 1R21.3.4.1)

- Green. The inspectors identified a finding having very low significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control." Specifically, the licensee failed to properly account for all loads on the diesel generators. Upon discovery, the licensee provided additional data and initiated procedure changes to ensure diesels were loaded within their ratings.

  The inspectors determined that the performance deficiency was more than minor because the lack of adequate diesel generator loading calculations resulted in some diesel loads not being properly accounted for, such that further evaluation needed to be performed in order to demonstrate that the equipment could perform its safety function. Although, by the end of the inspection, the licensee was able to demonstrate operability, at the time of discovery there was reasonable doubt on the operability of equipment. The inspectors screened the finding using IMC 0609, Appendix A. The issue was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations." (Section 1R21.3.5.1)

- Green. The inspectors identified a finding having very low significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control." Specifically, the licensee failed to incorporate the results of design calculations with respect to minimum refueling water storage tank (RWST) level and transfer of suction sources into the appropriate emergency operating. Procedures allowed operators to transfer suction at 4 percent indicated level in the RWST; however, at this level, significant air entrainment may damage the pumps. This finding has a cross-cutting aspect in the area of problem identification and resolution associated with the corrective action program because the licensee did not thoroughly evaluate problems such that the resolution addresses the extent of condition (P.1.c).

  This issue was more than minor because the existing margin was already low and as a consequence, the large error associated with the level instrument resulted in eliminating the entire margin, and jeopardized the functionality of the pumps taking suction from the RWST due to excessive air entrainment. The issue was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, "Significance

Determination of Reactor Inspection Findings for At-Power Situations" SDP Phase 1. (Section 1R21.3.7.1)

- Green. The inspectors identified a finding having very low significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control." Specifically, the licensee failed to appropriately account for service water strainer plugging in the service water system flow model. Upon discovery, the licensee placed this issue into their corrective action program and planned to formally revise the service water system flow model to reflect plugging of both strainers in a train.

  The issue was more than minor because the error had more than a minimal effect on the outcome of the calculation, considerably impacting the available margin of the system such that further evaluation needed to be performed in order to demonstrate that the service water system could perform its safety function. The issue was of very low safety significance because the issue was a design issue confirmed to not result in a loss of operability. (Section 1R21.3.9.1)

- Green. The inspectors identified a finding having very low significance and an associated NCV of 10 CFR Part 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Paragraph (b)(2), for the licensee's failure to scope the closing function of the screenhouse ventilation dampers into the monitoring program. Specifically, the degraded screen-house dampers fail to close and maintain ambient temperatures $\geq$ 60 °F such that service water system would remain operable and available after a station blackout event with severely cold outside temperatures. Following discovery, the licensee entered the issue into its corrective action program for resolution.

  This issue was more than minor because the licensee had not included the closing function of the screen-house ventilation dampers within the scope of its program for implementation of the Maintenance Rule. The issue was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations." (Section 1R21.3.10.1)

- Green. The inspectors identified a finding having very low significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III. Specifically, the licensee failed to account for component cooling water (CCW) piping temperatures as high as 176°F in the CCW "B" pump room and the impact upon the temperature in the CCW "B" pump room. As a result, the licensee used the non-conservative results in an operability evaluation for the auxiliary building fan coil unit (FCU). Upon discovery, the licensee placed this issue into their corrective action program, performed an immediate operability evaluation, and planned to perform a more thorough evaluation. This finding has a cross-cutting aspect in the area of human performance associated with decision making because the licensee did not use conservative assumptions. Specifically, the licensee failed to account for higher CCW piping temperatures because the licensee did not model the CCW room properly and did not use the maximum expected temperature under accident conditions when revising calculation C11156 (H.1.b).

The issue was more than minor because the error because, if left uncorrected, the finding would become a more safety significant concern. The use of a non-conservative value as a basis for operability could allow FCU performance to degrade to unacceptable levels without being detected and corrected. The issue was of very low safety significance because the issue was a design issue confirmed to not result in a loss of operability. (Section 1R21.3.11.1)

- Green. The inspectors identified a finding having very low significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion XI, “Test Control.” Specifically, the licensee failed to establish a testing program capable of identifying an unacceptable condition of the safety injection (SI) lube oil coolers. Upon discovery, the licensee initiated a change to the test program methodology and performed back-flushing and inspection on the two SI lube oil coolers. The licensee also assessed that as a result of the very cold temperature of the water of Lake Michigan during the inspection, the cooler was considered operable. This finding has a cross-cutting aspect in the area of problem identification and resolution associated with self- and independent assessments because during a 2005 audit of licensing commitments, the licensee failed to identify that the commitment to perform inspection and maintenance of the SI lube oil coolers in accordance with the licensee's response to Generic Letter 89-13 was not kept (P.3.a).

  This issue was more than minor because when later assessed, the licensee realized that the coolers would have failed previous tests when reevaluated performance factors were less than the acceptance criterion of 0.9. The issue was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, “Significance Determination of Reactor Inspection Findings for At-Power Situations.” (Section 1R21.3.12.1)

Barrier Integrity

- Green. The inspectors identified a finding having very low significance and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control." Specifically, the licensee failed to use the correct data when determining the most limiting conditions on the safety related motors of the containment fan coil units (CFCU). The engineers failed to use the combination of the greatest density of the air-steam mixture following a loss of coolant accident (LOCA) with the greatest flow rate attributed to the fans by testing. As a result, the licensee was not aware that post LOCA, the motors will be operating at 113 percent of their design rating, and drawing 13 additional kW from each diesel generator. Upon discovery, the licensee recalculated the motors' horsepower, recalculated the service factor (percent above continuous design rating) at which the motors will be operating, and recalculated the elevated current that will be drawn by the motors, and the elevated current at degraded voltage. In addition, the licensee had to reevaluate whether the over-current trip setpoint of the motors will be exceeded.

  This issue was more than minor because the assumed power drawn by the motors was significantly less, the existing margin was already low, and as a consequence, the error resulted in a significant reduction in margin. This issue also impacted the capability of the emergency diesel generators to supply the required power to the CFCU's motors. The issue was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations." (Section 1R21.3.8.1)

B. **Licensee-Identified Violations**

None

REPORT DETAILS

1. REACTOR SAFETY

Cornerstone: Initiating Events, Mitigating Systems, and Barrier Integrity

1R21 Component Design Bases Inspection (71111.21)

.1 Introduction

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

In addition, The inspectors reviewed several licensee audits and self-assessments to assess how effective licensee personnel were at self-identifying problems. The assessment was accomplished by comparing licensee-identified problems with problems that The inspectors identified during this inspection. The sample included selected completed audits and assessments of the engineering design control program. The inspectors noted that the self-assessment in preparation for this inspection was not approved and issued until April 28, 2007.

.2 Inspection Sample Selection Process

The inspectors selected risk significant components and operator actions for review using information contained in the licensee's PRA and the Kewaunee Standardized Plant Analysis Risk Model, Saphire Version 7.26, Kewaunee model 3.31, Revision 3.21. In general, the selection was based upon the components and operator actions having a risk achievement worth of greater than 2.0 and/or a risk reduction worth of greater than 1.005. The operator actions selected for review included actions taken by operators both inside and outside of the control room during postulated accident scenarios.

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

.3 Detailed Component Design Reviews (17 Samples)

The inspectors reviewed the Final Safety Analysis Report (FSAR), Technical Specifications (TS), design basis documents, drawings, calculations and other available design basis information, to determine the performance requirements of the selected components. The inspectors used applicable industry standards, such as the American Society of Mechanical Engineers Code, the Institute of Electrical and Electronics Engineers Standards and the National Electric Manufacturers Association (NEMA), to evaluate acceptability of the systems' design. The review was to verify that the selected components would function as designed when required and support proper operation of the associated systems. The attributes that were needed for a component to perform its required function included process medium, energy sources, control systems, operator actions, and heat removal. The attributes to verify that the component condition and tested capability was consistent with the design bases and was appropriate may include installed configuration, system operation, detailed design, system testing, equipment and environmental qualification, equipment protection, component inputs and outputs, operating experience, and component degradation.

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

The inspectors identified 18 findings of very low safety significance (Green) and associated Non-Cited Violations (NCVs). Four Unresolved Items were also identified.

.3.1 4.16 kV Bus 6

a. Inspection Scope

The inspectors reviewed AC load flow calculations to determine whether the 4160 V safety buses had sufficient capacity to support their required loads under worst case accident loading and grid voltage conditions. The inspectors reviewed elementary wiring diagrams for bus feeder and load breakers to determine whether system control logic was consistent with system design requirements stated in the FSAR. The inspectors reviewed bus and load protective relaying to determine whether it afforded adequate protection to the buses, and whether there would be any adverse interactions within the protection scheme that would reduce system reliability. The inspectors reviewed system operating procedures to determine whether they were adequate to assure reliable sources of power to the buses, and to determine whether the results of design calculations and modifications had been properly incorporated. The inspectors performed walkdowns of the switchgear to assess materiel condition and presence of hazards. In addition, the inspectors reviewed system health data and selected corrective action documents to determine whether there were any adverse equipment operating trends.

The inspectors reviewed calculations and drawings to determine if the design of the undervoltage protection scheme was as described in the design and licensing bases. The inspectors reviewed relay accuracy calculations to determine whether appropriate tolerances had been applied. The inspectors reviewed setpoint and time delay calculations to determine whether relays afforded proper undervoltage protection to safety related equipment, and whether settings were adequate to prevent spurious separation of Class 1E buses from the preferred (offsite) power supply. The inspectors reviewed relay scheme logic to determine whether it would respond as described in the design and licensing bases, and whether there was a potential for adverse interaction with other control schemes such as fast bus transfer. The inspectors reviewed calibration procedures and records for undervoltage relays to determine whether the relays were maintained as required and whether there were any adverse performance trends.

b. Findings

Two findings with violations of very low safety significance (Green) and two Unresolved Items were identified.

.1 No Analysis or Procedures to Establish Operability of the TAT Source

Introduction: The inspectors identified a finding having very low safety significance (Green) and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control." Specifically, the licensee failed to perform calculations to determine minimum voltage criteria needed to ensure operability of the 345 kV offsite power supply when isolated from the 138 kV switchyard at the Kewaunee power station, and to translate this criteria into procedures.

Description: As stated in Updated Safety Analysis Report (USAR) Section 8.2.2, either offsite power supply was capable of supplying both 4160V safety buses (buses 5 and 6). In its normal alignment, Bus 5 is aligned to the Tertiary Auxiliary Transformer (TAT) and Bus 6 is aligned to the Reserve Auxiliary Transformer (RAT). The TAT is supplied by the 345 kV system, which is normally interconnected to the 138 kV system through the Bank No. 10 Autotransformer. However, the TAT may be supplied only from the 345 kV system without the Bank No. 10 interconnection and without Technical Specification restriction. This alignment could occur either due to manual operator action, or automatic isolation due to a fault or relay malfunction.

The inspectors noted that the AC load flow analysis only analyzed the RAT as the offsite power supply. There were no calculations to determine capability of the TAT as an offsite power source for either one or two safety buses. In addition, station and grid operations procedures did not address the capability of the 345 kV system supplying the TAT. The inspectors determined that the licensee had not determined the minimum required 345 kV system voltage for this alignment, nor established criteria or procedures to enable operators to determine the capability of this source.

The licensee initiated CAP 041242 to address these issues and implemented compensatory measures including: (1) issuing Night Orders which prohibited alignment of two safety buses to the TAT except for brief periods while swapping power supplies; and (2) requiring declaration of the TAT source inoperable when the Bank No. 10 Transformer is disconnected from the 138 kV switchyard. The inspectors also noted that the failure to analyze all allowed power supply alignments was previously identified by the licensee in a 2003 CAP during review of operating experience at another station.

Analysis: The inspectors determined that failure to evaluate the capability of the 345 kV offsite power supply was a performance deficiency and a finding because operation of the station with certain switchyard configurations that are allowed by Technical Specifications could have resulted in spurious loss of one of the two required offsite power supplies. The inspectors further determined that the issue was within the licensee's ability to foresee and correct, and that it could have been prevented because the failure to analyze all allowed power supply alignments was previously identified by the licensee in a 2003 CAP during review of operating experience at another station.

The inspectors reviewed the performance deficiency against Inspection Manual Chapter (IMC) 0612, "Power Reactor Inspection Reports," and concluded the finding was more than minor. Specifically, the failure to evaluate the capability of the 345 kV offsite power source to be functional within TS allowable configurations affected the Initiating Event Cornerstone objective of limiting the likelihood of a loss of offsite power event. This finding related to the cornerstone attribute of Design Control. Procedures allowed operation of the station in unanalyzed configurations for which operability of one offsite source could not be assured, and new calculations were required to demonstrate the design basis was met. The inspectors performed an IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations," Phase 1 screening, and determined that the finding screened as Green because although the condition contributed to the likelihood of a reactor trip (due to a loss of offsite power), the finding did not contribute to the likelihood that mitigation equipment or functions will not be available. Although the unanalyzed switchyard configuration was allowed by procedures and Technical Specifications, the configuration was infrequently entered.

Enforcement: 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions. This includes specific values or ranges of values chosen for controlling parameters as reference bounds for design. These values may be requirements derived from analysis (based on calculation and/or experiments) of the effects of a postulated accident for which a structure, system, or component must meet its functional goals. The design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program. Contrary to the above, as of March 2, 2007, the licensee failed to ensure that the design basis, as defined in Technical Specification 3.7.1, was correctly translated into calculations and procedures. Specifically, the licensee failed to determine or demonstrate the capability of the TAT as an offsite power source for either one or two safety buses.

The licensee entered the finding into their corrective action program as CAP 041242. Because this violation was not willful, was of very low safety significance, and was entered into the licensee's corrective action program, this violation is being treated as a Non-Cited Violation (NCV), consistent with Section VI.A.1 of the NRC Enforcement Policy. (NCV 05000305/2007006-01(DRS))

.2 No Motor Starting Analyses for Offsite Power Supply

Introduction: The inspectors identified a finding having very low significance (Green) and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control." Specifically, the licensee failed to perform motor starting studies to demonstrate that motors would successfully start when connected to the offsite power supply.

Description: As discussed above, USAR Section 8.2.2 stated that either offsite power supply was capable of supplying both 4160V safety buses (buses 5 and 6). The inspectors noted that the existing load flow analysis assumed steady state operation only and did not address the capability of the offsite power supply to start safety related motors during an accident. Of particular concern were alignments where both safety buses were simultaneously connected to the RAT. This alignment could be entered manually or automatically due to an automatic transfer of Bus 5 to the circuit supplied by the RAT due to an undervoltage condition on Bus 5. In addition, the inspectors were concerned that the simultaneous starting of the containment spray pump motor with other motors, could cause stalling and tripping of the motors.

In response to the inspectors's questions, the licensee asserted that data from diesel testing was adequate to demonstrate motor starting capability, since the diesel was a less robust source than the offsite power sources. The inspectors concluded that diesel testing was not bounding for starting motors on the offsite source because:

- The diesel testing considered only one safety bus connected to a diesel whereas one offsite source could be required to simultaneously start safeguards loads on both redundant trains with identical starting sequences.

- The diesel testing was performed at nominal bus voltage whereas the offsite source could experience degraded voltage (below minimum expected switchyard voltage) and remain connected to the safety buses.

- The diesel testing did not evaluate the starting of the containment spray pump concurrent with other motors.

- The diesel employs an automatic voltage regulator that boosts voltage during starting transient, which would be beneficial for some slow starting loads.

The inspectors were concerned that spurious grid separation could occur while offsite power was within its expected voltage range, or in the case of degraded voltage, that safety related loads could trip and be locked out prior to transfer of the safety buses to the diesels. The licensee subsequently performed preliminary calculations using an electrical transient analyzer computer software program to evaluate various limiting lineups and motor starting scenarios. These included aligning two safety buses to one offsite source and starting the containment spray pumps concurrent with other motors. The case where two buses were aligned to one source during accident load sequencing showed that the motors would start, but that even with normal switchyard voltage, the heavy loading could cause a sustained 4160V safety bus voltage below the degraded voltage relay setpoint, and consequent separation of the buses from the offsite power supply. The case where the containment spray pump was started concurrent with other motors was analyzed for various grid voltage conditions, including the case where voltage was below the minimum expected switchyard voltage, but above the value where the safety buses would experience sustained voltage below the degraded voltage relay setpoint. After various model refinements, theses cases showed that the large safety related pump motors would start but that smaller loads could experience protracted starting transients and possible tripping. The licensee provided additional clarification regarding potentially overly-conservative assumptions for load inertia that would explain the anomalies, but time did not permit additional refinements to the preliminary calculations to obtain a definitive resolution of the issue during this inspection. However, the inspectors concluded that the preliminary calculations provided a basis for a reasonable expectation of operability pending completion of formal calculations.

The licensee initiated CAPs 043228, 041805, and 042382 to address these issues and implemented compensatory measures including: (1) procedure changes to prohibit manually aligning both 4160V safety buses to the RAT; and (2) positioning the circuit breaker controls in the manual position to prevent automatic bus transfers. The inspectors reviewed operator logs for the last three years and determined that both 4160V safety buses had been simultaneously aligned to the RAT on four occasions during the last three years, potentially rendering the offsite power supplies inoperable for the duration of the alignments. These alignments were of short duration and the inspectors concluded that the potential periods of inoperability of the offsite were less than the allowable Technical Specification time for having either one or both offsite power sources inoperable.

<u>Analysis</u>: The inspectors determined that the failure to perform motor starting calculations was a performance deficiency and a finding because the failure to assure that safety related motors have adequate voltage to start could cause a loss of function during a design basis accident.

The inspectors determined that this issue was more than minor in accordance with IMC 0612, Appendix E, Example 3j, because the lack of a formal motor starting calculations resulted in the adequacy of important aspects of the design not being demonstrated, such that further evaluation needed to be performed in order to demonstrate that the equipment could perform its safety function. Although, by the end of the inspection, the licensee was able to demonstrate operability, at the time of discovery there was reasonable doubt on the operability of motors. The performance deficiency also impacted the Mitigating Systems Cornerstone objective of ensuring the capability of safety related motors.

The inspectors screened the finding using the Phase 1 screening described in IMC 0609, Appendix A. The issue was of very low safety significance because it was not a design issue resulting in loss of function, did not represent an actual loss of a system safety function, did not result in exceeding a TS allowed outage time, and did not affect external event mitigation.

The inspectors determined that there was not a cross-cutting aspect to this finding.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that design control measures provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program. Contrary to the above, as of February 15, 2007, the licensee's design control measures failed to verify the adequacy of the design with respect to the adequacy of the 4160V safety bus voltage. Specifically, the load flow analysis and diesel testing results did not adequately address the impact of starting large motors. As a result of the finding, the licensee determined that starting various motors effected voltage on the safety buses and impacted operation of smaller motors. The licensee entered the finding into their corrective action program as CAPs 043228, 041805, and 042382. Because this violation was not willful, was of very low safety significance, and was as an entered into the licensee's corrective action program, this violation is being treated NCV, consistent with Section VI.A of the NRC Enforcement Policy (NCV05000305/2007006-02 (DRS)).

.3 No Analysis for Out of Phase Fast Transfer

Introduction: The inspectors identified an unresolved item regarding the ability of the plant to perform a fast transfer.

Description: The electrical distribution system features a voltage restoration scheme that will automatically transfer a safety related 4160V bus to an alternate source of power if an undervoltage condition develops, and voltage is available on an alternate source. The inspectors identified that an out of phase transfer could occur due the delay in the relaying scheme for the transfer that is sufficient to allow motor speed to decay while the bus is disconnected from both power sources during the transfer. An out of phase transfer could also be caused by a transfer between sources that are not synchronized. For very fast transfers between synchronized sources, motor speed does not have an opportunity to decay to unacceptable levels before the bus is connected to the new source. For slow transfers, voltage on the transferred bus will decay to levels where adverse effects will not occur. A review of the transfer relaying showed that the expected transfer time is in the region where adverse effects could occur. The magnitude of the effects would depend on the relay tolerances and the type and number of loads connected to the transferred bus. The electrical distribution system is also susceptible to transfers between unsynchronized sources when the Bank No. 10 transformer is disconnected from the 138 kV switchyard. The potential for adverse effects also depends on the type of undervoltage signal triggering the voltage restoration scheme. For transfers initiated by a loss of voltage signal, the delay in the loss of voltage scheme will enable bus voltage to decay to safe levels. However, for transfers initiated by the degraded voltage scheme, voltage levels could remain at unsafe levels during the transfer.

The inspectors determined that there were several alignments allowed by Technical Specifications and operating procedures that could result in damaging transfers. Of particular concern were alignments where both Bus 5 and 6 were aligned to the same offsite source, and the other source remained in service. Although this configuration was infrequently entered, it was allowable under station procedures without time limits. The inspectors was concerned that in this configuration, simultaneous transfer of both buses to the other offsite power source could, as a worst case, result in a complete loss of both redundant safety divisions. The inspectors was also concerned that when the Bank No. 10 transformer was disconnected from the 138 kV switchyard, and the redundant safety buses were aligned to their normal sources (Bus 5 aligned to the TAT and Bus 6 aligned to the RAT), that degraded voltage could occur on Bus 5 causing an out of phase transfer to the RAT. Once again, although this configuration was infrequently entered, it was allowable under station procedures without time limits.

The operability discussion in CAP 041804 presented arguments that damaging fast transfers were precluded by compensatory measures previously implemented, that would avoid certain vulnerable configurations, and that the licensing basis excluded a "partial loss of offsite power (LOOP)." In other words, the LOOP from only one of the two required offsite circuits was not required to be considered since the design basis was a loss of coolant accident (LOCA) concurrent with a LOOP, with a LOOP being defined as a complete loss of offsite power. Consequently, no technical discussion was provided regarding actual effects of a fast transfer.

The inspectors noted that the compensatory measures taken in response to NCV 05000305/2007006-01 and NCV 05000305/2007006-02 addressed this concern. This issue has been forwarded to the Office of Nuclear Reactor Regulation to determine the design and licensing basis with respect to a LOOP event. Pending resolution, this item will be tracked as an unresolved item (URI 05000305/2007006-03 (DRS)).

.4 <u>No Procedure for Determining Availability of Offsite Power Supply When Contingency Analyzer is Out of Service</u>

<u>Introduction</u>: The inspectors identified an unresolved item related to the contingency analyzer. Specifically, the licensee did not have a procedure for determining the availability of the offsite power supply when notified by the grid that the computer program relied upon for this purpose was not available.

<u>Description</u>: Station procedure A-EG-43, "Abnormal Grid Conditions", Revision E, relied on notification from the grid operator, ATC, that voltage on the 138 kV offsite power supply could fall below the minimum required voltage to prevent separation of the safety buses due to action of the degraded voltage relays. The ATC employs a real time network analysis program (contingency analyzer) that predicts voltage at the Kewaunee switchyard following an event such as a unit trip. If this tool is out of service, ATC is required by ATC Procedure RTO-OP-03 [6.5] to notify the licensee. However, Procedure A-EG-43 does not provide criteria for determining operability of the offsite power supply, or direct actions for operators to take in response to this notification. These criteria and

actions are needed to ensure that the grid and Safeguards buses are promptly evaluated to determine their operability. The licensee initiated CAP 041278 to address this issue. The inspectors noted that Generic Letter 2006-02, "Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power," discusses the use of transmission load flow analysis tools (analysis tools) to assist nuclear power plants in monitoring grid conditions to determine the operability of offsite power systems under plant technical specifications (TSs). The lack of written procedural guidance with respect to the operability of offsite power with the contingency analyzer out of service is considered an Unresolved Item (URI 05000305/2007006-04(DRS)) pending consultation with the Office of Nuclear Reactor Regulation.

.3.2 480 Motor Control Center 62C

a. Inspection Scope

The inspectors reviewed voltage drop calculations, testing used for design inputs, modifications and operability evaluations performed to determine whether motor control center (MCC) control circuits had adequate voltage margin available to operate safety-related components when required. This scope included 120Vac instrument buses supplied by inverters or their alternate transformer feeds, 120Vac control circuits supplied from MCC control power transformers, and 125Vdc circuits supplied by station batteries. The inspectors also reviewed corrective action documents and their associated operability evaluations related to this scope.

b. Findings

The inspectors identified one finding and associated violation of very low safety significance and one unresolved item.

.1 Increased Cable Resistance Due to Accident Temperatures

Introduction: The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," having very low safety significance (Green) for failure to consider the effects of accident temperatures on cable resistances in voltage calculations. Specifically, voltage drop calculations used a value for cable resistance based on a maximum conductor temperature of 75 degrees Celsius (°C), instead of a higher resistance based on accident environment temperatures that could exist in areas where safety related cables were routed.

Description: The inspectors noted that calculations for 120 Vac motor control center (MCC) control circuit voltage drop assumed a maximum cable temperature of 75°C and had not considered increased cable resistance due to higher temperatures in accident environments. The inspectors questioned whether other voltage drop calculations employed the same non-conservative assumption. Of particular concern were circuits using small gauge wire, where resistance was the predominant component of cable impedance. These circuits included 120Vac instrument buses supplied by inverters or their alternate transformer feeds, and 125Vdc circuits supplied by station batteries. The licensee confirmed that, with the exception of calculations for motor operated valve power circuits, accident temperatures had not been considered in the voltage drop calculations. In the case of the 120Vac instrument buses, the licensee had previously documented in CAP 025218 that voltage calculations did not exist. However, the operability justification relied on evidence of adequate voltage during normal plant operation, and did not consider the more limiting conditions that could exist during accidents. In response to the inspectors's concerns the licensee issued CAPs 041840, 042031, and 042134. These CAPs provided additional analyses to support operability of the circuits in question. For the circuits evaluated, the analyses showed that, although margin was reduced, there was still sufficient voltage to operate the affected equipment.

Analysis: The inspectors determined that the failure to use the correct conductor temperature for voltage drop calculations was a performance deficiency and a finding because the failure of the could have resulted in a loss of function during a design basis accident. The inspectors further determined that the issue was within the licensee's ability to foresee and correct, and that it could have been prevented because the licensee had reanalyzed the 120Vac MCC control circuits in 1994 and the 125Vdc circuits in 2002.

The inspectors determined that the performance deficiency was more than minor in accordance with IMC 0612, Appendix E, Example 3j, because the errors had more than a minimal effect on the outcome of the calculation, considerably impacting the available margin of the system such that further evaluation needed to be performed in order to demonstrate that equipment remained operable and could perform its safety function. Although, by the end of the inspection, the licensee was able to demonstrate operability, at the time of discovery there was reasonable doubt on the operability of the circuits. This performance deficiency also impacted the Mitigating Systems Cornerstone objective of ensuring the capability of the circuits. The inspectors also noted that this was a programmatic concern as both AC and DC calculations did not properly account for the voltage drop under high temperature conditions.

The inspectors performed a IMC 0609, Appendix A, Phase 1 screening. The finding screened as Green because it was not a design issue resulting in loss of function, did not represent an actual loss of a system safety function, did not result in exceeding a TS allowed outage time, and did not affect external event mitigation.

The inspectors did not identify a cross-cutting aspect associated with this finding.

Enforcement: The 10 CFR Part 50, Appendix B, Criterion III, “Design Control,” 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, as of February 20, 2007, the licensee's design control measures failed to verify the adequacy of design of safety related 120Vac and 125Vdc circuits. Specifically, the inspectors identified that the licensee failed to evaluate the effect of accident temperature environments on cable resistance which would affect voltage drop calculations for safety related electrical circuits.

The licensee entered the finding into their corrective action program as CAPs 041840, 042031, and 042134. Because this violation was not willful, was of very low safety significance, and was entered into the licensee's corrective action program, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000305/2007006-05(DRS)).

.2 Non-Conservative Voltage Calculations for MCC Control Circuits

Introduction: The inspectors identified an Unresolved Item concerning assurance that MCC control circuits had adequate voltage to operate when required.

Description: The inspectors reviewed calculation C-039-001 and other preliminary calculations used to support operability determinations for MCC control circuit voltage and identified several concerns including reliance on non-conservative test data and calculational errors, resulting in voltage potentially below acceptable levels for operability for several circuits. Specifically:

Non-conservative Data from Control Power Transformer Tests: MCC control circuits are powered by a separate 480V/120V single phase control power transformer (CPT) in each starter bucket. The tests on CPTs were intended to determine the actual voltage ratio for use as inputs to the voltage drop calculations. The inspectors identified the following specific issues:

- Separate measurements were performed with contactor inrush current and with the contactor picked up in steady state. Although the CPT secondary voltage was considerably lower with inrush current, calculation C-039-001 incorrectly used data from the steady state tests.

- The tests did not include preloads such as auxiliary relays or indicating lights so all of the CPT data shows higher secondary voltage than would be realized in the actual field installed circuits containing these devices.

- The tests were performed using only one or two specimens for each size CPT. This provided very low confidence that the test results were bounding for all CPTs.

- The tests were performed under shop conditions and the calculation did not include margin for lower secondary voltages or higher pickup voltages that could result from higher temperatures in energized MCCs.

Non-conservative Data From Contactor Tests: The calculation acceptance criteria used data from tests in lieu of the manufacturer's guaranteed pick up voltage of 85 percent of rated voltage (102 Vac). The test values were considerably below the manufacturer's guarantees, but no margin was included in the calculation to account for known differences between service and test conditions or for inherent uncertainties in test methods. The inspectors identified the following specific issues:

- The tests were performed using only one or two specimens for each size contactor. This provided very low confidence that the test results were bounding for all contactors. Calculation C-039-001 provided no margin for specimen variability.

- The tests were performed under shop conditions and the calculation did not include margin for higher pickup voltages that could result from higher coil resistance due to higher temperatures in energized MCCs..

- No allowance was made for aging, and there has been no periodic voltage testing to demonstrate that the original contactor test data remains valid.

Non-conservative Calculation Methodology: In addition to the concerns with test data described above, Calculation C-039-001 contained errors and omissions that contributed to the non-conservative results, as follows:

- In some cases, average data was used in lieu of worst case data so that calculations were known to be non-conservative for some devices. The calculation only considered voltage drop in cable due to contactor current and did not include current from additional loads such as relays and indicating lights.

- No allowance was made for increased cable resistance due to effect of accident temperatures.

- The calculation did not account for fuse resistance.

- The calculation used cable lengths based on lengths cut off reels and did not account for greater circuit length due to twisted construction of cables.

The licensee initiated CAPs 041709, 041801, and 041840 to address operability concerns for specific circuits and for the general concern for the non-conservative voltage drop calculation. The preliminary calculations used to support the operability evaluations in these CAPs were also non-conservative, and underwent several revisions over the course of the inspection to correct errors and omissions. The inspectors determined, based on licensee's preliminary calculations for the circuits that approximately 41 circuits would have had less than 5V margin for operability based on voltage afforded by undervoltage relays.

Toward the end of the inspection, the licensee performed modifications to several starter circuits, revised procedures to reduce MCC loads and revised the operability evaluation for the remaining circuits. The preliminary calculations supporting the revised operability justification showed a minimum margin of approximately 5V to account for uncertainties in test data, aging and uncertainties in other calculation inputs. Key inputs to the preliminary calculation included an unverified preliminary load flow calculation performed with the electrical transient analyzer computer program. The preliminary calculations also took credit for the minimum expected grid voltage of 140 kV which is controlled by non-safety related computer programs under the control of the transmission system operator. This voltage input was used in lieu of the design basis voltage afforded by the automatic safety related undervoltage relays.

The inspectors' concerns with the lack of assurance that MCC control circuits had adequate voltage to operate when required is considered an Unresolved Item (URI 05000305/2007006-06 (DRS)) pending the licensee's completion of a past operability assessment of the several circuits and further inspector review.

.3.3 **Safeguard 125 Vdc Station Battery (BRB-101)**

a. Inspection Scope

The inspectors reviewed electrical documents for the 125V direct current (DC) battery BRB-101 and associated DC distribution panel BRB-104, including battery duty cycle and voltage drop calculations, short circuit fault current calculation, breaker interrupting ratings and electrical coordination, battery float and equalizing voltages, overall battery capacity, five-year performance discharge test and quarterly battery surveillance tests. In addition, the voltage drop calculations for safety-related DC loads and DC control power to 4160V switchgears was evaluated to determine if adequate voltage was available at these loads during the first minute of the events and the end of four-hour of station blackout period. The inspectors performed a walkdown of battery and its DC distribution panel BRB-104 to verify the as-built configuration and their condition.

The inspectors reviewed the voltage drop calculations for safety-related DC loads and DC control power to 4160V switchgears to determine if adequate voltage was available at these loads during the first minute of the events and the end of four-hour of station blackout period.

b. Findings

The inspectors identified 5 findings and associated violations of very low safety significance.

.1 Failure to Ensure Adequate 125 Vdc Breaker Interrupting Short Circuit Current Capability

Introduction: The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control" having very low safety significance (Green) involving the licensee's failure to ensure that four of the 125 Vdc circuit breakers had adequate interrupting short circuit current capability.

Description: The inspectors reviewed calculation C-038-008, "Electrical Overcurrent Protective Device Coordination - 125Vdc Battery BRB-101," and identified the following concerns:

- During a walkdown of the 125 Vdc safety related DC buses, the inspectors noted that four DC breakers used to supply breakers for the instrument bus inverters had a short circuit fault interrupting rating of 10,000 Amps (10 KA) at 125 Volts. These four breakers had lower ratings than the other breakers installed at the same DC bus panels BRA/B-104. The inspectors noted that calculation C-038-008 incorrectly indicated that devices installed at bus BRB-104 had a minimum fault interrupting capability of 20 KA. In response to the inspectors' question, the licensee contacted the vendor, who stated that the breakers interrupting rating would be higher than 10 KA at 125 Vdc; however, could not guarantee it would meet 20 KA.

- In calculation C-038-008, the licensee determined the available fault current was 11.2 KA, higher than the rating.

- Section 4.4 of calculation C-038-008 indicated that the battery charger contribution to the fault current was not included because it was considered negligible compared to the battery contribution. The inspectors determined that this conclusion was not consistent with IEEE-946 standard "Recommended Practice for the Design of DC Auxiliary Power Systems for Generating Stations" standards.

The licensee performed an operability evaluation and concluded the breakers were operable because the most probable fault for any one of these four circuits would be at its respective inverters, the fault current value would be reduced to 6 KA due to the additional cable length from the DC bus to the inverter. The licensee initiated several corrective actions including: (1) recommended replacing the four breakers (CAP 041753); (2) incorporating correct battery voltage into the DC calculation revision project (CAP 041275); and (3) assessing the contribution from the charger into the DC calculation revision project (CAP 041730).

Analysis: The inspectors determined that the failure to assure that 125 Vdc circuit breakers were adequately rated for the available short circuit current was a performance deficiency and a finding because this failure could have caused the loss of the entire safety related 125 Vdc bus in the event of short circuit fault.

The inspectors determined that the finding was more than minor in accordance with IMC 0612, Appendix B, "Issue Disposition Screening," because the finding was associated with the Mitigating Systems cornerstone attribute of design control and affected the cornerstone objective of ensuring capability of systems that respond to initiating events. Specifically, a short circuit of the magnitude of the available short circuit fault current at any of these breakers could have caused damage to the breaker and could have resulted in loss of an entire safety related 125 Vdc bus.

The inspectors screened the finding using IMC 0609, Appendix A. The finding screened as Green because it was not a design issue resulting in loss of function, did not represent an actual loss of a system safety function, did not result in exceeding a TS allowed outage time, and did not affect external event mitigation.

The inspectors determined that there was not a cross-cutting aspect to this finding.

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

Contrary to the above, as of February 14, 2007, the licensee's design control measures failed to verify the adequacy of the design of safety related DC electrical circuit breakers. Specifically, the inspectors identified that the licensee failed to ensure that four 125 Vdc safety related circuit breakers were adequately designed for the available short circuit current interrupting capability.

The licensee entered the finding into their corrective action program as CAP 041275, CAP 041747, CAP 041730 and CAP 041753. Because this violation was not willful, was of very low safety significance and was entered into the licensee's corrective action program, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy. (NCV 05000305/2007006-07 (DRS))

.2 Failure to Use Actual Minimum Voltage Value in 125 Vdc Voltage Drop Calculation

Introduction: The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control" having very low safety significance (Green) involving the licensee's failure to use actual input design data in 125 Vdc voltage drop calculation. Specifically, the licensee used battery terminal voltage value of 117.49 Volts for BRA-101 and 118.95 Volts for BRB-101, for the first minute, and did not compensate for worse case conditions.

Description: The inspectors reviewed Calculation C-038-003 "125 Vdc Safeguard Network Cable Voltage Drops" which calculated the voltage drop for the DC safety related loads during the first minute following a station blackout (SBO). The inspectors identified the following concerns:

- The battery terminal voltage were assumed to be 117.49 Volts for battery BRA-101 and 118.95 Volts for BRB-101. These voltage values were based on previous recorded data for battery terminal voltage upon application of 350 Amps load to the battery. The inspectors noted that these terminal volt values were not the worst case values. In response to the inspectors' question, the licensee provided a preliminary calculation using the methodology described in IEEE-485 standard, Annex C "Calculating Cell Voltage During Discharge," for worst case battery conditions for temperature and aging factor. The preliminary calculation showed that battery terminal voltage for these conditions could decrease to a value of 113.87 Volts for batteries BRA/B-101.

- The inspectors noted that calculation C-10510 "Voltage Rating of Safeguard DC Operated Devices," showed that the diesel generators' governor boost motors and fuel prime pump motors were rated for operating voltage range between 105-140 Vdc. The licensee's preliminary evaluation showed that the voltage available to the engine control panel feeding the above devices was approximately 104.1 Volts. This voltage value was based on the licensee using the battery terminal voltage of 119.5 volts which was recorder after 20 seconds during the latest discharge test. The licensee used the voltage at 20 seconds from the start of the event, because of the fact that the loss of offsite AC power scenario is immediately followed by the blackout signal, which will automatically attempt to start the diesel generators and their associated fuel priming pump motor and governor boost pump motor. In response to inspectors's concern, the licensee provided information from the motors supplier, Dayton Phoenix Group, indicated that calculation C-10510 was incorrect and the minimum voltage for the motors was 100 Vdc not 105 VDC. The licensee issued CAP 042268 to address this issue.

Following discovery, the licensee performed a preliminary evaluation for affected components using a lower terminal voltage during the first minute. The licensee concluded that affected components would still perform their required safety functions in the event of the battery terminal voltage decrease to 113.87 Vdc.

Analysis: The inspectors determined that the failure to use correct and actual first minute battery terminal voltage value in the 125 Vdc safeguard distribution network voltage drop calculation, was a performance deficiency and a finding because the failure could have resulted in a loss of function during a design basis accident. The inspectors further determined that the issue was within the licensee's ability to foresee and correct, and that it could have been prevented because the licensee had performed the station battery load tests in 2004 which showed that the battery voltage dropped below the design basis calculation values.

The inspectors determined that the performance deficiency was more than minor in accordance with IMC 0612, Appendix E, Example 3j, because the errors had more than a minimal effect on the outcome of the calculation, considerably impacting the available margin of the system such that further evaluation needed to be performed in order to demonstrate that the equipment could perform its safety function. Although, by the end of the inspection, the licensee was able to demonstrate operability; at the time of discovery there was reasonable doubt on the operability of the circuits. This performance deficiency also impacted the Mitigating Systems Cornerstone objective of ensuring the capability of the circuits.

The inspectors screened the finding using IMC 0609, Appendix A, Phase 1 screening. The finding screened as Green because it was not a design issue resulting in loss of function, did not represent an actual loss of a system safety function, did not result in exceeding a TS allowed outage time, and did not affect external event mitigation.

The inspectors determined that there was not a cross-cutting aspect to this finding.

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

Contrary to the above, as of February 15, 2007, the licensee’s design control measures failed to verify the adequacy of the design for safety related DC electrical circuits to ensure that the available voltage was sufficient to operate the safety related equipment and devices. Specifically, the inspectors identified that the licensee failed to use the correct minimum voltage value for the first minute in the 125 Vdc safeguard distribution network voltage drop calculation for safety related electrical circuits.

The licensee entered the finding into their corrective action program as CAPs 041778, 042147, 042268, 042261 and 041736. Because this violation was not willful, was of very low safety significance and was entered into the licensee’s corrective action program, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy. (NCV 05000305/2007006-08 (DRS))

.3 Inadequate Acceptance Criteria in 125 Vdc Station Battery Load Tests Procedures

Introduction: The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion V, “Instructions, Procedures and Drawings.” having very low safety significance (Green) for failure to have adequate acceptance criteria in 125 safeguard station battery load test procedures. Specifically, the licensee failed to include the acceptable minimum battery terminal voltage, during the first minute, into the acceptance criteria for battery load test procedures SP-38-102A/B “Station Battery Load Test.”

Description: Surveillance procedures SP-38-102A/B “Station Battery Load Test,” was scheduled to be performed every 5 years to ensure that 125 Vdc safeguards station battery capacity was equal to or greater than 100 percent. These tests met the Technical Specification requirement 4.6.b.4 which required the batteries be subject to a load test once every 5 years and battery voltage monitored as function of time to establish that the batteries performed as expected during heavy discharge. During the inspectors’s review of the last test data completed in October 2004, the inspectors noted that the battery terminal voltage dropped down to approximately 114 Volts during the first minute of the discharge. The inspectors also noted that although, the battery terminal voltage was monitored during the entire discharge test, the procedures did not include acceptance criteria for the battery terminal voltage during the first minute. The only battery terminal voltage requirement was stated in step 6.2.6 which required operators to terminate the test when the terminal voltage reached 105 Volts.

The inspectors noted that the voltage drop calculation C-038-003 used a minimum battery terminal voltage during the first minute as 117.49 for battery BRA-101 and 118.95 for BRB-101. These terminal battery voltage were the basis for the calculated minimum voltage value for available safety related DC loads during the first minute in the event of loss offsite power conditions. As stated previously, the inspectors identified that these values were non-conservative. None-the-less, the inspectors determined that the acceptance criteria specified in test procedures SP-38-102A/B did not reflect the minimum values assumed in the design calculations. The test did not assure that the batteries had adequate voltage during the first minute to perform their safety functions. As stated earlier, the licensee performed preliminary evaluation using a battery terminal voltage of 113.87 and concluded that the voltage supplied to safety related DC components was adequate and components will perform their required safety functions. The licensee also issued CAP 042342 to revise acceptance criteria in procedures to include a minimum voltage value for the first minute.

Analysis: The inspectors determined that the failure to include the acceptable minimum battery terminal voltage during the first minute in the acceptance criteria for station battery load test procedures was a performance deficiency and a finding because the failure could have resulted in a loss of function during a design basis accident and or station blackout conditions. Specifically, the inadequacy of the acceptance criteria specified in procedures SP-38-102A/B allowed, during the performance of load test for the station batteries in 2004, the battery terminal voltage to drop below the value used in the batteries design basis calculations unnoticed and without proper evaluation. The inspectors further determined that the issue was within the licensee's ability to foresee and correct, and that it could have been prevented because the licensee had revised these procedures in 2005.

The inspectors determined that the performance deficiency was more than minor in accordance with IMC 0612, Appendix B, "Issue Disposition Screening," because the finding was associated with the Mitigating Systems cornerstone attribute of procedure quality and affected the cornerstone objective of ensuring capability of systems that respond to initiating events. Specifically, the failure to ensure that the battery terminal voltage during the first minute did not drop below the design input value could have affected the operability of safety related equipments in the event of a design basis accident and or SBO conditions.

The inspectors screened the finding using IMC 0609, Appendix A, Phase 1 screening. The finding screened as Green because it was not a design issue resulting in loss of function per Part 9900, did not represent an actual loss of a system safety function, did not result in exceeding a TS allowed outage time, and did not affect external event mitigation. As stated earlier, the licensee performed preliminary evaluation using a battery terminal voltage of 113.87 and concluded that the voltage supplied to safety related DC components was adequate and components will perform their required safety functions.

The inspectors determined that there was not a cross-cutting aspect to this finding.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings," requires, in part, that activities affecting quality shall be prescribed by procedures, and shall include appropriate acceptance criteria for determining that important activities have been satisfactorily accomplished.

Contrary to the above, as of March 1, 2007, licensee's procedures SP-38-102A and 102B failed to include appropriate acceptance criteria. Specifically, the inspectors identified that the licensee failed to include a minimum acceptable battery terminal voltage value during the first minute battery discharge in the safeguard station batteries load test procedures.

The licensee entered the finding into their corrective action program as CAP 042057 and CAP 042342. Because this violation was not willful, was of very low safety significance and was entered into the licensee's corrective action program, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy. (NCV 05000305/2007006-09 (DRS))

.4 Adequate Control Voltage for 4160V Breaker's Closing Coil Was Not Assured

Introduction: The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control" having very low safety significance (Green) involving the licensee's failure to assure that adequate control voltage was available to energize the closing coils for the 4160V breakers. Specifically, the licensee failed to assure that the minimum available control voltage at the 4160V breakers met the minimum rated voltage value for the closing coils, instead the licensee's design calculation credited a one time test value of 70 Volts.

Description: Calculation C-10812 "Verify Control Voltage for 4160V Safeguards Switchgear," Section 3.0 indicated that the coil voltage required for coil actuation was factory verified at 100 Vdc and 70 Vdc for the close and trip coils, respectively. Additional testing were performed during bench testing at the site, verified the close coil actuated at

70 Vdc. The calculation concluded that the voltage drop in the control circuit cabling was acceptable to ensure adequate voltage to operate the Westinghouse 4160V vacuum breakers during all mode of operation. This conclusion was based on verifying that the calculated cable length was greater than the actual cable length for the safeguards breaker close/trip coil circuits. The calculation assumed that the control voltage available at switchgear for normal operation was 130 Vdc, for station blackout (4-hour) was 113 Vdc and for the battery design discharge (8-hour) was 103 VDC.

The inspectors were concerned that the licensee used 70 Vdc for the minimum required voltage for the closing coil rather than the coil rated voltage value of 100 Vdc to calculate the maximum acceptable cable length. As indicated above the voltage value of 70 Vdc for the closing coils was only verified once during bench testing. Because of the lack of periodic testing for the minimum required voltage for the closing coils, the inspectors questioned whether the 70 Vdc was still adequate to close the breaker.

Following discovery, the licensee contacted Westinghouse regarding the use of a minimum closing voltage lower than the 100 Vdc, the rating value for the 4160V V vacuum circuit breaker closing coils. In a letter dated March 7, 2007 (Reference Number LTR-EMPE-07-54), Westinghouse provided justification for a closing coil rating of 90-140 Vdc. Based on the new information provided by Westinghouse, the licensee provided a preliminary evaluation indicating that the diesel generator output breakers would close during the initiation of a loss of offsite power and safety injection signal (SI), using the automatic circuit scheme. This was based on worst case battery voltage of 113.87 Vdc (for the first minute) at 65 degrees Fahrenheit and with cable losses at 75 degrees Celsius. The calculated voltage at the closing coil terminals was approximately 94 Vdc which was within the bounding values provided by Westinghouse. The licensee indicated that since the battery charger would be immediately available upon the closure of the diesel generator breaker, voltage at the other safety related breakers would be higher and adequate to close the breakers.

However, the evaluation indicated that during a station blackout, the worst case battery terminal voltage, after the first minute and within the four hour SBO duration was 115.64 Vdc. When the manual closure of the diesel generator output breakers is attempted from the control room, the available coil terminal voltage was calculated to be 88.4 Vdc, which was below the minimum value of 90 Volts. The licensee indicated that steps in the abnormal procedure direct the operators to locally close the diesel generator output breakers. The local operation of the 4160V breakers was a manual action that did not require a DC control voltage.

Analysis: The inspectors determined that licensee’s failure to assure adequate control voltage was available to energize the closing coils for the 4160V breakers was a performance deficiency and a finding because operability of safety related equipment could not be assured could have resulted in a loss of function during a design basis accident.

The inspectors determined that the performance deficiency was more than minor in accordance with IMC 0612, Appendix E, Example 3j, because the errors had more than a minimal effect on the outcome of the calculation, considerably impacting the available margin of the system such that further evaluation needed to be performed in order to demonstrate that the equipment could perform its safety function. Although, by the end of the inspection, the licensee was able to demonstrate operability; at the time of discovery there was reasonable doubt on the operability of the circuits. This performance deficiency also impacted the Mitigating Systems Cornerstone objective of ensuring the capability of emergency diesel generators and other safety related equipment to respond to initiating events.

The inspectors screened the finding using IMC 0609, Appendix A. The finding screened as Green because it was not a design issue resulting in loss of function per Part 9900, did not represent an actual loss of a system safety function, did not result in exceeding a TS allowed outage time, and did not affect external event mitigation.

The inspectors determined that there was not a cross-cutting aspect to this finding.

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

Contrary to the above, as of February 22, 2007, the licensee's design control measures failed to verify the adequacy of design of control voltage for safety related 4160V circuit breakers. Specifically, the licensee failed to assure that the minimum available control voltage at the 4160V breakers was adequate to energize the closing coils. The licensee failed to verify that the minimum available control voltage at the 4160V breakers met the minimum rated voltage value for the closing coils. Instead, the licensee's design calculation credited a one time test value of 70 Volts.

The licensee entered the finding into their corrective action program as CAP 042121. Because this violation was not willful, was of very low safety significance and was entered into the licensee's corrective action program, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy.
(NCV 05000305/2007006-10 (DRS))

.5 Safeguard Battery Load Profile Did Not Include LOOP/LOCA Loads

Introduction: The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control" having very low safety significance (Green) involving the licensee's failure to assure that safeguard battery loads profile was adequate to meet all USAR requirements. Specifically, the licensee failed to verify that the battery loading profile for LOCA coincide with loss of all AC power condition (LOOP/LOCA) was bounded by the SBO condition loading to ensure adequate battery sizing and testing.

Description: USAR Section 1.2.8 "Engineered Safety Features," (ESF) stated, in part, that the ESF provided redundancy of component and power supply sources such that under LOCA condition, the system can maintain the integrity of the containment. One of the systems provided was, two station batteries which can handle all expected shutdown loads, following a loss of all AC power, for a period of one hour without battery terminal voltage falling below 105 Vdc. USAR Section 8.2.4 "Station Blackout," stated, that the SBO duration was four-hour, battery capacity calculations existed and were based on IEEE-485 methodology and a duty cycle of eight-hour.

Calculation C-038-002 “125 Vdc Battery BRA-101 and BRB-101 Duty Cycle,” Section 4.2, stated, station battery must provide the power required by its connected distribution system for a defined duration without assistance from a battery charger and without support from any onsite or offsite AC power source. Section 4.4 of this calculation indicated that USAR Section 8.2.4 (SBO) and United State Atomic Energy Commission safety evaluation Section 8.3.2 were used to identify the minimum duty cycle for the safeguard battery as the plant condition of unit trip and loss of onsite and offsite AC power. The basis duty cycle minimum duration was considered four-hour. The inspectors noted that this calculation did not incorporate USAR Section 1.2.8 because it did not verify that the LOOP/LOCA loads were bounded by the SBO load profile. The inspectors were concerned that because the battery calculations were based on the SBO loading, the licensee did not evaluate the affect on the battery during the LOOP/LOCA loading.

In addition, Technical Specification Section 4.6.b.4 required that batteries shall be subject to a load test once every 5 years, battery voltage shall be monitored as a function of time to establish that the battery performance as expected during heavy discharge. The inspectors questioned whether this requirement was met because the battery load tests performed per surveillance procedures BRA/B-101 were based only on the SBO loading.

The licensee acknowledged this deficiency and issued CAP 042398 to include the LOOP/LOCA profile in the DC calculation upgrade project. The licensee also indicated that in the event of a LOOP/LOCA accident and the initiation of an SI signal, the emergency diesel generator will start and the DC loads will be carried by the associated battery charger.

Analysis: The inspectors determined that the licensee’s failure to verify that the safeguard battery loads profile was adequate to meet all USAR requirements was a performance deficiency and a finding because the licensee did not assure that safeguard batteries could meet their design function during a design basis accident.

The inspectors determined that the performance deficiency was more than minor in accordance with IMC 0612, Appendix B, “Issue Screening,” because the finding was associated with the Mitigating Systems cornerstone attribute of equipment performance and affected the cornerstone objective of ensuring capability of systems that respond to initiating events. Specifically, the failure to verify that battery calculation and testing were adequate for LOCA coincide with loss of all AC power loads did not ensure that battery was capable of performing their design function on their own without the support of the charger.

The inspectors screened the finding using IMC 0609, Appendix A. The finding screened as Green because it was not a design issue resulting in loss of function, did not represent an actual loss of a system safety function, did not result in exceeding a TS allowed outage time, and did not affect external event mitigation. Although the USAR required station batteries be capable to handle all safe shutdown loads for a period of one hour during an accident condition, the licensee was able to show that the charger will be available during this period and will provide additional support.

The inspectors determined that there was not a cross-cutting aspect to this finding.

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

Contrary to the above, as of March 2, 2007, the licensee’s design control measures including testing failed to verify the adequacy of design and testing of safeguard DC batteries. Specifically, the inspectors identified that the licensee failed to ensure that the battery loading during a LOOP/LOCA were bounded by the existing SBO battery load profile to ensure adequate design calculation and load testing.

The licensee entered the finding into their corrective action program as CAP 042398. Because this violation was not willful, was of very low safety significance and was entered into the licensee’s corrective action program, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy. (NCV 05000305/2007006-11 (DRS))

.3.4 Safeguard Battery Charger (BRB-108)

a. Inspection Scope

The inspectors reviewed electrical design documents for 125 Vdc battery charger BRB-108, including sizing calculation, its contribution to short circuit fault current, and breaker sizing. In addition, the test procedures were reviewed to determine if maintenance and testing activities for the battery charger BRB-108 and the spare charger BRA/B-108 were in accordance with USAR requirements and vendor recommendations. The inspectors performed a walkdown of battery chargers to verify the as-built configuration and their condition.

b. Findings

.1 Electrolytic Capacitors in Spare Safeguard Battery Charger Not Periodically Energized

Introduction: The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion XVI, “Corrective Action” having very low safety significance (Green) involving the licensee’s failure to incorporate a previously identified vendor recommendation for the spare safeguard battery charger. Specifically, the licensee failed to periodically energize the spare 125 Vdc safeguard battery charger for at least a half-hour every 18 months to ensure the operability of the electrolytic capacitor in the charger. The licensee had previously entered the vendor recommendation into its corrective action in 2002; however, the action was incorrectly closed without implementing the recommendation.

Description: Technical Specification Section 3.7 bases indicated that the plant safeguards 125 Vdc power was normally supplied by two batteries, each with a battery charger in service to maintain full charge. A third charger was available to supply either battery. The spare charger was described in USAR Section 8.2.2 which stated, in part, that the spare safeguard battery charger BRA/B-108 can be moved to its designated mounting in either safeguard battery room and connected to the DC bus in the event of a BRA-108 or BRB-108 charger failure.

In September 2002, an apparent cause evaluation (ACE000445) was completed for the failure of battery charger BRA-108, in July 2001, which required the installation of the spare charger BRA/B-108 in place of the failed charger. The evaluation documented the following:

- The failure of battery charger BRA-108 did not have a potential or actual safety consequence because the spare battery charger BRB-108 was placed in service.
- The cause of the battery charger failure was due to age related defective printed circuit boards.
- While attempting to replace the boards in the failed charger, the licensee found that both boards from the warehouse stock were defective and did not start the charger due to the electrolytic capacitors shelf life issue.
- The vendor indicated the boards had an expected inservice life of 10-15 years and a shelf life of 2-3 years after which the electrolytic capacitors on the boards have to be charged and reformed. This recommendation also applied to the filter capacitors installed in the charger, which have an expected inservice life of 7-10 years and a shelf life of 2-3 years after which time, should be rejuvenated by charging them.

Based on the above apparent cause evaluation, the licensee initiated a procedure charge request (PCR001326) to revise maintenance procedure, PMP 38-05, to incorporate energizing the spare charger to reform the electrolytic capacitors and boards, and to reform the capacitors and boards stored in the warehouse. The recommended frequency for this activity was 18 month. Action number 10763 in the procedure database to incorporate PCR1326 was submitted with a due date of November 2006. The inspectors noted that all corrective actions were closed and that the Preventive Maintenance (PM) card to revise the procedure was never issued and PCR001326 recommendation had not been implemented. Because of the previous July 2001 failure of battery charger BRA-108 due to aging issues and that the spare charger could be placed in service, the inspectors questioned the functionality of the spare charger. The licensee initiated CAP 041785 and declared the spare battery charger inoperable until further testing was accomplished.

<u>Analysis</u>: The inspectors determined that the failure to periodically energize the 125 Vdc spare safeguard battery charger for at least a half-hour every 18 months was a performance deficiency and a finding because the failure could have resulted in a loss of function during a design basis accident if the charger was installed. The inspectors further determined that the issue was within the licensee's ability to foresee and correct, and that it could have been prevented because the licensee had previously identified the need to periodically energize the spare charger to rejuvenate the electrolytic capacitors in 2002.

The inspectors determined that the performance deficiency was more than minor in accordance with IMC 0612, Appendix B, "Issue Screening," because the finding was associated with the Mitigating Systems cornerstone attribute of equipment performance and affected the cornerstone objective of ensuring capability of systems that respond to initiating events. Specifically, the failure to periodically energize the spare charger led to the degradation of the electrolytic capacitors and hence degradation of the voltage supplied to the safeguard loads and battery.

The inspectors screened the finding using IMC 0609, Appendix A. The finding screened as Green because it was not a design issue resulting in loss of function per Part 9900, did not represent an actual loss of a system safety function, did not result in exceeding a TS allowed outage time, and did not affect external event mitigation. The spare charger was not in place as the time of discovery.

The inspectors determined a contributing cause of this finding was related to the cross-cutting area of problem identification and resolution because the licensee failed to take appropriate corrective actions to address a previously failed charger. Specifically, the licensee developed corrective actions which included incorporating pertinent vendor recommendation into the preventive maintenance program but closed the action without ensuring completion (P.1.d).

<u>Enforcement</u>: Title 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requires, in part, that conditions adverse to quality are promptly identified and corrected. Contrary to this requirement, as of February 15, 2007, the licensee's failed to correct a condition adverse to quality associated with 125 Vdc safeguard spare charger. Specifically, the the licensee identified in 2002 the need to incorporate vendor recommendations to energize the safeguard spare charger BRA/B-108 at least a half-hour every 18 months to rejuvenate its electrolytic capacitors; however, the recommendation was never implemented. Without rejuvenating the capacitors, the licensee could not ensure operability of the spare charger.

The licensee entered the finding into their corrective action program as CAP 041785. Because this violation was not willful, was of very low safety significance and was entered into the licensee's corrective action program, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy. NCV 05000305/ 2007006-12 (DRS))

.3.5 Emergency Diesel Generator "A"

a. <u>Inspection Scope</u>

The inspectors performed a limited review of the design of the emergency diesel generators to determine whether they were loaded within their ratings. The inspectors reviewed calculations, surveillance procedures, operating procedures, operability determinations, and surveillance records relating to diesel generator loading.

b. Findings

The inspectors identified one finding and associated violation of very low safety significance and one unresolved item.

.1 Diesel Loading Calculations Non Conservative

Introduction: The inspectors identified a finding having very low significance (Green) and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, “Design Control.” Specifically, the licensee failed to properly account for all loads on the emergency diesel generators (EDG).

Description: Diesel generator loading is affected by generator frequency such that generator frequencies above the nominal frequency of 60 Hz can result in higher engine load than that experienced at the nominal generator frequency. The actual increase in load is dependent on the characteristics of the connected load, i.e., centrifugal pumps and fans will demand increased power at higher frequencies. In Calculation C-042-001, the licensee determined the loading on the diesel at nominal frequency (60 Hz). The licensee used these loading margins from Calculation C-042-001 as inputs into Calculation C-10915 and determined maximum frequency permissible to prevent overloading the diesels. However, the inspectors noted that the licensee failed to account for all loads on the diesels in Calculation C-042-001; therefore, the margins utilized in Calculation C-10915 were non-conservative, requiring a downward revision in maximum allowable frequency for both diesels. Specifically, the licensee failed to account for I^2R losses in cables. In response to the inspectors’ concerns, the licensee performed preliminary calculations that showed that increased loading due to cable losses was significant relative to previously calculated margins. This resulted in a reduction in maximum allowable frequency from 61.01 Hz to 60.88 Hz for DG 1A, and from 61.20 Hz to 61.07 Hz for DG 1B. The inspectors noted that this reduction in allowable frequency would require a revision to surveillance procedures that had an upper diesel frequency limit of 61 Hz. The inspectors further noted that the most recent diesel test data showed frequencies only slightly below the revised frequency limits; as such, this issue did not represent an immediate operability concern. The licensee has entered this item into the corrective action program as CAP 041345

Analysis: The inspectors determined that the failure to properly account for actual diesel generator loads was a performance deficiency and a finding because operating at higher than maximum allowable frequency could overload the EDGs.

The inspectors determined that the finding was more than minor in accordance with IMC 0612, “Power Reactor Inspection Reports,” Appendix B, “Issue Dispositioning Screening,” because it was associated with the attribute of design control, which affected the Mitigating Systems cornerstone objective of ensuring the availability and reliability of safety-related control circuits to respond to initiating events to prevent undesirable consequences. Specifically, the failure to properly ensure that the diesels were applied within their load ratings could impact their safety function.

The inspectors evaluated the finding using IMC 0609, Appendix A, “Significance Determination of Reactor Inspection Findings for At-Power Situations,” Phase 1 screening, and determined that the finding screened as Green because it was not a design issue resulting in loss of function, did not represent an actual loss of a system safety function, did not result in exceeding a TS allowed outage time, and did not affect external event mitigation. The basis for this conclusion was, that despite the higher than previously determined loading, and therefore, loss of design margin, there was still adequate margin for the diesels to perform their safety function.

The inspectors determined that there was not a cross-cutting aspect to this finding.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," required, 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, as of February 3, 2006, the licensee's design control measures failed to verify the adequacy of design, in that the methodology and design inputs used in calculations failed to include significant factors that adversely affected diesel generator loading. Specifically, the diesel generator loading calculations failed to account for cable losses, resulting in significant reduction in loading margin for the diesels.

The licensee entered the finding into their corrective action program as CAP 041345. Following discovery, the licensee performed preliminary calculations and placed surveillance procedures with inadequate criteria on administrative hold. Because this violation was not willful, was of very low safety significance, and was entered into the licensee's corrective action program, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000305/ 2007006-13 (DRS)).

.2 Emergency Diesel Generator Rooms Cooling Fans Testing Deficiencies

Introduction: The inspectors identified an unresolved item regarding the ability of the EDG Room Cooling Fan to maintain the room below its design temperature.

Description: While reviewing the EDG room cooling calculations, the inspectors noted the design flow rate for the EDG Room Cooling fans was 60,000 CFM and the calculated required flow rate for these fans was 60,303 CFM in order to maintain the room at its design temperature of 120ºF. The inspectors had several concerns:

- The inspectors determined that during a preoperational test, the licensee measured the flow velocity of the EDG Room Cooling fan and multiplied the velocity by the cross sectional area of the duct to determine the fan flow rate. During the pre-operational test, it was determined that the cross section area of the fan's duct was 18.6 square feet, and based on this value, the flow rate was calculated to be 60,200 CFM using anemometer readings and 59,300 CFM using velometer readings. However, the inspectors reviewed the manufacturer's certified performance test and noted that the cross sectional area of the fan's circular duct (54 inch diameter) was 15.9 not 18.6 square feet. In addition, the licensee calculated the cross sectional area of the duct by multiplying three linear dimensions (in feet) to arrive at a “square feet” answer.

- During the inspection, the licensee confirmed that the actual cross sectional area of the circular duct was 15.9 square feet. Using the correct cross sectional area and the originally measured flow velocities, the licensee recalculated the flow rate using the anemometer readings, was 51,468 CFM and using the velometer readings, was 50,689 CFM. These values were significantly lower than the original assumed design flow rates.

- The licensee did not account for a very large instrument uncertainty associated with the readings. The velometer readings which were later averaged, varied from 2900 to 3600 feet per minute, a difference of 24 percent (with respect to the smaller value). The anemometer readings which were later averaged, varied from 3050 to 3456 feet per minute, a difference of 13 percent (with respect to the smaller value).

- The original calculation used an EDG heat load assuming 2600 kW rating instead of the heat load assuming 2864.kW rating.

Following discovery, the licensee initiated a CAP and reperformed the calculation using 54,000 CFM (10 percent lower than the design flow rate of 60,000 CFM) as well as using the a new heat load based on the correct diesel kW rating. The licensee planned to perform EDG Room volumetric flow testing (Work Orders 07-2512 and 07-2513) to confirm the calculational results. This issue is considered unresolved pending review of test results. (URI 05000305/2007006-14 (DRS)).

.3.6 Reactor Trip Breakers

a. Inspection Scope

The inspectors examined engineering’ involvement in ensuring that the safety-related reactor trip breakers (RTBs) and their associated cell assemblies have been effectively maintained and tested per the latest external and internal operating experience (OE). The inspectors reviewed related OE and activities used to perform maintenance and surveillance testing on the RTBs and their cell assemblies. The inspectors also reviewed significant QA findings and related CAPs issued to document and address RTB and vendor technical information program (VETIP) issues. In addition, the inspectors performed field walkdowns; interviewed engineering, maintenance, and operations staff, and observed selected RTB maintenance activities.

b. Findings

Two findings and associated NCVs of very low safety significance were identified.

(1) <u>Failure to Incorporate and Effectively Implement Operating Experience into RTB Maintenance Activities</u>

<u>Introduction</u>: The inspectors identified a finding associated with a Non-Cited Violation (NCV) of 10 CFR 50.65(a)(3), having very low safety significance (Green), for the failure to incorporate and implement available internal and external operating experience into preventive maintenance activities on RTBs and their associated cells. Consequently, numerous vendor specified end-of-service life required maintenance activities on breaker components had been exceeded; therefore impacted the reliability of the breakers.

<u>Discussion</u>: On February 22 and 25, 1983, an anticipated transient without a scram (ATWS) event occurred at the Salem plant due to the reactor trip breakers' undervoltage trip attachment (UVTA) sticking resulting from improper maintenance and failure to use vendor information. As a result, the NRC issued several generic communications including: Generic Letter 83-28, "Required Actions Based on Generic Implications of Salem Events," Generic Letter 83-32, "NRC Staff Recommendations Regarding Operator Action for Reactor Trip and ATWS," and Bulletin 83-01, "Failure of Reactor Trip Breakers (Westinghouse DB-50) to Open on Automatic Signal." These documents required actions for the licensee to take to ensure operability of the RTBs. One activity required by Generic Letter 83-28 included actions to improve the reliability of the reactor trip system by requiring all licensees to establish a comprehensive program of preventive maintenance and surveillance testing to ensure reliable RTB operation. Specifically, Position 4.2 of GL 83-28 stated that licensees include in their RTB PM and surveillance program: (1) a planned program of periodic maintenance, including lubrication; (2) trending parameters affecting operation and measuring during testing to forecast degradation of operability; (3) life testing of breakers; and (4) periodic replacement of breakers and components consistent with demonstrated life cycles. In addition, the licensee was required to establish, implement and maintain a continuing program to reflect valid vendor guidance and technical information by ensuring that vendor information for safety-related components remained complete, current, and controlled throughout the life of the plant; and that vendor information is appropriately referenced or incorporated in plant instructions and procedures.

In a letter dated September 10, 1987, the licensee stated that "in addition to plant specific experience, industry experience and vendor recommendations are continually evaluated and incorporated into existing maintenance programs as applicable." The letter further stated that, "The most limiting reactor trip breaker maintenance activity, as described in WCAP-10852, "Report of the DB-50 Reactor Trip Breaker Shunt and Undervoltage trip Attachments Life Cycle Tests," is the UVTA lubrication, which was performed after 200 cycles of operation during testing." The letter further stated that Licensing, Maintenance and Technical Support personnel were cognizant of the fact that 200 cycles of the RTBs should not be exceeded between refueling outages.

The inspectors reviewed the preventive maintenance and surveillance testing for the safety-related Westinghouse DB-50 reactor trip breakers: four used in the reactor protective system and one spare. The inspectors noted that the latest vendor manual, "Maintenance Program Manual MPM-DB Breaker for Westinghouse Type DB Circuit Breakers and Associated Switchgear," dated March 31, 2002, was extensively updated to include industry experience, lessons learned, and vendor life cycle testing results. The 2002 MPM-DB manual provided detailed maintenance guidelines, including performance checks, tests, tolerance measurements, and results recording for purposes of early detection and correction of any RTB or cell degraded condition. To ensure operability in safety-related applications, Table 5-1, "Circuit Breaker Maintenance Interval and Service Life Recommendations in Number of Cycles," of the vendor manual, specified performing preventive maintenance and component replacement based on the number of RTB cycles (no-load close/open operation) and cell cycles (insertion and withdrawal). The manual explicitly stated that the ability to judge if a breaker requires a lubrication PM or replacement as a result of excess friction or rubbing is greatly impaired without an accurate count of the number of breaker cycles. These operating cycles and maintenance intervals recommendations were based on qualification testing and analysis performed by Westinghouse and were designed to meet American Standard Association (ASA) C37.16-1963.

The inspectors noted that Procedure PMP 47-01, "RCP-Reactor Trip Breaker Electrical Maintenance," Revision X, did not contain these latest vendor recommendations. The inspectors also noted that the licensee received the completely new RTB vendor manual in April 2002; however, did not initiate a review of the manual (through the GNP-05.02-01, "Vendor Technical Information Control) until June 2, 2005. This review was expected to be completed within 30 days; however, no action was taken. When questioned by the inspectors, the licensee initiated CAP 41329 on February 2, 2007. In addition, the inspectors identified that procedure NID-01.05.03, "Predictive Maintenance Infrared Thermography Program," required that component monitoring scope listing shall be updated annually. However, the procedure was last revised in July 2004. Despite thermography being referenced as a preventive maintenance process in the vendor manual, the RTBs had not been added to the thermography program. The licensee initiated CAP 041401 on February 5, 2007.

Because the licensee did not formally track the number of cycles and could not accurately identify when a breaker was close to or exceeded the 200/2500 or 4000 cycles of operations, the inspectors were concerned that several RTB components in service may have exceeded their maximum vendor specified end-of-service life and did not have the vendor required PM activities complete. In response to the inspectors' concerns, the licensee evaluated the vendor specified service life limits and PM requirements for the RTBs and noted the following:

- RTB S/N 3-24Y7275B, which was in service at the time, had exceeded the vendor specified service life limit of 2500 for the UVTA and shunt trip attachment (STA) cycle (by 276). Both should have been replaced before being placed in service in the fuel cycle when 2500 cycles would be reached. (CAP 042266)

- Two RTBs had exceeded the specified PM program in-service requirement for refurbishment of 5 years. (CAPs 042309 and 042524)

- The UVTA for RTB (S/N 850.027-1) exceeded 2500 cycles (by about 389) without being replaced. This RTB also had 214 cycles and had not been lubricated or tested. (CAP 042334)

- On March 5, 2007, based on inspectors questions, the licensee determined that reactor trip and bypass breakers did not meet the vendor recommended preventive maintenance (PM) for the RTB cell switch, breaker primary disconnect contacts (finger clusters) and breaker secondary contacts. These components should have been replaced every 100 cycles (insertion and removal) per the vendor. Procedure PMP 47-01 did not have requirements to monitor the cell assemblies cycles. (CAP 042524)

The licensee initiated numerous CAPs, shipped all five RTBs to the vendor for PM and refurbishment (to be completed prior to starting up from the February 2007 forced outage), and performed required PMs on the accessible RTB cell assemblies.

Through review of corrective action documents, vendor manuals, procedures, and interviews with engineers, the inspectors determined that the licensee (1) previously identified RTBs which had exceeded the vendor recommended cycles prior to maintenance; (2) experienced other breaker failures; and (3) previously identified concerns with vendor manual controls; however, the corrective actions for these issues were either non-existent or ineffective. Specifically:

- In late 1999, during PM activities, the licensee found one breaker (S/N 850.027-01) had exceeded the 200 cycles prior to maintenance. The breaker was sent to the vendor for refurbishment. (KAP 99-3726)

- In August 2001, the licensee identified that the same breaker (S/N 850.027-01) exceeded all three of the service requirement specified by the vendor which included: (a) exceeding the 12-month PM by 6 months; and (b) exceeding the UVTA service life of 2500 cycles, by 576 cycles; and exceeding the 200 cycles limit, before re-lubrication and testing, requirement by 99 cycles. The apparent cause for exceeding the vendor service requirements was documented as a lack of traceability caused by swapping the RTB into different cell locations without recording the serial numbers. (CAP 001771)

- In September 17, 2002, the Nuclear Oversight Assessment of VETIP program identified a Significant QA finding concerning VETIP process, procedure, backlog and missing manuals. (CAP012970)

- On July 8, 2005, the licensee identified one RTB (S/N 1-24Y7275B) exceeded the 200 cycles vendor recommended service life and was cycled 214 times without performing the PM per MPM-47-1. (CAP 028300)

- On December 16, 2005, licensee personnel were concerned that RTBs were routinely rotated from cubicle to cubicle causing a loss of configuration control. Several procedure change requests were issued in the last few years to revise the I&C monthly surveillances to include steps to document the RTB counter readings. However, this action was not completed. (CAP 030561)

- In April 26, 2006, operators manually tripped the reactor when the main turbine failed to trip as a result of a main feedwater pump trip. The licensee identified a misaligned linkage resulting in a malfunction of the mechanically operated contact

(MOC) switch assembly in a 4.16 kV breaker cubicle for a feedwater pump motor. The cause for this event was failure to incorporate into station procedures available internal and external operating experience pertaining to the 4.16kV switchgear (MOC) switch linkage assemblies. For this issue, a violation was issued in NRC IR 305/2006010, with a cross cutting aspect of problem identification and resolution. As part of the corrective action to this violation, the licensee was to perform an extent of condition to determine if other procedures used to conduct PM activities on breakers, including the RTBs, failed to incorporate and reflect the vendor specified and required maintenance activities.

- In October 2006, the plant was challenged during an unplanned plant shutdown due to issues with sub-components of a 4kV balance of plant breaker. The cause investigation identified weaknesses in the preventive maintenance procedures similar to those discovered during the April 2006 manual reactor trip. An inadequate extent of condition review was performed for this event.

Analysis: The inspectors determined that the failure to incorporate and effectively implement available internal and external operating experience into RTB maintenance activities and their associated cells was a performance deficiency and a finding. Specifically, RTB operability on demand could not be ensured if all specified maintenance activities were not performed in accordance with vendor specifications.

This issue was more than minor based on review of IMC 0612, “Power Reactor Inspection Reports,” Appendix E, “Examples of Minor Issues,” Examples 4.I because the licensee failed to ensure that the RTBs, and their associated cell assemblies, had been maintained in a continuous state of operational readiness by performing effective maintenance and surveillance activities in accordance with relevant vendor specifications and available operating experience. This finding affected the Initiating Events Cornerstone attribute of Equipment Performance. The issue was of very low safety significance based on a Phase 1 screening because the finding did not contribute to both the likelihood of a reactor trip and the likelihood that mitigation equipment or functions will not be available. A potential failure of a RTB may result in ATWS initiating event and does not contribute to a reactor trip.

This finding has a cross-cutting aspect in the area of Problem Identification and Resolution, Corrective Action Program because the licensee did not thoroughly evaluate similar previous breaker issues and did not perform adequate extent of condition reviews. Specifically, as described in the Description section, the licensee initiated several corrective action documents in response to identified issues; however, did not perform adequate evaluations of the conditions to address the cause or resolve the identified issue. (P.1.(c))

Enforcement: Title 10 CFR 50.65(a)(3) states, in part, that preventive maintenance activities shall be evaluated at least every refueling cycle and take into account, where practical, industry-wide OE.

Contrary to the above, from March 31, 2002, through February 7, 2007, the licensee had failed to incorporate the latest vendor and operational experience in performing preventive maintenance and component replacement activities on reactor trip breakers and their associated cell assemblies, thus ensuring breaker operation on demand.

Because this violation was not willful, was of very low safety significance, and was entered into the licensee's corrective action program as CAPs 041248, 04160V1, 041651, 041656, 041710, 041758, 041776, 041788, 042266, 042309, 042334, 042368, 042437, 042524, 042754, and 042757, this violation is being treated as an NCV consistent with Section VI of the NRC Enforcement Policy (NCV 05000305/2007006-15). The licensee corrected the identified deficient conditions. The licensee also planned to conduct an extent-of-condition for other safety-related breakers/cells and to re-evaluate existing OE.

(2) Acceptance Criteria Not Met Due to Failure to Follow Procedure

Introduction: The inspectors identified a finding and an associated NCV of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings,"having very low safety significance (Green) for failure to follow the preventative maintenance procedure, PMP-47-01, for the RTBs.

Discussion: The inspectors reviewed preventive and predictive maintenance program procedures for maintenance and surveillance testing activities on the RTBs and their cell assemblies. The inspectors identified that on May 22, 2006 during the performance of Procedure PMP-47-01, "RCP-Reactor Trip Breaker Electrical Maintenance." step 6.13.(e), maintenance technician recorded three trip bar force trials as 30 oz, 22 oz and 32 ounces when testing RTB S/N 850-027-1. The acceptance criteria for the trip bar force was 16 to 31 ounces. The procedure required the licensee to lubricate and retest the breaker until the acceptance criteria was met. Otherwise, the breaker needed repair. The inspectors identified that one of the three measurements recorded exceeded the acceptance criteria; however, no action was taken by licensee. Discussions with the licensee indicated that an average of the three values was used to determine if the acceptance criteria was met. The licensee initiated CAP 041727 to address this issue. In addition, the licensee removed the breaker from service and performed the surveillance to determine the as-found trip bar force. The inspectors observed portions of the test. The recorded trip bar values were in the acceptable range, however, the test conditions were radically different from the initial testing conditions in that the room temperature was much lower.

Analysis: The team determined that the licensee's failure to follow PMP-47-01 procedures was performance deficiency and a finding. This issue was more than minor based on review of IMC 0612, "Power Reactor Inspection Reports because the failure to follow the maintenance procedures affected the Initiating Events Cornerstone attribute of Equipment Performance. Specifically, not meeting the acceptance for the trip bar force impacted the reliability of the RBTs because excessive force could result in a failure to trip the breaker. The issue was of very low safety significance based on a Phase 1 screening because the finding did not contribute to both the likelihood of a reactor trip and the likelihood that mitigation equipment or functions will not be available. A potential failure of a RTB may result in ATWS initiating event and does not contribute to a reactor trip.

This finding has a cross-cutting aspect in the area of Human Performance, Work Practices because the licensee did not perform an adequate peer check of the surveillance results.

Specifically, several individuals including the person performing the task did not identify that the RTB trip bar force exceeded the acceptance criteria. (H.4.(c))

Enforcement: Title 10 CFR 50, Appendix B, Criterion V, “Instructions, Procedures, and Drawings,” states, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings.

Procedure PMP-47-01, “RCP-Reactor Trip Breaker Electrical Maintenance,” step 6.13.(e), stated the acceptance criteria for the trip bar force was 16 to 31 ounces. If the acceptance criteria is not met, the procedure further required the licensee to lubricate and retest the breaker until the acceptance criteria was met. Otherwise, the breaker needed repair.

Contrary to the above, on May 22, 2006 during the performance of PMP-47-01, maintenance technician recorded a trip bar force of 32 ounces when testing RTB-S/N-850-027-1, which exceeded the acceptance criteria; however, no further actions were taken.

Because this violation was not willful, was of very low safety significance, and was entered into the licensee’s corrective action program as CAPs 041727 and 41651, this violation is being treated as an NCV consistent with Section VI.A of the NRC Enforcement Policy (NCV 05000305/2007006-16). The licensee retested the breaker and placed a hold on the maintenance procedure to clarify the acceptance criteria.

.3.7 Refueling Water Storage Tank (RWST) Level Instrumentation

a. Inspection Scope

The inspectors reviewed calculations, drawings, and operating procedures associated with the RWST, its level instruments and its level alarms. The inspectors assessed the tank's volume, capacity, levels, and setpoints with respect to suction by the SI, residual heat removal (RHR), and internal containment spray (ICS) pumps. The inspectors reviewed flow rates at different tank levels, operator actions required at 37 precent, 10 percent and 4 percent level, as well as time allotted for the operator actions. The inspectors assessed the adequacy of pump suction with respect to vortex limits and air entrainment and compared instrument uncertainties, engineering requirements, and operating procedures.

b. Findings

.1 RWST Level Instruments May Not Protect SI and RHR Pumps From Excessive Air Entrainment

Introduction: The inspectors identified a finding having very low safety significance (Green) and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, “Design Control.” Specifically, the licensee failed to incorporate the results of design calculations with respect to minimum RWST level and transfer of suction sources into the appropriate emergency operating procedures. The problem was identified before May 2005, and was still not resolved at the time of the inspection.

Description: The inspectors noted that calculation 0065-0014-cbs-1, “Minimum Required Submergence of ECCS Pump Suction Nozzles in RWST,” identified that the minimum required submergence was an actual tank water level of 2.17 percent. The tank level indication had a 3.6 percent uncertainty; therefore, an indicated 4 percent level could correspond to an actual level of 0.4 percent which is significantly lower than the calculated minimum level. A control room annunciator will alarm at 4 percent level; however, the instrumentation that feeds into this alarm has a 1.64 percent uncertainty. Therefore, the actual water level could be as low as 2.36 percent water level. In accordance with this calculation, as long as the operators stopped the pumps when the alarm was received, the pumps would not experience excessive air entrainment. Calculation C10996, “NPSH [net positive suction head] (Available) to the RHR, SI, and ICS Pumps When Drawing Suction form the RWST,” confirmed that the RWST 4 percent level alarm was acceptable as long as suction from the tank was stopped upon receipt of the Lo-Lo Level alarm.

The inspectors reviewed the applicable emergency operating procedures and other pertinent documents and identified the following concerns:

- Procedure ES-1.3, “Transfer to Containment Sump Recirculation,” dated May 18, 2006, directed operators to check that RWST level was less than or equal to 4 percent, and then stop all pumps taking suction from RWST. As stated in calculation C10996, stopping the pumps at an indicated level of 4 percent (actual level as low as 0.4 percent) could result in excessive air entrainment. The licensee responded that the procedure also included a caution that any pumps taking suction from the RWST should be stopped upon Lo-Lo Level alarm at 4 percent. However, the inspectors determined that having this caution, and having the statement “Check RWST Level - Less than or equal to 4 percent,” in Section 20 of the procedure was confusing to the operators, especially because the procedure also stated “Do NOT continue in this procedure until RWST level is less than or equal to 4 percent.” Then, the operators were directed to stop all pumps taking suction from RWST.

- Procedure ECA-1.1, “Loss of Emergency Coolant Recirculation,” June 21, 2005, also had the specific requirement to “Check RWST level - LESS than 4 percent, and only then, directs the operators to “Stop pumps taking suction from RWST.” This procedure did not have the caution to act upon the 4 percent level alarm. If the operators followed this procedure, the pumps could have excessive air entrainment. The licensee responded that the operators were trained to act on the first received indication.

- Based on the results of Calculation 404, “Kewaunee Tank Level EOP Setpoints,” Revision 0, the licensee determined that swapping suction from the RWST to the sump needed to be complete within 21.2. minutes. The inspectors questioned the validity of the 21.2 minutes based on the inaccuracies associated with the level instruments. The licensee recalculated the time required to complete the actions to 8.7 minutes, significantly lower than 21.2 minutes. The licensee also noted that the operators had performed these actions in 7.0 minutes and in 5.8 minutes.

- Because of the 3.6 percent uncertainty, the inspectors determined that the operators may stop all suction from the RWST when the level indicator shows 4 percent but the actual level could be as high as 7.6 percent. The inspectors noted that the licensee previously attempted to change the level from 4 percent to 6 percent, but abandoned this solution because 6 percent ignored the 4 percent level used in other calculations and safety analyses. The inspectors identified that the licensee did not consider the indicated level of 4 percent (which could be 7.6 percent actual level) could also exceed the values used in those calculations and analyses.

In response to the inspectors' concerns, the licensee initiated several CAPs including: (1) CAP 41927 to identify that no corrective action was initiated for changing the alarm setpoint; (2) CAP 042129 to address why instrument uncertainties for RWST level instrumentation were not considered when determining the time available for transferring to containment sump recirculation; (3) CAP 042318 to assess the adequacy of calculation 0065-0014-cbs-1; and (4) PCR 030063 to revise the emergency procedures and the associated basis documents to return to the 4 percent and 10 percent RWST level setpoints (affected procedures are ES-1.3, ECA-1.1, ECA-1.3, and FR-Z.1); and (5) Corrective Action CA030098 was issued to require that the 21.2 minutes allotted for operator actions be changed to 8.7 minutes. However, by the end of this inspection, some of these actions were retracted because the licensee may consider other solutions such as installing more accurate gauges or revising all affected calculations.

The inspectors also reviewed several corrective action documents and determined that the licensee was aware of the discrepancy between indicated level, alarm level, and procedure direction. The inspectors concluded that since May 5, 2005, the actions taken to address this issue were ineffective and indicative of lack of rigor in engineering and a weak interface with operations. Specifically:

- In May 2005, the licensee was aware that responding to tank level indication could result in excessive air in the suction piping of the SI, RHR, and ICS pumps. In April 2006, the licensee issued CAP 032653 to document that the error associated with the RWST level instrument was not taken into account in numerous calculations including accident analyses and emergency operating procedures (EOP) setpoints.

- In November 2006, the licensee issued CAP 039039 to document that acting upon the level instrument is unacceptable. The CAP had two recommendations. 1) revise procedures to change 4 percent to 6 percent, and 2) change the Lo-Lo Level alarm from 4 percent to 6 percent. A procedure change request (PCR 027962) was initiated to require operator action at 6 percent <u>indicated</u> level and Calculation number 404, "Kewaunee Tank Level EOP Setpoints," Rev. 0, was completed to support the procedure change. No action was taken to address the alarm setpoint.

- In January 2007, CAP 040650 was issued, stating that the new revision to ES-1.3 did not consider impact on other calculations and safety analysis. Apparent Cause Evaluation AC 003367 was initiated and identified many calculations which used the 4 percent and 10 percent levels originally specified but were not considered when the procedure change was initiated. The licensee also identified that no corrective action was generated to change the setpoint of the RWST Lo-Lo Level alarm. However, the licensee did not address this fact until prompted by inspectors questioning in February 2007.

Analysis: The inspectors determined that failure to incorporate the results of design calculations with respect to minimum RWST level and transfer of suction sources into the appropriate emergency operating procedures was a performance deficiency and a finding because the failure resulted in the potential to damage all pumps taking suction from the RWST. The inspectors further determined that the issue was within the licensee's ability to foresee and correct, and that it could have been prevented because the problem was known for almost two years and numerous CAPs were written attempting to resolve the problem.

The inspectors determined that the performance deficiency was more than minor in accordance with IMC 0612, Appendix E, Example 3k because the existing margin was already low and as a consequence, the large error associated with the level instrument resulted in eliminating the entire margin, and jeopardized the functionality of the pumps taking suction from the RWST due to excessive air entrainment. This performance deficiency impacted the Mitigating Systems Cornerstone objective of ensuring the capability of the Safety Injection and RHR pumps to perform their safety function.

The inspectors performed a IMC 0609, Appendix A, Phase 1 screening. The finding screened as Green because it did not represent an actual loss of function, although it did cause degradation of the function; did not represent an actual loss of a system safety function; did not result in exceeding a TS allowed outage time; and did not affect external event mitigation.

This finding has a cross-cutting aspect in the area of problem identification and resolution associated with the corrective action program because the licensee did not thoroughly evaluate problems such that the resolution addresses the extent of condition. Specifically, the licensee failed to incorporate the minimum RWST level into the appropriate emergency operating procedures because the licensee’s evaluation of this identified problem lacked sufficient depth, were not sufficiently comprehensive, and failed to address all the elements of the problem; hence, jeopardized the functionality of the SI and RHR pumps taking suction from the RWST (P.1.c).

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, “Design Control,” requires, in part, that measures be established to assure that applicable regulatory requirements and the design basis, as defined in § 50.2 and as specified in the license application, for those structures, systems, and components to which this appendix applies are correctly translated into specifications, drawings, procedures, and instructions. Design bases means that information which identifies the specific functions to be performed by a structure, system, or component of a facility, and the requirements derived from analysis (based on calculation and/or experiments) of the effects of a postulated accident for which a structure, system, or component must meet its functional goals

Contrary to the above, as of March 2, 2007, the licensee failed to correctly translate the requirements of engineering calculations 0064-0014-cbs-1 and C10996 to operating procedures ES-1.3, ECA-1.1, ECA-1.3, and FR-Z.1. Specifically, the licensee failed to revise the emergency procedures to reflect the calculated minimum required submergence needed to prevent excessive air entrainment into the suction of the SI and RHR pumps was an actual tank water level of 2.17 percent

The licensee entered the finding into their corrective action program as CAPs 041927, 042129 and 42318. Because this violation was not willful, was of very low safety significance, and was entered into the licensee's corrective action program, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000305/2007006-17(DRS)).

.3.8 Containment Fan Cooling

a. Inspection Scope

The inspectors reviewed the heat removal capacity of the containment fan coil units (CFCUs), design conditions, including air temperature and the density of the air-steam mixture following a large break LOCA, heat exchanger drawings, flow of service water and motor capacity to drive the air-steam mixture through the units' coils. The inspectors also reviewed the current drawn by the motors, the current that will be drawn under degraded voltage and the over-current trip setpoint. The inspectors reviewed engineering calculations, heat exchanger specification data sheet, conformance to Generic Letter 96-06 that included two-phase flow and water hammer events, testing methodology, set-up of test instrumentation, testing frequency, trending of test results, and computer program used to assess the heat exchangers' heat removal rate.

b. Findings

.1 Loss of Coolant Environment Improperly Considered in Containment Fan Coil Unit Calculation

Introduction: The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion XI, “Test Control,” having very low safety significance (Green) because the licensee failed to use the correct data when determining the most limiting conditions on the safety related motors of the CFCU. Specifically, the engineers failed to use the combination of the greatest density of the air-steams mixture following a LOCA with the greatest flow rate attributed to the fans by testing. As a result, the licensee was not aware that post LOCA, the motors will be operating at 113 percent of their continuous design rating, drawing 13 additional kW from each diesel generator.

Description: The inspectors reviewed design calculations for the containment fan coil units and determined that the licensee did not use the correct data when determining the most limiting conditions for the safety related motors. Specifically, the most limiting conditions under which the motors of the containment fan coil units may operate are associated with post LOCA conditions combined with the greatest possible flow rate of service water (1200 gpm), as well as service water temperature of 33 ºF and a clean cooler (zero fouling factor). At these conditions the density of the air-steam mixture will be greatest (about 0.184 lb/cubic ft). When combined with the high flow rate of 66,000 cubic feet per minute attributed to the fans by testing, the inspectors determined that the motors would operate at 13.5 percent above their continuous design rating. This will cause the motors to draw more current, and under degraded voltage conditions, the motors will draw up to 183.5 amperes. Since the motors are located immediately downstream of the 268ºF air-steam mixture, the operation at 113.5 percent of their continuous design rating, for up to 40 minutes was not within the rated performance of the motors. Following discovery, the licensee issued CAPs and evaluated the capability of the motors to operate under these conditions and found them acceptable. The licensee also evaluated the motors' over-current setpoint trip and found it set at 195 amperes (>183.5 amperes).

Operation of the fans above their design rating also impacted a current operability evaluation for the EDGs. Specifically, as documented in Licensee Event Report 2006-004-01, "Incorrect Assumption Regarding De-Rating of EDGs During Loaded Operation," the licensee developed Operability Determination OD-151 which assessed the EDG loading and determined parameters under which the EDGs remained operable. Because the fans would draw an additional 13 kW from each EDG, the licensee reassessed EDG operability and established a new, more restrictive set of parameters to maintain EDG operability.

Analysis: The inspectors determined that failure to properly assess the limiting conditions under which the CFCUs would operate was a performance deficiency and a finding, because the failure under estimated the work that would be done by the motors, underestimated the power that would be drawn by the motors, overestimated the margin to failure of CFCUs, and overestimated the margin between the current drawn and the over-current trip setpoint.

The inspectors determined that the finding was more than minor in accordance with IMC 0612, "Power Reactor Inspection Reports," Appendix E, "Examples of Minor Issues," Examples 3j because the errors had more than a minimal effect on the outcome of the calculation, considerably impacting the available margin of the system such that further evaluation needed to be performed in order to demonstrate that the equipment could perform its safety function. Specifically, because the assumed power drawn by the motors was significantly less and the existing margin was low, the error resulted in a significant reduction in margin. Although, by the end of the inspection, the licensee was able to demonstrate operability; at the time of discovery there was reasonable doubt on the operability of the fans and the impact on the EDGs. This finding impacted the Barrier Integrity Cornerstone objective of ensuring the capability of the safety related CFCUs to fulfill their safety function as well as the capability of the emergency diesel generators to supply the required power to the CFCU's motors.

The inspectors performed a IMC 0609, Appendix A, Phase 1 screening. The finding screened as Green because it did not represent an actual open pathway in the physical integrity of reactor containment, or involve an actual reduction in defense-in-depth for the atmospheric pressure control or hydrogen control functions of the reactor containment.

The inspectors determined that there was not a cross-cutting aspect to this finding.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that measures be established to assure that applicable regulatory requirements and the design basis, as defined in § 50.2 and as specified in the license application, are correctly translated into specifications, drawings, procedures, and instructions. This includes information which identifies the specific functions to be performed by a structure, system, or component of a facility, and the specific values or ranges of values chosen for controlling parameters as reference bounds for design. These values may be requirements derived from analysis of the effects of a postulated accident for which a structure, system, or component must meet its functional goals.

Contrary to the above, as of March 2, 2007, the licensee did not correctly translate design parameters into specifications. Specifically, the licensee did not adequately assess the CFCU operation under the most limiting conditions. The motors of the fan coil units were evaluated for operation at milder conditions than those expected following a Loss of Coolant Accident.

The licensee entered the finding into their corrective action program as CAPs 41566, 42047, and 42219. Because this violation was not willful, was of very low safety significance, and was entered into the licensee's corrective action program, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000305/2007006-18 (DRS)).

.3.9 Service Water Strainers

a. Inspection Scope

The inspectors reviewed the assumptions relative to the service water strainers that were used in the service water system flow model calculations. The inspectors reviewed strainer hole sizing effect upon downstream components. The inspectors reviewed operating procedures associated with the service water strainers. The inspectors reviewed the maintenance procedure for inspection of the service water strainers. In addition, the inspectors reviewed CAPs relating to the service water strainers.

b. Findings

.1 Non-Conservative Assumption Used in Service Water Flow Model Calculation

Introduction: The inspectors identified a finding of very low safety significance (Green) and an associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," involving a service water system flow model calculation. Specifically, the licensee failed to appropriately account for service water strainer plugging in the service water system flow model.

Description: The licensee performed flow testing of the service water system in 2001. Calculation C11344, "2001 SW [service water] System Flow Test," Revision 0, performed on November 24, 2001, used the results of the flow tests performed for development of the service water system flow model. The results were used by other evaluations as a basis to demonstrate operability of the service water system. For evaluation of the flow test results, the licensee modeled the strainer for one of two pumps in a train as being plugged with a differential pressure across the strainer of 12 pounds per square inch - differential (psid). The licensee had based the 12 psid on the assumption that operators would take action to clean the strainers after an alarm (which would occur at a nominal 8 psid differential pressure) had been received in the control room. The inspectors considered the licensee's assumptions for modeling a plugged strainer to be reasonable. However, the strainer for the other pump in the train was modeled as clean with a differential pressure across the strainer of only 1.18 psid. When questioned, the licensee engineering staff were unable to provide a basis for modeling one of the strainers as being clean.

The inspectors noted that each service water pump in a train had a single strainer downstream of the pump. Plugging of the strainers from lake debris would result in a greater differential pressure across the strainers, lower service water header pressure, and lower service water system flow. The inspectors noted that the backwash for the strainers came on at a nominal 5 psid across the strainers (not accounting for instrument uncertainties). However, the backwash for the strainers was non-safety related and, as such, could not be credited under accident conditions.

During the inspection, the licensee performed informal service water system flow model calculations to determine the impact of the strainer modeling upon system operability. The most limiting component in the service water system was the "A" CFCU which required 38.7 pounds per square inch - atomospheric (psia) back pressure to prevent flashing of water within the CFCU under accident conditions. Assuming one strainer cleaned, the licensee had calculated the available back pressure was 42.79 psia. The impact of assuming both strainer plugged was not apparent; therefore, additional calculations were necessary. The licensee informal calculation determined that the "A" CFCU would have 39.91 psia back pressure when both strainers were modeled as being plugged with a differential pressure of 12 psid across the strainers. This represented a significant reduction of margin.

Analysis: The inspectors determined that the failure to appropriately account for service water strainer plugging in the service water system flow model was a performance deficiency and a finding because the failure to ensure adequate system pressure and flow would be available could result in a loss of function of safety-related components during an accident. The inspectors further determined that the issue was within the licensee's ability to foresee and correct, and that it could have been prevented because the licensee had performed the calculation in 2001 and had partially recognized the need to account for strainer plugging at that time.

The inspectors determined that the finding was more than minor in accordance with IMC 0612, Appendix E, Example 3j, because the error had more than a minimal effect on the outcome of the calculation, considerably impacting the available margin of the system such that further evaluation needed to be performed in order to demonstrate that the service water system could perform its safety function. Although by the end of the inspection, the licensee was able to demonstrate operability; at the time of discovery, there was reasonable doubt on the operability of the service water system. Therefore, this performance deficiency impacted the Mitigating Systems Cornerstone objective of ensuring the capability of the service water system under accident conditions.

The inspectors screened the finding using IMC 0609, Appendix A. The finding screened as Green because it did not represent an actual loss of function, although it did cause degradation of the function; did not represent an actual loss of a system safety function;

did not result in exceeding a TS allowed outage time; and did not affect external event mitigation.

The inspectors determined that there was not a cross-cutting aspect to this finding.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III,"Design Control," requires, in part, that design control measures provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program. Contrary to the above, as of November 24, 2001, the licensee's design control measures failed to verify the adequacy of the design, in that, the methodology and design inputs used in licensee calculations failed to appropriately account for service water strainer plugging. Specifically, the inspectors identified that the licensee had assumed that one of two service water strainers in a train would be clean without a technical basis for the assumption. When this issue was identified, the licensee placed this issue into their corrective action program under CAP 041661. The licensee planned to formally revise their service water system flow model to reflect plugging of both strainers in a train. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program, this violation is being treated as an NCV, consistent with Section VI.A of the NRC Enforcement Policy. (NCV 05000305/2007006-19 (DRS)).

.3.10 Service Water Pumps

a. Inspection Scope

During field walkdown the inspectors noted that the exhaust fan was wind-milling due to the dampers failing to close properly. The inspectors reviewed the functions of the dampers and verified if the licensee had included the screen-house ventilation dampers within the structures, systems, and components (SSCs) monitored under the maintenance rule (10 CFR 50.65) to determine if the closing function was monitored under the maintenance rule. The inspectors examined the design circuitry of the screen-house dampers, corrective action documents issued for the Screen-house dampers and corrective and preventive maintenance on the dampers to assess the effect on service water operability after an SBO event.

b. Findings

.1 Inadequate Screen-House Ventilation Damper Maintenance

Introduction: The inspectors identified an NCV of 10 CFR Part 50.65 (b)(2) having a very low safety significance (Green), for the licensee’s failure to scope the closing function of the screen-house ventilation dampers into the monitoring program. Specifically, the dampers failing to close could prevent maintaining internal screen house temperatures $\geq$ 60 °F, with outside temperatures down to -20 °F; thereby, preventing the safety-related service water system from fulfilling its function after an SBO coping period due to freezing.

Description: During a walkdown of the screen-houses on January 29, 2007, the inspectors noted that the ventilation exhaust dampers did not close and the exhaust fans were windmilling backwards. The room temperature was distinctly cool due to the cold air blowing through the room with a moderate West wind and a 28°F outside temperature. The dampers open to a pre-set minimum when the exhaust fan starts and modulates to full open on high temperatures. The dampers also have a function to close, when the exhaust fans are not required, to prevent excess cooling of the screen-house. The Environmental Qualification Plan from the Project Design Manual listed the Winter design value as $\geq$ 60°F internally with outside temperatures down to -20°F and any wind conditions.

The inspectors verified that the licensee had included the ventilation dampers within the SSCs monitored under the maintenance rule (10 CFR 50.65); however, the closing function was not monitored under the rule. The licensee informed the inspectors that the screen-house ventilation dampers were not safety-related; however, the dampers support the operation of the emergency diesel generator and service water systems. The inspectors examined the design circuitry of the screen-house dampers and verified that the dampers failed open on a loss of power. The inspectors were concerned that a loss of off-site power would expose the screen-house to outside temperatures with no mitigating heat source. This condition could exist during the 4-hour coping period for a SBO. After further review, the licensee stated that components in the SW system could freeze during an SBO coping period when starting from cold screen-house conditions and documented this in CAP 042281 on February 28, 2007.

The inspectors reviewed corrective action documents related to the Screen-house dampers and determined that the dampers had been severely degraded since 1993. Numerous CAPs had been written, a request to develop a Screen-house Ventilation Model had been made, and several WOs had been generated. However, no repairs had been accomplished until March 2, 2007.

Analysis: The inspectors concluded that the failure to scope the closing function of the screen-house ventilation dampers into the monitoring program was a performance deficiency and a finding. This finding was more than minor in accordance with IMC 0612, Appendix E, "Examples of Minor Issues," Example 7d because the licensee had not included the closing function of the screen-house ventilation dampers within the scope of its Maintenance Rule and the dampers' performance problems were such that effective control of performance or condition through appropriate preventive maintenance under (a)(2) could not be demonstrated. Due to the extremely degraded condition of the closing function of the ventilation dampers, the screen house internal temperature may not be maintained at the design $\geq$60°F at outside temperatures down to -20°F. The finding was associated with the Mitigating Systems cornerstone attribute of equipment performance and affected the cornerstone objective of ensuring the reliability of systems that respond to initiating events.

The issue was of very low safety significance based on a Phase 1 screening in accordance with IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations." The finding did not represent an actual loss of function, although it did cause degradation of the function; did not represent an actual loss of a system safety function; did not result in exceeding a TS allowed outage time; and did not affect external event mitigation.

The inspectors did not identify a cross-cutting aspect to this finding.

Enforcement: Title 10 CFR 50.65 (b)(2) requires in part, that the scope of the monitoring program specified in Paragraph (a)(1) include non-safety related SSCs whose failure can prevent safety-related SSCs from fulfilling their safety-related function.

Contrary to the above, as of March 2, 2007, the closing function of the screen-house ventilation dampers was not included in the scope of the monitoring program specified in 10 CFR 50.65 (a)(1). The inclusion of the closing function was necessary because the failure of that function could cause the internal room temperature to be much lower than design during periods of extreme cold weather and wind conditions. The room cold temperature could prevent the service water system, a safety-related system, from fulfilling its safety-related function after an SBO coping period. The licensee entered the finding into their corrective action program as CAP 042281. Because this violation was not willful, was of very low safety significance, and was entered into the licensee's corrective action program, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000305/2007006-20 (DRS)).

.3.11 Component Cooling Water Pumps

a. Inspection Scope

The inspectors reviewed calculations which demonstrated that the component cooling water (CCW) pumps would provide adequate flow and that pumps would have adequate net positive suction head. The inspectors reviewed procedures and test results for inservice testing of the pumps. The inspectors reviewed calculations demonstrating that adequate room cooling existed for the pumps. The inspectors reviewed piping diagrams and performed walkdowns of portions of the CCW system surge tank line to verify that it would not be susceptible to damage from a high energy line break. The inspectors reviewed CAPs relating to the component cooling water pumps. In addition, the inspectors performed walkdowns to assess the material condition of the pumps.

b. Findings

.1 Non-Conservative Assumption Used for ‘B’ CCW Pump Room Heat Gain Calculation

Introduction: The inspectors identified a finding of very low safety significance (Green) and associated NCV of 10 CFR Part 50, Appendix B, Criterion III, for the failure to account for CCW piping temperatures as high as 176°F in the CCW “B” pump room and the impact upon the temperature in the CCW “B” pump room for calculation.

Description: The inspectors reviewed calculation C11156, “Auxiliary Building Mezzanine Post Accident Area Heat Gain,” Revision 1, performed on June 23, 2006, to assess the room cooling capability to support CCW pump operation. The calculation evaluated overall heat gain for the mezzanine area of the auxiliary building at the equipment environment qualification limit of 120 degrees Fahrenheit (°F). Revision 1 to calculation C11156 had calculated 152,844 Btu/hr as the amount of heat which was needed to be removed from the mezzanine area of the auxiliary building. The CCW pumps and heat exchangers were located in the mezzanine area of the auxiliary building. However, the calculation did not specifically account for the “B” CCW pump room which was a room within the mezzanine area of the auxiliary building. Supply ventilation from the auxiliary building fan coil unit's (FCU) was provided to the "B" CCW pump room along with exhaust path through a normally open fire damper which communicated with the rest of the mezzanine area.

The inspectors noted that calculation C11156 established the return CCW piping temperature as 128°F which was not consistent with the CCW system fluid temperatures used in accident analyses. Specifically, calculation C11546, "Containment Integrity and Long Term Cooling Analysis for 7.4 percent Power Uprate," Revision 1, determined that the return CCW fluid temperatures would be 176°F. Based on discussions with the preparer of the heat gain calculation, calculation C11156, the inspectors determined that the primary reason for the difference in temperatures was that calculation C11156 assumed that heat would be removed from both CCW heat exchangers whereas the power uprate calculation, calculation C11546, assumed that heat would be removed from only one heat exchanger due to the postulated loss of one train of equipment. Since the heat gain calculation, calculation C11156, also accounted for the heat loads from both trains of equipment operating, the heat gain calculation methodology may have been acceptable for the open areas of the auxiliary building mezzanine area. However, the assumption that heat would be removed from both CCW heat exchangers was non-conservative for the "B" CCW pump room. Under design basis accident conditions with a postulated loss of off-site power and failure of the "A" diesel generator, heat would only be removed from the "B" CCW heat exchanger thereby resulting in CCW fluid temperatures much higher than 128°F (i.e., about 176°F based on the power uprate calculation, calculation C11546). As the "B" CCW pump room contained primarily CCW return piping, a CCW pump, and a non-safety related (and non-credited) room cooler, the heat gain from the CCW return piping due to higher fluid temperatures would be significant. The inspectors was also concerned that the licensee failed to evaluate this licensing basis scenario which could result in room temperatures significantly higher than 120°F.

The original version of the heat gain calculation, calculation C11156, Revision 0, had established a value of 244,566 British thermal units per hour (Btu/hr) of heat which was needed to be removed from the area. The 244,566 Btu/hr value had been incorporated into the auxiliary building mezzanine FCU surveillance tests, procedure PMP-17-11, "ACA - Auxiliary Building Mezzanine Fan Coil Unit Performance Monitoring and Cooling Coil Inspection and Flushing (QA-1)," Revision E, as an acceptance criteria for FCU performance. However, recent testing had demonstrated that the "B" auxiliary building mezzanine FCU could not meet the 244,566 Btu/hr acceptance criteria while maintaining the area at its design equipment qualification temperature. Specifically, CAP 041445, "Auxiliary Building Mezzanine FCU B Failed Performance Monitoring," documented the heat removal capability of the FCU as 224,880 Btu/hr versus the 244,566 Btu/hr acceptance criteria. The licensee evaluated the as-found condition and determined that the "B" FCU performance was acceptable based on the 152,844 Btu/hr heat removal needs calculated by Revision 1 of the heat gain calculation, C11156. As described above, the inspectors were concerned that revision 1 of calculation C11156 underestimated the amount of heat which was needed to be removed from the area.

When this issue was brought to the attention of the licensee, the licensee attempted to locate an analysis which evaluated the heat loads for the "B" CCW pump room. However, the licensee was unable to locate such an analysis. The licensee initiated CAP 042314, "No evaluation of required cooling airflow to the B CCW Pump room could be found," February 28, 2007, and performed an operability determination. The licensee based the operability, in part, on the relatively cool lake temperatures which existed at the time of the inspection due to the winter season. The relatively cool lake temperatures would ensure that the service water used by the FCU's could remove more heat than what could be removed at higher service water temperatures experienced during the summer. The licensee planned to perform a more thorough evaluation prior to elevated lake temperatures being approached during summer. The inspectors considered the licensee's operability determination to be reasonable given that the FCU performance was within 92 percent of the original acceptance criteria and the original acceptance criteria had been conservatively calculated.

Analysis: The inspectors determined that the failure to account for CCW piping temperatures as high as 176°F in the CCW "B" pump room and the impact upon the temperature in the CCW "B" pump room for calculation was a performance deficiency and a finding. The inspectors further determined that the issue was within the licensee's ability to foresee and correct, and that it could have been prevented because the impact of CCW piping temperatures on area temperatures was specifically evaluated in calculation C11156, Revision 1, which was performed in June 2006.

The inspectors determined that the performance deficiency was more than minor in accordance with IMC 0612, Appendix B, "Issue Screening," issued November 2, 2006, because, if left uncorrected, the finding would become a more safety significant concern. Specifically, the licensee had used the non-conservative value calculated by calculation C11156, Revision 1, as a basis for operability of the auxiliary building mezzanine "B" FCU. In addition, the licensee had planned to use to use the non-conservative value as an acceptance criteria for the auxiliary building mezzanine "B" FCU surveillance procedure. The use of a non-conservative value as a basis for operability could allow the "B" FCU performance to degrade to unacceptable levels without being detected and corrected.

The inspectors screened the finding using IMC 0609, Appendix A. The finding screened as Green because it did not represent an actual loss of function, although it did cause degradation of the function; did not represent an actual loss of a system safety function; did not result in exceeding a TS allowed outage time; and did not affect external event mitigation.

This finding has a cross-cutting aspect in the area of human performance associated with decision making because the licensee did not use conservative assumptions. Specifically, the licensee failed to account for higher CCW piping temperatures because the licensee did not model the CCW room properly and did not use the maximum expected temperature under accident conditions when revising calculation C11156 (H.1.b).

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

Contrary to the above, as of June 23, 2006, the licensee's design control measures failed to verify the adequacy of the design, in that the methodology and design inputs used in licensee calculations failed to include significant factors that affected room temperatures for the “B” CCW pump room. Specifically, the licensee failed to account for CCW piping temperatures as high as 176°F in the CCW “B” pump room and the impact upon the temperature in the CCW “B” pump room for calculation C11156, Revision 1. This failure resulted in a non-conservative value being used as an acceptance criteria for determining operability of an auxiliary building FCU. When this issue was identified, the licensee placed this issue into their corrective action program under CAP 042314 and performed an operability evaluation to justify operability of the FCUs. Operability, at the time of the inspection, was based, in part, upon the relatively low lake temperatures associated with winter. The licensee planned to perform a more thorough evaluation prior to elevated lake temperatures associated with summer being experienced. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program, this violation is being treated as an NCV, consistent with Section VI.A of the NRC Enforcement Policy (NCV 05000305/2007006-21)

.3.12 High Pressure Safety Injection Pumps

a. Inspection Scope

The inspectors reviewed analyses, operating procedures, test procedures, and test results associated with the operation of the safety injection pumps. The evaluation considered both test and accident conditions. The analyses included hydraulic performance, RWST vortex limits, transfer to sump recirculation mode, net positive suction head, and minimum flow. The inspectors reviewed piping and instrumentation diagrams, pump line up, pump capacity, and ability to withstand air entrainment. The inspectors also reviewed the pump's lube oil cooler, including test methodology, compliance with GL 89-13, test acceptance criteria and overall capability to remove the heat from the pump's lube oil.

The inspectors reviewed analyses, operating procedures, test procedures, and test results associated with the operation of the safety injection pumps. The evaluation considered both test and accident conditions. The analyses included hydraulic performance, RWST vortex limits, transfer to sump recirculation mode, net positive suction head, and minimum flow. The inspectors reviewed piping and instrumentation diagrams, pump line up, pump capacity, and ability to withstand air entrainment. The inspectors also reviewed the pump's lube oil cooler, including test methodology, compliance with GL 89-13, test acceptance criteria and overall capability to remove the heat from the pump's lube oil.

b. Findings

.1 Safety Injection Pump Lube Oil Coolers Testing Deficiencies

Introduction: The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion XI, “Test Control,” having very low safety significance (Green) for failure to implement an effective test program to ensure that the safety related SI pumps lube oil coolers are capable of performing their safety function. Specifically, neither the test method, nor the acceptance criteria used, nor the test results were acceptable for determining operability of the SI lube oil coolers. This resulted in heat exchangers whose heat removal capability was unknown.

Description: In a letter to the NRC dated January 29, 1990, “Response to Generic Letter 89-13,” the licensee committed to install instrumentation and conduct a performance test on nearly all the safety related heat exchangers cooled by open cycle service water. The licensee added an exception stating that the only safety related heat exchangers that were not instrumented (temperature and flow) were the safety injection pumps lube oil coolers. The licensee stated that in lieu of performance testing, a periodic maintenance and inspection program would be performed. Hence, the licensee committed to perform periodic inspections and maintain the coolers clean to assure sufficient heat removal capacity. This commitment was in accordance with the guidance provided by the NRC in the Generic Letter.

However, the inspectors determined that the licensee had not perform the inspection and maintenance program as committed, rather, the SI lube oil coolers were tested by measuring the differential pressure (dP) across the service water side of the cooler and results were adjusted for the flow rate. The inspectors determined that this testing practiced was inadequate because:

- Procedure PMP-33-11, “Safety Injection Pump Lube Oil Coolers Performance Monitoring,” established an arbitrary acceptance criterion with no basis to confirm that it passed the test, and that the heat exchanger would fulfill its safety function. The acceptance criterion was based on the square root of the ratio of the dP of a perfectly clean cooler to the dP of the tested cooler. The acceptance criterion was based on having a fouling layer that blocks not more than 10 percent of the tube's cross sectional area (this heat exchanger has only one tube). In an interview, the licensee confirmed that the conductivity of the fouling layer is unknown and therefore, the resistance of the fouling layer to transfer heat was unknown. Therefore, the capacity of the tested coolers to remove heat was unknown, and there was no assurance that they can fulfill their safety function.

- The dP test results appeared to have an unacceptably high measurement uncertainty. According to the equations developed to establish the acceptance criterion, a test must result in a performance factor lower than 1.0, because according to these formulas, only a perfectly clean heat exchanger can have factor equal to 1.0. The performance factor must also be greater than 0.9 or the heat exchanger would have failed the test. However, in 21 dP tests performed since January 26, 2005 (11 of the A cooler and 10 of the B cooler), the performance factors were greater than 1.0 and as high as 1.44. Having such high performance factors (e.g., 1.44) means that the measurement bias was so large that even a grossly fouled heat exchanger would have resulted in a performance factor greater than 0.9 and passed the test. During the inspection, the licensee attempted to account for a certain bias inherent in the dP and flow instruments and came up with performance factors as low as 0.8, well below the acceptance criterion of 0.9.

Therefore, the inspectors determined that the surveillance method, the acceptance criterion, and the results were inadequate to determine cooler capacity or operability.

The licensee issued CAPs 41257, 41283, 41327, 42299, 41200, and 41773 to address these issues. In CAP 042299, the licensee concluded that based on current Lake Michigan water temperature, the heat exchangers were operable. The licensee also issued PCR 029891 to develop a new procedure to quarterly back-flushing and inspection which will replace the dP testing method for the SI lube oil coolers. The licensee also back-flushed the two SI lube oil coolers during the inspection and inspected the discharged material.

Analysis: The inspectors determined that failure to choose a proper test method, combined with the failure to determine a proper acceptance criterion and the failure to account for the gross bias inherent in the test instruments was a performance deficiency and a finding, because the failure resulted in unknown heat removal capabilities of the SI lube oil coolers. The inspectors further determined that the issue was within the licensee's ability to foresee and correct, and that it could have been prevented because the NRC issued Generic Letter 89-13 describing the acceptable methods for conducting open cycle heat exchanger testing (or inspections) and because personnel responsible for developing acceptance criteria were directly involved in the conduct of the tests.

The inspectors determined that the performance deficiency was more than minor in accordance with IMC 0612, Appendix E, Example 2a and 4c because the spread of test results proved a gross bias, that when later assessed, the licensee realized that the coolers would have failed some of the tests with a performance factor less than the acceptance criterion of 0.9. As a result of the inspection, the licensee abandoned the surveillance program and initiated a different program to ascertain operability of the coolers. Therefore, this performance deficiency impacted the Mitigating Systems Cornerstone objective of ensuring the capability of the SI lube oil coolers to perform their safety function.

The inspectors performed a IMC 0609, Appendix A, Phase 1 screening. The finding screened as Green because it did not represent an actual loss of function, although it did cause degradation of the function; did not represent an actual loss of a system safety function; did not result in exceeding a TS allowed outage time; and did not affect external event mitigation.

This finding has a cross-cutting aspect in the area of problem identification and resolution associated with self- and independent assessments because the licensee a 2005 self-assessment was not comprehensive. Specifically, during a 2005 audit of licensing commitments, the licensee failed to identify that the commitment to perform inspection and maintenance of the SI lube oil coolers in accordance with the licensee's response to Generic Letter 89-13 was not kept (P.3.a).

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion XI, “Test Control,” requires, in part, that a test program shall be established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents, and that test procedures shall include provisions for assuring that all prerequisites for the given test have been met, that adequate test instrumentation is available and used, and that the test is performed under suitable environmental conditions.

Contrary to the above, as of March 2, 2007, the licensee failed to adequately conduct tests that demonstrate that the safety injection lube oil coolers would perform satisfactorily.

Specifically, the acceptance criterion for dP in procedure PMP-33-11 was not technically justified and subsequent test results did not demonstrate the SI lube oil coolers were capable of performing their safety function.

The licensee entered the finding into their corrective action program as CAPs 41257, 41283, 41327, 42299, 41200, and 41773. Because this violation was not willful, was of very low safety significance, and was entered into the licensee's corrective action program, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000305/2007006-22 (DRS))

.3.13 <u>Turbine Driven Auxiliary Feedwater Pump:</u>

a. <u>Inspection Scope</u>:

The inspectors reviewed various analyses, procedures, and test results associated with operation of the auxiliary feedwater pumps under transient, accident, and station blackout conditions. The evaluation considered test and accident conditions. The analyses included hydraulic performance, condensate storage tank vortex limits, net positive suction head, minimum flow, and the capability to trip the pump at low water level. Inservice testing (IST) results were reviewed to verify acceptance criteria were met and performance degradation would be identified. The inspectors reviewed piping and instrumentation diagrams, pump lineup, and pump capacity.

b. <u>Findings</u>

No findings of significance were identified.

.3.14 <u>Component Cooling Heat Exchanger</u>:

a. <u>Inspection Scope</u>:

The inspectors reviewed the CCW heat exchanger specifications and heat removal calculations to ensure that design basis heat removal requirements were met. The review included the service water and component cooling water flow rates, conformance to Generic Letter (GL) 89-13, testing methodology, test instrumentation set-up , testing frequency, trending of test results, and computer program used to assess the heat exchangers' heat removal rate as well as the projection of test results to design limiting conditions.

b. <u>Findings</u>

No findings of significance were identified.

.3.15 Motor Operated Valves (3 samples):

a. Inspection Scope:

The inspectors reviewed the FSAR, TS, component and system design basis documents, drawings, and other available design basis information, to determine the performance requirements of the selected components. The review included installed configuration, system operation, detailed design, system testing, equipment and environmental qualification, equipment protection, component inputs and outputs, operating experience, and component degradation to verify that the selected components would function as required and support proper operation of the associated systems. The inspectors reviewed the following motor operated valves (MOVs) (3 samples):

- MOV SI-9A: The inspectors reviewed thrust calculations, weak link analysis calculations, and required thrust calculations.

- MOV CVC-301: The inspectors reviewed thrust calculations, weak link analysis calculations, and required thrust calculations. In addition, the inspectors reviewed valve stroke test results.

- MOV SW-601A: The inspectors reviewed thrust calculations, weak link analysis calculations, and required thrust calculations. In addition, the inspectors reviewed valve stroke test results.

b. Findings:

No findings of significance were identified.

.4 Operating Experience

a. Inspection Scope

The team reviewed seven operating experience issues (5 samples) to ensure that NRC generic concerns had been adequately evaluated and addressed by the licensee. The operating experience issues listed below were reviewed as part of this inspection effort:

- Bulletin 88-04,Potential Safety-Related Pump Loss";

- Information Notice 96-06, Assurance of Equipment Operability and Containment Integrity During DBA Conditions";

- Industry Experience on Westinghouse DB-50 Breaker Abnormal Trip Bar Movement - DTA Test Procedure;

- Information Notice 92-51, Misapplication and Inadequate Testing of MCCBs"; and

- Internal Experience Document, LTR-EMPE-05-294, DB-50 Closing Solenoid Control Relay Trip/Window Assembly Lubrication; September 15, 2005.

b. Findings

No findings of significance were identified.

.5 Modifications

a. Inspection Scope

The team reviewed six permanent plant modifications related to the selected risk significant components to verify that the design bases, licensing bases, and performance capability of the components have not been degraded through modifications. One interim and one temporary modification were reviewed to ensure that current plant conditions met the design basis and that non-conforming conditions were being resolved within the guidance of RIS 2005-20, “Revision to Guidance Formerly Contained in NRC Generic Letter 91-18, “Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability.” The modifications listed below were reviewed as part of this inspection effort:

- DCR 3338 Service Water Isolation to the Turbine Building
- DCR 3381 Install CCW Pump Recirc. Lines
- DCR 3451 Change SI Pump Motor Breaker Relays
- DCR 3518 Replace Safety Injection Pump Lube Oil Coolers
- DCR 3469 Battery Charger High Voltage Setpoint Change
- DCR 3577 Change AFWP Lubricating Oil Coolers and Bearing Oil Coolers Drain Flow Path

b. Findings

No findings of significance were identified.

.6 Risk Significant Operator Actions

a. Inspection Scope

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

- Refill refueling water storage tank in transients and small break loss of coolant accident;

- Manually align non-safety related diesel generator post station blackout;

- Reactor coolant system cooldown and depressurization in steam generator tube rupture, isolate ruptured steam generator;
- Operator fails to initiate high pressure recirculation; and
- Refilling RWST in steam generator tube rupture event.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES (OA)

4OA2 Problem Identification and Resolution

.1 Review of Condition Reports

a. Inspection Scope

The team reviewed a sample of the selected component problems that were identified by the licensee and entered into the corrective action program. The team reviewed these issues to verify an appropriate threshold for identifying issues and to evaluate the effectiveness of corrective actions related to design issues. The specific corrective action documents that were reviewed by the team are listed in the attachment to this report.

b. Findings

No findings of significance were identified.

4OA6 Meetings, Including Exits

Exit Meeting Summary

The team presented the inspection results to Ms L. Hartz and other members of licensee management at the conclusion of the inspection on March 2, 2007. A second telephone exit was conducted on April 17, 2007, to inform the licensee of changes to the findings discussed during the exit meeting on March 2, 2007. Proprietary information was reviewed during the inspection and was handled in accordance with NRC policy.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee
L. Hartz, Site Vice President
M. Crist, Plant Manager
J. Madden, Nuclear Oversight Manager
B. Koehler, Manager, Project Engineering, Tech. Lead for CDBI
J. Gausman, Manager, Design Engineering Department
K. Peveler, Manager, Program Engineering
T. Webb, Director, Safety and Licensee
S. Yuen, Manager, System Component Engineers
T. Breene, Licensing Manager
J. Gadzala, Licensing Engineer
K. McCann, System Engineer
R. Repshas, Licensing Engineer
K. Pointer, Licensing Engineer
P. Swetland, CDBI Support Team
J. Owens, Supervisor, Corrective Action
M. Sortwell, Design Engineering
E. Gilson, Manager, Protection Services

Nuclear Regulatory Commission
C. Pederson, Director, Division of Reactor Safety (DRS)
S, Burton, Senior Resident Inspector

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

0500305/2007006-03	URI	No Analysis for Out of Phase Fast Transfer (Section 1R21.3.1.3)
0500305/2007006-04	URI	No Procedure for Determining Availability of Offsite Power Supply When Contingency Analyzer is OOS (Section 1R21.3.1.4)
0500305/2007006-06	URI	Non-Conservative Voltage Calculations for MCC Control Circuits (Section 1R21.3.2.2)
0500305/2007006-14	URI	Emergency Diesel Generator Rooms Cooling Fans Testing Deficiencies (Section 1R21.3.5.2)

Opened and Closed

0500305/2007006-01	NCV	No Analysis or Procedures to Establish Operability of the TAT Source (Section 1R21.3.1.1)

0500305/2007006-02	NCV	No Motor Starting Analyses for Offsite Power Supply (Section 1R21.3.1.2)
0500305/2007006-05	NCV	Increased Cable Resistance Due to Accident Temperatures (Section 1R21.3.2.1)
0500305/2007006-07	NCV	Failure to Ensure Adequate 125 Vdc Breaker Interrupting Short Circuit Current Capability (Section 1R21.3.3.1)
0500305/2007006-08	NCV	Failure to Use Actual Minimum Voltage Value in 125 Vdc Voltage Drop Calculation (Section 1R21.3.3.2)
0500305/2007006-09	NCV	Inadequate Acceptance Criteria in 125 Vdc Station Battery Load Tests Procedures (Section 1R21.3.3.3)
0500305/2007006-10	NCV	Adequate Control Voltage for 4160V Breaker's Closing Coil was not Assured (Section 1R21.3.3.4)
0500305/2007006-11	NCV	Safeguard Battery Load Profile Did Not Include LOOP/LOCA Loads (Section 1R21.3.3.5)
0500305/2007006-12	NCV	Electrolytic Capacitors in Spare Safeguard Battery Charger Not Periodically Energized(Section 1R21.3.4.1)
0500305/2007006-13	NCV	Diesel Loading Calculations Non Conservative(Section 1R21.3.5.1)
0500305/2007006-15	NCV	Failure to Incorporate and Effectively Implement Operating Experience into RTB Maintenance Activities (Section 1R21.3.6.1)
0500305/2007006-16	NCV	Acceptance Criteria Not Met Due to Failure to Follow Procedure (Section 1R21.3.b.20)
0500305/2007006-17	NCV	RWST Level Instruments Do Not Protect SI and RHR Pumps From Excessive Air Entrainment (Section 1R21.3.7.1)
0500305/2007006-18	NCV	Loss of Coolant Environment Improperly Considered in Containment Fan Coil Unit Calculation (Section 1R21.3.8.1)
0500305/2007006-19	NCV	Non-Conservative Assumption Used in Service Water Flow Model Calculation (Section 1R21.3.9.1)
0500305/2007006-20	NCV	Inadequate Screen-House Ventilation Damper Maintenance (Section 1R21.3.10.1)
0500305/2007006-21	NCV	Non-Conservative Assumption Used For "B" CCW Pump Room Heat Gain Calculation (Section 1R21.3.11.1)
0500305/2007006-22	NCV	Safety Injection Pump Lube Oil Coolers Testing Deficiencies (Section 1R21.3.12.1)

LIST OF DOCUMENTS REVIEWED

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

<u>CAPs and Associated Corrective Action Documents Reviewed During the Inspection</u>

039039; RWST Level Indication Accuracy; November 2, 2006
040650; RWST Setpoint Changes Proposed Do Not Consider Effect on Calculations; January 16, 2007
000074; CCW Pump Performance; dated January 23, 2002
012749; Predicted CC flow for components supplied is less than documented requirements; dated August 28, 2002
019545; SI Pump ‘A’ Lube Oil Cooler SW Flow Test and GL89-13 cooler inspection; dated January 15, 2004
019684; Inadequate SW Strainer PM; dated January 24, 2004
019747; Safety Classification of Service Water Strainers; dated January 28, 2004
020887; CCW Pump A Performance Anomaly; dated April 20, 2004
021228; CCW Pump Discharge Pressure Indicators Extent of Condition; dated May 21, 2004
021683; Service Water Strainer 1A2 DP Indicates Greater Than Expected; dated June 25; 2004
022031; SW Strainer A2 Differential Pressure High; dated July 30, 2004
030002; Evaluate the practice of closing discharge valve CC-4A(B) when shifting CCW Pump; dated November 9, 2005
012970; Significant QA Finding-VETIP Issues; September 17, 2002
034000; Lack of documented basis for SI pump minimum flow recirculation; dated May 18, 2006
037714; Evaluate potential for procedural enhancement; dated September 27, 2006
028514; Overhaul of Low and Medium Voltage circuit Breakers; March 10, 2005
038367; Reactor Trip Breaker Switchgear Enclosures; October 15, 2006
031829; Update PMP 47-01 to Reflect Changes Made in Manual MPM-DB Breaker Manual March 2002; March 7, 2006
001771; Reactor Trip Breaker b Exceeded Operating Recommendations from Westinghouse; August 6, 2001
028300; Reactor Trip Breaker A Exceeded Operating Recommendations from Westinghouse; July 8, 2005
030561; RTBs Configuration Control and Number of Cycles Too High; December 16, 2005
028437; Reactor Trip Bypass Breaker A Failed to remain Closed During Testing; July 18, 2005
017380; Protective Relay 50/51C/1-606BKR Out of Spec at Alarm Point; July 24, 2003
019314; Minimum 138 kV Substation Voltage; December 18, 2003
024912; HRLM Inspection Activity-Lack of Adequate Basis for DGV Assumptions Used; January 11, 2005
024970; HRLM NRC Inspection Activity - No Transient Voltage Calculation Exists; January 14, 2005
025218; HRLM Inspection - Degraded Grid & SI Voltages not Calculated Down to Motor Level; January 28, 2005

031301; Differential Current Relays for Diesel Generators A & B not Set Per Instruction; February 2, 2006
034718; Error on Breaker Type in Coordination Calculation 2417-E2, BRA/B-127; June 22, 2206
035827; RHR Pump Motor Operation at 210 HP, DG Load Over Conservative; August 9, 2006
037045; Error on Relay Setting Drawing E-2295, BRA/B Main Circuit Breakers; September 11, 2006
037321; During Perf of PMP 247-25 Control Indications Were not Stable; September 18, 2006
001936; Battery Charger A (BRA-108) Appears to be in an Equalizing Charge Mode; July 3, 2001

CAPs Generated As a Result of the Inspection

041125	Gauge 11076, SW to IA Compressor A, Blowdown Line Has a Small Leak; dated January 29, 2007
041126	SW-410A has small packing leak; dated January 29, 2007
041127	TI-12132, IA Compressor A Aftercooler Outlet Temp Gauge Glass Is Broken; dated January 29, 2007
041159	Review of Calculation 8814-05-EPED-1 Revision I (CAPTOR) identifies issues; dated January 30, 2007
041181	2007 CDBI Issue Related to A1 SW Pump Chlorination Quill; dated January 30, 2007
041200	Error in CAP032935 Description - SI Pump Acceptance Criteria; dated January 31, 2007
041205	Administrative Deficiencies in PMP-47-01; dated January 31, 2007
041213	CDBI Item: Signature Missing from SP-38-101B-1 Data Sheet; dated January 31, 2007
041234	Screenhouse Exhaust Dampers are Partially Open; dated January 31, 2007
041242	TAT Primary Voltage Requirements not Established by Calculation; January 31, 2007
041246	Additional Information Required in AFW DBD, CDBI Question; dated January 31, 2007
041247	Gap Analysis for vendor Manual MPM-DB Breaker dated march 2002 Not Found; dated January 31, 2007
041248	CAP Was Not Written When a PM Acceptance Criterion Was Not Met
041254	Calculation C10431 Need to be Superseded; dated February 1, 2007
041257	NRC Commitment not Updated Following DCR 3518; dated February 1, 2007
041262	NRC Bulletin 88-04 Responses not Incorporated in USAR; dated February 1, 2007
041264	NRC CDBI Questioned Evaluation Philosophy for CCW Heat Exchanger 1B; dated February 1, 2007
041275	Calculation Uses Lower Than Expected Value of Battery Voltage for Short Circuit; dated February 1, 2007
041278	Additional Guidance May Be Appropriate for Transmission Grid Evaluation; dated February 1, 2007

041283 NRC CDBI Questioned Results of SIP LO Cooler differential Pressure Monitoring; dated February 1, 2007

041288 Confirm DG Vent Supply Fan Blade Pitch; dated February 1, 2007

041309 Engineering Review of Scaffold not documented on Checklist; dated February 2, 2007

041317 Equipment Panel door Latch Moved Without Authorization; dated February 2, 2007

041323 EDG Vent Fan Pre-Op Test PT-TAV-01; dated February 2, 2007

041327 NRC CDBI Questions on SI Lube Oil Cooler: dated February 2, 2007

041329 GNP-05.02.01, Vendor Technical information Control, Not Followed; dated February 2, 2007

041345 Diesel Generator loads Cable Losses not Included in DG Loading; dated February 3, 2007

041393 Voltage Drop Analysis for MOV’s Assumes NO MOV’s Loaded on Safety Buses; dated February 5, 2007

041401 NID-01.05.03, Predictive Maintenance Infrared Thermography Program; dated February 5, 2007

041420 SI Pump Motor Breaker Overcurrent Relays Have High Allowed Tolerances; dated February 6, 2007

041449 Missing CCW Pump Calculation (Calculation Number C11358); dated February 6, 2007

041492 Revision Needs to be Prepared for CC Pump Recirc Oriffice sizing Calc; dated February 7, 2007

041511 NRC Questions Regarding Calculation C10044, Revision O; dated February 7, 2007

041556 Change to Procedure GNP-04.03.04 (Calculations) is Required; dated February 8, 2007

041566 Vendor Calculation not in QA Vault; dated February 8, 2007

041587 2004 Electrical Inspection Record for DG A Unavailable in the Vault; dated February 8, 2007

041591 Diesel Generator Non-Conservative Transformer Power Factors in DG Loading; dated February 8, 2007

041601 Rector Trip BKR 52/BYA s/n 850-027-1 is Approaching 200 Operations; dated February 9, 2007

041606 Procedure CMP 33-01 Needs Revision; dated February 9, 2007

041649 Calculation C11524, Service Water Flow Model, was Inadequately Superseded; dated February 12, 2007

041651 Reactor Tip Breaker Trip Bar Force Out of Spec.; dated February 12, 2007

041656 Reactor Trip Bkr 52/BYA s/n 850-027-1 Exceeded 200 Operations; dated February 12, 2007

041661 Single Input to Current SW Flow Model that May Not Be Conservative; dated February 12, 2007

041680 CDBI Questions No. 260 Sp-42-047A Data Sheet No. 2 Discrepancies; dated February 13, 2007

041681	CDBI Questions No. 260 SP-42-047A EDG 1A Operation Log Discrepancies; dated February 13, 2007
041709	Calc C-039-001 Maximum Field Cable conductor Lengths Non-Conservative
041710	New Reactor Trip Breaker is Needed; dated February 13, 2007
041727	PMP 47-01 Trip Bar Force Recording an Average Value as a Setting; dated February 14, 2007
041730	CDBI - Fault Current Contributions to the DC Bus thru battery Chargers BRA/B-108; dated February 14, 2007
041736	Diesel Air Start Solenoids near Minimum Voltage at End of Station Blackout; dated February 14, 2007
041745	Non Basis Support for Cable resistance in C-038-003; dated February 14, 2007
041747	Instrument Bus Inverter Improvements; dated February 14, 2007
041753	CDBI - DC Supply Breakers for Instrument Bus Inverters (BRA/B-104); dated February 14, 2007
041758	CDBI - Issue Identified for reactor Trip Breaker Monitoring; dated February 15, 2007
041768	2007 CDBI Inspection Item. Evaluate Monitoring SW Chlorination Unavailability; dated February 15, 2007
041773	CDBI Identifies Missing Instrument Accuracy Information; dated February 15, 2007
041776	Enhance Formal Process on the Tracking of the counts on the reactor Tip Breaker; dated February 15, 2007
041778	CDBI - DC Load Calculation Discrepancy for First Minute of SBO; dated February 15, 2007
041783	CDBI Question on EDG; dated February 15, 2007
041785	BRA/B108 Spare Battery Charger; dated February 15, 2007
041788	NRC CDBI Team Raised a Concern with Timeliness of CAP for RX Trip Breakers; dated February 15, 2007
041800	Untimely CAP Submission for an NRC Concern; dated February 15, 2007
041801	Calc C-039-001 Non-Conservatisms Impact Cont rm PA Recirc Fan Operability at DGV; dated February 15, 2007
041802	Voltage Drop on Instrument Buses not Analyzed When on alternate Feed; dated February 15, 2007
041803	A NRC Inspector Identified the Operability Note in CAP041709 is Non-Conservative; dated February 15, 2007
041804	CDBI - NRC Concern With Transferring Safety Related Buses to alternate Sources; dated February 15, 2007
041805	CDBI - NRC Concern with Starting Large Motors Concurrent with a Safety Injection; dated February 15, 2007
041817	2007 CDBI Item - Evaluate if the Low Pressure Closure of SW-3A/B Need a Calculation; dated February 16, 2007
041840	C-039-001 Methodology Contains Inherent Non-Conservatism; dated February 16, 2007
041911	Potential Instrument Air adverse Trend in Performance; dated February 19, 2007

041927	No Corrective Action Item Exists to Change RWST Lo-Lo Level Alarm to 6 percent; dated February 19, 2007
041942	DC Voltage Drops Not Taken Out to Grouped Loads in Calc C 038-003; dated February 19, 2007
041979	Suggested Procedure Enhancement not Implemented; dated February 20, 2007
042020	Diesel Generator Excitation System Tuning Change to Reduce voltage Overshoot; dated February 20, 2007
042031	CDBI - NRC Concern with Temperature Effects on Cables Located in Adverse Areas; dated February 20, 2007
042047	Post Accident CFCU Motor Load Calculations Require Update; dated February 21, 2007
042056	CDBI - Station Battery Load testing Frequency (BRA-101 and BRB-101); dated February 21, 2007
042057	CDBI - Stations Battery Load test Procedures SP-38-102A&B; dated February 21, 2007
042090	CDBI - Ref letter 5.2 for Calculation KEW-EPED-DCR-2392-2 Unable to Find; dated February 22, 2007
042121	KPS Does not Perform a Reduced Control Voltage Test for 4160V VAC SR Breakers; dated February 22, 2007
042129	Instrument Uncertainty Not Considered for Transfer to Sump Recirculation; dated February 22, 2007
042134	CDBI - NRC Concern with Temperature Effects on 120 V Vital AC cables LOCA/HELB; dated February 22, 2007
042147	CDBI - Calculation Discrepancy of voltage Rating of EDG Start Up SV's; dated February 23, 2007
042162	Perform a Trend analysis of Issues identified from NRC CDBI; dated February 23, 2007
042217	PCR13035 Closed Prior to Obtaining Clarification; dated February 26, 2007
042219	CFCU Motor Load on safeguards Diesel generator Non-Conservative; dated February 26, 2007
042228	Calculational Error Found in Procedure SP-02-317 Data; dated February 26, 2007
042231	Procedure SP-02-138B Missing Review Signature; dated February 26, 2007
042241	Quality and Standard of the PMP 47-01 for the Reactor Trip Breaker is Poor; dated February 27, 2007
042245	CDBI - Station Battery Monthly/Quarterly Inspections (SP-38-101A&B); dated February 27, 2007
042261	CDBI - Calculation C10510 Revision 0 Requires a Revision for Motor Data Updates; dated February 27, 2007
042266	52/RTB has Exceeded Vendor Recommendation for Service Life on UVTA; dated February 27, 2007
042268	CDBI - Increase Margin on the EDG DC Fuel Priming Motor; dated February 27, 2007
042281	Question Regarding Adequacy of "Guidance for SBO Coping; dated February 28, 2007

042286	No Technical Information for Motor 1-036, TDAFP Aux LO Pump Motor; dated February 28, 2007
042299	Enhancement of CAP041327 Operability Discussion; dated February 28, 2007
042305	Calculation C10812 Minor Error; dated February 28, 2007
042309	PMs for the Refurbishments for the RTBs Have Not Followed the 5 Year Cycles; dated February 28, 2007
042314	No Evaluation of required Cooling Airflow to the B CCW Pump Room Could be Found; dated February 28, 2007
042318	RWST Level Vortexing Calculation Requires Additional review and Explanation; dated February 28, 2007
042334	RX Trip Breaker UVTA Exceeds Recommended Number of Cycles Before Replacement; dated March 1, 2007
042336	CDBI - Basis for S/R 4160V Breaker Close Coil voltage Rating Unknown; dated March 1, 2007
042342	CDBI - Include additional Acceptance Criteria in Calc C-038-003; dated March 1, 2007
042368	Spare Breaker has Exceeded vendor Recommendation for Service Life on STA; dated March 1, 2007
042382	CDBI - NRC Concern with Preliminary Data showing Low Motor Starting voltage: dated March 1, 2007
042397	CDBI - NRC Concern with Not Entering the 50.59 Process for Issuing a Night Order; dated March 2, 2007
042398	CDBI - Perform a LOCA Station Battery Profile for BRA 101
042400	Aux Bldg Mess Post Accident Heat Load - calculation C11156 Revision 1 dated March 2, 2007
042403	Procedure N-EDC-38 May Be Non-Conservative; dated March 5, 2007
042524	Rx Trip and Bypass Brks May Have Not Met the Manufacturer's Recommended PM; dated March 5, 2007
042667	Inadequate CAP Identified During CDBI; dated March 8, 2007
042669	Inadequate CAP Identified During CDBI; dated March 8, 2007
042754	PTE Not Documented for Westinghouse Part Upgrades to Reactor Trip Breakers; dated March 10, 2007
042757	CAP Not Generated for Conditions Identified During Rx Trip Breaker Maintenance; dated March 10, 2007
042781	During as SBO - Required DC Voltage for the EDG Output Breakers is Challenged; dated March 12, 2007
043228	NRC Concern-Starting Motors during an SI Event with Bus 5/6 Connected to RAT; dated March 23, 2007

Calculations

0064-0014-cbs-1; Minimum Required Submergence of ECCS Pump Suction Nozzles; Revision 1
C10915; Safeguards Diesel Generator Loading Adjustments for Operation at Frequencies Other Than 60 Hertz; Revision 4
C10859-3; Condensate Storage Tank EOP Switchover to Alternate Water Source Setpoint; March 9, 2005
C10044; Diesel Generator Room Temperature; Revision ORIG
1238.M2; Diesel Generator Room Temperature; Revision 0
1238.E1; Diesel Generator Room Elec. Equip. Heat Rejection; Revision 0
404; Kewaunee Tank Level EOP Setpoints; Revision 0
C10431; Component cooling Pump Minimum Flow Evaluation; Revision 0
C10637; Maximum Thrust Calculation for Valves SI-9A/9B (stem only); Revision 0
C11156; Auxiliary Building Mezzanine Post Accident Area Heat Gain; Revision 0
C11156; Auxiliary Building Mezzanine Post Accident Area Heat Gain; Revision 1
C11343; 2001 SW Flow Test Analysis; Revision 0
C11343, Addendum A; SW Flow Test Analysis; Revision 0
C11344; 2001 SW System Flow Test; Revision 0
C11345; Determination of Required Turbine Building SW header isolation setpoints; Revision A
C11353; Determination of CCW Pump delta-P acceptance Criteria for use in SP31-168; Revision 2
C11359; Component Cooling Flow Evaluation of 01-1932; Revision 0
C11404; Maximum Available Torque for Limitorque SMB and SB Actuators; Revision 1
C11405; Minimum Required Stem Thrust; Revision 1
C11406; Maximum Available Stem Thrust Limits for Limitorque SMB and SB Actuators; Revision 1
C11409; CC System Flow Model Development; Revision 0
C11409, Addendum A; CCS Flow Impact due to Flow Increase for the RCPs; Revision 0
C11429; Determination of Target Thrust and Available Margin Windows for MOVs; Revision 0
C11442; Containment Thermal Hydraulic Response to Design Basis Accident (DBA) Loss of Coolant Accident (LOCA) with reduced Component Cooling System (CCS) Flow; Revision 0
C11462; Low CCS Flow during Post-LOCA Recirc.
C11461, Addendum A; Evaluate Low CCS Flow with CC-302 also Closed; Revision 0
C11480; CC Pump Recirc Orifice Sizing: Revision 1
C11524; CCS Flow Impact due to CC Pump Recirc; Revision 0
C11537; Evaluate impact of CCW flow changes associated with use of Boric Acid Evaporator following implementation of DCR 3500; Revision 0
C11546; Containment Integrity and Long Term Cooling Analysis for 7.4 percent Power Uprate; Revision 1
KNPP-205614-P01; Main Feedwater Line GL 87-11 Break Location Evaluation; Revision 1
TR-2003-04; 24 Hour Pump Operation on Recirculation Flow; Revision 0
C-042-001; Safeguards Diesel Generator Loading; Revision 6B
C-10915; Safeguards Diesel Generator Loading Adjustments for Operating an Frequencies Other Than 60 Hertz; Revision 4 Addendum A
C-039-001; 480V MCC Starter Control Circuit Conductor Length; Revision 1
NEP-14.14; MOV Electrical/Control System Review; Revision B
C-040-001; 480V MCC Starter Control Circuit Application Using G.E. CR120B as Interposing Relays; Revision 0
C10988; DC2930-480VAC MOV Control Circuit Voltage Drop; Revision 1

C10038; Bus 1-5 $ 1-6 Undervoltage Test and Calibration; Revision 1
C10433; Safeguard Bus Second Level Undervoltage Relay Time Delay Setting; Revision 0
C-038-001; 125 VDC Safeguard Distribution System Short Circuit Current; Revision 1
C-038-002; 125 VDC Battery BRA-101 and BRB-101 Duty; Revision 4
C-038-003; 125 VDC Safeguard Distribution Network Cable Voltage Drop; Revision 5
C-038-008; Electrical Overcurrent Protective Device Coordination - 125 VDC Battery BRB-101; Revision 5
KEW-EPED-DCR-2392-2; 125 VDC Safeguards Battery Charger Sizing; Revision 3
C10812; Verify Control Voltage for 4160V Safeguards Switchgear; Revision 1
C10510; Voltage Rating of safeguard DC Operated Devices; July 19, 1993

Correspondence

Letter Engine Systems Inc to Paul DeTemple, Kewaunee Station; May 19, 2006
KP-S-2786; Letter J.F. Burton of Pioneer Services to Mr. D. Hintz, Kewaunee, Diesel Generator Vent Fans; December 21, 1972
06-1009; Letter Kewaunee to NRC on Licensee Event Report 2006-004-01; December 28, 2006
MKS Letter to Mike Anthony of Kewaunee on Diesel De-Rating Curve; June 11, 1992
NRC-90-10; Letter Kewaunee to NRC Response to Generic Letter 89-13; January 29, 1990
Letter Joy Manufacturing to Kewaunee's Mr. F. W. Hickey; No Subject; February 1, 1972
LTR-EMPE-07-51; Westinghouse Response to Kewaunee Site Requirements for P.O. 70165666, dated March 2, 2007
SLK-91-047; Transfer of Original Calculations; May 2, 1991
LTR-EMPE-07-54; Westinghouse Response to Kewaunee Questions Regarding the Use of Minimum Closing Voltage; March 7, 2007

Design Basis Documents

DCR 3338; Service water Isolation to the Turbine Building; Revision 1

Drawings

XK-152-1; RWST Erection Diagram; July 15, 1997
APM-547; Analytical Part Flow Service Water System Containment Cooling; Revision H
M-956; SW Return from Containment Fan Coil Units; Revision B
E-1621; Integrated Logic Diagram Diesel Generator Mech. System; Revision AM
E-1634; Integrated Logic Diagram Diesel Generator Electric; Revision U
OPERM-61; Flow Diagram Turbine & Aux. Bldg. Ventilation; Revision CR
026C32199; Schematic 7.5 KVA Regulated Rectifier 480 VAC, 3 Phase, 60 Hz, 140VDC; Revision A
237127A-E233; Circuit Diagram DC Aux. and Emergency AC; Revision AQ
E-221; Metering and Relaying Diagram Generator and 4160V Equip; Revision AA
E-240; Circuit Diagram 4160V and 480V Power Sources; Revision AS
E-226; AC Schematics -4160V Switchgear Bus 1-5 Source Breakers; Revision AG
E-230; Metering and Relaying Diagram 4160V Switchgear -Buses 1-5 & 1-6; Revision N
E-231; AC Schematics 4160V Switchgear Bus 1-6 Source Breakers; Revision AK
E-232; Station Synchronizing Diagram; Revision T
E-238; Metering and Relaying 480 SWGR-Safeguard Buses & Associated 4160V Equipment Emergency Generators; Revision AB

E-883; A.C. Schematics- 4160V Switchgear Bus 1-5 Feeders; Revision M
E-884; A.C. Schematics- 4160V V Switchgear Bus 1-6 Feeders; Revision K
E-911; Interlock Logic Diagram Safeguard Protection; Revision F
E-914; Interlock Logic Diagram Bus 1-5 Source Breakers; Revision M
E-915; Interlock Logic Diagram Bus 1-6 Source Breakers; Revision K
E-1066; Schematic Diagram Synchronizing Check; Revision F
E-1042; Control Schematic 4160V Breaker 1-508; Revision W
E-1035; Control Schematic 4160V. Breaker 1-501; Revision V
E-1036; Control Schematic 4160V Breaker 1-502; Revision AA
E-1037; Control Schematic 4160V. Breaker 1-503; Revision W
E-1038; Control Schematic 4160V Breaker 1-504; Revision AL
E-1039; Control Schematic 4160V Breaker 1-505; Revision R
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E-1056; Control Schematic 4160V Breaker 1-607; Revision P
E-1057; Control Schematic 4160V Breaker 1-608; Revision X
E-1058; Control Schematic 4160V Breaker 1-609; Revision X
E-1059; Control Schematic 4160V Breaker 1-610; Revision S
E-1338; Schematic Diagram MCC 1-52A Motors 1-201 & 1-116; Revision AA
E-1442; Schematic Diagram - MCC 1-62J Motor 1-266; Revision X
E-1634; Integrated Logic Diagram Diesel Generator Electric; Revision U
E-1635; Integrated Logic Diagram Diesel Generator Electric; Revision Q
E-1636; Integrated Logic Diagram Diesel Generator Electric; Revision X
E-1871; Schematic Diagram Voltage Restoring Bus 1-5; Revision P
E-1872; Schematic Diagram Voltage Restoring Bus 5; Revision Y
E-1873; Schematic Diagram Automatic Voltage Restoring Bus 1-5; Revision Q
E-1874; Schematic Diagram Voltage Restoring Bus 5; Revision X
E-1888; Schematic Diagram Load Shedding Train “B”; Revision N
E-1889; Schematic Diagram Load Shedding Train “B”; Revision N
E-1890; Schematic Diagram Load Shedding Train “B”; Revision R
E-1891; Schematic Diagram Sequence Loading Bus 1-6; Revision U
E-1892; Schematic Diagram Sequence Loading Bus 1-6; Revision N
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ECA-0.0; Loss of All AC Power; Revision AI
ECA-0.1; Loss of All AC Power Recovery Without SI Required; Revision Q
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N-EDC-38B; Operation of Station Inverters; Revision Y
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N-ELV-40-52; Bus 52 and Associated MCC's AC Supply and Distribution System; Revision 0
SP-42-047A; Diesel Generator A Operational Test; Revision AD
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SP-38-102B; Station Battery BRB101 Load Test Electrical Maintenance (QA-1); Revision E
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8D4085; Under Voltage Monitor; Revision 2
8D4111; Catalog 214B111 1 Phase Undervoltage Monitor; Revision 1
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05-012478-000 - Preventive Work Order to Inspect/Clean/Test CRD Spare Reactor Trip Breaker 52/BYA; dated May 24, 2006
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06-001599-000 - Preventive Work Order to Inspect/Clean/Test CRD Train B Reactor trip Breaker 52/RTA; dated August 3, 2006
07-001726-000; Benchtesting on DB-50 Breaker -- Trip Bar Force; dated February 17, 2007

LIST OF ACRONYMS USED

AC	Alternating Current
ADAMS	Agency-Wide Document and Management System
ATWS	Anticipated Transient Without a Scram
BTU/Hr	British thermal Units Per Hour
CAP	Corrective Action Process
CCW	Component Cooling Water
CDBI	Component Design Basis Inspection
CFCU	Containment Fan Cooling Units
CFR	Code of Federal Regulations
CPT	Control Power Transformer
DC	Direct Current
DRS	Division of Reactor Safety
EDG	Emergency Diesel Generator
EOP	Emergency Operating Procedures
ESF	Engineered Safety Feature
FCU	Fan Coil Unit
FSAR	Final Safety Analysis Report
ICS	Internal Containment Spray
IMC	Inspection Manual Chapter
IN	Information Notice
KA	Kiloamps
LOCA	Loss of Coolant Accident
LOOP	Loss of Offsite Power
MCC	Motor Control Center
MOC	Mechanically Operated Contact
MOV	Motor Operated Valve
NCV	Non-Cited Violation
NEI	Nuclear Energy Institute
NEMA	National Electric Manufacturers Association
NRC	Nuclear Regulatory Commission
OE	Operating Experience
PCR	Procedure Change Request
PM	Preventive Maintenance
PRA	Probabilistic Risk Assessment
PSI	Pounds per Square Inch
PSIA	Pounds per Square Inch - Atmospheric
PSID	Pounds per Square Inch - Differential
RAT	Reserve Aux, Transformer
RTB	Reactor Trip Breaker
RWST	Refueling Water Storage Tank
SBO	Station Blackout
SDP	Significance Determination Process
SI	Safety Injection
SSC	Structures, Systems, and Components
TAT	Tertiery Aux. Transformer
TS	Technical Specification
URI	Unresolved Item

USAR	Updated Safety Analysis Report
UVTA	Under Voltage Trip Attachment
V	Volts
V/HZ	Voltage/Hertz
VETIP	Vendor Technical Information Program
°C	Degree Celsius
°F	Degree Fahrenheit