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

December 5, 2008

Mr. Adam C. Heflin, Senior Vice
President and Chief Nuclear Officer
Union Electric Company
P.O. Box 620
Fulton, MO 65251

SUBJECT: CALLAWAY PLANT - NRC COMPONENT DESIGN BASES INSPECTION REPORT 05000483/2008008

Dear Mr. Heflin:

On August 22, 2008, the US Nuclear Regulatory Commission (NRC) completed a component design bases inspection at your Callaway Plant. The enclosed report documents our inspection findings. The preliminary findings were discussed on August 22, 2008, with Mr. F. Diya, and other members of your staff. After additional in-office inspection, a final exit meeting was conducted on October 21, 2008, with Messrs. M. McLaghlan and L. Graessie.

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

Based on the results of this inspection, the NRC has identified three findings that were evaluated under the risk significance determination process. Violations were associated with all of the findings. All three of the findings were found to have very low safety significance (Green) and the violations associated with these findings are being treated as noncited violations, consistent with Section VI.A.1 of the NRC Enforcement Policy. If you contest any of the noncited violations, or the significance of the violations you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the US Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with copies to the Regional Administrator, U.S. Nuclear Regulatory Commission, Region IV, 612 East Lamar Blvd., Suite 400, Arlington, Texas 76011; the Director, Office of Enforcement, US Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Callaway Plant.

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

Sincerely,

/RA/

Thomas Farnholtz, Chief, Engineering Branch 1
Division of Reactor Safety

Docket: 50 483
License: NPF 30

Enclosures: NRC Inspection Report
05000483/2008008 w/attachment:
Supplemental Information

cc w/enclosure:
John O'Neill, Esq.
Pillsbury Winthrop Shaw Pittman LLP
2300 N. Street, N.W.
Washington, DC 20037

Scott A. Maglio, Assistant Manager
Regulatory Affairs
AmerenUE
P.O. Box 620
Fulton, MO 65251

Missouri Public Service Commission
Governor's Office Building
200 Madison Street
P.O. Box 360
Jefferson City, MO 65102-0360

H. Floyd Gilzow
Deputy Director for Policy
Missouri Department of Natural Resources
P. O. Box 176
Jefferson City, MO 65102-0176

Rick A. Muench, President and
Chief Executive Officer
Wolf Creek Nuclear Operating Corporation
P.O. Box 411
Burlington, KS 66839

Kathleen Smith, Executive Director and
Kay Drey, Representative Board of Directors
Missouri Coalition for the Environment
6267 Delmar Boulevard, Suite 2E
St. Louis City, MO 63130

Lee Fritz, Presiding Commissioner
Callaway County Courthouse
10 East Fifth Street
Fulton, MO 65251

Les H. Kanuckel, Manager
Quality Assurance
AmerenUE
P.O. Box 620
Fulton, MO 65251

Director, Missouri State Emergency
Management Agency
P.O. Box 116
Jefferson City, MO 65102-0116

Scott Clardy, Director
Section for Environmental Public Health
Missouri Department of Health and
Senior Services
P.O. Box 570
Jefferson City, MO 65102-0570

Luke H. Graessle, Manager
Regulatory Affairs
AmerenUE
P.O. Box 620
Fulton, MO 65251

Thomas B. Elwood, Supervising Engineer
Regulatory Affairs and Licensing
AmerenUE
P.O. Box 620
Fulton, MO 65251

Certrec Corporation
4200 South Hulen, Suite 422
Fort Worth, TX 76109

Keith G. Henke, Planner III
Division of Community and Public Health
Office of Emergency Coordination
Missouri Department of Health and
Senior Services
930 Wildwood,
P.O. Box 570
Jefferson City, MO 65102

Technical Services Branch Chief
FEMA Region VII
2323 Grand Boulevard, Suite 900
Kansas City, MO 64108-2670

Ronald L. McCabe, Chief
Technological Hazards Branch
National Preparedness Division
DHS/FEMA
9221 Ward Parkway, Suite 300
Kansas City, MO 64114-3372

Electronic distribution by RIV:
Regional Administrator (Elmo.Collins@nrc.gov)
Deputy Regional Administrator (Chuck.Casto@nrc.gov)
DRP Director (Dwight.Chamberlain@nrc.gov)
DRP Deputy Director (Anton.Vegel@nrc.gov)
DRS Director (Roy.Caniano@nrc.gov)
DRS Deputy Director (Troy.Pruett@nrc.gov)
Senior Resident Inspector (David.Dumbacher@nrc.gov)
Resident Inspector (Jeremy.Groom@nrc.gov)
Branch Chief, DRP/B (Vincent.Gaddy@nrc.gov)
Senior Project Engineer, DRP/B (Rick.Deese@nrc.gov)
CWY Site Secretary (Dawn.Yancey@nrc.gov)
Public Affairs Officer (Victor.Dricks@nrc.gov)
Team Leader, DRP/TSS (Chuck.Paulk@nrc.gov)
RITS Coordinator (Marisa.Herrera@nrc.gov)
DRS STA (Dale.Powers@nrc.gov)
S. Williams, OEDO RIV Coordinator (Shawn.Williams@nrc.gov)

SUNSI Review Completed: RAK ADAMS: √ **Yes** □ No Initials: _RAK_
√ **Publicly Available** □ Non-Publicly Available □ Sensitive √ **Non-Sensitive**

DOCUMENT: R:_Reactors_CW 2008008-RAK-RP.doc ML

EB1/SRI	EB1/SRI	OB/SOE	EB1/SRI	EB1/RI	EB1/NSPDP
RKopriva	JDrake	TMcKernon	WSifre	GGeorge	DReinert
/RA/	RAK for JD	/RA/	RAK for WS	RAK for GG	RAK for DR
11/18/08	11/24/08	12/1/08	11/18/08	11/18/08	11/18/08

C/EB1	DRP:C/PB	DRS:DD/SRA	C/EB1
TFarnholtz	VGaddy	TPruett	TFarnholtz
/RA/	DProulx for	***/RA/***	***/RA/***
11/4/08	11/5/08	11/5 /08	11/5/08

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket:	50-483
License:	NPF-30
Report Nos.:	05000483/2008008
Licensee:	Ameren Electric Co.
Facility:	Callaway Plant
Location:	Junction Highway CC and Highway O, Fulton, Missouri
Dates:	July 28 through August 22, 2008
Team Leader:	R. Kopriva, Senior Reactor Inspector, Engineering Branch 1
Inspectors:	J. Drake, Senior Reactor Inspector, Plant Support Branch 2 P. Gage, Senior Examiner, Operations Branch G. George, Reactor Inspector, Engineering Branch 1 W. Sifre, Senior Reactor Inspector, Engineering Branch 1
Accompanying Personnel:	C. Baron, Mechanical Engineer, Beckman and Associates N. Della Greca, Electrical Engineer, Beckman and Associates
Others:	D. Loveless, Senior Reactor Analyst D. Reinert, PhD., Reactor Inspector, Engineering Branch 1
Approved By:	Thomas Farnholtz, Acting Chief Engineering Branch 1 Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000483/2008008; July 28 through August 22, 2008; Callaway Plant: baseline inspection, NRC Inspection Procedure 71111.21, Component Design Basis Inspection.

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

A. NRC-Identified Findings

Cornerstone: Mitigating Systems

- Green. The team identified a non-cited violation 10 CFR 50, Appendix B, Criterion III, "Design Control," for failure to verify the adequacy of design and for failure to correctly translate the 125 Vdc system design basis into instructions, procedures, and drawings. Specifically, the licensee failed to include momentary loads in the battery sizing calculation, thus reducing the peak load demand voltage during the first minute of an event, an intermediate scenario event, and the last minute of the battery duty cycle. Additionally, the licensee's subsequent review determined that the calculation had failed to include three additional momentary loads. The failure to include these loads prevented the licensee from developing a battery duty cycle profile that conforms to the guidance of IEEE 485-1983 and correctly simulates the battery loads following a design basis or station blackout event. The licensee entered this finding into their corrective action program as Callaway Action Request 200808609.

  The failure to account for all loads, including momentary loads, in the battery design calculation was a performance deficiency because it prevented the licensee from correctly analyzing available voltage at safety-related components during the battery peak loading periods. The finding was more than minor because it is associated with the Design Control attribute of the Mitigating Systems cornerstone objective of ensuring the availability, reliability, and capability of the safety-related battery systems to respond to initiating events and prevent undesirable consequences. Using the Manual Chapter 0609, Phase 1 screening worksheet, the issue screened as having very low safety significance because adequate margins had been included in the battery selection and, therefore, the issue was a design deficiency confirmed not to result in loss-of-operability in accordance with NRC Manual Chapter Part 9900, "Technical Guidance, Operability Determination Process for Operability and Functional Assessment." (Section 1R21.b.1).

- Green. The team identified a noncited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for not verifying the adequacy of the design. Specifically, an incorrect pipe break location in the analysis for loss of the condensate storage tank feed to the auxiliary feedwater pumps caused the analysis to be non-conservative for the amount of water available to the auxiliary feedwater pumps. This error provided for more water to be available for use by the auxiliary feedwater pumps than would actually be available if the analysis had identified the correct location of the postulated pipe break. The licensee has entered this finding into their corrective action program as Callaway Action Request CAR 200808674.

The failure to meet design control requirements associated with the pipe break analysis with sufficient water to run the auxiliary feedwater pumps prior to switch over to the essential service water system is a performance deficiency. Per Manual Chapter 0612, Appendix E, Section 3, “Non-significant Dimensional, Time, Calculation, or Drawing Discrepancies,” Example J, this finding is more than minor because the engineering calculation error resulted in a condition where there was a reasonable doubt on the operability of a system or component. Using Manual Chapter 0609, Significance Determination Process Phase 1 screening worksheet, the team determined that the finding was of very low safety significance. There was no actual loss of safety function and the new analysis demonstrated that the auxiliary feedwater pumps would have enough water available from the Condensate Storage Tank prior to switchover to the Essential Service Water system to complete their design function. (Section 1R21.b.2).

- Green. The team identified a non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawing” for the failure to follow Procedure APA-ZZ-00500, Appendix 1, Revision 6, “Operability Determination.” The evaluation did not include the additional heat loading on equipment in the turbine driven auxiliary feedwater pump room, caused from an active steam leak from the turbine governor end case joint. The licensee had failed to include the additional steam leak heat load in either of the room temperature calculations M-GF-415 or BO -05, which were used in the operability determination. The heat input into the room, due to the steam leak, may have adversely affected the operation of the turbine digital speed control unit. The licensee has entered this finding into their corrective action program as Callaway Action Request 200808777.

  The failure to either correct the active steam leak or to account for the leak in their design calculations, is a performance deficiency. Per Inspection Manual Chapter 0612, Appendix E, Section 3, “Non-significant Dimensional, Time, Calculation, or Drawing Discrepancies,” Example J, this finding is more than minor because the licensee had not resolved the deficiency, resulting in a condition in which there was a reasonable doubt regarding the reliability of the turbine digital speed control unit. Using Inspection Manual Chapter 0609, "Significance Determination Process," Phase 1 screening worksheets, the team determined that the finding was of very low safety significance. Since there was no actual loss of safety function and the new analysis demonstrated that the maximum room temperature, including the additional heat load, would not exceed the design limit of digital turbine speed controls unit, the issue was a design deficiency confirmed not to result in loss of operability per NRC Manual Chapter Part 9900, “Technical Guidance, Operability Determination Process for Operability and Functional Assessment.” The finding had crosscutting aspects in the area of human performance (decision making) because the licensee used non-conservative assumptions in decision making and failed to either repair the active steam leak, or to account for it in their design calculations. This activity was indicative of current performance as the steam leak still existed and had not been included in the design calculations until October 2008. [H.1 (b)] (Section 1R21.b.3).

B. Licensee-Identified Violations.

None.

REPORT DETAILS

1 REACTOR SAFETY

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

1R21 Component Design Bases Inspection (71111.21)

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

a. Inspection Scope

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

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

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

The inspection procedure requires a review of 20 to 30 risk-significant and low design margin components, 3 to 5 relatively high-risk operator actions, and 4 to 6 operating experience issues. The sample selection for this inspection was 21 components, 5 operator actions, and 6 operating experience items.

The components selected for review were:

Mechanical

<u>BM-HV-002, Steam Generator Blowdown Air-Operated Valve</u>
The team reviewed the Final Safety Analysis Report (FSAR), selected drawings, calculations, maintenance records, and operating procedures to verify the capability of the air operated valve to perform its intended function during design basis events. The team reviewed design calculations to evaluate the capability of the valve to change position as required under the most limiting accident conditions. The team reviewed the calculations to verify that the most limiting system operating conditions were considered in the calculations, including the required air pressure for valve operation. The team also reviewed operating procedures related to the valve to ensure they were consistent with the design basis calculations and the licensing basis and performed a walkdown of the valve.

<u>AB-PV-003, Main Steam Atmospheric Dump Air-Operated Valve</u>
The team reviewed the FSAR, selected drawings, calculations, maintenance records, and operating procedures to verify the capability of the air operated valve to perform its intended function during design basis events. The team reviewed design calculations to evaluate the capability of the valve to change position as required under the most limiting accident conditions. The team reviewed the calculations to verify that the most limiting system operating conditions were considered in the calculations, including the required air pressure for valve operation and the capacity of the nitrogen accumulator to operate the valve for the required duration. The team also reviewed operating procedures related to the valve to ensure they were consistent with the design basis calculations and the licensing basis and performed a walkdown of the valve.

<u>EJ-HV-8701B, RHR Hot Leg Isolation Motor Operated Valve</u>
The team reviewed the FSAR, Design Basis Document (DBD), selected drawings, calculations, maintenance records, and operating procedures to verify the capability of the motor operated valve to perform its intended function during design basis events. The team reviewed Generic Letter 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," calculations and requests for resolution to evaluate the capability of the valve to change position as required under the most limiting accident conditions. The team reviewed the calculations to verify that the most limiting system operating conditions were considered in the calculations. The team reviewed the design and testing of the control interlocks and setpoints associated with the valve. The team reviewed electrical calculations to verify the appropriate voltage values were included in the valve calculations. The team also reviewed operating procedures related to the valve to ensure they were consistent with the design basis calculations and the licensing basis.

<u>EJ-HV-8804A, RHR to Safety Injection Motor Operated Valve</u>
The team reviewed the FSAR, DBD, selected drawings, calculations, maintenance records, and operating procedures to verify the capability of the motor operated valve to perform its intended function during design basis events. The team reviewed Generic Letter 89-10 calculations and requests for resolution to evaluate the capability of the valve to change position as required under the most limiting accident conditions. The team reviewed the calculations to verify that the most limiting system operating conditions were considered in the calculations. The team reviewed the design and

testing of the control interlocks associated with the valve. The team reviewed electrical calculations to verify the appropriate voltage values were included in the valve calculations. The team also reviewed operating procedures related to the valve to ensure they were consistent with the design basis calculations and the licensing basis.

TAP-01, Condensate Storage Tank
The team reviewed the FSAR, DBD, selected drawings, calculations, maintenance records, and operating procedures to verify the capability of the tank to perform its intended function during postulated station blackout events. The team reviewed various calculations to evaluate the inventory, instrument uncertainty, and capacity of the tank. The team reviewed the vortex limit and Net Positive Suction Head (NPSH) calculations for the auxiliary feedwater pumps. The team reviewed calculations to verify the amount of water that would be required for the postulated station blackout event. The team also reviewed operating procedures related to the tank to ensure they were consistent with the design basis.

Internal Flooding of Vital Electrical Areas
The team reviewed the FSAR, DBD, selected drawings, calculations, and operating procedures to evaluate the potential internal flooding of plant areas containing safety related electrical equipment. This review addressed both postulated design basis floods and beyond design basis floods addressed by risk assessments. The team reviewed various flooding calculations for the safety related switchgear areas, emergency diesel generator rooms, and safety related battery areas. These calculations were based on postulated cracks or breaks of piping in those areas, and considered the leakage paths from the areas containing the safety related equipment. The team also performed walkdowns of these areas.

Emergency Service Water Pump “B”
The team reviewed DBD’s, including procedures, calculations, drawings, vendor manuals, inservice testing requirements, and accident analyses to verify that the pump is capable of meeting it’s functional and design basis requirements. In addition, the team reviewed surveillance procedures, maintenance procedures, and the associated results of the surveillance and post maintenance tests to ensure that the pump would be operated and maintained within its design basis. Specifically, the team reviewed the emergency service water flow balance procedures and the corresponding calculation for flow balance acceptance criteria.

Emergency Service Water Valve, EFHY0060
The inspection team reviewed valve motor torque calculations, flow balance, condition reports, inservice testing results, and vendor manuals to assess whether the motor operated valve, EFHY0060, would be able to perform its design function in a design basis accident. Specifically, the team assessed whether design modifications to the valve were controlled within the original design basis and vendor specifications. Additionally, the team assessed whether any deviations from the original design basis or vendor specifications were controlled under applicable regulatory requirements. The team’s review also included a walkdown of the emergency service water system.

Component Cooling Water Heat Exchanger “B”
The team reviewed the DBD’s, test and maintenance procedures, and calculations to ensure the component cooling water heat exchanger “B” would perform its design basis function. In addition to the test and maintenance procedures, the inspectors reviewed

previous heat exchanger test results from 2003 to 2008, to ensure that the heat exchanger never exceeded the fouling factor and tube plugging limits. The team also reviewed results from the component cooling water heat exchanger inspections. The team's review of calculations included a review of the design basis heat load analysis and worst case tube plugging limits.

Auxiliary Feedwater Pump 2A Turbine Control System and Digital Control Panel (FC219).
The team reviewed the Qualification Report for the Turbine Control System Upgrade installed on Turbine Driven Auxiliary Feedwater Pump 2A. The control logic was reviewed and coupled to the potential spectrum of design basis events requiring pump operation. The team also reviewed seismic and environmental qualification of the controller. The team also reviewed IST data, testing data, surveillance test procedures, corrective action entries, and significant procedures that require operation of this pump.

Steam Generator Blowdown Isolation Valve BM-TV-00040.
The team reviewed the Generic Letter 89-10 design basis calculation, which included design features of the motor, actuator and valve. The control logic was reviewed and coupled to the potential spectrum of design basis events requiring valve operation. Maximum opening and closing differential pressures, including the required opening and closing stroke times were reviewed. The team also reviewed Inservice Testing (IST) data, Valve Operation Test & Evaluation System (VOTES) testing data, surveillance test procedures, corrective action entries, and significant procedures that require operation of this valve.

Control Room Pressurization and Ventilation Isolation Logic
The team reviewed the design basis calculations associated with control room habitability. The control and actuation logics for both the Control Room Air Conditioning System (CRACS) and Control Room Emergency Ventilation System (CREVS) were reviewed and coupled to the potential spectrum of design basis events requiring system actuation and interactions. The team reviewed system testing data, surveillance and operating procedures, and corrective action entries associated with the actuation logic circuits associated with the systems. The inspectors also verified system compliance with Regulatory Guides 1.52, "Criteria For Programmable Digital Computer System Software In Safety-Related Systems Of Nuclear Power Plants," 1.78, "An Approach For Plant-Specific Risk-Informed Decisionmaking For Inservice Inspection Of Piping," Revision 1, and Generic Letter (GL) 2003-01, "Control Room Habitability."

Electrical

EDG Load/Voltage/Frequency
The team inspected the electrical portions of the emergency diesel generator (EDG) and associated supply breaker to verify the adequacy of the equipment to respond to design basis events. The team reviewed diesel generator starting logic and output breaker control logic to verify the appropriate functionality was implemented. The team reviewed completed surveillances to verify that the technical specification requirements were met. The team reviewed protection/coordination and short-circuit calculations to verify the EDG was adequately protected by protective devices during test mode and emergency operation. Additionally, the team reviewed calculations and technical evaluations to verify that: 1) steady-state and transient loading were within design capabilities; 2) adequate voltage would be present to start and operate connected loads; and 3)

operation at maximum allowed frequency would be within the design capabilities. The review included determining the bases for brake horsepower loading values used, and verifying that design bases and design assumptions had been appropriately translated into the design calculations and procedures. The team reviewed the basis for the EDG load sequence time delay setpoints. The team reviewed the EDG feeder breaker maintenance and control voltage to verify that the components would function when required. Finally, the team performed a walk down of the emergency diesel generator and breaker to assess the installation configuration, material condition, and potential vulnerability to hazards.

Breakers 52NG0Y06 and 52NG0103
The team reviewed selected calculations for electrical distribution system load flow/voltage drop, short circuit, and electrical protection and coordination. The adequacy and appropriateness of design assumptions and calculations were reviewed to verify that bus capacity was not exceeded and bus voltages remained above minimum acceptable values under design basis conditions. The Motor Control Center's (MCC's) protective device settings and breaker ratings were reviewed to ensure that selective coordination was adequate for protection of connected equipment during worst case short circuit conditions. The inspectors performed a visual non-intrusive inspection of observable portions of the load center to assess the installation configuration, material condition, and the potential vulnerability to hazards.

Safeguards Transformer "A"
The team reviewed selected calculations for electrical distribution system load flow/voltage drop, short circuit, and electrical protection and coordination. The adequacy and appropriateness of design assumptions and calculations were reviewed to verify that bus capacity was not exceeded and bus voltages remained above minimum acceptable values under design basis conditions. The switchgear's protective device settings and breaker ratings were reviewed to ensure that selective coordination was adequate for protection of connected equipment during worst case short circuit conditions. The team reviewed the voltage protection scheme and the adequacy of instrumentation/alarms available. To ensure that breakers were maintained in accordance with industry and vendor recommendations, the team reviewed the preventive maintenance inspection and testing procedures. The 125Vdc voltage calculations were reviewed to determine if adequate voltage would be available for the breaker open/close coils and spring charging motors. The team performed a visual non-intrusive inspection of observable portions of the safety related 480Vac load center to assess the installation configuration, material condition, and the potential vulnerability to hazards. The team assessed the sizing, loading, protection, and voltage taps for Safeguards Transformer "A" to ensure adequate voltage to the 480V switchgear. The team reviewed the ampacity for the source and load side feeder cables as well as the protective device settings to ensure that the feeder cables and transformer was protected in accordance with industry standards. A review of the testing requirements, preventive maintenance, and instrumentation/alarms was performed. The team performed a visual non-intrusive inspection of observable portions of the transformer to assess the installation configuration, material condition, and potential vulnerability to hazards.

Safety-Related 125Vdc Station Battery NK11 and Inverter NN11
The team selected Station Battery NK11 and Inverter NN11 for their review. Inverter NN11, with a rating of 7.5 KVA, supplies power to the Channel I, safety-related instrumentation. The team conducted a design review of the components, including

design capabilities, voltage drop calculations, list of related design changes, vendor manuals, maintenance history, testing criteria and results, and condition reports initiated during the last five years. The team interviewed system and design engineering personnel to gain an understanding of recent margin and performance issues and the overall reliability of the inverters. The team conducted a walkdown of the batteries and inverters to inspect their physical condition and to confirm that input and output voltages and currents were reasonable and corresponded to the values used in the battery sizing calculations.

Non-Safety-Related 125 Vdc Station Battery PK21
Battery PK12 is a non-safety related battery, but is risk significant because it provides the 125Vdc control power necessary for operation of circuit breakers and circuit interrupters required for realignment of the offsite power to the emergency bus following a loss of offsite power or station blackout event. Additionally, the battery provides DC power to various fire protection components. In selecting battery PK12, the team considered its potential failure and the resulting consequences for mitigating the above events. The team reviewed the battery sizing and voltage drop calculations to verify that the battery selected for the intended function would satisfy the requirements of the risk significant loads and that the minimum required voltage was taken into account. Specifically, the evaluation focused on verifying that the battery was adequately sized to supply its anticipated loads during and following a loss of coolant accident/loss of offsite power or station blackout scenarios, and that adequate voltage would remain available to the loads required to operate during and at the end of a postulated four-hour SBO coping duration. The review included a physical inspection of the battery and the associated battery charger. During the walkdown, the team visually inspected the battery for signs of inadequate maintenance or component degradation such as excessive terminal corrosion and electrolyte leaks. The team also confirmed that the battery charger supplied power at an acceptable voltage level to the battery and its loads. The team reviewed battery surveillance test results to confirm that the applicable test acceptance criteria and test frequency requirements specified for the battery were being met. The team also interviewed responsible design and system engineers regarding design aspects of the system and operating history for the battery.

Selected Operator Actions:

- Loss of class 1E 125 Vdc bus (NK01) and pressurizer steam space leak.
- Loss of instrument air and failure of 'B' Power Operated Relief Valve (PORV) to open.
- Inadvertent Safety Injection (SI) with failure of automatic reactor trip and feedwater break.
- Loss of All Alternating Current (AC), natural circulation cooldown.
- Steam Generator Tube Rupture (SGTR) with failure of affected Main Steam Isolation Valve (MSIV) to close.

Review of Industry Operating Experience and Generic Issues

NRC Information Notice 94-24, Inadequate Maintenance of Interruptible Power Supplies and Inverters.
This review addressed the adequacy of Callaway maintenance activities related to the safety-related inverters to ensure that such activities did not negatively impact the reliability of the inverters themselves and the availability of AC power to safety-related instrumentation during a design basis event or a station blackout.

NRC Information Notice 94-80, Inadequate DC Ground Detection in Direct Current Distribution Systems.
This review evaluated the 125 Vdc ground detection system at Callaway to ensure that it was sufficiently sensitive to prevent a failure of the system during a design basis event or a station blackout.

NRC Information Notice 2006-26: Failure of Magnesium Rotors in MOV Actuators
The inspectors reviewed the applicability/actions taken by Callaway to address IN 2006-26, which discussed three recent examples of Motor Operated Valve (MOV) failures due to magnesium rotor degradation, described three failure modes, and provided references for potential corrective and preventive actions to address the degradation mechanisms. The inspectors noted that Callaway identified which MOV's in the plant have magnesium rotors that meet the criteria identified in IN 2006-26. The inspectors reviewed Callaway's MOV program to address inspections for magnesium rotor degradation for the high risk MOV's.

NRC Information Notice 2006-31: Inadequate Fault Interrupting Rating of Breakers
The team reviewed the applicability/actions taken by Callaway to address IN 2006-31, which addressed concerns of inadequate fault interrupting rating of breakers. Callaway electrical calculations show that the postulated worst-case fault currents are within the breaker, switchgear, and bus bracing ratings.

NRC Generic Letter 2006-02 Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power
The team reviewed the applicability/actions taken by Callaway to address GL 2006-02, which discussed the use of protocols between the nuclear power plant and the transmission system operator and the use of transmission load flow tools in monitoring grid conditions to determine the operability of offsite power systems under plant technical specifications. The team reviewed Callaway procedures for operation and maintenance of switchyard equipment identified in response to GL-2006-02.

NRC Generic Letter 2003-01 Control Room Habitability
The team reviewed the applicability/actions taken by Callaway to address GL 2003-01, which addressed concerns of control room habitability. The team reviewed the licensee's response to the generic letter and verified that the licensee's control room habitability systems were designed, constructed, configured, operated and maintained in accordance with the design and licensing basis.

b. Findings

1. Safety-Related 125 Vdc Station Battery NK11 Inadequate Battery Sizing Calculation

a. Inspection Scope

The team reviewed the design and testing documents of the safety-related, Division I, 125 Volt direct current (Vdc) battery NK11 to verify that it was adequately designed and tested, and that it was capable of performing its required safety functions. The team reviewed the battery sizing calculation to confirm that the duty cycle of the battery was adequately addressed and that the selected battery size took into account component aging and performance at minimum ambient and electrolyte temperature. The team also reviewed voltage drop calculations to confirm that cable sizes and temperatures were adequately evaluated and that the components minimum voltage requirements were being adequately met under worst battery loading conditions. In addition, the team reviewed short circuit calculations to confirm that distribution equipment was adequately protected and capable of withstanding calculated maximum short circuits.

The team reviewed electrical schematics to evaluate loads supplied by the battery and to confirm that selected loads had been included in the battery sizing and voltage drop calculations. The team also verified that the system included a ground detection system and that the alarm setpoint was sufficiently low to ensure proper protection of the battery from unwanted grounding under design basis events. The system review included an evaluation of the circuit protection provided and, for selected circuits, confirmed that adequate coordination existed between the downstream and the upstream fuses. The team also verified that adequate float and equalizing charging voltages were being provided to the battery and that the battery tests required by the technical specification (TS), including service and performance discharge tests, were being performed at the TS required frequency and met the TS specified acceptance criteria. The system undervoltage relay setpoint and the calibration procedure were also reviewed.

The team conducted detailed walkdowns of the battery and associated components to determine their physical/material condition and to confirm that the battery and charger room temperatures were within specified design temperature ranges. During the walkdowns, the team visually inspected the battery for signs of degradation such as excessive terminal corrosion and electrolyte leaks and confirmed that the battery float voltage was at the recommended level.

b. Findings

Introduction. The team identified a Green, non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, “Design Control,” for an inadequate battery sizing calculation. The calculation assumed that momentary loads would have insignificant impact on the battery size. Therefore, they were specifically ignored. The inclusion of momentary loads is required to ensure that the battery is capable of providing adequate voltage to all components during battery peak loading conditions, including when momentary loads are being applied to the battery. In response to the team’s concerns, the licensee evaluated the impact of their failure to include the momentary loads and confirmed that the size of the battery was adequate and that the minimum voltage during peak loading remained within acceptable range.

Description. The size of the battery is determined by reviewing the loads it is required to carry during the period for which it is required to perform its safety function, duty cycle, and verifying that the minimum design voltage under peak loading conditions remained within acceptable limits. In their evaluation of the battery loads, the licensee elected not to include momentary loads, such as breaker trip coils and motor starting inrush currents.

Following a loss of offsite power, in anticipation for emergency diesel generator (EDG) load sequencing, many breakers are concurrently tripped. When the EDG reaches proper voltage and frequency, loads are added to the EDG at a predetermined sequence, by closing the associated breakers. Closure of a breaker is followed by the starting of the spring charging motor to get the breaker ready for a subsequent trip and automatic closure, if necessary. Both the trip coil and motor starting inrush current are of very short duration and have minimal impact on the selection of the battery size. However, the combined effect of all the trip coils on the selected battery during the very brief period when all breakers are automatically tripped could be sufficient to lower the voltage to a level that could prevent some breakers from tripping. Similarly, during the motor starting inrush period, the voltage could drop sufficiently to prevent a relay from energizing or cause a relay to drop out on low voltage.

Regarding momentary loads, IEEE Standard 485-1983, to which the licensee is committed, states that, "Although momentary loads may exist for only a fraction of a second, each is considered to exist for a full minute because the instantaneous battery voltage drop for a given momentary load is essentially the same as the voltage drop after 1 minute. When several momentary loads occur within the same 1 minute period and a discrete sequence cannot be established, the load shall be assumed to be the sum of all the momentary loads occurring within that minute. If a discrete sequence can be established, the load for 1 minute period shall be assumed to be the maximum current at any instant." This battery loading analysis represents the battery duty cycle that is then used to select the size of the battery necessary to supply quality voltage to all its loads throughout the duty cycle. As indicated previously, the battery duty cycle calculated by the licensee prior to the inspection did not include momentary loads at the beginning of the test. The loads imposed on the battery were much higher than postulated, and the licensee could not assure that adequate voltage would be available to its loads during peak loading.

As a result of the team's questions, the licensee did confirm that the battery size had adequate margin to accommodate the additional momentary loads and that the minimum voltage derived from the battery performance curves was sufficient to supply adequate voltage to all the loads during peak loading. During this review, the licensee also observed that the load list did not include three additional shunt trips. The licensee issued Callaway Action Request (CAR) 200808609 to address these deficiencies.

Analysis. The failure to account for all loads, including momentary loads in the battery design calculation, was a performance deficiency because it prevented the licensee from correctly analyzing available voltage at safety-related components during the battery peak loading periods. This finding was more than minor because it affected the mitigating system cornerstone objective (design control attribute) to ensure the reliability and capability of the equipment needed to mitigate initiating events. The team used the Manual Chapter 0609, "Significance Determination Process," Phase 1 screening worksheet and determined that the finding screened as having very low safety significance because adequate margins had been included in the battery selection and, therefore, the issue was a design deficiency confirmed not to result in loss-of-operability in accordance with NRC Manual Chapter Part 9900, "Technical Guidance, Operability Determination Process for Operability and Functional Assessment."

Enforcement. Part 50 of Title 10 of the Code of Federal Regulations, Appendix B, Criterion III, "Design Control," requires, in part, that measures be established for verifying the adequacy of design. These measures may include calculations. The licensee used Calculation NK-05 to calculate the duty cycle and size of the Division I, safety-related Battery NK11. Contrary to the above, as of August 22, 2008, the design control measures for calculating the size and duty cycle of the NK11 battery were inadequate, in that Calculation NK-05 failed to include momentary loads and failed to include three additional safety-related breaker shunt trips also powered by the battery. Because the violation is of very low safety significance and has been entered into the licensee's corrective action program as CAR 200808609, this violation is being treated as a non-cited violation, consistent with Section VI.A.1 of the NRC Enforcement Policy: NCV 05000483/2008008-01, Safety-Related 125 Vdc Station Battery NK11 Inadequate Battery Sizing Calculation.

2. Non-conservative Pipe Break Location for the Condensate Storage Tank Supply to Auxiliary Feedwater Pumps.

a. Inspection Scope

The inspection team reviewed uncertainty calculations, vendor manuals, drawings, and walkdowns of the condensate storage tank and auxiliary feedwater systems. The team reviewed the calculation to determine the pressure setpoint for automatic switchover from the condensate storage tank to the essential service water suction supply. The team reviewed the corresponding emergency diesel generator loading sequence of the components necessary to complete the automatic switchover. In addition, the team reviewed the operability assessment of the turbine driven auxiliary feedwater pump after a concurrent loss-of-off-site power and safe shutdown earthquake.

b. Findings

Introduction. The inspection team identified a Green, non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for failure to verify the adequacy of the design for turbine driven auxiliary feedwater pump operability. Specifically, the licensee used a non-conservative pipe break location in a calculation to model the effects of a design basis earthquake on the non-seismic portion of the condensate storage tank and auxiliary feedwater suction piping.

Description. The team reviewed the licensee's Request for Resolution (RFR) 14020, "Operability of Turbine Drive Auxiliary Feedwater Pump after Safe Shutdown Earthquake and Loss of Offsite Power." This RFR was based on a 1997 concern which questioned the operability of the turbine driven auxiliary feedwater pump following a seismic event that results in both the loss of the non-seismically designed condensate storage tank and the electrical switchyard.

In an external seismic event with concurrent loss-of-offsite-power scenario, the non-safety related condensate storage tank, the primary source to the auxiliary feedwater system, may be unavailable. Twelve seconds after the event, when diesel generators are at necessary speed, the auxiliary feedwater pump suction header will begin to isolate from the condensate storage tank on low header pressure, using motor operated valves. Concurrently, with the condensate storage tank isolation, the emergency service water system, the secondary source to the auxiliary feedwater system, will begin to align to the auxiliary feedwater suction header.

During this swap over sequence, the emergency service water pumps are idle and the turbine driven auxiliary feedwater pump is running. The original concern was that during this swap over period, the turbine driven auxiliary feedwater pump would operate for 20 seconds without an adequate suction supply until the emergency service water pumps would start, 32 seconds after the event.

To resolve the concern, the licensee issued Revision B of RFR 14020 in October 1997. Assuming a failure of the condensate storage tank, this evaluation determined the volume of water necessary, during the swap over period, for the demand of the turbine driven auxiliary feedwater pump. This volume was 67 gallons. The evaluation also determined the volume of water in the seismic Category 1 sections of the auxiliary feedwater suction piping that would be available to feed the turbine driven pump. This volume was 97 gallons. Additionally, the licensee modified the steam admission valve to the turbine driven auxiliary feedwater pump to open coincident with the emergency diesel generator loading.

The team reviewed RFR 14020, Revision B, noting that the licensee assumed that a pipe break would occur at the non-seismically designed nozzle of the condensate storage tank. The elevation of this break location is 2001 feet. The team determined this break location was not conservative because the non-seismically designed section of the auxiliary feedwater piping begins at a lower elevation of 1991 feet. The team determined a pipe break at the unprotected portion of the lower elevation pipe location would render water volume, credited in RFR 14020, unusable.

In response to the team’s concerns, the licensee entered the non-conservative condition into the corrective action system as CAR 200808674. The licensee engineering staff promptly performed an analysis to determine the effects of the pipe break at lower elevations. Since the emergency service water pumps are idle for 32 seconds in this scenario, the analysis included the effects of no pressure and subsequent system drain-down in the emergency service water system when aligned to the auxiliary feedwater system for 20 seconds.

The licensee’s analysis determined that by taking a pipe break at the lower elevation, 1991 feet, the credited water volume in the seismically designed sections of the auxiliary feedwater piping would be lost upstream of the condensate storage supply line check valve, which is at an elevation of 2003 feet. This lowered the usable volume of water to 81 gallons. The licensee determined that the turbine driven auxiliary feedwater pump would remain functional for the 20 second pump run because the idle emergency service water system equilibrium water column level provided an adequate net positive suction head.

Analysis. The inspection team determined the licensee’s failure to verify the adequacy of the design for turbine driven auxiliary feedwater pump operability is a performance deficiency because the licensee failed to meet 10 CFR Part 50, Appendix B, Criterion III, “Design Control.” The finding is more than minor because the calculation error resulted in a condition where there was reasonable doubt in the turbine driven auxiliary feedwater pump to perform its design function. Using Phase 1 worksheet of NRC Manual

Chapter 0609, "Significance Determination Process," this finding is determined to have very low safety significance (Green) because there was no actual loss of safety function.

Enforcement. Part 50 of Title 10 of the Code of Federal Regulations, Appendix B, Criterion III, "Design Control," requires, in part, that measures be established for verifying the adequacy of design. These measures may include seismic calculations on safety-related and non safety-related pipe break analysis. Contrary to this, between October 1997 and October 2008, the licensee failed to verify the adequacy of the design for turbine driven auxiliary feedwater pump operability. Specifically, the licensee used a non-conservative pipe break location in a calculation to model the effects of a design basis earthquake on the non-seismic portion of the condensate storage tank and auxiliary feedwater suction piping. Because this finding is of very low safety significance and has been entered in the licensee's corrective action program as CAR 200808674, this violation is being treated as a NCV consistent with Section VI.A of the NRC Enforcement Policy. NCV 05000483/2008008-02, Non-conservative Pipe Break Location for the Condensate Storage Tank Supply to Auxiliary Feedwater Pumps.

3. Auxiliary Feedwater Turbine Digital Control Panel (FC219)

a. Inspection Scope

The team reviewed turbine driven auxiliary feedwater pump room temperature calculations to determine whether the digital control panel would remain within its environmental design limits during accident conditions. The team reviewed corrective action documents to determine if there were any adverse operating trends. The team performed a visual inspection of the turbine driven auxiliary feedwater pump room to assess equipment and environmental conditions. In addition, the team interviewed licensee engineering and operations personnel regarding the qualification of the turbine digital controls, observations during routine pump surveillance testing, and compensatory administrative controls for monitoring room temperatures.

b. Findings

Introduction. The team identified a Green, non-cited violation of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings." Specifically, the team identified that the licensee had failed to follow Procedure APA-ZZ-00500, Appendix 1, Revision 6, "Operability and Functionality Determinations." The evaluation did not include the additional heat loading on equipment in the turbine driven auxiliary feedwater pump room, caused from an active steam leak from the turbine governor end case joint. The licensee had failed to include the additional steam leak heat load in either of the room temperature calculations M-GF-415 or BO-05, which were used in the operability determination.

Description. In 2001, an active steam leak from the turbine governor end case joint was identified, and the gland casing was repaired during a turbine overhaul during refuel outage 13. The steam leak reappeared in 2004. The licensee issued CAR 200400798 and performed an operability determination of the steam leak. The leakage was considered acceptable until a repair could be performed during refuel outage 14. The team determined that the operability determination contained no quantitative justification for the acceptance of the added heat load attributed to the steam leak. The gland casing was replaced during refuel outage 14, however, the steam leak reappeared soon thereafter. The condition was left uncorrected through refuel outage 15. The justification for the acceptance of this degraded condition was based upon the previous operability determination documented in CAR 200400798. The licensee recognized that the leak would worsen with increased usage of the turbine, so in 2004, to limit the rate of degradation, the frequency of the turbine driven auxiliary feedwater pump surveillance was changed from a monthly surveillance to a quarterly surveillance test.

In the operability determination, Calculations M-GF-415, “Temperature of Callaway Turbine-Driven Auxiliary Feedwater Pump Room” and BO-05, “Station Blackout Room Temperature” were performed to evaluate the turbine driven auxiliary feedwater pump room (Room 1331) temperature under normal and emergency operating conditions. FSAR 16.7.4.1, "Area Temperature Monitoring," states that the maximum allowable temperature in Room 1331 is 147°F. The maximum room temperature during a Station Blackout event as calculated in BO-05, Addendum 14, is 143.6°F. This calculation included heat loads from the turbine driven auxiliary feedwater pump, main and auxiliary steam piping, and room lighting, but did not consider the added heat load due to an active steam leak from the governor end case joint outboard gland casing. The team noted there was no documentation to support the ability of the digital turbine control unit to perform it’s safety function should the room temperature exceed 147°F.

The licensee cited previous operational data in which the room temperature increases were very minor in relation to the maximum room temperature limit of 147°F. This data was collected during routine turbine driven auxiliary feedwater pump surveillance and testing. However, in each of these instances, the room temperature increase was substantially mitigated by the non-safety related ventilation system in Room 1331. During an accident condition the room ventilation would be assumed unavailable.

In response to the team’s concerns, the licensee performed a prompt operability determination and calculated that the maximum room temperature, including the additional heat load from the steam leak, would not exceed the 147°F design limit. The licensee entered this issue in their corrective action program as CAR 200808777.

Analysis. The licensee’s failure to either correct the active steam leak or to account for the leak in their design calculations, is a performance deficiency. Per Inspection Manual Chapter 0612, Appendix E, Section 3, “Non-significant Dimensional, Time, Calculation, or Drawing Discrepancies,” Example J, this finding is more than minor because the licensee had not resolved the deficiency, resulting in a condition in which there was a reasonable doubt regarding the operability and reliability of the turbine digital speed control unit. The team screened the finding using the Inspection Manual Chapter 0609, "Significance Determination Process" Phase 1 worksheets. The finding screened as having very low safety significance (Green) because the subsequent analysis verified that there was no loss of operability or functionality. The finding had crosscutting aspects in the area of human performance (decision making) because the licensee used non-conservative assumptions in decision making in assessing whether to either correct the active steam leak or to include the steam leak heat input into design calculations M - GF-415 and BO-05. This activity was indicative of current performance as the steam leak still existed and had not been included in the design calculations until October 2008. [H.1 (b)]

Enforcement. Part 50 of Title 10 of the Code of Federal Regulations, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires 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. Contrary to the above, in the spring of 2004 and fall of 2005, the licensee failed to follow the requirements of Procedure APA-ZZ-00500, Appendix 1, Revision 6, "Operability and Functionality Determinations," step 4.2, "Scope of Prompt Operability Determinations." The licensee did not assure that the operability requirements for the system, structure and component encompass all necessary support systems (per the TS definition of operability) regardless of whether the TS explicitly specify operability requirements for the support functions. Specifically, an active steam leak within the turbine driven auxiliary pump room had not been included in calculations M-GF-415 and BO-05, used in the Operability Determination, which evaluated the turbine driven auxiliary feedwater pump room (Room 1331) temperature under normal and emergency operating conditions. However, because the finding is of very low safety significance and the licensee entered this issue into their corrective action program as CAR 200808777, this finding is being treated as a NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy. NCV 05000483/2008008-03, Auxiliary Feedwater Turbine Digital Control Panel (FC219).

4. Adequacy of the NK11 Battery Service Test.

Introduction: The team identified an unresolved issue (URI) related to the service testing of the safety-related NK11 and NK14 batteries.

Description: Surveillance Requirement 3.8.4.7 of the Callaway TS requires that every 18 months the licensee, "verify that the battery capacity is adequate to supply, and maintain in OPERABLE status, the required emergency loads for the design duty cycle when subjected to a battery service test." The service test to which the NK11 and NK14 safety related batteries are subjected at the required 18-month frequency was described in Callaway test procedures MSE-NK-QB011 and MSE-NK-QB014, respectively. The team's review of these procedures determined that the service test loading requirements and durations were included in Section 3.1 of the procedures, as part of the acceptance criteria for battery service test (duty cycle) and that these requirements corresponded to those specified in Table 8.3-2 of the FSAR, "125 V DC Class IE Battery Loading Cycle (Amperes Required per Time Interval per Battery after Loss of AC Power) Subsystems 1 and 4." The latest revision of Table 8.3-2 was dated March 2003. The team also observed that the 200-minute duration for the duty cycle, contained in the FSAR table and the test procedure, was not consistent with another section of the FSAR. In fact, in Table 8.3A-1, as a result of their station blackout coping analysis, the licensee concluded that Callaway was a four-hour or a 240-minute plant. This statement implies that the battery must be proven to be capable of providing adequate voltage to the station blackout loads for the entire coping duration, 240 minutes, and have sufficient capacity to allow restoration of the normal AC power sources at the end of the 240-minute coping period.

The licensee recognized the need to demonstrate such capability and in Note 2 of Table 8.3-2 stated that "The 200 minute duty cycle is the design load cycle for the batteries. The batteries have been analyzed for a 240 minute loading cycle to support the Station Blackout coping analysis." The team's review of the battery sizing calculation determined that the licensee did evaluate the capability of the selected batteries to support the 240 minute loading cycle during the station blackout, albeit the licensee made no distinction between LOCA/LOOP and SBO loads. The importance of the service (duty cycle) test is to confirm that, given the plant specific duty cycle loading, the battery is capable of supplying adequate voltage to the loads for the duration of the service life of the battery and to detect degradation of the system as the battery approaches the end of its service life. The team discussed their concern with the licensee who simply indicated that the 200 minute duty cycle in the test enveloped the 240 minute loading cycle calculated in NK-05. This item is unresolved pending further review by the NRC of the license requirements under the SBO rule and the licensee's revision of battery sizing calculation, NK-05. URI 05000483/2008008-04, Adequacy of the NK11 Battery Service Test.

4 OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems

The team reviewed CARs associated with the selected components, operator actions and operating experience notifications. One issue was identified with respect to Identification of Problems. The licensee failed to identify an error in a operability determination, where they did not include the additional heat input from an active steam leak into design calculations used in the operability determination discussed in section 1R.21.b.3. No other issues were identified.

4OA6 Meetings, Including Exit

On August 22, 2008, the team leader presented the preliminary inspection results to Mr. F. Diya, Vice President, Nuclear, and other members of the licensee's staff. On September 24, 2008, the Engineering Branch 1 Chief conducted a telephonic exit meeting with Mr. D. Turley, Supervising Engineer, and other members of the licensee's staff discussing the unresolved issue, and on October 21, 2008, the team leader held a final exit with Mr. M. McLaghlan and Mr. L. Graessle. No proprietary information was received or included in this report.

4OA7 Licensee Identified Violations

None.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

R. Andreasen, Associate Engineer
D. Dickneite, Consulting Engineer
F. Diya, Vice President, Nuclear Operations
R. Farnam, Manager, Radiation Protection
E. Goss, Consulting Engineer
L. Graessle, Manager, Regulatory Affairs
M. Haag, Principal Engineer
M. Hudson, Consulting Engineer
J. Imhoff, Principal Engineer
W. Jessop, Manager, Business Operations
L. Kanuckel, Manager, Quality Assurance
D. Lantz, Superintendent, Nuclear Operations Training
J. Little, Consulting Engineer
S. Maglio, Assistant Manager, Regulatory Affairs
D. Martin, Supervising Engineer
M. McLaghlan, Manager, Engineering Services
K. Mills, Manager, Plant Engineering
D. Neterer, Plant Director
J. Norman, ESW Design Engineer
E. Olson, Superintendent, Performance Improvement
S. Petzel, Engineer, Regulatory Affairs
J. Pitts, Supervisor, Engineering Technical Support
S. Reed, Assistant Manager, Engineering Services
N. Smith, System Engineer
D. Stepanovic, Assistant Manager, Engineering
T. Szumski, Design Engineer
K. Tipton, System Engineer
D. Trokey, Regulatory Affairs Specialist, Regulatory Affairs
D. Turley, Supervising Engineer
E. Vaughn, Mechanical Design Engineer
R. Wilson, Consulting Engineer, Engineering Services

LIST OF ITEMS OPENED AND CLOSED

Opened

05000483/2008008 04	URI	Adequacy of the NK11 Battery Service Test. (Section 1R21.b.4.)

Opened and Closed

05000483/2008008 01	NCV	Safety-Related 125 Vdc Station Battery NK11 Inadequate Battery Sizing Calculation (Section 1R21.b.1).
05000483/2008008 02	NCV	Non-conservative Pipe Break Location for the Condensate Storage Tank Supply to Auxiliary Feedwater Pumps. (Section 1R21.b.2)
05000483/2008008 03	NCV	Auxiliary Feedwater Turbine Digital Control Panel FC219. (Section 1R21.b.3)

LIST OF DOCUMENTS REVIEWED

The following is a partial list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspector 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.

Section 1R21: Component Basis Design Inspection

ADMINISTRATIVE DOCUMENTS

APA-ZZ-00395, Significant Operator Response Timing, Revision 9

TDB-001, Tank Data Book, Revision 44

CALCULATIONS

06-131, Thermal Performance Test Data Evaluation and Uncertainty Analysis for CCW Heat Exchanger EEG01B, Revision A

2004-01120, Essential Service Water Hydraulic Model, Revision 1

AB-42, ABPV0001 Capability and Margin Calculation, Revision 0

AL-18, Verification of Adequate Water Inventory for TDAFP Startup without CST Availability and LOOP, Revision 0

AL-22, Aux Feedwater Pumps Suction Pressure Setpoints, Revision 3

AL-24, Evaluate Potential for Surface Vortex Formation in TAP01, Revision 0, Add. 4

AL-57, Air Transport Time to ALV0001 Following a CST Postulated Line Break, Revision 0

AP-02, Required CST Capacity, Revision 0, Add. 2

AP-05, Condensate Storage Tank Volume, Revision 0

ARC-582, Backup Nitrogen Supply System Design Pressure Losses, Revision 0

ARC-727, PAL02 Suction Pressure Evaluation Prior to WSW Pump Start, Revision 0

BG-73, Computer Flow Model of Charging and RCP Seal Water Lines, Revision 0

BM-16, BMHV0001 Capability and Margin Calculation, Revision 0

BO-04, CST Inventory for 4 Hour SBO – 158,000 Gallons, Revision 2

BO-05, Station Blackout Room Temperature, Revision 1, Add.14

BO-05 ADD 14-001, Revision to Normal Plant Operation Room Temperature for Turbine Driven Auxiliary Feedwater Pump (TDAFP) Room, Revision 0

E-21028(Q), Relay Setting Tabulation – Systems NK &NN, Revision 7

EE-003, Electrical Load Growth, Revision 3

EF-54, Ultimate Heat Sink Thermal Performance Analysis, Revision 3

EG-14, Component Cooling Water System, Revision 0, Add. 4

FL-08, Control Building Flooding, Revision 3, Add. 2

FL-10, Control Building Flooding, Revision 0

FL-12, Control Building Flooding, Revision 0

H-9, Systems NG/PG Relay Settings, Revision 3

J2A04, Accuracy: Input Current to Voltage Buffer, Foxboro 2AI-I3V, Revision 1

J2A08, Foxboro Dynamic Compensator (Lead/Lag) 2AC+DYC, Revision 0

J2A10, Voltage-to-Current Converter Foxboro 2AO-V2I, Revision 0

J2C01, Accuracy: Pressure Transmitters, Rosemount 1153 B, Revision 1

J2G01, C.C.C. Bistable and Sensing Resistor, Revision 0

J-U-GEN, Methodology for determination of Instrument Loop Uncertainty Estimates/Methodology for determination of Technical Specification setpoints and related information, Revision 0

J-USA06, Instrument Loop Uncertainty Estimate, Rack Allowance for System AL Loops 37, 38, 39, Revision 1

M-EG-14, Component Cooling Water System Calculation, Revision 0

M-EG-14, Reference Calculation M-EG-20 Add #1 for Changes in the Design Basis Operational Temperatures of the CCW System, Revision 0, Add.1

M-EG-14, Update CCW Calculation to Reflect the Removal of the PDP, Revision 0, Add.2

M-EG-14, EBG08 A/B Flow Revision, Revision 0, Add 3

M-EG-14, Clarification of Component Cooling Water (CCW) System Acceptable Flows and Heat Loads for Essential and Non-Essential Loads, Revision 0, Add.4

M-EG-20, Max CCW Temperature Post LOCA, Revision 0, Add.1

M-EG-42, Calculate the Number of Tubes that Can Be Plugged, Revision 0

M-GF-415, Temperature of Callaway Turbine-Driven Auxiliary Feedwater Pump Room, 12/18/2006

NB-05, NB System Protective Relays, Revision 4

NG-02, Voltage Drop in Control Circuits fed from MCC Class 1E Distribution Panels

NG-22, NG Load Center Setpoint, Revision 1

NK-01, CMP 86-0069-A 125 V DC Ground Detector Relays, Revision 0

NK-02, CMP 86-0069-A DC Ground Detector Relay Calculation for 60% Rated Voltage Test Resistor Value, Revision 0

NK-04, Calculation to Determine Sensitivity for Ground Detector Relays, Revision 0

NK-05, Class 1E Battery Capacity, Revision 6

NK-08, System NK Relay Settings, Revision 0

NK-08, System NK Undervoltage Relay Settings, Revision 0, Add.1

NK-08, NK System Setpoint Calculation, Revision 0, Add.2

NK-08, NK System Setpoint Calculation, Revision 0, Add.3

NK-09, 125 Volt DC System Short Circuit Study, Revision 2

NK-10, NK System Dc Voltage Drop, Revision 1

NK-10, NK System Dc Voltage Drop, Revision 1, Add. 2

NN-02, NN System Voltage Drop, Revision 2

NN-02, NN System Voltage Drop, Revision 2, Add. 1

PK-01, PK-11 and PK-12 Battery and Charger Sizing, Revision 0

PK-01, PK-11 and PK-12 Battery Sizing, Revision 0, Add.1

PK-01, This Addendum Calculates the Battery Capacity to Support FSAR 9.5.1.2.2.2, Revision 0, Add. 1

PK-01, PK-11 and PK-12 Battery and Charger Sizing, Revision 0, Add. 3

PK-01, PK-11 and PK-12 Battery and Charger Sizing, Revision 0, Add. 4

ZZ-145, Short Circuit Calculation, Revision 2

ZZ-179, Plant AC Load List, Revision 7

ZZ-214, MOV Voltage Drop Calculation, Revision 9

ZZ-224, MOV Sizing Calculation, Revision 11

ZZ-274, Internal Fooling Analysis, Revision 0

ZZ-278, PRA Human Error Calculation, Revision 0, Add. 1

ZZ-279, Callaway Internal Flooding Study, Revision 0

ZZ-466, Quantitative Screening of Callaway Flood Areas for Internal Flooding Evaluation Revision 0

ZZ-62, Voltage Drop Calculations, Revision 9

CALLAWAY ACTION REQUEST SYSTEM (CARS)

200300070	200603457	200700074	200706268	200803830
200400798	200603478	200700499	200706561	200804000
200401735	200604044	200700827	200706811	200804282
200406180	200604360	200701152	200706837	200804397
200502333	200604730	200701406	200706859	200805357
200504537	200604772	200701483	200707405	200805577
200505062	200605025	200701963	200707421	200805932
200506993	200605158	200702196	200707575	200806332
200507299	200605252	200702529	200708773	200806475
200507496	200605307	200702713	200708786	200806902
200507515	200605466	200703036	200709432	200807250

CALLAWAY ACTION REQUEST SYSTEM (CARS)

200507702	200605786	200703163	200710631	200808328
200507755	200605844	200703225	200710837	200808351
200507785	200605847	200703519	200711647	200808416
200507930	200606074	200703740	200711849	200808424
200508006	200606499	200703776	200711935	200808485
200508780	200606822	200703854	200800269	200808509
200508800	200607191	200703861	200800367	200808580
200509392	200608086	200704024	200800976	200808592
200509429	200608833	200704185	200801091	200808629
200509667	200608902	200704429	200801345	200808668
200600074	200609073	200704500	200801400	200808740
200600295	200609516	200704729	200801444	200808769
200600680	200609710	200705366	200801504	200808775
200600903	200609726	200705415	200801656	200808777
200601090	200610063	200705685	200801667	200808799
200601437	200610086	200706016	200801735	200808800
200602527	200610371	200706049	200801883	200808812
200602559	200700023	200706073	200802225	

DESIGN BASIS DOCUMENTS

ULDBD-EG-001, Component Cooling Water System, Revision 0

ULDBD-EJ-001, Residual Heat Removal, Revision 0

ULDBD-FLOOD-001, Internal Flooding, Revision 0

ULDBD-SB0-001, Station Blackout, Revision 0

DESIGN CHANGE PACKAGES

MP 05-3050, Increase Pressure Retention Capability of Masoneilan Model 38 Actuators, Revision 0

DRAWINGS

033C19537, Schematic 7.5 KVA AC Rectifier 480 VAC, 3PH, 60Hz, 130 VDC,

730200025, Positioner Assembly; Bailey Type AP2 6 inch – Stroke, March 9, 1978

730300010, Manual Override Assembly, March 29, 1978

8600-X-89233, Single Line Diagram On-Site Electrical Power Distribution System, Revision 37

E-1045-00004, Inverter Single Line Diagram, Revision 0

E-21001 (Q), FSAR Figure 8.3-1 Sheet 1

Power distribution single line diagram, Revision 13

E-21005 (Q), List of Loads Supplied by Emergency Diesel Generator, Revision 32

E-21010A, DC Main Single Line Diagram (PK03 and PK04 Bus), Revision 5

E-21024 (Q), Relay Setting Tabulation and Coordination Curves Systems NG and PG, Revision 8

E-21NB01 (Q), Lower Medium Voltage System Class 1E 4.16KV Single Line Meter and Relay Diagram, Revision 7

E-21NB02 (Q), Lower Medium Voltage System Class 1E 4.16KV Single Line Meter and Relay Diagram, Revision 7

E-21NB03 (Q), Lower Medium Voltage System Class 1E 4.16KV Single Line Meter and Relay Diagram, Revision 1

E-21NG01(Q), Low Voltage System Class IE 480 V System Meter & Relay Diagram, Revision 13

E-21NG02 (Q), Low Voltage System Class IE 480V Single Line Meter and Relay Diagram, Revision 16

E-21NG02(Q), Low Voltage System Class IE 480 V System Meter & Relay Diagram, Revision 16

E-21NK01(Q), Class IE 125 V DC System Meter & Relay Diagram, Revision 8

E-21NK02(Q), Class IE 125 V DC System Meter & Relay Diagram, Revision 8

E-21NN01(Q), Class IE Instrument AC Schematic, Revision 10

E-21PG06 (Q), Low Voltage System Non-Class IE 480V Single Line Meter and Relay Diagram, Revision 9

E-21PK01, Non-Class IE 125 V DC System Meter & Relay Diagram, Revision 14

E-21PK02, Non-Class IE 125 V DC System Meter & Relay Diagram, Revision 18

E-21PK03, Non-Class IE 125 V DC System Meter & Relay Diagram, Revision 11

E-21PK04, Non-Class IE 125 V DC System Meter & Relay Diagram, Revision 9

E-21PN01(Q), Instrument AC Power (Non Class IE PWR System), Revision 1

E-23BM06A, Schematic Diagram – SG Blowdown to Blowdown Flash Tank Isolation Valves, Revision 14

E-23BM20, Schematic Diagram; Steam Blowdown to Feedwater System Valve, Revision 1

E-23EF04, ESW from Component Cooling Water Heat Exchanger Isolation Valve EFHV59, Revision 14

E-23EJ04A, Schematic Diagram – RHR Pump 1 to Charging Pump Valve, Revision 9

E-23EJ05B(Q), Schematic Diagram – RHR Loop 2 Inlet Isolation Valve, Revision 12

E-23KJ01A (Q), Schematic Diagram – Diesel Generator KKJ01A Engine Control (Start/Stop Circuit), Revision 14

E-23KJ01B (Q), Schematic Diagram – Diesel Generator KKJ01A Engine Control (D/G Trips), Revision 1

E-23KJ06 (Q), Schematic Diagram – Diesel Generator KKJ01A Governor Control, Revision 4

E-23NE12 (Q), Schematic Diagram – Diesel Generator KKJ01A Exciter/Voltage Control, Revision 10

E-23NK10 (Q), 125 V DC Class IE Power System Schematic, Revision 9

E-23NK11 (Q), 125 V DC Class IE Power System Schematic, Revision 3

E-23NK12 (Q), Class 1E 125 V DC System Swing Transfer Switch Control Diagram, Train A, Revision 3

E-23NN01 (Q), Class IE Instrument AC Schematic, Revision 10

E-U1001 (Q), Single Line Diagram Essential Service Water System, Revision 6

J-02BM13, Steam Generator Blowdown System Control Logic Diagram, Revision 0

J-104-0076, Logic Block Diagram ESFAS, Revision 13

J-1070-00035, Input Drive Adaptor, Revision 0

M-018-00077, Electrical Schematic - Diesel Generator Control NE107 (NE106), Revision 15

M-018-00634, Regulator Products – WNR – Logic & Firing Circuits, Revision 2

M-018-00635, Colt Industries – Type WNR Volt Reg. & Excitation System, Revision 7

M-018-00636, Colt Industries – WNR Volt Reg. & Excitation System, Revision 2

M-22AP01, P&ID Condensate Storage and Transfer System, Revision 25

M-22BM01 (Q), P&ID Steam Generator Blowdown System, Revision 35

M-22BM02, Piping and Instrumentation Diagram; Steam Generator Blowdown System, Revision 16

M-22EF01, Piping and Instrumentation Diagram, Essential Service Water System, Revision 64

M-22EF02, Piping and Instrumentation Diagram, Essential Service Water System, Revision 64

M-22EJ01 (Q), P&ID RHR System, Revision 57

M-22EM01 (Q), P&ID High Pressure Coolant Injection System, Revision 33

M-22EM02 (Q), P&ID High Pressure Coolant Injection System, Revision 19

M-22EM03 (Q), P&ID High Pressure Coolant Injection System, Revision 13

M-22GM01(Q), P&ID Diesel Generators Building HVAC, Revision 2

M-22KJ01, Standby Diesel Generator A Cooling Water System, Revision 20

M-22KJ02, Standby Diesel Generator A Intake, Exhaust, Fuel Oil, and Starting Air Systems, Revision 20

M-22KJ03, Standby Diesel Generator A Lube Oil System, Revision 18

M-22KJ04, Standby Diesel Generator B Cooling Water System, Revision 19

M-22KJ05, Standby Diesel Generator B Intake, Exhaust, Fuel Oil, and Starting Air Systems, Revision 24

M-22KJ06, Standby Diesel Generator B Lube Oil System, Revision 17

M-22LE02 (Q), Piping and Instrumentation Diagram Control and Diesel Generator Bldg Oily Waste System, Revision 4

M-23EJ01 (Q), Piping Isometric RHR System Auxiliary Building – A Train, Revision 19

M-23EJ04 (Q), Piping Isometric RHR System Reactor Building, Revision 14

M-2G022, Equipment Locations Reactor and Auxiliary Buildings Plan Ground Floor EL 2000’-0”, Revision 61

M-2G024, Equipment Location Reactor and Auxiliary Buildings Plan Operating Floor EL. 2047’-6”, Revision 56

M-2G050, Equipment Locations, Control Building and Common Corridor Plant Elevation 1974 ft. 0in. & 1984 ft. 0in., Revision 29

M-2G051, Equipment Locations Control & Diesel Gens. BLDGS. and COMM. Corridor Plan EL. 2000’-0” & EL. 2016’-0”, Revision 35

M-UG080, Essential Service Water System, Pumphouse Equipment Locations-Plan, Revision 14

EMERGENCY OPERATING PROCEDURES

Addendum 14, Main Steam Header Isolation - Local, Revision 1

Addendum 23, Local CST Emergency Fill, Revision 2

Addendum 7, Restoring Offsite Power, Revision 4

BD-ECA-0.0, Loss of All AC Power, Revision 2

CSF-1, Critical Safety Function Status Trees, Revision 9

E-0, Reactor Trip or Safety Injection, Revision 12

E-1, Loss of Reactor or Secondary Coolant, Revision 11

E-2, Faulted Steam Generator Isolation, Revision 9

E-3, Steam Generator Tube Rupture, Revision 13

ECA-0.0, Loss of All AC Power, Revision 8

ECA-0.1, Loss of All AC Power Recovery Without SI Required, Revision 8

ECA-0.2, Loss of All AC Power Recovery With SI Required, Revision 6

ES-0.0, Rediagnosis, Revision 6

ES-0.1, Reactor Trip Response, Revision 7

ES-0.2, Natural Circulation Cooldown, Revision 9

ES-0.3, Natural Circulation Cooldown with Steam Void in Vessel (with RVLIS), Revision 9

ES-0.4, Natural Circulation Cooldown with Steam Void in Vessel (without RVLIS), Revision 9

ES-1.1, SI Termination, Revision 9

GENERAL OPERATING PROCEDURES and ANNUNCIATOR REPONSE PROCEDURES

OTG-ZZ-0005, Plant Shutdown 20% Power to Hot Standy, Revision 31

OTG-ZZ-0006, Plant Cooldown Hot Standby to Cold Shutdown, Revision 49

OTA-NK-0001, 125 Vdc Class 1E Panel NK01, Revision 5

MODIFICATIONS

00-1009B, Main Steam Isolation Valve Actuator Modification, Revision 0

96-1026, Terry Turbine Controls Upgrade, 10/19/2001

MODIFICATIONS

CMP 87-1066, Add Drain Lines to the oil collection troughs on the standby diesels, 06/03/2004

J-1070-00001, Qualification Plan of Woodward 505/PGPL Turbine Control Modification for AMEREN Services Company, 02/23/2001

NORMAL OPERATING PROCEDURES

OTN-NB-0001A, NB01 Loss of Power Recovery, Revision 0

OTN-NE-0001B, Standby Diesel Generation System Train B, Revision 21

OFF-NORMAL OPERATING PROCEDUERS

OTO-BB-00003, Reactor Coolant System Excessive Leakage, Revision 15

OTO-KA-00001, Partial or Total Loss of Instrument Air, Revision 13

OTO-NK-00002, Loss of Vital 125 Vdc Bus, Revision 7

PROCEDURES

APA-ZZ-00312, Probabilistic Risk Assessment (PRA), Revision 6

APA-ZZ-00323, Configuration Management Process, Revision 4

APA-ZZ-00500, Appendix 1, Operability and Functionality Determinations, Revision 6

APA-ZZ-00600, Design Change Control, Revision 31

APA-ZZ-00604, Requests for Resolution, Revision 24

APA-ZZ-00605, Temporary System Modifications, Revision 22

E-0, Reactor Trip or Safety Injection, Revision 12

E-3, Steam Generator Tube Rupture, Revision 13

EC Supp Guide, Emergency Coordinator Supplemental Guideline, Revision 6

ECA-0.0, Loss Of All AC Power, Revision 8

ECA-1.2, LOCA Outside Containment, Revision 6

ECA-1.3, Sump Blockage Mitigation, Revision 7

ECA-2.1, Uncontrolled Depressurization of All steam Generators, Revision 10

ECA-3.3, SGTR without Pressurizer Pressure Control, Revision 7

EDP-EF-UHS01, UHS Cooling Tower Operational Guidance Following a LOCA, Revision 1

EDP-ZZ-01114, Motor Operated Valve Program Guide, Revision 15

EDP-ZZ-04015, Evaluating and Processing Requests for Resolution (RFR),Revision 49

EDP-ZZ-04023, Calculations, Revision 24

EIP-ZZ-00240, Technical Assessment Coordinator Checklist, Revision 5, Add. B

ES-0.2, Natural Circulation Cooldown, Revision 9

ES-1.1, SI Termination, Revision 9

ES-1.3, Transfer to Cold Leg Recirculation, Revision 9

ESP-AB-01000, Main Steam Safety Valve Set Pressure Testing, Revision 6

ESP-EF-0002B, Essential Service Water Train B Flow Verification, Revision 9

ETP-EG-00001, Component Cooling Water Heat Exchanger Test, Revision 8

ETP-EG-00002, Component Cooling Water System Flow Verification, Revision 9

ETP-EG-00002, Component cooling Water System Flow Verification, Revision 8

ETP-NE-ST001, Diesel Generator NE01 Governor Testing, Revision 2

ETP-NE-ST002, Diesel Generator NE02 Governor Testing, Revision 1

ISF-GK-00R04, Functional Test Surveillance Procedure; Control Building Supply Air Radiation Detection, Revision 16

ISL-AL-00P39, CST to Suction Header Pressure Channel Calibration, Revision 17

ISL-GK-00R04, I&C Loop Calibration Surveillance Procedure; Loop Nuclear; Control Room Supply Air Radiation Detection, Revision 19

ISP-SA-00007, I&C Surveillance Procedure; Control Room Ventilation Time Response Test Channel 1, Revision 4

ISP-SA-02414, Instrumentation Surveillance Test Procedure; ESFAS Trip Actuating Device Test, Revision 13

ITL-FC-0S313, I&C Loop Calibration Procedure; Loop-Misc.; Auxiliary Feedwater Pump Turbine Speed Control, Revision 9

MDP-ZZ-S0001, Scaffolding Installation and Evaluation, Revision 23

MDP-ZZ-S001, List of Designated Assessment Personnel, Appendix A, 03/29/01

MPE-NK-QB04, NK Class 1E Battery Charger Inspection, Revision 6

MPE-PK-NB001, Electrical Preventive Maintenance Procedure MPE-PK-NB001 Battery Performance Discharge Test, Revision 6

MPE-PK-NB008, PK 125V Non-Vital Battery Charger Inspection, Revision 5

MPE-ZZ-NB001, Monthly Inspection of Large Non-Safety Related Station Batteries, Revision 7

MPE-ZZ-NB002, Quarterly Inspection of Large Non-Safety Related Station Batteries, Revision 5

MPE-ZZ-NB004, Inter-Cell Connection Inspection and Testing of Non-Safety Related Station Batteries, Revision 5

MPE-ZZ-QS005, General Electrical Breaker PM, Revision 27

MPE-ZZ-QS006, GE Magne-Blast Breaker Overhaul, Revision 6

MPE-ZZ-QS009, Testing of Molded Case Circuit Breakers, Starters and Ground Fault relaying, Revision 23

MPE-ZZ-QY300, Test and Calibration of Time Delay and Control Relays, Revision 11

MPM-EJ-QP001, Residual Heat Removal Pump Overhaul, Revision 12

MSE-NK-QB011, Refueling Outage Inspection and Surveillance of NK11 Battery and Battery Charger NK21/NK25, Revision 12

MSE-NK-QB011, Refueling Outage Inspection and Surveillance of NK11 Battery and Battery Charger NK21/NK25, Revision 14, 04/30/2008

MSE-NK-QB011, Refueling Outage Inspection and Surveillance of NK11 Battery and Battery Charger NK21/NK25, Revision 15, 05/19/2008

MSE-NK-QB014, Refueling Outage Inspection and Surveillance of NK14 Battery and Battery Charger NK24/NK26, Revision 15, 05/19/2008

MSE-NK-QB01A, Weekly Inspection of NK11 Large Stationary Batteries, Revision 9

MSE-NK-QB02A, Quarterly Inspection of NK11 Large Stationary Batteries, Revision 9

MSE-ZZ-QS004, 18 Month Selection of Molded Case 480V Containment Overcurrent Protective Devices, Revision 25

MSE-ZZ-QS005, Molded Case Circuit Breaker Functional Test, Revision 19

MTE-ZZ-QA013_007, MOVATS UDS Testing of Torque Controlled Limitorque Motor Operated Rising Stem Valves, Revision 7

MTE-ZZ-QA014_007, MOVATS UDS Testing of Limit Controlled Limitorque Motor Operated Rising Stem Valves, Revision 7

MTE-ZZ-QA015_008, MOVATS UDS Testing of Limitorque Motor Operated Butterfly Valves, Revision 8

MTE-ZZ-QA023, MOVATS UDS Testing of Torque Controlled Limitorque Motor Operated Rotating Rising Stem Valves

MTE-ZZ-QB001, D.C. Ground Location, Revision 9

MTE-ZZ-QB002, Battery Charger Troubleshooting, Revision 8

MTE-ZZ-QN003, Insulation Resistance Testing, Revision 12

NN11-PBWI, Replace Sync and Oscillator Boards for NN12 Inverters, 6/30/2008

ODP-ZZ-0016E, Equipment Operator Watchstation Practices, Revision 19

ODP-ZZ-0016E, Equipment Operator Watchstations Practices and Logs, Revision 2

ODP-ZZ-00310, WPA and Caution Tagging, Revision 33

OSP-AB-V0003, Main Steam System Manual Valve Inservice Test, Revision 5

OSP-AB-V002A, SG Atmospheric Steam Dump (ASD) Valves Inservice Test, Revision 28

OSP-AL-P0002, Turbine Driven Auxiliary Feedwater Pump Inservice Test – Group B, Revision 57

OSP-BM-V001A, SG Blowdown System Valve Operability, Revision 12

OSP-EF-P001B, ESW Train B Inservice Test, Revision 53

OSP-EJ-P001A, RHR Train A Inservice Test- Group A, Revision 45

OSP-EJ-V003A, RHR Train A Mode 5 Valve Inservice Test, Revision 14

OSP-GK-0002A, Train A Control Room Ventilation and Pressure Test, Revision 10

OSP-GK-0003A, CRVIS A Damper Stroke Time Test, Revision 3

OSP-KA-V0003, Nitrogen Accumulator Inservice Leak Rate Test, Revision 17

OSP-NE-00002, Simultaneous Start of Both Diesel Generators, Revision 19

OSP-NE-0001A, Standby Diesel Generator A Periodic Tests, Revision 30

OSP-NE-0001B, Standby Diesel Generator B Periodic Tests, Revision 31

OSP-NE-0024A, Standby Diesel Generator A 24 Hour Run and Hot Restart Test, Revision 22

OSP-NE-0024B, Standby Diesel Generator B 24 Hour Run and Hot Restart Test, Revision 22

OSP-SA-0010A, Train A CISA Slave Relay Test, Revision 14

OSP-SA-0015A, Train A SIS Slave Relay Test, Revision 10

OSP-SA-0017A, Train A SIS-CSAS Slave Relay Test, Revision 22

OSP-SA-0017B, Train B SIS-CSAS Slave Relay Test, Revision 23

OSP-SA-2413A, Train A Diesel Generator and Sequencer Testing, Revision 6

OSP-SA-2413B, Train B Diesel Generator and Sequencer Testing, Revision 8

OTA-RK-00024, Addendum 94E, Control Building Oily Waste Sump Level High, Revision 0

OTA-RK-00024, Addendum 94F, Miscellaneous Sumps Level High, Revision 0

OTA-RK-00024, Addendum 95A, RHR Pump Room Sump A or B Level High, Revision 1

OTA-RK-00024, Addendum 95B, Diesel Generator Room A Sump Level Hi, Revision 0

OTA-RK-00026, Add 128A, Auxiliary Feedwater Pump Discharge Pressure Low, Revision 0

OTA-RK-00026, Add 128E, TD AFP Speed High or Low, Revision 0

OTN-EF-00001, Essential Service Water System, Revision 39

OTN-PK-00001 Add. 01, Operation of Pk01, PK11, and PK21, Revision 2

OTO-BB-00003, Reactor Coolant System Excessive Leakage, Revision 14

OTO-EG-00001, CCW System Malfunction, Revision 10

OTO-EJ-00002, Loss of RHR Due To Heavy Load Drop in Containment, Revision 7

OTO-EJ-00003, Loss of RHR While Operating at Reduced Inventory or Mid-Loop Conditions, Revision 1

OTO-NB-00001, Loss of Power to NB01, Revision 19

OTO-ZZ-00001, Control Room Inaccessibility, Revision 31

OTS-QD-00001, Emergency Lighting Tests, Revision 13

PM0812100, NN12 – 7.5 KVA Inverter Fed NK0211, Revision 2

XNG02, Transformer Lockout, Revision 0

REQUEST FOR RESOLUTION

4602, Review Safety Function of EM Isolation Valves, Revision E

5353, Valves EJHV8804A and B, Revision F

8746, Determination of Thrust Values, Revision L

10060 A, Determine Max. CCW Temperature Post LOCA, 02/13/2007

14020, Operability of TDAFP after SSE and LOOP, Revision B

14020, Operability of TDAFP after SSE and LOOP, Revision C

14072, Review DP Requirements for Selected GL 89-10 MOVs, Revision A

14421 F, Approval of ABC Fire Extinguishers on Cart, 07/02/1997

14612, Review DP Requirements for Selected GL 89-10 MOVs, Revision A

17044, Classification of SG Blowdown Isolation Valves, Revision D

20356 A, Storage of Chemistry Equipment in ESW Pumps Room, 05/31/2001

23383A, Evaluate Hoses/drain rigs mounted to operable systems, 04/12/2004

COMPLETED SURVEILLANCES / WORK ORDERS

04502797/260, PK12 Discharge Test, 04/13/2008

05515199, EDG B voltage and frequency testing RF15, RF 15

05515515, EDG B voltage and frequency testing RF14, RF 14

06520492/290, Maintenance Inspection of NK21 – 125 VDC Vital Battery Charger #1 per MPE-NK-QB004, Revision 4, 08/20/2007

06529794/250, PK12 Inter-Cell Resistance Check, 04/07/2008

07514532, Quarterly Inspection of NK11 Large Stationary Batteries, 02/25/2008

08501966, Quarterly Inspection of NK11 Large Stationary Batteries, 05/27/2008

08502043, Quarterly Inspection of PK12 Battery, 05/19/2008

08505932/500, Monthly Testing of PK12 Battery, 07/07/2008

08506639, Weekly Inspection of NK11 Large Stationary Batteries, 07/0/2008

08506932, Weekly Inspection of NK11 Large Stationary Batteries, 07/14/2008

08507161, Weekly Inspection of NK11 Large Stationary Batteries, 07/21/2008

08507422, Weekly Inspection of NK11 Large Stationary Batteries, 07/28/2008

59973, Inverter Final Test Report, 12/19/1994

MSE-NK-QB011, Refueling Outage Inspection and Surveillance of NK11 Battery and Battery Charger NK21/NK25, 10/01/2005

MSE-NK-QB011, Refueling Outage Inspection and Surveillance of NK11 Battery and Battery Charger NK21/NK25, 04/19/2007

MSE-NK-QB014, Refueling Outage Inspection and Surveillance of NK14 Battery and Battery Charger NK24/NK26, 10/24/2005

MSE-NK-QB014, Refueling Outage Inspection and Surveillance of NK14 Battery and Battery Charger NK24/NK26, 04/08/2007

NERP8171, Evaluation 18 AWG Wire Use for Float/Equal Pot & Sw Ckt, 01/15/2003

P655113, Maintenance Inspection of NK21 – 125 VDC Vital Battery Charger #1 per MPE-NK-QB006, R6, 02/07/2006

P707833, Clean and Inspect NK11 Battery Charger - Capacitor Replacement, 11/30/2004
P721522/550, Troubleshoot NN12 Fuse Blowing,

S699473, Refuel Insp-NK11 Battery (Service Test), 05/07/2004

S725335, EDG A voltage and frequency testing RF14, RF 14

S725337, EDG A voltage and frequency testing RF15, RF 15

VENDOR DOCUMENTS

Instruction Manual 4303, Model 1153 Series B Alphaline Pressure Transmitters for Nuclear Service, Revision E

M-140-00018, Instruction Manual for Nozzle Type Safety Valves; Crosby, Revision 6

TI 2AC-175, Technical Information: SPEC 200 Dynamic Compensator, November 1973

TI 2AI-130, Technical Information: Current-to-Voltage Converters,, October 1977

TI 2AO-135, Voltage-to-Current Converter, Models 2AO-V3I and 2AO-V5I, October 1977

MISCELLANEOUS DOCUMENTS

Bechtel Letter: Environmental Qualification of Auxiliary Feedwater Pumps and Turbine Driver – Specification M-021, 09/13/1983

Gould Station Battery Installation and Operating Instructions (for Lead-Antimony and Lead Calcium Types)

List of Root Cause Evaluations Related to Component Failures or Design Issues

List of Equipment Common Cause Evaluations

List of SSCs in MR but not modeled in PRA

Performance Monitoring Report – NK 125VDC (Class IE), 04/03/2008, 07/31/2008

Performance Monitoring Report – NN Instrument AC Power, 04/03/2008

Performance Monitoring Report – PA Higher Medium Voltage (13.8KV) System, 04/03/2008

Performance Monitoring Report – PK 125 VDC System, 07/29/2008

E-Mail from Chris Richards to Ken J Tipton RE: Pielstick Cold Start w/ Cold Start Test Data, 08/14/2008

10466-M-021, Design Specification for Auxiliary Feedwater Pumps and Turbine Drive for Standardized Nuclear Unit Power Plant System, Revision 6

384-1974, IEEE Trial –Use Standard Criteria for Separation of Class 1E Equipment and Circuits, 1974

4645-P41-12, Technical Specification for Security Diesel Generator, Revision 2
96-1026, Terry Turbine Controls Upgrade, Revision A

A210.0027, Summary Report on the Fourth Update of the Callaway Level 1 PRA, Revision 5

AP06-006, Quality Assurance Audit of Design Control, 07/31/2006

AP06-018, Quality Assurance Audit of Inservice Inspection, 12/12/2006

AP07-002, Quality Assurance Audit of Testing, 04/05/2007

AP07-003, Quality Assurance Audit of Operations, 06/01/2007

AP07-011, Quality Assurance Audit of Special Nuclear Materials Accountable Source Control and Fuel Reliability, 09/27/2007

AP08-003, Quality Assurance Audit of Design Control, 04/10/2008

APA-ZZ-00303, App. 1, Callaway Plant Systems, Revision 7

E-050-00016, Instruction Manual for Batteries and Battery Packs, Revision 14

E-051-00090, Instruction Manual for Three-Phase Thyristor Control Class IE 130V Battery Charger – Power Conversion Products, Inc., Revision 7

E-051A-00014, Instruction Manual for Three-Phase SCR Battery Charger – Power Conversion Products, Inc., Revision 0

E-1038-00008, Instruction Manual for 7.5 KVa Inverter – Solid State Controls, Inc., Revision 9

E-21013, Installation, Inspection, and Testing Details for Electrical Equipment and Cable, Revision 44

ECN 05-01, Environmental Qualification Change Notice: M-237 MEQ, 08/24/2005

EDP-ZZ-01128, SSCS in the Scope of the Maintenance Rule at Callaway, Revision 4

J-1010-0046-01, Instruction Manual for Inverter XSK01A, 03/07/1986

J-1070, Technical Specification for Terry Turbine Controls Upgrade, Revision 1

J-1070-00001, Qualification Plan of Woodward 505 /PGPL Turbine Control Modification for Ameren Services Company, 07/31/2008

J-1070-00001, Qualification Plan of Woodward 505/PGPL Turbine Control Modification for Ameren Services Company, 09/26/2002

J-1070-00002, Failure Mode and Effects Analysis for Woodward 505/PGPL Turbine Control Modification for Ameren Services Company, 08/08/2000

J-1070-00003, DC Load Calculations for Woodward 505/PGPL Turbine Control Modification for Ameren Services Company, 08/02/2000

J-1070-00004, Callaway Plant Woodward 505 Governor Modification, 08/30/2000

J-1070-00022, Instruction Manual for Callaway Nuclear Plant Terry Turbine 505 Digital Controller, Revision 3

J-1070-00022, Woodward Company Manual for 505 Digital Governors for Steam Turbines with Single or Split Range Actuators – Volume 1, 02/01/2000

J-1070-00023, Nuclear Seismic Qualification for Turbine Control Panel, 07/24/2002

J-1070-00024A, Design Change Certification, 10/16/2002

J-1070-00025, Nuclear Seismic Qualification for Woodward PGPL Actuator and Actuator Drive, 07/24/2002

J-1070-00026, Nuclear Seismic Qualification for Remote Servo and Bracket Assembly, 07/24/2002

J-1070-00027, Nuclear Seismic Qualification for Remote Speed Indicator Panel, 07/24/2002

J-1070-00028, Software Development Lifecycle for Woodward 505/PGPL Turbine Control Modification for Ameren Services Company, 03/07/2001

J-1070-00029, Site Test Procedure for PGPL Actuator, Speed Reducer and Turbine Control Panel, 03/07/2000

J-1070-00030, Installation Procedure for Terry Turbine Modification, 03/07/2001

J-1070-00031, Factory Test Report for PGPL Actuator, Speed Reducer and Turbine Control Panel, 02/26/2001

J-1070-00032, Electromagnetic Compatibility Test Plan, 03/02/2001

J-1070-00033, Electromagnetic Compatibility Immunity Test Report, 03/02/2001

J-1070-00034, Electromagnetic Compatibility Immunity Test Report (Supplement), 03/02/2001

J-1070-00036, 505 Configuration List, 02/13/2004

J-1070-00864806, Seismic Qualification Review for Turbine Control Panel, Woodward PGPL Actuator, Remote Servo and Remote Speed Indicator, 10/09/2002

J-1071-00001, Failure Modes and Effects Analysis Governor System Upgrade Ameren Nuclear Power Plant, Revision 1

NES 94-129, NRC Information Notice No. 94-24 Response, 05/26/1994

TM-08-0001, Install Jumper into Bypass Fused Disconnect NK5423, 03/09/2008

ULDBD-GK-001, Control Room Building HVAC System, Revision 0

ULDBD-NE/KJ-001, Emergency Diesel Generators Design Basis Document, Revision 0

ULDBD-SB-001, Topical Area – Station Blackout, Revision 0

W205836, RHR Train B Safety Injection Pumps Supply Isolation Operation, 03/20/2000