UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
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61 FORSYTH STREET, SW, SUITE 23T85
ATLANTA, GEORGIA 30303-8931

April 7, 2008

Virginia Electric and Power Company
ATTN: Mr. David A. Christian
President and Chief Nuclear Officer
Innsbrook Technical Center – 2SW
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: SURRY POWER STATION - NRC COMPONENT DESIGN BASIS INSPECTION REPORT 05000280/2008006 AND 05000281/2008006

Dear Mr. Christian:

On February 29, 2008, the U. S. Nuclear Regulatory Commission (NRC) completed an inspection at your Surry Power Station, Units 1 & 2. The enclosed inspection report documents the inspection findings, which were discussed on February 29, 2008, with Mr. Don Jernigan and other members of your staff.

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

Based on the results of this inspection, the inspectors identified three findings of very low safety significance (Green), which involved violations of NRC requirements. Additionally, one licensee-identified violation which was determined to be of very low safety significance is listed in this report. However, because of their very low safety significance and because they are entered into your corrective action program, the NRC is treating these findings as Non-Cited Violations (NCVs) consistent with Section VI.A.1 of the NRC's Enforcement Policy. If you contest any of these NCVs you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the United States Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at Surry Power Station.

In accordance with 10 CFR 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/

Binoy B. Desai, Chief
Engineering Branch 1
Division of Reactor Safety

Docket Nos.: 50-280, 50-281
License Nos.: DPR-32, DPR-37

Enclosure: Inspection Report 05000280, 281/2008006
w/Attachment: Supplemental Information

cc w/encl:
Chris L. Funderburk, Director
Nuclear Licensing and
Operations Support
Virginia Electric & Power Company
Electronic Mail Distribution

Donald E. Jernigan
Site Vice President
Surry Power Station
Virginia Electric & Power Company
Electronic Mail Distribution

Virginia State Corporation Commission
Division of Energy Regulation
P. O. Box 1197
Richmond, VA 23209

Lillian M. Cuoco, Esq.
Senior Counsel
Dominion Resources Services, Inc.
Electronic Mail Distribution

Attorney General
Supreme Court Building
900 East Main Street
Richmond, VA 23219

Letter to David A. Christian from Binoy Desai dated April 7, 2008.

SUBJECT: SURRY POWER STATION - NRC COMPONENT DESIGN BASIS INSPECTION REPORT NOS. 05000280/2008006 AND 05000281/2008006

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Richard Jervey, NRR

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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.:	50-280, 50-281
License Nos.:	DPR-32, DPR-37
Report No.:	05000280/2008006 and 05000281/2008006
Licensee:	Virginia Electric and Power Company (VEPCO)
Facility:	Surry Power Station, Units 1 & 2
Location:	5850 Hog Island Road Surry, VA 23883
Dates:	January 28, 2008 through February 29, 2008
Inspectors:	R. Berryman, P.E., Senior Reactor Inspector (Lead) S. Rose, Senior Reactor Inspector W. Fowler, Reactor Inspector C. Baron, Contractor G. Skinner, Contractor
Accompanying Personnel:	B. Collins, Reactor Inspector (trainee) G. Gardner, Reactor Inspector (trainee) J. Hamman, Reactor Inspector (trainee)
Approved by:	Binoy B. Desai, Chief Engineering Branch 1 Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000280/2008006, 05000281/2008006; 1/28/08 - 2/29/08; Surry Power Station, Units 1 and 2; Component Design Basis Inspection.

This inspection was conducted by a team of three NRC inspectors, three NRC inspectors who were in training, and two NRC contract inspectors. Three Green findings, all of which were non-cited violations (NCVs) were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using IMC 0609, “Significance Determination Process” (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, “Reactor Oversight Process,” (ROP) Revision 4, dated December 2006.

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

- Green. The inspectors identified two examples of a Green non-cited violation of 10 CFR 50, Appendix B, Criterion III, Design Control, for failure to evaluate variations of emergency diesel generator (EDG) output frequency in electrical design loading calculations, and failure to consider worst case 4160 VAC bus voltage in safety related motor starting calculations. This finding was entered into the licensee’s corrective action program as condition reports (CR) 091493 and 091494. Planned corrective actions included revision of the EDG loading calculations to incorporate the most limiting voltages and frequencies.

  This finding is more than minor because it affects the Mitigating Systems Cornerstone objective ensuring the availability, reliability, and operability of the EDGs to perform the intended safety function during a design basis event and the cornerstone attribute of Design Control, i.e. initial design. The inspectors assessed the finding using the SDP and determined that the finding was of very low safety significance (Green) because the deficiencies did not result in any EDG being inoperable based upon additional analysis that showed that the EDGs had sufficient margin to accommodate the increased loading due to worst case acceptably high EDG output frequency; and all safety related motor loads remained operable since they were still capable of starting with the revised worst case low voltage values. (Section 1R21.2.12)

- Green. The inspectors identified a Green NCV of 10 CFR 50, Appendix B, Criterion XI, Test Control, for incorrect acceptance criteria in test procedure 1-EPT-0106-01, Main Station Battery 1A Service Test. This finding was entered into the licensee’s corrective action program as condition report 091906. Planned corrective actions included revision of the main station battery test procedures to include the correct voltage at the one minute mark.

  This finding is more than minor because it affects the Mitigating Systems Cornerstone objective ensuring the availability, reliability, and operability of the station batteries to perform the intended safety function during a design basis event and the cornerstone

attribute of Procedure Quality, i.e. maintenance and testing procedures. The inspectors assessed the finding using the SDP and determined that the finding was of very low safety significance (Green) because the deficiency did not result in station batteries being inoperable based upon a recent review of station battery discharge test results.

The inspectors determined that the lack of a thorough evaluation of condition report 022112, which addressed deficiencies in station battery test procedures such that resolutions addressed causes, was a significant cause of this performance deficiency. Failure to thoroughly evaluate problems such that resolutions address causes is directly related to the Corrective Action Program component of the cross-cutting area of Problem Identification and Resolution and the aspect of thorough evaluation of problems (P.1(c)). (Section 1R21.2.13)

- Green. The inspectors identified a Green non-cited violation of 10 CFR 50, Appendix B, Criterion III, Design Control, for failure to evaluate the most limiting differential pressure (dP) for opening valve 2-FW-MOV-260A, auxiliary feedwater (AFW) cross-tie motor-operated valve (MOV). This finding was entered into the licensee's corrective action program as condition report 091698. Planned corrective actions included internal inspection of the valve and revision of the evaluation that identified the most limiting dP for opening.

  This finding is more than minor because it affects the Mitigating Systems Cornerstone objective ensuring the availability, reliability, and operability of the AFW system to perform the intended safety function during a design basis event and the cornerstone attribute of Design Control, i.e. initial design and plant modifications. The inspectors assessed the finding using the SDP and determined that the finding was of very low safety significance (Green) because the deficiency did not result in 2-FW-MOV-260A being inoperable based upon additional analysis which showed that the MOV had sufficient margin to accommodate opening against the worst case high dP.

  The inspectors determined that the lack of control or understanding of the actual margin to maximum allowable dP to open 2-FW-MOV-260A was a significant cause of this performance deficiency. Failure to maintain design margins is directly related to the Resources component of the cross-cutting area of Human Performance and the aspect of maintenance of plant safety by the maintenance of design margins (H.2(a)). (Section 1R21.2.19)

B. Licensee-Identified Violations

One violation of very low safety significance, which was identified by the licensee has been reviewed by the inspectors. Corrective actions taken or planned by the licensee have been entered into the licensee's corrective action program. This violation and corrective action tracking number are listed in Section 4OA7 of this report.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

1R21 Component Design Bases Inspection (71111.21)

.1 Inspection Sample Selection Process

The team selected risk significant components and operator actions for review using information contained in the licensee's Probabilistic Risk Assessment (PRA). In general, this included components and operator actions that had a risk achievement worth factor greater than two or Birnbaum value greater than 1 $X10^{-6}$. The components selected were located within the auxiliary feedwater (AFW) system, component cooling water (CCW) system, safety injection system, charging system, emergency diesel generator (EDG) support and electrical subsystems, 4160 VAC electrical system, alternate AC diesel generator (AAC Diesel) support and electrical subsystems, 125Vdc battery system, and reserve station service (RSS) transformer system. The sample selection included 19 components, five operator actions, and four operating experience items. Additionally, the team reviewed one modification by performing activities identified in IP 71111.17, "Permanent Plant Modifications," Section 02.02.a. and IP 71111.02, "Evaluations of Changes, Tests, or Experiments."

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 due to modification, or 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 action, repeated maintenance, maintenance rule (a)1 status, RIS 05-020 (formerly GL 91-18) 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. An overall summary of the reviews performed and the specific inspection findings identified are included in the following sections of the report.

.2 Results of Detailed Reviews

.2.1 <u>AAC Diesel (engine, fuel oil, lubrication, jacket water cooling, ventilation)</u>

a. <u>Inspection Scope</u>

The team reviewed the Updated Final Safety Analysis Report (UFSAR), Design Basis Documents (DBDs), drawings, calculations, maintenance records, and operating procedures to verify the capability of the AAC Diesel to perform the intended function during a station blackout (SBO) event. Tank capacity calculations were reviewed to ensure sufficient fuel oil was available in the fuel oil day tank to support the required mission time for the AAC Diesel. Cooling, lubrication, and air start capabilities were reviewed to verify that these systems were adequately sized. A walk down of the AAC Diesel and support systems was conducted to ensure that the installed systems matched the descriptions in the DBD. Design change history and related corrective actions were reviewed to assess potential component degradation and impact on design margins.

b. Findings

No findings of significance were identified.

.2.2 Check Valves SI-224 and 225 (Cold Leg Injection); and SI-25 and 410 (RWST Cross-Connect)

a. Inspection Scope

The team reviewed Technical Specifications (TS); UFSAR; design drawings and calculations; and plant procedures to verify the appropriateness of design assumptions, boundary conditions, and models. This review was also conducted to verify that the licensee's analytical methods were appropriate. The team verified that design assumptions and limitations were translated to operational and testing procedures. Plant personnel were interviewed and a component walk down was conducted to verify that potential degradation was being monitored or prevented. A system walk down was also conducted to verify that the observable material condition would support the design operation, component configurations were being maintained consistent with design assumptions, and the equipment was adequately protected from external events. The team also reviewed maintenance and corrective action history to verify that potential degradation was being monitored or prevented and that component replacement was consistent with qualification life.

b. Findings

No findings of significance were identified.

.2.3 EDG-1/2/3 (Mechanical)

a. Inspection Scope

The team reviewed the UFSAR, TS, TS Bases, and DBDs to identify the design basis of various support systems associated with the operation of the EDGs during design basis accident conditions. The EDG fuel oil sub-system was reviewed to verify its ability to provide sufficient fuel oil to meet the design basis of seven days of operation while fully loaded. Calculations and procurement controls were reviewed to verify that the acceptance of ultra low sulfur fuel oil (ULSFO) would not impact the capability of the EDGs to complete a seven day mission time. American Petroleum Institute (API) acceptance limits and underground fuel oil storage tank level instrumentation were reviewed to verify density and energy content changes associated with different API values would not impact the ability of operators to verify sufficient fuel oil availability in the underground storage tanks at higher API values.

The team reviewed calculations and design documents for the diesel fuel oil transfer system to verify its capability of performing the design function of providing adequate fuel from two underground storage tanks to the diesel room auxiliary and day tank. Calculations associated with fuel oil consumption rates, pumping requirements, and net positive suction head (NPSH) were reviewed to verify adequate fuel oil can be transferred for multiple EDG operation.

Calculations, EDG Owners Group recommendations and vendor manuals were reviewed to verify that EDG de-rating was not required. The EDG jacket water cooling system and diesel building air temperature calculations were reviewed to verify limiting jacket water exit temperatures would not be exceeded during times of elevated ambient air temperatures. Jacket water chemistry controls were reviewed to verify that system fluid additives did not conflict with assumptions used to validate that engine de-rating was not required.

The team reviewed design features for the diesel building ventilation system with regards to adverse weather such as tornados. Ventilation system drawings and documentation related to Regulatory Issue Summary 2006-23, Post Tornado Operability of Ventilating and Air-Conditioning Systems Housed in Emergency Diesel Generator Rooms, were reviewed to verify the system was capable of operating as designed during pressure transients experienced during tornado events. Walkdowns were conducted to verify system components are being maintained and that system alignment was consistent with current operation practices.

b. Findings

No findings of significance were identified.

.2.4 Charging Pump Lubricating Oil Coolers (1-CH-E-5A, B and C)

a. Inspection Scope

The team reviewed the UFSAR, DBDs, calculations and corrective actions documents to verify that the charging pump lubricating oil coolers could perform the design basis function of providing adequate heat removal for the inboard and outboard bearing oil and pump speed increaser gear box. Calculations were reviewed to verify the existence of adequate heat transfer capability between the lubricating oil and the charging pump service water system. Calculation inputs were reviewed and compared to the installed plant equipment to verify design inputs were correct. Maintenance and procurement controls were reviewed to verify that operational experience associated with tube corrosion was being effectively implemented. Control logic was reviewed to verify the capability of providing adequate service water flow control in order to maintain proper lube oil temperatures. Corrective action documentation was reviewed to verify that system conditions were being monitored and corrected as appropriate. Walkdowns were performed to verify that adverse material conditions were being addressed.

b. Findings

No findings of significance were identified.

.2.5 Charging Pump Seal Cooling System Surge Tank (1-CC-TK-3)

a. Inspection Scope

The team reviewed the UFSAR and DBDs to identify the level control design features and requirements of the charging pump seal cooling system surge tank. Control logic diagrams were reviewed to verify that level control met the design basis requirements. Calculations for charging pump cooling water (CPCW) pump available NPSH were reviewed to verify the level control system was providing the required water level to prevent cavitation of the CPCW pumps. CPCW pump curves were reviewed to verify adequate margin exists with respect to required NPSH. CPCW system flow calculations and modification records associated with the CPCW pumps were reviewed to verify that any component replacements had not adversely impacted the NPSH margins. Walkdowns were performed to verify that observable adverse material conditions were being addressed and that an appropriate tank level existed with respect to design calculations.

b. Findings

No findings of significance were identified.

.2.6 AFW Discharge Check Valves (1/2-FW-142, 157 and 172)

a. Inspection Scope

The team reviewed the UFSAR, DBDs and surveillance procedures to verify that the AFW pump discharge check valves could perform the required design function of preventing backflow. Completed surveillance test data was reviewed to verify that components were satisfying acceptance criteria and being properly maintained. System walkdowns were performed to verify that verify that observable adverse material conditions were being addressed.

b. Findings

No findings of significance were identified.

.2.7 Low Pressure Injection Relief Valves (SI-RV-1845A, B and C)

a. Inspection Scope

The team reviewed the UFSAR, DBDs and work orders to verify that the low pressure safety injection pump discharge relief valves could perform the required design function of preventing over-pressurization of the low pressure safety injection discharge piping.

Design documents were reviewed to verify that the relief valve setpoints were consistent with bench test work order acceptance criteria and piping design pressure ratings. Completed bench testing results were reviewed to verify that satisfactory results were obtained and that procedural requirements associated with unsatisfactory test results were being performed. Corrective action documentation was reviewed to identify if any unanticipated relief valve lifting had occurred.

b. Findings

No findings of significance were identified.

.2.8 Reactor Coolant Pump (RCP) Thermal Barrier Cooling (CC-RV-116 and CC-TV-120)

a. Inspection Scope

The team reviewed the UFSAR, DBD's, correspondence letters and design change packages (DCPs) to identify the design requirements of the RCP thermal barrier heat exchanger CCW outlet isolation valves and the inlet pressure relief valves. Periodic testing and maintenance documents were reviewed to verify that the outlet isolation valves could perform their design function of isolating the outlet of the thermal barrier heat exchangers in the event of a tube leak to prevent contamination of the CCW system with primary water. Design documents were reviewed to verify that the selected valves' design pressures were adequate to provide proper isolation. Bench testing documentation was reviewed to verify that inlet relief valve settings were consistent with piping design pressures. Completed DCPs and current field drawings were reviewed to verify that design features were being maintained.

b. Findings

No findings of significance were identified.

.2.9 Motor Driven AFW Pumps and Motors (1/2-FW-P-3A and B)

a. Inspection Scope

The inspectors reviewed AFW system hydraulic calculations to verify that the performance and the required NPSH of the motor driven pumps were satisfied. The inspectors also reviewed the surveillance test acceptance criteria bases and test results to verify that the pumps would have sufficient capability at the minimum acceptable performance. In addition, the inspectors verified that the pumps had adequate protection for potential minimum flow and runout conditions. The inspectors reviewed the design of the pumps and associated rooms with regard to postulated high energy line breaks (HELBs) and internal missile hazards to verify that these hazards could be mitigated. The inspectors reviewed condition reports and corrective maintenance associated with the equipment to verify that degraded conditions were appropriately addressed. The inspectors also reviewed operating procedures and the control logic associated with the pumps and associated equipment to verify that the equipment was capable of performing the intended functions. The inspectors reviewed the design of the alternate water supplies to verify the capability to provide adequate suction flow if the supply from the emergency condensate storage tank (ECST) was not available.

The inspectors reviewed pump power requirements during all postulated conditions, including runout conditions to verify that the power supplies could supply adequate power. The inspectors reviewed AC load flow and voltage calculations to verify that adequate motive power was available during worst case degraded voltage and service conditions. The inspectors reviewed wiring and logic diagrams to verify that motor control logic was consistent with the design bases. The inspectors reviewed power supply cable calculations to verify that feeder cable current limitations were not exceeded. The inspectors reviewed overcurrent protective device settings to verify that the motors were adequately protected and that they were not susceptible to spurious tripping during runout conditions. This included a review of the modification to overcurrent protection relays which allowed increased settings to account for runout conditions. The inspectors performed walkdowns of the pumps and associated equipment to verify that the configuration and material condition of the equipment was consistent with the design requirements.

b. Findings

No findings of significance were identified.

.2.10 AFW Flow Control Valves (FW-151 E and F)

a. Inspection Scope

The inspectors reviewed AC load flow and voltage calculations to verify that adequate motive power was available during worst case degraded voltage and service conditions. The inspectors reviewed motor control center (MCC) control circuit voltage drop calculations to determine whether motor-operated valve (MOV) contactors had adequate voltage to pick up when required. The inspectors reviewed wiring diagrams to verify that control logic was in conformance with the design bases.

The inspectors reviewed calculations and test data to verify the capability of these flow control valves to provide the required AFW flow to the steam generators under the most limiting accident conditions. This review included the MOV calculation inputs and results. The inspectors also reviewed the surveillance test acceptance criteria and test results to verify that the MOVs were capable of performing the intended function. The inspectors reviewed condition reports and corrective maintenance records to verify that material deficiencies were addressed appropriately. The inspectors reviewed operating procedures and the control logic associated with the equipment to verify that the valves would operate as designed. The inspectors also reviewed the operating procedures associated with manually closing the valves in the event of failure of the MOVs to remotely operate to verify that the procedures were appropriate. The inspectors performed walkdowns of the valves and associated equipment to verify that the configuration and observable material condition of the equipment was consistent with the design requirements.

b. Findings

No findings of significance were identified.

.2.11 RCP Seal Injection Isolation Valve (1-CH-MOV-1370)

a. Inspection Scope

The inspectors reviewed AC load flow and voltage calculations to verify that adequate motive power was available during worst case degraded voltage and service conditions. The inspectors reviewed MCC control circuit voltage drop calculations to determine whether MOV contactors had adequate voltage to pick up when required. The inspectors reviewed wiring diagrams to verify that control logic was in conformance with the design bases.

The inspectors reviewed calculations and test data to verify that 1-CH-MOV-1370 was capable of providing the required seal injection flow and isolation as required under the most limiting conditions. This review included the MOV calculation inputs and results. The inspectors reviewed condition reports and corrective maintenance associated with the valve. The inspectors reviewed operating procedures and the control logic associated with the equipment to verify that the valve would operate as designed.

b. Findings

No findings of significance were identified.

.2.12 EDG-1/2/3 (Electrical)

a. Inspection Scope

The inspectors reviewed static loading calculations to verify that the automatically sequenced and manual loads expected during worst case accident conditions would be within the specified ratings of the EDGs. The inspectors reviewed load sequencing logic and dynamic loading calculations to determine whether the transient loading expected during worst case conditions was within the capability of the generators. The inspectors reviewed EDG test procedures and results to determine whether they were consistent with licensing basis requirements and whether they demonstrated adequate performance. The inspectors reviewed permissible frequency variations to verify that they have been properly accounted for in equipment performance and diesel loading calculations. The inspectors reviewed EDG output breaker logic to verify that automatic functions were consistent with the design bases. The inspectors reviewed protective relay logic and set points to verify that they afforded adequate protection and would not cause spurious tripping of the EDG. The inspectors reviewed maintenance and corrective action documents to determine whether the EDGs had exhibited adverse performance trends. The inspectors performed a visual inspection of the EDGs to assess the observable material condition and the presence of hazards.

b. Findings

Introduction: The inspectors identified two examples of a Green non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion III, Design Control, for failure to evaluate variations of EDG output frequency in electrical design loading calculations, and failure to consider worst case 4160 VAC bus voltage in safety related motor starting calculations.

Description: Calculation EE-0035 determined static loading on all three EDGs for various accident and event scenarios to ensure that loads resulting from automatic and required manual actions would not exceed the ratings of the EDGs. This calculation did not make any allowance for acceptable frequency variations. An EDG output frequency higher than the nominal 60 Hz would cause an increase in real power loading on the EDGs. This is due to the fact that centrifugal loads such as pumps and fans run faster at higher frequency and therefore demand higher real power input. TS 4.6.A.1.b requires EDG testing during each reactor shutdown for refueling. Refueling outage test procedure 1-OPT-ZZ-001, ESF Actuation with Undervoltage and Degraded Voltage, allows a steady-state EDG output frequency of up to 60.33 Hz. The inspectors determined that the 0.33 Hz higher than nominal frequency allowed by test procedures would increase EDG loading by approximately 1%. This was not evaluated in the original calculations. In response to the inspector's inquiries, the licensee confirmed that sufficient margin existed to accommodate the additional loading potentially caused by acceptable frequency variations. The licensee initiated CR 091493 to revise the calculations.

In the second example, calculation EE-0034, Surry Voltage Profiles, determined the minimum voltage at the terminals of large motors that start automatically at the onset of a design basis loss of coolant accident (LOCA) for all three EDGs supplying both units. When large motors are started, the 4160 VAC bus voltage drop could be large enough to cause the degraded voltage relay to drop out. In order to stay connected to the offsite power supply, bus voltage must return above the relay reset set point prior to the expiration of the degraded voltage relay time delay. Calculation EE-0034 analyzed this scenario and applied a positive tolerance to the relay reset value, since this required a higher bus voltage (and higher corresponding switchyard voltage) for relay reset and was the limiting case for offsite power availability. However, negative tolerance of the relay reset feature which would permit a lower voltage on a 4160 VAC safety bus (and the switchyard), without transfer to the EDG was not considered. Specifically, the licensee failed to base EDG loading calculations on the worst case acceptable frequency allowed by test procedures, and failed to use worst case bus voltage afforded by the degraded voltage protection scheme in motor starting studies. This would represent a more limiting case for motor starting voltage. The licensee initiated CR 091494 to address this issue. The licensee performed subsequent analysis which demonstrated that safety related motors would still have adequate starting voltage.

Analysis: The two examples of failures to use appropriate inputs in 4160 VAC electrical design calculations were performance deficiencies. This finding is more than minor because it affects the Mitigating Systems Cornerstone objective ensuring the availability, reliability, and operability of the EDGs to perform the intended safety function during a design basis event and the cornerstone attribute of Design Control, i.e. initial design. The inspectors assessed the finding using the SDP and determined that the finding was of very low safety significance (Green) because the deficiencies did not result in any EDG being inoperable based upon additional analysis that showed that the EDGs had sufficient margin to accommodate the increased loading due to worst case acceptably high EDG output frequency; and all safety related motor loads remained operable since they were still capable of starting with the revised worst case low voltage values. This finding was reviewed for cross-cutting aspects and none were identified since the performance deficiencies have existed since initial operation and are not indicative of current licensee performance.

Enforcement: 10 CFR 50, Appendix B, Criterion III, Design Control, states, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis for structures, systems, and components are correctly translated into specifications, drawings, procedures, and instructions. Contrary to the above, the licensee failed to evaluate variations of EDG output frequency in electrical design loading calculations, and failed to consider worst case 4160 VAC bus voltage in safety related motor starting calculations. Because this finding is of very low safety significance and was entered into the licensee's corrective action program as condition report (CR) 091493 and CR 091494, this violation is being treated as a NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy. This finding is identified as NCV 05000280, 05000281/2008006-01, Failure to Evaluate and Use Limiting Case 4160 VAC Bus Frequency and Voltage in Design Calculations.

.2.13 4160 VAC Transfer Bus F and Breakers 15F1, 15C1, 15H8, 25J9, and 25C1

a. Inspection Scope:

The inspectors reviewed 125VDC voltage drop calculations and battery test results to verify that circuit breaker controls would have adequate voltage to operate when required. The inspectors reviewed bus and breaker elementary diagrams to determine whether control logic was consistent with the design bases. The inspectors reviewed AC load flow and protective relay calculations to determine whether overcurrent protection was appropriate for accident loading. The inspectors reviewed system health, maintenance, and corrective action documents to determine whether the equipment had exhibited adverse performance trends.

b. Findings:

Introduction: The inspectors identified a Green NCV of 10 CFR 50, Appendix B, Criterion XI, Test Control, for incorrect acceptance criteria in test procedure 1-EPT-0106-01, Main Station Battery 1A Service Test.

Description: The inspectors identified that the licensee had accepted an incorrect acceptance criterion in a test procedure. The licensee had identified that test procedure 1-EPT-0106-01 did not evaluate battery voltage during critical periods of battery operation. Specifically, the first minute voltages were not measured. The licensee generated CR 022112 on October 10, 2007 to address this issue on all four station battery test procedures. The licensee subsequently revised refueling outage test procedure 1-EPT-0106-01 to include recording and trending of first minute voltages. CR 022112 was then dispositioned as having been resolved. However, the procedure was revised to include an acceptance criterion of 105 volts during the first minute based on an incorrect assumption that it was acceptable for battery voltage to reach a minimum of 105 volts during the first minute of a discharge test. Calculation 07797.06-E-001, Voltage Drop Calculations for Battery Loads, took credit for a minimum of 112 volts during the first minute. Therefore, the first minute acceptance criterion of 105 volts would not have been adequate to assure the battery would supply adequate voltage to supplied loads for the required duration during a design basis event.

Analysis: The failure to use appropriate acceptance criteria for battery voltage at the one minute mark was a performance deficiency. This finding is more than minor because it affects the Mitigating Systems Cornerstone objective ensuring the availability, reliability, and operability of the station batteries to perform the intended safety function during a design basis event and the cornerstone attribute of Procedure Quality, i.e. maintenance and testing procedures. The inspectors assessed the finding using the SDP and determined that the finding was of very low safety significance (Green) because the deficiency did not result in station batteries being inoperable based upon a recent review of station battery discharge test results. Discharge test results at the one minute mark were greater than 112 volts.

The inspectors determined that the lack of a thorough evaluation of CR 022112, which addressed deficiencies in station battery test procedures such that resolutions addressed causes, was a significant cause of this performance deficiency. Failure to thoroughly evaluate problems such that resolutions address causes is directly related to the Corrective Action Program component of the cross-cutting area of Problem Identification and Resolution and the aspect of thorough evaluation of problems (P.1(c)).

Enforcement: 10 CFR 50, Appendix B, Criterion XI, Test Control, states, in part, that test programs shall be established to assure that all testing required to demonstrate that structures, systems and components will perform satisfactorily in service. Contrary to the above, the licensee did not establish adequate test control measures to assure that station batteries would perform as designed. Because this finding is of very low safety significance and was entered into the licensee's corrective action program as CR 091906. This violation is being treated as a NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy. This finding is identified as NCV 05000281/2008006-02, Failure to use Appropriate Acceptance Criteria for Testing Battery Voltage at the One Minute Mark.

.2.14 RSS Transformer C (1-EP-RST-1C)

a. Inspection Scope:

The inspectors reviewed AC load flow calculations to determine whether the transformer had sufficient capacity to support its required loads under worst case accident loading and grid voltage conditions. The inspectors reviewed load tap changer design parameters, including target voltage, time delays, and operating time to determine whether it was able to respond to prevent tripping of the under voltage relays during accident conditions. The inspectors also reviewed power sources and voltage available to the transformer tap changer. The inspectors reviewed transformer protective relaying schemes to verify that they would afford adequate protection and whether there would be any adverse interactions that would reduce system reliability. The inspectors reviewed maintenance procedures and records to determine whether maintenance was adequate to assure operability of automatic functions during accident conditions. The inspectors reviewed system health and corrective action documents to determine whether there were adverse equipment operating trends.

b. Findings:

No findings of significance were identified.

.2.15 AAC Diesel (Electrical)

a. Inspection Scope:

The inspectors reviewed the DBDs, UFSAR, AAC Diesel specifications, loading calculations, and name plate data to verify that the AAC Diesel was capable of performing the intended function. Protective relay trip setting calculations were reviewed to verify that devices were appropriately sized and coordinated. The inspectors reviewed performance and surveillance test data for the AAC Diesel to verify that applicable test acceptance criteria and test frequency requirements were satisfied and to verify that the AAC Diesel would satisfy design requirements. Component replacement histories for the AAC Diesel generator and associated relays and breakers were reviewed to verify that the equipment had not been modified in a way to degrade the capabilities of the AAC Diesel generator. Vendor manuals were reviewed to verify that vendor recommendations were implemented as appropriate. The inspectors reviewed related corrective actions to verify that appropriate actions have been taken for adverse conditions and to note any adverse trends. The inspectors conducted a field walk down of the diesel housing facility, electrical relay cabinets, output breaker control switches and breaker position indicating lights to assess observable material conditions and to verify that the installed configuration was consistent with system drawings and documentation.

b. Findings:

No findings of significance were identified.

.2.16 4160 VAC Breaker 15H7

a. Inspection Scope:

The inspectors reviewed DBDs, drawings, calculations, the UFSAR, breaker specifications and name plate data to verify that 4160 VAC breaker 15H7 was capable of performing the intended function. Logic diagrams, coordination calculations and coordination curves were reviewed to verify that breaker control logic would satisfy the safety related functions. Short circuit and voltage drop calculations were reviewed to verify that operation and protection of the breaker would be satisfied under worst case operating conditions. The inspectors reviewed the trip characteristics and interrupting capability to verify that the breaker would be protected from postulated fault currents. The inspectors reviewed completed performance and surveillance test data for circuit breaker 15H7 to verify that applicable test acceptance criteria and test frequency requirements were satisfied and to verify that the breaker would satisfy design requirements. Component replacement histories were reviewed to verify that the equipment had not been modified in a way to degrade the capabilities of the breaker. Vendor manuals were reviewed to verify that vendor recommendations were implemented as appropriate. The inspectors reviewed related corrective actions to verify appropriate actions had been taken for adverse conditions and to note any adverse trends. A visual inspection of breaker panel 15H7 was performed to verify that output breaker control switches, breaker position indicating lights and general field conditions to assess observable material conditions and to verify that the installed configuration was consistent with system drawings and documentation.

b. Findings:

No findings of significance were identified.

.2.17 Turbine Driven AFW Pumps (1/2-FW-P-2)

a. Inspection Scope:

The inspectors reviewed AFW system hydraulic calculations to verify that the performance and the NPSH requirements of the turbine driven AFW pumps were satisfied. The inspectors also reviewed the surveillance test acceptance criteria bases and test results to verify that the pumps would have sufficient capability at their minimum acceptable performance. In addition, the inspectors reviewed the potential of the pumps causing an over-pressure condition in the downstream piping due to a postulated over-speed condition and verified that the pumps had adequate protection for potential minimum flow and runout conditions. The inspectors reviewed the design of the pumps and associated rooms with regard to postulated HELBs and internal missile hazards to verify that these hazards could be mitigated. The inspectors reviewed condition reports and corrective maintenance associated with the equipment to verify that degraded conditions were appropriately addressed. The inspectors also reviewed operating procedures and the control logic associated with the pumps and associated equipment to verify that the equipment was capable of performing the intended functions.

The inspectors reviewed the design of the alternate water supplies to verify the capability to provide adequate suction flow if the supply from the ECST was not available. The inspectors also reviewed the steam supply to the pumps and the capacity of the pumps to verify that the pumps could operate with minimum steam pressure. The inspectors performed walk downs of the pumps and associated equipment to verify that the configuration and observable material condition of the equipment was consistent with the design requirements.

b. Findings:

No findings of significance were identified.

.2.18 Emergency Condensate Storage Tank (1-CN-TK-1)

a. Inspection Scope:

The inspectors reviewed AFW system calculations to verify that the capacity and level of the ECST would satisfy system requirements. The inspectors also reviewed tank level setpoints to verify that the ECST would have sufficient capacity to support the AFW system under the most limiting design basis conditions when considering instrument uncertainties, allowance for vortexing, and operator action times. The inspectors reviewed the design of the tank and associated piping to verify that postulated HELBs and internal missile hazards were addressed appropriately. The inspectors reviewed condition reports and corrective maintenance associated with the ECST to verify that adverse material conditions were addressed appropriately. The inspectors also reviewed operating procedures associated with the tank and associated equipment to verify that they supported the intended functions.

The inspectors reviewed the design of the alternate water supplies to verify the capability to provide adequate suction flow if the supply from the ECST was not available. This review included piping located in the turbine building. The inspectors performed walkdowns of the ECST and associated equipment to verify that the configuration and observable material condition of the equipment was consistent with the design requirements.

b. Findings:

No findings of significance were identified.

.2.19 AFW Cross-Connect Valves (2-FW-MOV-260A/B)

a. Inspection Scope:

The inspectors reviewed AC load flow and voltage calculations to verify that adequate motive power was available during worst case degraded voltage and service conditions. The inspectors reviewed MCC control circuit voltage drop calculations to determine whether MOV contactors had adequate voltage to pick up when required. The inspectors reviewed wiring and logic diagrams to verify that control logic was in conformance with the design bases.

The inspectors reviewed calculations and test data to verify the capability of these cross-connect valves to provide AFW flow from the Unit 1 AFW pumps to the Unit 2 steam generators under the most limiting conditions. This review included the MOV calculation inputs and results. The inspectors also reviewed the surveillance test acceptance criteria and test results to verify that the MOVs were capable of performing the intended function. The inspectors reviewed operating procedures and the control logic associated with the equipment to verify that the valves would operate as designed. The inspectors also reviewed the operating procedures associated with manually closing the valves in the event of failure of the MOVs to remotely operate to verify that the procedures were appropriate. The inspectors performed walkdowns of the valves and associated equipment to verify that the configuration and observable material condition of the equipment was consistent with the design requirements.

b. Findings:

Introduction: The inspectors identified a Green NCV of 10 CFR 50, Appendix B, Criterion III, Design Control, for failure to evaluate the most limiting differential pressure (dP) for opening valve 2-FW-MOV-260A.

Description: The inspectors reviewed engineering transmittal ET-CME-04-0018, Evaluate Potential Impact if Coefficient of Friction (COF) is assumed to be 0.20, which evaluated higher than expected COF values being discovered during MOV testing. This transmittal addressed the capability of motor operated valves, including 2-FW-MOV-260A, to operate with increased COF values. In the case of 2-FW-MOV-260A, the original calculations were based on opening the valve with an assumed COF of 0.15 and a maximum dP of 1440 psid. However, engineering transmittal ET-CME-04-0018, performed in 2007, addressed a maximum COF of 0.213 (based on August 2001 as-left test data) and assumed a maximum dP of only 500 psid. This engineering transmittal also referred to a previous engineering transmittal (ET-CME-01-0024, Evaluation of Negative Jog Margin Values due to Inclusion of Rate of Loading (ROL) and Stem Lubrication Degradation Corrections) that had used an assumed dP of 1000 psid. The inspectors noted that the reduced dP values did not appear sufficient to account for opening this valve with the AFW pumps in operation and questioned the bases of these values. Specifically, the licensee failed to base the maximum dP for opening 2-FW-MOV-260A on the worst case high value which would occur in the event of a HELB or fire causing a loss of AFW flow on Unit 2 concurrent with an automatic start signal of AFW pumps in Unit 1.

The licensee initiated CR 091698 on February 25, 2008 in response to this concern. The condition report stated that the assumed dP values were non-conservative and that the engineering transmittals had failed to recognize that the AFW pumps would automatically start in the event of a loss of off-site power (LOOP) event. Specifically, the existing design analyses did not fully address the required capability of valve 2-FW-MOV-260A to provide AFW flow from Unit 1 to Unit 2 in the event of a postulated HELB or fire which caused a loss of AFW on Unit 2. The CR also stated that 2-FW-MOV-260A may not have been capable of performing its design function. The licensee declared the valve inoperable at that time. During the inspection, the licensee performed an actuator overhaul to replace the torque carrying components that could have been fatigued due to previous testing with high dP. Subsequent analysis concluded that the valve would have been capable of opening against the maximum dP under accident conditions.

Analysis: The failure to evaluate valve 2-FW-MOV-260A to be capable of opening against the most limiting maximum dP of 1440 psid was a performance deficiency. This finding is more than minor because it affects the Mitigating Systems Cornerstone objective ensuring the availability, reliability, and operability of the AFW system to perform the intended safety function during a design basis event and the cornerstone attribute of Design Control, i.e. initial design and plant modifications. The inspectors assessed the finding using the SDP and determined that the finding was of very low safety significance (Green) because the deficiency did not result in 2-FW-MOV-260A being inoperable based upon additional analysis which showed that the MOV had sufficient margin to accommodate opening against the worst case high dP.

The inspectors determined that the maintenance of design margins was a significant cause if this performance deficiency. Failure to maintain design margins is directly related to the Resources component of the cross-cutting area of Human Performance and the aspect of maintenance of plant safety by the maintenance of design margins (H.2(a)).

Enforcement: 10 CFR 50, Appendix B, Criterion III, Design Control, states, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis for structures, systems, and components are correctly translated into specifications, drawings, procedures, and instructions. Contrary to the above, the licensee failed to use limiting inputs in design calculations. Because this finding is of very low safety significance and was entered into the licensee's corrective action program as CR091698 this violation is being treated as a NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy. This finding is identified as NCV 05000280, 05000281/2008006-03, Failure to Use Limiting Case High dP in 2-FW-MOV-260A Design Calculations.

.3 Review of Low Margin Operator Actions

a. Inspection Scope

The team performed a margin assessment and detailed review of five risk significant and time critical operator actions. Where possible, margins were determined by the review of the assumed design basis and UFSAR response times and performance times documented by job performance measures (JPMs). For the selected components and operator actions, the team performed an assessment of the Emergency Operating Procedures (EOPs), Abnormal Operating Procedures (AOPs), Alarm Panel Procedures (APPs), and other operations procedures to determine the adequacy of the procedures and availability of equipment required to complete the actions. Operator actions were observed on the plant simulator and during plant walk downs.

The following operator actions were observed on the licensee's operator training simulator:

- Actions for a LOCA outside containment per 1-ECA-1.2, LOCA Outside Containment
- Actions to align alternate AC sources; transfer EDG 3 from unit 2 to unit 1 per 1-ECA-0.0, Loss of All AC Power, and loading 1J bus onto the AAC Diesel per 0-AP-17.06, AAC Diesel Generator - Emergency Operations

- Actions to initiate gravity feed cooling from the refueling water storage tank on a loss of residual heat removal cooling per 1-AP-27.00, Loss of Decay Heat Removal Capability, Attachment 8, Gravity Feed Cooling

Additionally, the team walked down, “table-topped” and investigated the following operational scenarios:

- Turbine Driven AFW pump operation during a loss of all AC and DC power, including alignment of alternate power from the portable generator per LFFG2, Large Fire, Flood Mitigation Guidelines TSC Response
- Alignment of backup sources for AFW suction per 1-FR-H.1, Response to Loss of Secondary Heat Sink, Attachment 1, Alternate AFW Sources

b. Findings

No findings of significance were identified.

.4 Review of Industry Operating Experience

a. Inspection Scope

The team reviewed selected operating experience issues that had occurred at domestic and foreign nuclear facilities for applicability at the Surry Power Station. The team performed an independent applicability review for issues that were identified as applicable to the Surry Power Station and were selected for a detailed review. The issues that received a detailed review by the team included:

- IN 86-14, Overspeed Trips of HPCI, RCIC and AFW Turbines
- IN 88-70, Check Valve In-Service Testing Program Deficiencies
- IN 00-21, Detached Check Valves Disc not detected by the use of Acoustic and Magnetic Non-Intrusive Test Techniques
- IN 2006-026, Failure of Magnesium Rotors in Motor-operated Valve Actuators

b. Findings

No findings of significance were identified.

.5 Review of Permanent Plant Modifications

a. Inspection Scope

The team reviewed one modifications related to the selected risk significant components in detail to verify that the design bases, licensing bases, and performance capability of the components have not been degraded through modifications. The adequacy of design and post modification testing of these modifications was reviewed by performing activities identified in IP 71111.17, Permanent Plant Modifications, Section 02.02.a. Additionally, the team reviewed the modifications in accordance with IP 71111.02, Evaluations of

Changes, Tests, or Experiments, to verify the licensee had appropriately evaluated them for 10 CFR 50.59 applicability. The following modification was reviewed:

- DCP 06-007, Emergency Switchgear Room – Chilled Water System – Trench Piping Replacement and DCP 07-007, Control Room AC CC Pipe Replacement Phase I & II

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA6 Meetings, Including Exit

Exit Meeting Summary

On February 29, 2008, the team presented the inspection results to Mr. Don Jernigan, Surry Power Station Site Vice President, and other members of the licensee staff. The team returned all proprietary information examined to the licensee. No proprietary information is documented in the report.

4OA7 Licensee-Identified Violations

The following violations of very low safety significance (Green) were identified by the licensee and are violations of NRC requirements which meet the criteria of Section VI of the NRC Enforcement Policy, NUREG-1600, for being dispositioned as NCVs.

- 10 CFR 50, Appendix B, Criterion III, Design Control, requires that that measures shall be established to assure that applicable regulatory requirements and the design basis for structures, systems, and components are correctly translated into specifications, drawings, procedures, and instructions. UFSAR Table 15.2-1 lists the AFW pumps as being components that will not fail during a tornado since they are protected by tornado resistant structures. Contrary to this, turbine drive AFW pumps 1/2-FW-P-2 were not completely protected in that the steam exhausts from the turbines could have been blocked by tornado missile damage. This was identified in the licensee's corrective action program as CR 001132. The inspectors assessed the finding using the SDP and determined that the finding was of very low safety significance (Green) because it involved a severe weather initiating event and did not degrade more than one train of a multi-train safety system.

ATTACHMENTS: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

T. Arnett, Rapid Response Electrical Engineer
B. Garber, Supervisor, Licensing
L. Gordon, Component Engineering
F. Grover, Manager, Operations
A. Harrow, Supervisor, Electrical Systems Engineering
M. Haduck, Outage Coordinator
J. Hartka, Unit Supervisor
E. Hendrixson, Director, Engineering-Surry
L. Hilbert, Manager Oversight
D. Ingell, Mechanical Design Engineer
D. Jernigan, Site Vice President
L. Jones, Manager, RP/Chemistry
M. Kacmarcik, Rapid Response Mechanical Engineer
P. Kershner, Engineer, Licensing
B. McCloskey, Mechanical Design Engineer
J. McGinnis, Component Engineering
R. Portlock, I&C Technician
J. Rosenberger, Maintenance Manager
D. Schappell, Manager, Nuclear Site Services
E. Shore, Supervisor, Mechanical Design (Inns)
C. Silcox, Systems Engineer
K. Sloane, Surry Power Station Nuclear Plant Manager
K. Stacy, Procedure Writer
M. Wilda, Supervisor, Component Engineering
M. Wilson, Manager, Nuclear Training

NRC

C. Welch, Senior Resident Inspector, Surry Power Station
D. Merzke, Acting Resident Inspector, Surry Power Station

LIST OF ITEMS OPENED, CLOSED, AND REVIEWED

Opened

05000280/2008006, 05000281/2008006-01	NCV	Failure to Evaluate and Use Limiting Case 4160 VAC Bus Frequency and Voltage in Design Calculations (Section 1R21.2.12)
05000280/2008006, 05000281/2008006-02	NCV	Failure to Use Appropriate Acceptance Criteria for Testing Battery Voltage at

		the One Minute Mark (Section 1R21.2.13)
05000281/2008006-03	NCV	Failure to Use Limiting Case High dP In 2-FW-MOV-260A Design Calculations (Section 1R21.2.19)

LIST OF DOCUMENTS REVIEWED

Design Basis Documents and System Descriptions

SDBD-SPS-AFW, System Design Basis Document for Auxiliary Feedwater System, Rev.14
SDBD-SPS-CH, System Design Basis Document for Chemical and Volume Control System, Rev. 5
SDBD-SPS-EG, System Design Basis Document for Emergency Diesel Generator System Surry Power Station, Rev. 12
SDBD-SPS-EP, System Design Basis Document Emergency Power System Surry Power Station, Rev. 10
SDBD-SPS-SI, System Design Basis Document for Safety Injection System Surry Power Station, Rev. 13
Virginia Electric and Power Company Surry Power Station Units 1 and 2 Station Blackout (SBO) Alternative Design, Serial No. 93-292, 05/10/1993

Procedures

0-AP-10.18, Response to Grid Instability (With 2 Attachments), Rev. 7
0-AP-17.06, AAC Diesel Generator-Emergency Operations, Rev.19
0-DRP-SBO, Attachment 20, 0-BFO-LI-3A/3B, Fuel Oil Day Tank Level Meter Calibration Data, Rev. 1
0-DRP-SBO, Attachment 21, 0-BFO-LT-3, Fuel Oil Day Tank Level Transmitter Calibration Data, Rev. 1
0-ECM-0302-03, 480 Volt K-Line Breaker Maintenance, Rev. 40
0-ECM-0303-01, 4160 Volt Breaker Maintenance, Rev. 35
0-FCA-14.00, Establishing Stable RCS Makeup Flowpaths, Rev. 6
0-MOP-AAC-001, Removal from Service of the AAC Diesel Generator, Rev. 12
0-MOP-AAC-002, Return to Service of the AAC Diesel Generator, Rev. 13
0-MCM-1005-01, Rotating Spectacle Flange Closed or Open, Rev. 5
0-OP-AAC-001, AAC Diesel Generator Operation, Rev. 15
0-OPT-ZZ-012, Dynamic Voltage and Frequency Testing of EDG-3, Rev. 10
0-OSP – AAC- 001, Quarterly Test Of 0-AAC-DG0M, Alternate AC Diesel Generator, Rev. 22
1-AP-27.00, Loss of Decay Heat Removal Capability, Attachment 8, Gravity Feed Cooling, Revs. 15, 16 and 17
1-AP-8.00, Loss of Normal Charging Flow, Rev. 9
1-AP-9.02, Loss Of RCP Seal Cooling, Rev. 11
1-E-0, Reactor Trip or Safety Injection, Rev. 58
1-E-1, Loss of Reactor or Secondary Coolant, Rev. 28
1-E-2, Faulted Steam Generator Isolation, Rev. 13
1-E-3, Steam Generator Tube Rupture, Rev. 35
1-ECA-0.0, Loss of All AC Power, Rev. 28
1-ECA-0.1, Loss of All AC Power Recovery Without SI Required, Rev. 17
1-ECA-0.2, Loss of All AC Power Recovery With SI Required, Rev. 14
1-ECA-1.2, LOCA Outside Containment, Rev. 6
1-EPT-0106-01, Main Station Battery 1A Service Test, Rev. 15
1-FR-H.1, Response to Loss of Secondary Heat Sink, Rev. 24
1-GOP-1.3, Unit Startup, RCS Heatup From 345°F To HSD, Rev. 39

1-GOP-2.5, Unit Cooldown, 351°F To Less Than 205°F, Rev. 24
1-MOP-FW-002, Removal from and Return to Service of Turbine Driven AFW Pump 1-FW-P-2, Rev. 8
1-MOP-FW-003, Removal from and Return to Service of AFW Pumps 1-FW-P-3A and 1-FW-P-3B, Rev. 6
1-OPT-FW-001, Motor Driven Auxiliary Feedwater Pump 1-FW-P-3A, Rev. 23
1-OPT-FW-001, Motor Driven Auxiliary Feedwater Pump 1-FW-P-3A, Rev. 26
1-OPT-FW-002, Motor Driven Auxiliary Feedwater Pump 1-FW-P-3B, Rev. 21
1-OPT-FW-002, Motor Driven Auxiliary Feedwater Pump 1-FW-P-3B, Rev. 25
1-OPT-FW-003, Turbine Driven Auxiliary Feedwater Pump 1-FW-P-2, Rev. 31
1-OPT-FW-003, Turbine Driven Auxiliary Feedwater Pump 1-FW-P-2, Rev. 34
1-OPT-FW-004, AFW Valve Position Verifications, Rev. 4
1-OPT-FW-006, Auxiliary Feedwater MOV Test, Rev. 11
1-OPT-FW-008, AFW Check Valve Operability, Rev. 17
1-OPT-FW-010, Turbine Driven AFW Pump Steam Supply Line SOV Operability Test, Rev. 12
1-OPT-ZZ-001, ESF Actuation with Undervoltage and Degraded Voltage – 1H Bus, Rev. 24
1-OPT-ZZ-012, Dynamic Voltage and Frequency Testing of EDG-1, Rev. 9
2-FCA-5.00, Limiting Safeguards Area Fire, Rev. 11
2-FR-H.1, Response to Loss of Secondary Heat Sink, Rev. 26
2-OPT-FW-006, Auxiliary Feedwater MOV Test, Rev. 8
2-OPT-ZZ-012, Dynamic Voltage and Frequency Testing of EDG-2, Rev. 7
Annunciator Response Procedure 1B-F3, SFGDS Area Sump HI LVL, Rev. 1
Annunciator Response Procedure 1J-F4, 110,000 GAL LO LEVEL, Rev. 3
DNAP-3002, Dominion Nuclear Operating (OE) Program, Rev. 1
ER-AA-102, Preventive Maintenance Program, Rev. 0
ER-SU-5402, Periodic Test/Scheduling System Program, Rev. 0
LFFG1, Surry Power Station Large Fire, Flood Mitigating Guidelines, Rev. 1
LFFG2, Surry Power Station Large Fire, Flood Mitigating Guidelines, Rev. 3
LFFG2, Large Fire, Flood Mitigation Guidelines TSC Response, Rev. 3
SU-M-DSE-611, Surry Switchyard RSST "C" LTC and Transformer Maintenance, Rev. 6
SU-M-DSE-616, RSST "C" LTC Controller Maintenance, Rev. 3
SU-M-DCO-807H, Surry Switchyard – Train "A" (1H Bus) – SI/CDA Load Shed Reserve Transformer Step Timing Test, Rev. 0
VPAP-1101, Test Control, Rev. 6
VPAP-1102, Periodic Testing, Rev. 7

Completed Test Procedures

0-OPT-ZZ-012, Dynamic Voltage and Frequency Testing of EDG 3, Rev. 10, performed on October 15, 2006
0-OPT-ZZ-012, Dynamic Voltage and Frequency Testing of EDG 3, Rev. 10, performed on October 24, 2007
1-OPT-SI-007, Refueling Test of HHSI Check Valves to Cold Legs, Rev. 15, performed on May 8, 2006
1-OPT-SI-007, Refueling Test of HHSI Check Valves to Cold Legs, Rev. 16, performed on October 30, 2007
1-OPT-SI-007, Refueling Test of HHSI Check Valves to Cold Legs, Rev. 16, performed November 14, 2007

1-OPT-SI-012, Refueling Test of LHSI lines to Charging Pumps, Rev. 14, performed on November 15, 2007
1-OPT-ZZ-012, Dynamic Voltage and Frequency Testing of EDG 1, Rev. 009, performed on May 17, 2006
1-OPT-ZZ-012, Dynamic Voltage and Frequency Testing of EDG 1, Rev. 009, performed on October 25, 2007
2-OPT-SI-007, Refueling Test of HHSI Check Valves to Cold Legs, Rev. 11, performed on October 20, 2006
2-OPT-ZZ-012, Dynamic Voltage and Frequency Testing of EDG 2, Rev. 007, performed on April 27, 2005
2-OPT-ZZ-012, Dynamic Voltage and Frequency Testing of EDG 2, Rev. 007, performed on October 16, 2006
0-OSP-AAC-001, Quarterly test of 0-AAC-DG-0M, Alternate AC Diesel Generator, Rev. 19, performed on February 14, 2007, May 3, 2007, June 23, 2007, and October 21, 2006

Drawings

11448-ESK-3A, Elementary Diagram Control Switch Contact Diagram Surry Power Station – Unit 1, Rev. 5
11448-ESK-3B, Control Switch Contact Diagrams Surry Power Station Unit 1, Rev. 2
11448-ESK-5A, Elementary Diagram 4160-480 Substation Supply ACB's Surry Power Station Unit 1, Rev. 7
11448-ESK-5K, Elementary Diagram 4160V Aux Stm Gen Feed Pumps Surry Power Station – Unit 1, Rev. 28
11448-ESK-5K1, Elementary Diagram Aux Steam Generator Feed Pumps Surry Power Station – Unit 1,Rev. 6
11448-ESK-6BF, Elementary Diagram 480V Circuit Motor Operated Valves 02-FW-MOV-260A & B Surry Power Station – Unit 1, Rev. 10
11448-ESK-6BM, Elementary Diagram 480V Circuit Motor Operated Valves 1-SI-MOV-1842 & 01-CH-MOV-1370 Surry Power Station – Unit 1, Rev. 26
11448-ESK-6BY, Elementary Diagram 480V Circuits Motor Operated Valves 01-FW-MOV-151E & F Surry Power Station – Unit 1, Rev. 18
11448-ESK-11AA, Elementary Diagram Bus H Degraded and Undervoltage Sensing Surry Power Station – Unit 1, Rev. 7
11448-ESK-11AA1, Elementary Diagram Surry Power Station – Unit 1, Rev. 2
11448-ESK-11AB, Elementary Diagram Bus H Degraded and Undervoltage Protection Surry Power Station – Unit 1, Rev. 11
11448-ESK-11AC, Elementary Diagram Bus H Degraded and Undervoltage Protection Surry Power Sta., Rev. 7
11448-ESK-11AD, Elementary Diagram Bus J Degraded and Undervoltage Sensing Surry Power Station – Unit 1, Rev. 9
11448-ESK-11AD1, Elementary Diagram Surry Power Station – Unit 1, Rev. 2
11448-ESK-11AE, Elementary Diagram Bus J Degraded and Undervoltage Protection Surry Power Station – Unit 1, Rev. 14
11448-ESK-11AF, Elementary Diagram Bus J Degraded & Undervoltage Protection Surry Power Sta., Rev. 6
11448-FB-4C, Yard Fuel Oil Lines, Rev. 12
11448-FB-038B, Fuel Oil Lines, Rev. 45

11448-FE-1A, Main One Line Diagram Surry Power Station – Unit 1, Rev. 27
11448-FE-1A1, 4160 Volt System Unit 1 & 2 Surry Power Station, Rev. 18
11448-FE-1A2, Electric Power Distribution One Line Integrated Schematic Surry Power Station, Rev. 26
11448-FE-2E, Wiring Diagram Reserve Station Service and Intake Structure Transformers Surry Power Station – Unit 1, Rev. 17
11448-FE-1A3, One Line Diagram Switchyard Layout Surry Power Station – Unit 1 & 2, Rev. 3
11448-FE-1B, One Line Diagram 4160V Bus 1A & 1B 4160V Transfer Bus D & E Surry Power Station – Unit 1, Rev. 26
11448-FE-1C, One Line Diagram 4160V Bus 1C & 1D 4160V Transfer Bus F Surry Power Station – Unit 1, Rev. 21
11448-FE-1D, 4160V One Line Diagram Surry Power Station – Unit 1, Rev. 19
11448-FE-1F, 480V One Line Diagram Surry Power Station – Unit 1, Rev. 23
11448-FE-1L, 480V One Line Diagram Surry Power Station – Unit 1, Rev. 58
11448-FE-1M, 480V One Line Diagram Surry Power Station – Unit 1, Rev. 67
11448-FE-1P1, 480V One Line Diagram MCC 1J1-1A Surry Power Station – Unit 1, Rev. 67
11448-FE-1Q, 480V One Line Diagram Emergency Switchgear 1H1 & 1J1 Surry Power Station – Unit 1, Rev. 11
11448-FE-1X, 4160 One Line Diagram AAC System – Bus 0L Surry Power Station Unit 1, Rev. 1
11448-FE-1Y, 4160 One Line Diagram AAC System – Bus 0M Surry Power Station Unit 1, Rev. 0
11448-FE-1Z1, 480 Low Voltage Switchgear 0M1 Surry Power Station Unit 1, Rev. 0
11448-FE-1Z2, AAC 125 V DC Surry Power Station Unit 1, Rev. 0
11448-FE-1Z, 480 Volt MCC 0M1-1 Surry Power Station Unit 1, Rev. 0
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11448-FE-19AB, Elementary Diagram Emergency Diesel Generator No. 1 Generator Controls Surry Power Station – Unit 1, Rev. 10
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11448-FE-21BA, Elementary Diagram Reserve Station Service Transformer A Surry Power Station – Unit 1, Rev. 1
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11448-FE-21BC, Elementary Diagram Reserve Station Service Transformer C LTC and Aux Control Cabinet, Rev. 1
11448-FE-21C, AC Elementary Diagram Station Res. S.S & Intake Struct Trans Surry Power Station – Unit 1, Rev. 12
11448-FE-21H, Elementary Diagram 4160V Circuits Surry Power Station – Unit 1, Rev. 11
11448-FE-21J, Elementary Diagram 4160V Circuits Surry Power Station – Unit 1, Rev. 20
11448-FE-21K, Elementary Diagram 4160V Circuits Surry Power Station – Unit 1, Rev. 20
11448-FE-21Q, Elementary Diagram 4160V Bus 1H Bkr 15H3 & 15H8 Surry Power Station – Unit 1, Rev. 9

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CR002218, Seal Injection flow alarms received on Unit 1, 10/07/2006
CR002509, #3EDG frequency response during performance of 0-OPT-ZZ-012, 10/15/2006
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CR023546, Grease Degradation found during Inspection
CR024157, Exceeding Test Plan Limits on 1-CH-MOV-1370
CR024228, High Running Current on 1-CH-MOV-1370
CR028702, Quarterly AAC Diesel oil sample PM not completed before late date

CR089900, Setpoint/Alarm change for SPS 00-BFO-LI-3A/B
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00766383 01, Perform radiography for IST Program (SI-224), 10/30/2007
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DCP 03-022, Modification of EDG #3 Output Breaker 15j3 Closing Circuit Surry Unit 1 & 2, dated February 17, 2003
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<u>Corrective Action documents initiated due to CDBI activity</u>:

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CR090208, Superseded EDG fuel oil calculation still shows up in DMIS
CR090210, Calculation 1039.3410-M-3 used wrong EDG fuel consumption value
CR090931, AP-27 attachment lacks clarity for gravity feed flow paths
CR091067, RSS Transformer load tap changer (LTC) timing test procedures do not include acceptance criteria
CR091079, Off-site source operability not addressed during manual operation of RSS transformer LTC
CR091142, Missed AAC diesel quarterly oil sample
CR091184, RSS transformer control power sources do not have redundancy
CR091493, Calculation EE-0034 does not consider worst case low voltage
CR091494, Calculation EE-0035 does not consider frequency variation
CR091676, Charging pump gear box heat load used in calculations
CR091698, 2-FW-MOV-260A non-conservative differential pressure for opening
CR091720, Could not locate vendor technical manual for 30kVA transformer
CR091809, AAC diesel testing periodicity
CR091877, Manual AFW isolation valves not included in in-service testing program
CR091878, Potential for ground on emergency bus when offsite power restored
CR091895, EDG voltage and frequency dynamic response
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CR091906, Battery discharge test voltage acceptance criteria incorrect for first minute