UNITED STATES



NUCLEAR REGULATORY COMMISSION

REGION II SAM NUNN ATLANTA FEDERAL CENTER 61 FORSYTH STREET, SW, SUITE 23T85 ATLANTA, GEORGIA 30303-8931

April 30, 2007

South Carolina Electric & Gas Company ATTN: Mr. Jeffrey B. Archie Vice President, Nuclear Operations Virgil C. Summer Nuclear Station P. O. Box 88 Jenkinsville, SC 29065

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION - NRC INTEGRATED INSPECTION REPORT 05000395/2007002 AND ANNUAL ASSESSMENT MEETING SUMMARY

Dear Mr. Archie:

On March 31, 2007, the United States Nuclear Regulatory Commission (NRC) completed an inspection at your Virgil C. Summer Nuclear Station. The enclosed integrated inspection report documents the inspection results, which were discussed with you and other members of your staff on April 5, 2007.

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 inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

This report documents two self-revealing findings of very low safety significance (Green) which were determined to be violations of NRC requirements. However, because of their very low safety significance and because they are entered into your corrective action program, the NRC is treating these violations as non-cited violations (NCVs) consistent with Section VI.A.1 of the NRC Enforcement Policy. If you contest any NCV in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the 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, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Virgil C. Summer Nuclear Station.

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

NRC Public Document Room or from the Publicly Available Records (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/

Eugene F. Guthrie, Chief Reactor Projects Branch 5 Division of Reactor Projects

Docket No.: 50-395 License No.: NPF-12

Enclosure: NRC Integrated Inspection Report 05000395/2007002 w/Attachment: Supplemental Information

cc w/encl: (See page 3)

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Letter to Jeffrey B. Archie from Eugene F. Guthrie dated April 30, 2007 SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION - NRC INTEGRATED INSPECTION REPORT 05000395/2007002

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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.:	50-395
License No.:	NPF-12
Report No.:	05000395/2007002
Licensee:	South Carolina Electric & Gas (SCE&G) Company
Facility:	Virgil C. Summer Nuclear Station
Location:	P. O. Box 88 Jenkinsville, SC 29065
Dates:	January 1, 2007 - March 31, 2007
Inspectors:	J. Zeiler, Senior Resident Inspector J. Polickoski, Resident Inspector
Approved by:	Eugene F. Guthrie, Chief Reactor Projects Branch 5 Division of Reactor Projects

SUMMARY OF FINDINGS

IR 05000395/2007-02; 01/01/2007 - 03/31/2007; Virgil C. Summer Nuclear Station; Operability Evaluations and Event Followup.

The report covered a three-month period of inspection by resident inspectors. Two Green self-revealing findings, both of which were non-cited violations (NCVs), were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

A. <u>NRC-Identified and Self-Revealing Findings</u>

Cornerstone: Mitigating Systems

• <u>Green</u>. A Green self-revealing non-cited violation of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," was identified for inadequate corrective actions which resulted in repetition of a significant condition adverse to quality involving the spurious tripping of safety-related molded case circuit breaker associated with the "A" emergency diesel generator (EDG) room ventilation cooling fan "A" due to asymmetrical in-rush starting current. The licensee documented this failure in their corrective action program and implemented breaker trip setpoint changes to preclude spurious tripping from this phenomenon.

This finding is more than minor because it affected the equipment performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability and capability of systems that respond to initiating events to prevent undesirable consequences. The finding is of very low safety significance because it did not result in a loss of safety function of one or more trains of the EDGs and was not potentially risk-significant due to possible external events. The cause of this finding involved the thorough evaluation of identified problems aspect of the Problem Identification and Resolution cross-cutting area, in that, the extent of condition evaluation for the previous spurious trip of the "A" EDG room cooling fan "B" failed to consider the need to readjust the trip setpoint of "A" EDG room ventilation cooling fan "A" in order to mitigate the possibility of spurious tripping. (Section 1R15).

Cornerstone: Barrier Integrity

• <u>Green</u>. A Green self-revealing non-cited violation of Technical Specification 3.3.2 was identified for failure to maintain two containment radiation monitors operable and capable of automatically isolating reactor building purging operations in the event of high containment radioactivity during a design basis accident. The licensee documented this violation in their corrective action

program and implemented procedural enhancements and control board tagging controls to alert operators when containment purging operations were in service.

This finding is more than minor because it affected the configuration control attribute of the Barrier Integrity cornerstone and affected the cornerstone objective of providing reasonable assurance that the containment physical design barrier protect the public from radionuclide releases caused by accidents or events. The finding is of very low safety significance because there was no loss of safety function since radiation monitor RM-A4 was still operable during this period to provide isolation of the inside containment purge supply and exhaust containment isolation valves and because of the short time the RM-A2 train was inoperable. The cause of this finding is related to the human performance and error prevention aspect of the cross-cutting area of human performance due to inadequacies in the pre-job briefing that failed to recognize the adverse interaction posed by conducting the surveillance test with the reactor building alternate purge system in service. (Section 4OA3.2)

B. Licensee-Identified Violations

None.

REPORT DETAILS

Summary of Plant Status

The unit began the inspection period at 100 percent rated thermal power (RTP). On February 2, 2007, power was reduced to 95 percent RTP to support removing the "D" feedwater booster pump from service and repairing a leak from the pump inboard bearing seal. On February 5, a manual reactor trip was initiated from 95 percent RTP due to a steam leak from a failed "D" feedwater booster pump recirculation line flow orifice gasket while attempting to place the "D" feedwater booster pump back in service. The reactor was restarted on February 6 and the unit returned to 100 percent RTP on February 8. The unit remained at or near full power for the remainder of the inspection period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

1R04 Equipment Alignment

a. Inspection Scope

The inspectors conducted four partial equipment alignment walkdowns (listed below) to evaluate the operability of selected redundant trains or backup systems with the other train or system inoperable or out-of-service (OOS). Correct alignment and operating conditions were determined from the applicable portions of drawings, system operating procedures (SOPs), Final Safety Analysis Report (FSAR), and technical specifications (TS). The inspections included review of outstanding maintenance work requests (MWRs) and related Condition Evaluation Reports (CERs) to verify that the licensee had properly identified and resolved equipment alignment problems that could impact mitigating system availability. Documents reviewed are listed in the Attachment to this report.

- "A" motor driven emergency feedwater (MDEFW) pump (while "B" MDEFW pump was OOS for routine maintenance);
- "A" and "C" service water (SW) pumps (while "B" SW pump was OOS for scheduled maintenance);
- "B" and "C" component cooling water (CCW) pumps (while "A" CCW pump was OOS for scheduled maintenance); and,
- "B" emergency diesel generator (EDG); "B" MDEFW pump; turbine driven emergency feedwater (TDEFW) pump; safety switchyard electrical line-up; and Parr Hydroelectric Facility (while "A" EDG was OOS for an 18-month extended maintenance outage).

b. Findings

No findings of significance were identified.

1R05 Fire Protection

a. Inspection Scope

The inspectors reviewed recent CERs, MWRs, and impairments associated with the fire protection system. The inspectors reviewed surveillance activities to determine whether they supported the operability and availability of the fire protection system. The inspectors assessed the material condition of the active and passive fire protection systems and features and observed the control of transient combustibles and ignition sources. The inspectors conducted routine inspections of the following nine areas (respective fire zones also noted):

- 1DB switchgear and heating, ventilation, and air conditioning (HVAC) rooms (fire zones IB-16, IB-17, IB-22.2);
- Service water pumphouse (fire zones SWPH-1, SWPH-3, SWPH-4 and SWPH-5.1/5.2);
- "A" and "B" CCW pumps/heat exchangers and service water booster pump room (fire zones IB-25.1.1, IB-1.2, IB-1.3, and IB-1.5);
- "A" and "B" EDG rooms (fire zones DG-1.1/1.2 and DG-2.1/2.2);
- Control building (fire zones CB-1.1, CB-1.2, CB-2, CB-5, and CB-17.1);
- "A," "B," and "C" charging pump rooms (fire zones AB-1.5, AB-1.6, and AB-7);
- TDEFW pump room (fire zone IB-25.2);
- Auxiliary building (fire zones AB-1.4 and AB-1.18); and,
- Intermediate building (fire zones IB 25.6.1/2, 25.7).

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Requalification Program

a. Inspection Scope

On March 14, 2007, the inspectors observed performance of senior reactor operators and reactor operators on the plant simulator during an emergency planning drill. The scenario involved a 2/3 operating basis earthquake, high vibrations and current overload on "A" reactor coolant pump, catastrophic failure of reactor coolant pump "A," and a containment breach via failed packing of a component cooling water isolation valve (EPP-04-01A). The inspectors assessed overall crew performance, communications, oversight of supervision, and the evaluators' critique. The inspectors verified that any training issues were appropriately captured in the licensee's corrective action program (CAP).

b. Findings

No findings of significance were identified.

1R12 Maintenance Effectiveness

a. Inspection Scope

The inspectors evaluated two equipment issues described in the CERs listed below to verify the licensee's effectiveness of the corresponding preventive or corrective maintenance associated with structures, systems or components (SSCs). The inspectors reviewed maintenance rule (MR) implementation to verify that component and equipment failures were identified, entered, and scoped within the MR program. Selected SSCs were reviewed to verify proper categorization and classification in accordance with 10 CFR 50.65. The inspectors examined the licensee's 10 CFR 50.65(a)(1) corrective action plans to determine if the licensee was identifying issues related to the MR at an appropriate threshold and that corrective actions were established and effective. The inspectors' review also evaluated if maintenance preventable functional failures (MPFF) or other MR findings existed that the licensee had not identified. The inspectors reviewed the licensee's controlling procedures, i.e., engineering services procedure (ES)-514, "Maintenance Rule Implementation," and the Virgil C. Summer "Important To Maintenance Rule System Function and Performance Criteria Analysis" to verify consistency with the MR requirements.

- CER C-04-0787, maintenance rule criteria and function historical review for the heat trace (ET) system and related MPFFs; and,
- CER C-06-3702, "A" EDG failed to reach rated frequency in ten seconds.
- b. Findings

No findings of significance were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control

a. Inspection Scope

The inspectors evaluated, as appropriate, for the five selected work activities listed below : (1) the effectiveness of the risk assessments performed before maintenance activities were conducted; (2) the management of risk; (3) that, upon identification of an unforseen situation, necessary steps were taken to plan and control the resulting emergent work activities; and, (4) that emergent work problems were adequately identified and resolved. The inspectors evaluated the licensee's work prioritization and risk characterization to determine, as appropriate, whether necessary steps were properly planned, controlled, and executed for the planned and emergent work activities listed below:

 Work Week 2007-02, risk assessment for routine maintenance on "B" MDEFW; emergent maintenance on the instrument air standby compressor; routine maintenance on the "B" reactor building (RB) spray pump and refueling water storage tank (RWST) suction valve, and routine maintenance on the "B" SW and service water booster pumps (SWBP);

Enclosure

- Work Week 2007-03, risk assessment for scheduled maintenance and/or testing on "A" chill water system, "A" EDG, and "A" CCW pump;
- Work Week 2007-04, risk assessment for scheduled maintenance and/or testing on the "A" SW pump, "A" SWBP, "A" reactor make-up water supply pump discharge valve, diesel fire service pump, relay room CO₂ header, and the "A" main condenser vacuum pump;
- Work Week 2007-05, risk assessment for scheduled maintenance and/or testing the TDEFW pump, west penetration (412' elevation) ventilation supply, the electric fire service pump, and "C" chill water pump; and,
- Work Week 2007-08, risk assessment for emergent maintenance on "A" EDG to replace power supply for engine tachometer indication.

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations

a. Inspection Scope

The inspectors reviewed five operability evaluations affecting risk significant mitigating systems to assess, as appropriate: (1) the technical adequacy of the evaluations; (2) whether operability was properly justified and the subject component or system remained available, such that no unrecognized increase in risk occurred; (3) whether other existing degraded conditions were considered; (4) where compensatory measures were involved, whether the compensatory measures were in place, would work as intended, and were appropriately controlled; and, (5) the impact on TS limiting conditions for operations and the risk significance in accordance with the Significance Determination Process (SDP). Also, the inspectors verified that the operability evaluations were performed in accordance with station administrative procedure (SAP)-999, "Corrective Action Program."

- CER C-07-0187, measured core axial flux difference is not in agreement with core design predictions;
- CER C-07-0195, degraded voltage calculation DC08200-001 does not properly evaluate the impact of the existing installed degraded voltage relay setpoints;
- CERs C-07-0458, C-07-0471, C-07-0472, 1B heater and "B" reheater emergency drains are not working properly; during investigation of heater drain valves not functioning, discovered excessive desiccant in instrument air dryer after filters;
- CER C-07-0560, compartments 1 and 2 of the diesel fuel oil tanker failed the clear and bright visual test; and,
- CER C-07-0629, XFN0075A ("A" EDG ventilation supply fan "A") tripped on auto start.

b. Findings

<u>Introduction</u>. A Green self-revealing non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," was identified for the failure to take adequate corrective actions to preclude repetition of a significant condition adverse to quality involving the spurious tripping of safety-related molded case circuit breaker (MCCB) associated with the "A" EDG room ventilation cooling fan "A" (XFN0075A) due to asymmetrical in-rush starting current.

Description. On June 9, 2004, the breaker for the "A" EDG room ventilation supply fan XFN0075A was found tripped. Further investigation attributed the cause to a known plant and industry problem affecting magnetic only MCCBs involving asymmetrical inrush starting current exceeding the breaker's instantaneous overcurrent trip setpoint. The licensee's immediate corrective actions for the spurious trip involved replacing the breaker with instructions to set the new breaker's instantaneous overcurrent trip setpoint high in +/-15% tolerance range. However, contrary to this, one of the phases was left at -3.85%. Subsequent actions documented in CER 04-1779, involved adding all four EDG room ventilation supply fan breakers to a list in the MCCB preventive maintenance test procedure for modifying the overcurrent trip setpoint tolerance range from +/-15% to -0% to +15% to help prevent spurious breaker tripping. This setpoint modification had previously been implemented to address spurious tripping of control room emergency ventilation fan motor breakers. Engineering personnel accepted the as-left overcurrent trip setpoint for the new XFN0075A breaker (with one phase set at -3.85%) with the intent that it be changed to the new setting during the next scheduled breaker preventive maintenance (set at a 5 year periodicity).

On April 28, 2006, the breaker for "A" EDG room ventilation supply fan "B" (XFN0075B) was found tripped. The licensee's investigation, documented in CER 06-1449, attributed the cause to asymmetrical in-rush current. Post trip calibration results revealed that the "as-found" trip setting of the breaker was within the previously modified tolerance range of -0% to +15%. As a result of this trip, the NRC determined that the licensee had not implemented adequate and timely corrective actions to address spurious tripping of safety related MCCBs susceptible to asymmetrical in-rush starting currents. A Green NRC-identified NCV of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," was identified in NRC Integrated Inspection Report 05000395/2006003, dated July 28, 2006. As result of the latest trip event, the licensee decided to begin processing a design modification (ECR 50649) to raise the setpoint of all MCCBs susceptible to asymmetrical in-rush current spurious tripping above the worst case theoretical asymmetrical offset value. The scheduled implementation date of this modification for all four EDG room ventilation cooling fan breakers was April 7, 2007.

On February 18, 2007, the "A" EDG room ventilation cooling supply fan XFN0075A, failed to automatically start during an engine surveillance test run. The fan breaker was found tripped and a subsequent investigation identified the cause of the spurious trip to be from asymmetrical in-rush starting current. While the licensee's corrective actions for the previous trip of XFN0075B on April 28, 2006, included a long term solution to the phenomenon, the licensee's extent of condition investigation failed to consider the need

Enclosure

to raise the "as-left" overcurrent trip setpoint (previously left at -3.85%) higher in the allowed tolerance range until the design modification could be implemented. The inspectors determined that had such interim actions been taken, the spurious trip of XFN0075A may have been prevented. As a result of the February 2007 spurious trip of XFN0075A, the licensee completed the design modification to raise the setpoint for all four EDG room ventilation cooling fan breakers and implemented these changes during the week of March 19, 2007.

Analysis. The failure to conduct an adequate extent of condition evaluation for the April 28, 2006, spurious trip of XFN0075B, constituted a performance deficiency and a finding. This finding is more than minor because it affected the equipment performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability and capability of systems that respond to initiating events to prevent undesirable consequences. On an emergency start of the EDGs, both ventilation cooling fans in each EDG room are designed to auto-start to provide room cooling. The finding is of very low safety significance because it did not result in a loss of safety function of one or more trains of the EDGs and was not potentially risk-significant due to possible external events. If either fan experienced a spurious trip due to the in-rush current phenomenon, the operators would be alerted to the condition via fan trip alarms in the control room and could subsequently reset the fan motor breakers located in the EDG rooms and restart the fans prior to exceeding design basis room temperatures that might challenge the capability of the EDGs to perform their designed safety function. The cause of this finding involved the thorough evaluation of identified problems aspect of the cross-cutting area of Problem Identification and Resolution, in that, the extent of condition evaluation for the previous spurious trip of the EDG room cooling fan XFN0075B failed to consider the need to readjust the trip setpoint of EDG room cooling fan XFN0075A to within -0% to +15% in order to mitigate the possibility of spurious tripping.

Enforcement. 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," requires, in part, that measures be established to assure that conditions adverse to quality are promptly identified and corrected. In addition, for significant conditions adverse to quality, measures shall assure that the cause of the condition is determined and corrective actions be taken to preclude repetition. Contrary to this, the licensee failed to take adequate corrective actions following the April 28, 2006, spurious trip of the "A" EDG room ventilation cooling fan XFN0075B due to asymmetrical in-rush current to preclude the subsequent spurious trip of the "A" EDG room ventilation supply fan XFN0075A on February 18, 2007, due to the same phenomenon. Because the finding is of very low safety significance and has been entered into the licensee's CAP as CER C-07-0629, this violation is being treated as a NCV, consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000395/2007002-01, Inadequate Corrective Actions Results in Repetitive Spurious Tripping of EDG Room Ventilation Fan Molded Case Circuit Breakers.

1R19 Post-Maintenance Testing

a. Inspection Scope

For the six maintenance activities listed below, the inspectors reviewed the associated post-maintenance testing (PMT) procedures and witnessed either the testing and/or reviewed test records to assess whether: (1) the effect of testing on the plant had been adequately addressed by control room and/or engineering personnel; (2) testing was adequate for the maintenance performed; (3) test acceptance criteria were clear and adequately demonstrated operational readiness consistent with design and licensing basis documents; (4) test instrumentation had current calibrations, range, and accuracy consistent with the application; (5) tests were performed as written with applicable prerequisites satisfied; (6) jumpers installed or leads lifted were properly controlled; (7) test equipment was removed following testing; and, (8) equipment was returned to the status required to perform its safety function. The inspectors verified that these activities were performed in accordance with general test procedure (GTP)-214, "Post Maintenance Testing Guideline."

- PMT for "B" MDEFW pump following routine maintenance (MWR 0610466);
- PMT for "B" EDG following jacket water header leaks (MWR 0701413);
- PMT for "C" SW pump following planned maintenance (MWRs: 0609661, 0609880, 0610046, 0613595, and 0605819);
- PMT for "B" residual heat removal (RHR) pump electrical maintenance (MWRs 0609141, 0610811, and 0610658);
- PMT for "B" EDG 18-month overhaul maintenance activities; and,
- PMT for "A" EDG room cooling supply fan XFN0075A motor breaker instantaneous trip setpoint change (MWR 0702202).
- b. Findings

No findings of significance were identified.

1R20 Refueling and Other Outage Activities

a. Inspection Scope

The inspectors performed the inspection activities described below for the outage following a manual reactor trip. The outage began on February 5 and ended on February 7.

The inspectors confirmed that, when the licensee removed equipment from service, defense-in-depth was maintained commensurate with the outage risk control plan for key safety functions and applicable TS, and that configuration changes due to emergent work and unexpected conditions were controlled in accordance with the outage risk control plan.

During the outage, the inspectors specifically:

- Reviewed the status and configuration of important plant safety equipment to verify that those systems met TS requirements and the licensee's outage risk control plan;
- Reviewed licensee control of containment entries to verify that the licensee controlled these activities in accordance with the appropriate TS and procedures, and could achieve and maintain containment closure and integrity for the required conditions;
- Reviewed selected control room operations to verify that the licensee was controlling reactivity in accordance with the TS;

The inspectors reviewed the licensee's plans for changing plant configurations to verify on a sampling basis that TS, license conditions, and other requirements, commitments, and administrative procedure prerequisites were met prior to these changes.

The inspectors reviewed various problems that arose during the outage to verify that the licensee was identifying problems related to outage activities at an appropriate threshold and entering them in the CAP.

b. Findings

No findings of significance were identified.

1R22 <u>Surveillance Testing</u>

a. Inspection Scope

The inspectors observed and/or reviewed the six surveillance tests listed below to verify that TS surveillance requirements were followed and that test acceptance criteria were properly specified to ensure that the equipment could perform its intended safety function. The inspectors verified that proper test conditions were established as specified in the procedures, that no equipment preconditioning activities occurred, and that acceptance criteria were met.

In-Service Tests:

• STP-360.034, "Reactor Building Sample Line Atmospheric Monitor, RM-A2 Operational Test;"

Reactor Coolant System (RCS) Leakage:

• STP-114.002, "Operational Leakage Calculation;"

Other Surveillance Tests:

- STP-125.002B, "Diesel Generator B Operability Test;"
- STP-205.002, "RCS Flow Rate Measurement;" (performed with PTP-230.002, "Main Turbine Performance Testing");
- STP-503.003, "Functional Test of SW to EF Cross Connect Circuits;" and,
- STP-222.002, "Component Cooling Pump Test," (for "A" pump).
- b. Findings

No findings of significance were identified.

Cornerstone: Emergency Preparedness

- 1EP6 Drill Evaluation
 - a. Inspection Scope

On March 14, 2007, the inspectors reviewed and observed the performance of an emergency planning drill that involved a simulated operating basis earthquake followed by a catastrophic failure of a reactor coolant pump with an inter-system loss of coolant accident through the component cooling water system (EPP-04-01A, Emergency Planning Drill). The inspectors assessed emergency procedure usage, emergency plan classifications and notifications. This inspection evaluated the adequacy of the licensee's conduct of the drill and critique performance. Drill issues were captured by the licensee in CER C-07-0964 through CER C-07-0969 and were reviewed by the inspectors to ensure drill weaknesses were appropriately captured in the CAP.

b. Findings

No findings of significance were identified.

- 4. OTHER ACTIVITIES
- 4OA1 Performance Indicator (PI) Verification
- .1 Reactor Safety: Initiating Events Cornerstone
- a. Inspection Scope

To verify the accuracy of the data reported for the PIs listed below, the inspectors used performance indicator definitions and guidance contained in Nuclear Energy Institute (NEI) 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 4. The inspectors reviewed Licensee Event Reports (LERs), station logs and databases, corrective action program documents, and PI data sheets to verify the basis for reporting the data element. The inspectors interviewed licensee personnel

associated with the PI data collection, evaluation and distribution. The inspectors verified data for the period annotated for the following PIs:

- Unplanned Scrams (July 2006 December 2006);
- Unplanned Scrams with loss of Heat Sink (July 2006 December 2006); and,
- Unplanned Power Changes per 7,000 Critical Hours (July 2006 December 2006).
- b. Findings

No findings of significance were identified.

- 4OA2 Identification and Resolution of Problems
- .1 Daily Screening of Corrective Action Items
- a. Inspection Scope

As required by Inspection Procedure 71152, "Identification and Resolution of Problems," and in order to help identify repetitive equipment failures or specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the licensee's corrective action program. This review was accomplished by either attending daily screening meetings that briefly discussed major CERs, or accessing the licensee's computerized corrective action database and reviewing each CER that was initiated.

b. Findings

No findings of significance were identified.

- .2 <u>Annual Sample Review</u>
- a. Inspection Scope

The inspectors reviewed one issue in detail to evaluate the effectiveness of the licensee's corrective actions for important safety issues documented in CER C-05-4358, CER C-05-3824, CER C-05-3571, CER C-04-0787, and CER C-03-1787. These five CER's were associated with the failure, degradation, and out of tolerance conditions of various safety and maintenance rule related, freeze protection heat trace system components. The inspectors assessed whether the issues were identified; documented accurately and completely; properly classified and prioritized; adequately considered extent of condition, generic implications, common cause, and previous occurrences; adequately identified root causes/apparent causes; and identified appropriate corrective actions. Also, the inspectors verified the issues were processed in accordance with SAP-999, "Corrective Action Program."

b. Findings and Observations

No findings of significance were identified. However, the inspectors identified several weaknesses with the licensee's CER documentation and corrective actions as follows:

- CER C-04-0787 documented the historical review of the maintenance rule criteria and functions for the heat trace (ET) system. A review of this CER and its related ET MPFFs revealed a weakness in the problem identification and common cause review of the failures in regards to physical integrity electrical preventive maintenance of freeze protection heat trace components. Specifically, the heat trace electrical maintenance procedure (EMP-120.002, "Freeze protection Heat Tracing Inspection," Revision 3) lacked checks of some safety related heat trace protected components. The licensee initiated CER C-07-1160 to correct this weakness.
- CER C-03-1767 and CER C-04-0787 documented ET system obsolescence, age-related degradation, and increased numbers of work orders and repair hours as supported by specific system component failures and out of tolerance conditions in CER C-05-3824 and CER C-05-3577. A review of these CER's revealed that the licensee's corrective actions were not thorough. Specifically, CER C-03-1767 documented and was closed to an engineering change request (ECR 50537) to replace the heat tape and temperature control modules for all safety related applications. This ECR was approved on April 27, 2004, for original implementation in March 2005 and had an original internal licensee priority ranking by the Plant Health Committee (PHC) of 9. Though proposed each year for implementation, this ECR's PHC ranking has lowered successively from 9 to 12 and now 18 and the ECR is currently proposed for implementation in 2008 at the earliest. The corrective action weakness involved the timeliness of implementation of this ECR that could directly impact the operability of safety related systems and in the PHC scoring methodology that does not directly account for continuing degradation of system due to aging.
- CER C-05-4358 documented a maintenance rule related heat trace control panel breaker that was found open during a building walk-down. A review of this CER revealed the licensee's corrective actions were not thorough. Specifically, the action from this CER incorporated heat trace control panel breakers into the SOP electrical line-up verification for only the specific system found out of position. The corrective action weakness involved the extent of condition review, in that, there was no consideration to include this breaker verification check in all safety related ET system SOP's. The licensee initiated a procedure feedback to correct this weakness.
- Based on review of yearly completed ET preventive maintenance, the inspectors noted that this maintenance for all safety related ET equipment was not always completed prior to the onset of freezing weather conditions. This could allow missed opportunities to identify ET equipment deficiencies prior to cold weather conditions that rely on the ET equipment to function properly. The licensee

Enclosure

added an additional action item to CER C-05-4358 to investigate the need to provide more timely implementation of ET system preventive maintenance.

- 4OA3 Event Followup
- .1 <u>Manual Reactor Trip Due to Steam Leak from Failed Feedwater Booster Pump</u> <u>Recirculation Line Flow Orifice Gasket</u>
- a. Inspection Scope

The inspectors reviewed the February 5, 2007, manual reactor trip due to failure of the "D" main feedwater booster pump recirculation line flow orifice gasket. The inspectors reviewed CER C-07-0411 associated with the event, plant logs, plant computer data, and interviewed operations personnel to assess the cause of the event, confirm plant equipment performed as required, and ensure that operator actions were appropriate and in accordance with required operating, alarm response, abnormal, and emergency procedures.

b. Findings

No findings of significance were identified.

- .2 (Closed) LER 05000395/2006002-00: Securing an Associated Radiation Monitor While the Reactor Building Alternate Purge System Was in Service.
- a. Inspection Scope

The inspectors reviewed the subject LER and CER C-06-3273 associated with the event to verify the accuracy of the LER, evaluate the initiating cause of the incident, and appropriateness of corrective actions.

b. Findings

<u>Introduction</u>. A Green self-revealing NCV of TS 3.3.2 was identified for failure to maintain two containment radiation monitors operable and capable of automatically isolating reactor building purging operations in the event of high containment radioactivity during a design basis accident.

<u>Description</u>. On October 6, 2006, the operations crew was tasked with performing the quarterly surveillance test for stroking the containment isolation valves for containment radiation monitor RM-A2 in accordance with STP-144.001, "Nuclear Sampling Valve Operability Test," Revision 8. While a pre-job briefing was conducted for the test, it failed to consider the impact of performing the test with the reactor building alternate purge system in service. The alternate purge system had been placed in service several days earlier to provide atmospheric cleanup in preparation for the upcoming start of the refueling outage. Subsequently, when the RM-A2 sample pump was secured in accordance with STP-144.001, which rendered RM-A2 inoperable, the plant

Enclosure

had only one of two required radiation monitors available to isolate the open purge supply and exhaust valves which constituted a violation of TS 3.3.2. Upon receiving the trouble alarm for the secured RM-A2 radiation monitor sample pump, the Shift Supervisor, who had just entered the control room, recognized the impact of securing the pump with alternate purge in service and directed the sample pump to be restarted. The station was in violation of TS 3.3.2 for approximately one minute.

Analysis. The failure to ensure both containment radiation monitors were maintained operable with the alternate purge system in service constituted a performance deficiency and a finding. This finding is more than minor because it affected the configuration control attribute of the Barrier Integrity cornerstone and affected the cornerstone objective of providing reasonable assurance that the containment physical design barrier protect the public from radionuclide releases caused by accidents or events. With the RM-A2 sample pump secured, it was incapable of isolating the outside containment purge supply and exhaust containment isolation valves on a high containment radiation signal resulting in a violation TS 3.3.2. The finding is of very low safety significance (Green) because there was no loss of safety function since radiation monitor RM-A4 was still operable during this period to provide isolation of the inside containment purge supply and exhaust containment isolation valves and because of the short time the RM-A2 train was inoperable. Therefore, an actual open pathway in containment would not have existed during a design basis accident. The cause of this finding is related to the human performance and error prevention aspect of the crosscutting area of human performance due to inadequacies in the pre-job briefing that failed to recognize the adverse interaction posed by conducting the surveillance test with the reactor building alternate purge system in service.

<u>Enforcement</u>. TS 3.3.2 requires two containment radiation monitors (RM-A2 and RM-A4) be available to automatically and independently isolate reactor building purging operations in the event of high containment activity. Contrary to the above, on October 6, 2006, with the reactor building alternate purge system in operation, operations personnel rendered one of the two containment radiation monitors (RM-A2) inoperable while conducting an RM-A2 containment isolation valve stroke test. Because this violation was determined to be of very low safety significance and was placed in the corrective action program as CER C-06-3273, this violation is being treated as a NCV in accordance with Section VI.A.1 of the NRC Enforcement Policy, and is identified as NCV 05000395/2007002-02, Shutdown of Required Containment Radiation Monitor During Reactor Building Purge System Operation Results in Violation of TS 3.3.2.

.3 (Closed) LER 50-395/2006003-00: Emergency Diesel Generator Start Due to Undervoltage on 1DB Emergency Bus.

The inspectors reviewed the subject LER and CER C-06-4031 to verify the accuracy of the LER and the appropriateness of the corrective actions. No new findings of significance were identified. This LER is closed.

.4 (Closed) LER 50-395/2006004-00: Turbine Trip Due to High Steam Generator Level P-14.

The inspectors reviewed the subject LER and CER C-06-4275 to verify the accuracy of the LER and the appropriateness of the corrective actions. No new findings of significance were identified. This issue was previously discussed in NRC Integrated Inspection Report 05000395/2006005 and the operator human error that resulted in the steam generator water level transient and turbine trip was the subject of a self-revealing NCV of TS 6.8.1.a for the failure to follow startup procedures while transitioning from emergency to main feedwater.

4OA6 Meetings, Including Exit

.1 Integrated Report Exit

The inspectors presented the inspection results to Mr. Jeffrey Archie and other members of the licensee staff on April 5, 2007. The licensee acknowledged the results. The inspectors confirmed that inspection activities discussed in this report did not contain proprietary material.

.2 <u>Annual Assessment Meeting Summary</u>

Subsequent to the end of this inspection period, on April 19, 2007, the NRC's Chief of Reactor Projects Branch 5 and the Resident Inspector assigned to the Virgil C. Summer Nuclear Station met with South Carolina Electric and Gas Company to discuss the NRC's Reactor Oversight Process (ROP) and the NRC's annual assessment of V. C. Summer's safety performance for the period of January 1 through December 31, 2006. The major topics addressed were the NRC's assessment program, and the results of the V. C. Summer assessment. Attendees included V. C. Summer site management, members of the site staff, corporate management and a representative from the South Carolina Public Service Authority.

This meeting was open to the public. The presentation material used for the discussion and the list of attendees is available from the NRC's document system (ADAMS) as accession numbers ML071160007 and ML071160282, respectively. ADAMS is accessible from the NRC Web site at http://www/nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

- J. Archie, Vice President, Nuclear Operations
- F. Bacon, Manager, Chemistry Services
- M. Browne, Manager, Quality Systems
- A. Cribb, Supervisor, Nuclear Licensing
- G. Douglass, Manager, Nuclear Protection Services
- M. Fowlkes, General Manager, Engineering Services
- D. Gatlin, General Manager, Nuclear Plant Operations
- D. Lavigne, General Manager, Organizational Effectiveness Training
- G. Lippard, Manager, Operations
- G. Moffatt, Manager, Nuclear Training
- P. Mothena, Manager, Health Physics and Safety Services
- J. Nesbitt, Manager, Materials and Procurement
- K. Nettles, General Manager, Nuclear Support Services
- R. Stokes, Manager, Design Engineering
- W. Stuart, Manager, Plant Support Engineering
- B. Thompson, Manager, Nuclear Licensing
- A. Torres, Manager, Planning / Scheduling and Project Management

NCV

S. Zarandi, Manager, Maintenance Services

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Opened and Closed

05000395/2007002-01

05000395/2007002-02

NCV Shutdown of Required Containment Radiation Monitor During Reactor Building Purge System Operation Results in Violation of TS 3.3.2 (Section 40A3.2)

Inadequate Corrective Actions Results in Repetitive Spurious Tripping of EDG Room Ventilation Fan Molded Case Circuit Breakers (Section 1R15)

Closed

0500395/2006002-00 LER Securing an Associated Radiation Monitor While the Reactor Building Alternate Purge System Was in Service (Section 4OA3.2)

Attachment

A-2

5000395/2006003-00	LER	Emergency Diesel Generator Start Due to Undervoltage on 1DB Emergency Bus (Section 4OA3.3)
5000395/2006004-00	LER	Turbine Trip Due to High Steam Generator Level P-14 (Section 4OA3.4)
Discussed		

None

LIST OF DOCUMENTS REVIEWED

Section 1R04: Equipment Alignment

Procedures and Drawings CER C-07-0073, EFW Valve XVK1019A Locked Incorrectly; SOP-117, Service Water System, Rev. 20; SOP-118, Component Cooling Water, Rev. 17; SOP-211, Emergency Feedwater System, Rev. 13; SOP-304, 115kV, 7.2 kV Operations, Rev. 11G; SOP-306, Emergency Diesel Generator, Rev. 17B; STP 125.001, Electrical Power Systems Weekly Test, Rev. 14D; D-302-085, Emergency Feedwater (Nuclear), Rev. 40; D-302-221 and D-302-222, Service Water Cooling; Parr Hydro Black Start Procedure, Rev. 1/10/07.

Section 1R05: Fire Protection

<u>Procedures and Drawings</u> Fire Protection Pre-Fire Plan, Rev. 8/1/05; IB-412/423-6; AB-436; IB-436/436; EPAA/451; AB-388/397; CB-400/412; CB-425.

Section 1R19: Post Maintenance Testing

Procedures FSAR, Section 9.2.1., Service Water System, Amendment 00-01; SOP-117, Service Water System, Rev. 20D; SOP-211, Emergency Feedwater System, Rev. 13; SOP-306, Emergency Diesel Generator, Rev. 17B; STP-220.001A, Motor Driven Emergency Feedwater Pump and Valve Test, Rev. 8; STP-223.002A, Service Water Pump Test, Rev. 8.

Section 1R22: Surveillance Testing

<u>Procedures and Drawings</u> SOP-306, Emergency Diesel Generator, Rev. 17B; D-302-085, Emergency Feedwater (Nuclear), Rev. 40.