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Docket Nos. 50-424, 50-425
License Nos. NPF-68, NPF-81

Georgia Power Company
ATTN: Mr. C. K. McCoy
Vice President
Vogtle Electric Generating Plant
P. O. Box 1295
Birmingham, AL 35201

Gentlemen:

SUBJECT: NOTICE OF VIOLATION
(NRC INSPECTION REPORT NOS. 50-424/94-12 AND 50-425/94-12)

This refers to the inspection conducted by R. Moore of this office on May 9-20, 1994. The inspection included a review of activities authorized for your Vogtle facility. At the conclusion of the inspection, the findings were discussed with those members of your staff identified in the enclosed report.

Areas examined during the inspection are identified in the report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observation of activities in progress.

Based on the results of this inspection, certain of your activities appeared to be in violation of NRC requirements, as specified in the enclosed Notice of Violation (Notice). The violation is of concern because in one case an equipment protection function on safety related equipment was disabled. In the other, required interim measures were not accomplished for Emergency Diesel Generator air system parameters identified outside their acceptance criteria.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. In your response, you should document the specific actions taken and any additional actions you plan to prevent recurrence. After reviewing your response to this Notice, including your proposed corrective actions and the results of future inspections, the NRC will determine whether further NRC enforcement action is necessary to ensure compliance with NRC regulatory requirements.

In accordance with 10 CFR 2.790 of the NRC's "Rule of Practice," a copy of this letter, its enclosure and any reply will be placed in the NRC Public Document Room. If you wish to withhold information contained therein, please notify this office by telephone within ten days of the date of this letter and promptly thereafter submit a written application to withhold information contained therein. Such application must be consistent with the requirement

NUCLEAR REGULATORY COMMISSION Staff
Docket No. 50-424/425-OLA-3 EXHIBIT NO. II-10
In the matter of Georgia Power Co. et al., Vogtle Units 1 & 2
☐ Staff ☐ Applicant ☐ Intervenor ☐ Other
☑ Identified ☐ Received ☐ Rejected Reporter KHU
Date 7/20/95 Witness Marbaugh

of 10 CFR 2.790(b)(1). If we do not here from you in this regard within the period specified above, this letter, its enclosure and any reply will be placed in the NRC Public Document Room.

Should you have any questions concerning this letter, please contact us.

Sincerely,

ORIGINAL SIGNED BY
CHARLES A. CASTO

Charles A. Casto, Acting Chief
Engineering Branch
Division of Reactor Safety

Enclosures:
1. Notice of Violation
2. NRC Inspection Report

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JUN - 9 1994

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NRC Senior Resident Inspector
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SEND TO	OFC NAME	RII:DRS RMoore LCM	RII:DRS GMacDonald	RII:DRS MWaterman for	RII:DRS MSykmlock cc LCM 6/6/94	RII:DRP PSkinner
PDR?	DATE	5/19/94	5/31/94	5/31/94	6/7/94	6/2/94
Yes No	COPY?	Yes No	Yes No	Yes No	Yes No	Yes No

OFFICIAL RECORD COPY DOCUMENT NAME: S:\DRS\EB\VOG9412L.RM

ENCLOSURE 1

NOTICE OF VIOLATION

Georgia Power Company
Vogtle Nuclear Plant

Docket Nos. 50-424 and 50-425
License Nos. NPF-68 and NPF-81

During an NRC inspection conducted on May 9-20, 1994, a violation of NRC requirements was identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," 10 CFR 2, Appendix C, the violation is listed below:

10 CFR 50 Appendix B, Criterion V, Instructions, Procedures, and Drawings, as implemented by the Vogtle Electric Generating Plant Operations Quality Assurance Policy Manual, revision 12, requires that activities affecting quality shall be prescribed by documented procedures and activities shall be accomplished in accordance with these procedures.

Contrary to the above, on May 9-20, 1994, two examples were identified in which activities affecting quality were not accomplished in accordance with prescribed procedures.

Example 1:

Procedure SCL 00166, Diesel Generator Air Start Dryer Maintenance, revision 5, step 4.E, required that moisture checks be accomplished every 12 hours if dew point analysis indicated air system dew point was not within the acceptance criteria of 32°F to 508 °F. On January 19, 1994, dew point analysis indicated that the dew point exceeded the acceptance criteria for six of eight air receivers. These results were documented on maintenance work orders 19303293, 29303950, and 19303290. No moisture checks were performed and the actual air quality was not verified until February 5, 1994. This analysis verified that EDG 1A receiver K02 exceeded the acceptance criteria.

Example 2:

Procedure 27563-C, Generator and Engine Control Panel Functional Test, revision 8, step 4.2.57, required that tubing E-14 to the jacket water pressure switch (1 PSL 19114) be re-connected following completion of the test. During the April 1, 1993, performance of this procedure on Emergency Diesel Generator (EDG) 1A, the E-14 tubing was not re-connected. This resulted in the jacket water low pressure trip being disabled for approximately one year.

This is a Severity Level IV violation (Supplement I).

Pursuant to the provisions of 10 CFR 2.201, Georgia Power Company is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555 with a copy to the Regional Administrator, Region II, and a copy to the NRC Resident Inspector at the Vogtle facility, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation" and should include for each violation: (1) the reason for the violation, or, if contested, the basis for disputing the violation, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid further violations, and (4) the date when full compliance will be achieved. If an adequate reply is not received within the time specified in this Notice, an order or Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

Dated at Atlanta, Georgia
this 9th day of June 1994

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

Report No.: 50-424/94-12 and 50-425/94-12

Licensee: Georgia Power Company
P.O. Box 1295
Birmingham, AL 35201

Docket Nos.: 50-424 and 50-425 License Nos.: NPF-68 and NPF-81

Facility Name: Vogtle 1 and 2

Inspection Conducted: May 9-20, 1994

Inspectors: _____ for
R. Moore, Region II — Date Signed: 5-31-94

_____
G. MacDonald, Region II — Date Signed: 5-31-94

_____ for
M. Waterman, NRR per telcon — Date Signed: 5/31/94

Approved by: _____ for
M. Shymlock, Chief
Plant Systems Section
Division of Reactor Safety — Date Signed: 6/9/94

SUMMARY

Scope:

This routine electrical maintenance inspection focussed on the effectiveness of the licensee's corrective actions for emergency diesel generator (EDG) 1A and 1B failures which occurred in 1990. The failures were related to malfunctions of the EDG pneumatic control and protection system.

Results:

The licensee's corrective actions effectively resolved problems with the pneumatic control system which contributed to EDG failures in 1990.

One violation was identified during this inspection. The violation identified two examples of the licensee's failure to follow maintenance procedures (paragraph 2.5.1 and 2.7).

REPORT DETAILS

1. Persons Contacted:

Licensee Employees

*B. Beasley, General Manager
*W. Burmeister, Engineering Support Manager
*R. Burns, Engineering Support
*S. Chesnut, Technical Support Manager
*W. Copeland, Materials Supervisor
*C. Coursey, Maintenance Superintendent
*R. Dorman, Plant Training Manager
*C. Eckert, Senior Technical Specialist
*W. Gabbard, Nuclear Specialist
*J. Gasser, Operation Unit Superintendent
*W. Kitchens, Assistant General Manager - Support
*R. Moye, Plant Engineering Supervisor
*M. Sheibani, Nuclear Safety Supervisor
*K. Stokes, Senior Engineer
*J. Swartzwelder, Outage and Planning Manager
*K. Burr, Senior Project Engineer

Other licensee employees contacted included technicians, supervisors, engineers maintenance personnel and office personnel.

NRC Resident Inspectors

*B. Bonser, Senior Resident Inspector
*D. Starkey, Resident Inspector
*M. Shymlock, RII, Plant Systems Section Chief

*Attended exit meeting

Abbreviations and Acronyms are listed in paragraph 5.0

2.0 Electrical Maintenance (62705)

2.1 Background

In March 1990, EDG 1A experienced failures attributable to malfunctions of the pneumatic protection and control system. Investigations in 1990 concluded that the primary root cause was improper intermittent operation of the Calcon jacket water temperature sensors. Additional contributing causes were identified as pneumatic control system leaks and inconsistent Calcon instrument calibration techniques. Similar trips were experienced on EDG 1B in May of 1990.

In this inspection, the inspectors assessed the effectiveness of the licensee's corrective actions for pneumatic protection and control system problems identified in the 1990 EDG failure evaluations. Additionally, the inspectors reviewed other factors which could potentially impact the pneumatic control system function such as air quality, system configuration, modifications, and equipment history of

critical system components such as the P-3 pressure switch and the pneumatic logic boards. Equipment history was assessed by review of approximately 780 maintenance work orders (MWOs) and 165 deficiency cards (DCs) from 1988 to the present.

2.2 Calcon Instrument Malfunctions

The inspectors assessed the effectiveness of the licensee's actions to address Calcon instrument malfunctions which were identified as a primary contributor to the March 20, 1990, EDG 1A failures. The corrective action addressed improvement of procedures and methodology for calibration of the instrumentation. A review of instrument equipment history indicated the effectiveness of upgrading calibration procedures and methodology.

2.2.1 Calibration Procedures

Calibration procedures prior to April 1990, were generic procedures supplemented with written instructions from a Request for Engineering Review (RER). The following procedures provided guidance for instrument calibrations in that time period:

- Procedure 22721-C, Pressure Switch Calibration, revision 3
- Procedure 22332-C, Temperature Switch Calibration, revision 2
- Procedure 23820-C, Generic Instrumentation Calibration, revision 3
- RER 88-0707, Instrument Tolerances for EDG Calcon Switches, dated November 10, 1988

After the March 20, 1990, EDG 1A failures, the licensee evaluated calibration procedures and methodology and developed new procedures in conjunction with Wyle Labs. The new procedures provided more specific instructions and improved calibration methodology. The inspectors reviewed the following procedures which were being used for instrument calibrations at the date of this inspection:

- Procedure 22981-C, Calcon Pneumatic Temperature Sensor Calibration, Equipment Nos. 1(2)TSH-19112, 1(2)TSH-19119, 1(2)TSH-19146, 1(2)TSH-19153, revision 6
- Procedure 22983-C, Calcon Pressure Switch Calibration, Equipment Nos. 1(2)PSL-4749 A, B, C, D, E, 1(2)PSL-4859 A, B, C, D, E, 1(2)PSL-19114 and 19121, revision 2
- Procedure 22982-C, Calcon Pneumatic Vibration Sensor Model E-4600 Functional Test, revision 2

The current procedures provided specific instructions for calibrating the Calcon sensors and provided a more systematic and well-defined calibration process. For example, these calibration procedures provided

detailed requirements for test equipment and cleaning materials incorporating vendor recommendations. Additional instructions were included to address sensor venting problems and expected sensor performance. The instructions more clearly defined the procedure for adjusting the sensor to achieve the correct instrument response. A sensor preheat period not specified in the previous procedures was addressed in the new procedures. The new procedures also address verification of sensor tube connection tightness. Analysis of calibration processes in 1990 indicated that loose sensor tubes impacted sensor setpoints. The current calibration procedures required that a calibration be performed three times to verify that the trip and reset values were within the specified limits. The inspectors concluded that the changes in calibration procedures provided for more consistent reliable calibration of Calcon instruments.

The new instructions also addressed isolation of problem sensors for analysis and installation practices. Sensors with excessive drift or calibration problems were to be tagged and stored for engineering analysis and Engineering was required to be notified if any problem was encountered during calibration of a sensor, including any sensor found out of calibration. Specific guidance was incorporated in the procedures to minimize the presence of foreign material in the sensor body. For example, the use of locktite was specified as a thread sealant as opposed to "pipe dope" which had been found on sensor internals and contributed to improper sensor venting. Additionally, specific instructions were provided for the application of thread sealant after the sensor fitting was screwed into the sensor body approximately two full turns. The inspectors concluded that these additional instructions contributed to reduction in sensor failures.

2.2.2 Instrument Failure Experience

The inspectors reviewed MWOs to assess the Calcon instrument equipment history at Vogtle to determine if the instruments' reliability had improved as a result of the corrective actions discussed above. NUREG 1410 listed 67 Calcon instrument failures at Vogtle between 1985 and 1990. This included 48 temperature sensors, 13 pressure sensors, 3 vibration sensors and 3 air trip valve (P3) failures. The inspectors reviewed the following MWOs which identified Calcon Instrument failures since April, 1990:

TEMPERATURE SENSOR MWOs

19002711	(3 Failures)	19203584	2 Failures
19103008		19203585	3 Failures
19103009		29003403	
19104772		29200295	
19104829			

PRESSURE SENSOR MWOs		VIBRATION SENSOR MWOs
19203577		19104783
29201061		29102850
29102840	(3 Failures)	
19101227		

The MWOs listed above indicate that 22 sensor failures occurred since April 1990. These included, 14 temperature, 6 pressure and 2 vibration sensors that either failed to properly function or calibrate. Several of the temperature malfunctions occurred on EDG 1B on May 23, 1990, following initial use of the new calibration procedures. No instrument malfunctions have occurred since April 1993. The inspectors concluded that the reliability of the sensors had improved since the Vogtle Loss of Vital AC Power event on March 20, 1990, (67 sensor problems prior to April 1990, versus 22 sensor problems after April 1990, with no malfunctions since April 1993).

2.3 Critical Components

The inspectors reviewed the equipment history for selected critical components of the EDG pneumatic control system to determine if past performance of these components impacted EDG reliability. The components reviewed were the P3 shutdown pressure switches and the pneumatic logic boards.

2.3.1 P3 Shutdown Pressure Switches.

The purpose of the P3 shutdown Calcon pressure switch was to trip the EDG when a trip parameter, such as high crankcase pressure, reached its setpoint. This switch ensured a shutdown following establishment of a trip condition. Setpoint errors could result in inappropriate initiation of trips from non-emergency trip parameters.

The inspectors reviewed the MWOs and DCs initiated from 1990 to the present. There have been three incidents in which the P3 pressure switch was thought to have failed (MWOs 19001537 and 19001542, and DCP 90-V1N0164). The failure addressed by MWO 19001542 was reported on March 25, 1990, and required replacement of the P3 switch. The pressure switch failure addressed by MWO 19001537 occurred when the P3 switch failed to reset after tripping. The switch was replaced. MWO 19001511 dated March 28, 1990, tested the EDG 1A P3 switches at various air pressures and with different orifices sizes on the test stand. The test conclusion was that repeatability throughout the variations was consistent. The following MWOs during 1990 included P3 switch replacements and calibrations: 19000068, 19002711, and 19000016. These MWOs did not identify problems with setpoint repeatability.

DCR 90-V1N0164 was initiated to lower the set point on P3 pressure switches. This DCR was cancelled and the set points were not changed. The basis for cancellation stated that the P3 set/reset set point values were not the cause of EDG 1A failures being investigated. P3 switch

operation was impacted by normally charged lines being bled down during maintenance. These lines had not been sufficiently recharged prior to attempted EDG starts.

The inspectors concluded that P3 switch malfunctions have not impacted EDG reliability. The Maintenance history indicated few failures and the calibration documents did not identify occurrences of setpoint repeatability problems.

2.3.2 Pneumatic System Logic

The inspectors reviewed MWOs and DCs from 1990 to the present to evaluate the failure history of EDG pneumatic logic boards. The following MWOs were identified which documented pneumatic logic board replacements and repair of components on pneumatic logic boards.

29004795	Pneumatic logic board replacement
19001219	Pneumatic logic board replacement
19001409	Pneumatic logic board component (OR gate) cleaned
19001537	Pneumatic logic board replacement
29303314	Pneumatic logic board component replacement

The inspectors reviewed these MWOs in detail and confirmed that pneumatic logic boards were replaced during pneumatic control system troubleshooting. The original logic boards that were replaced were later inspected and tested by the vendor and determined to be acceptable. The logic boards had not failed, but were replaced during troubleshooting as a potential failure cause. The inspectors reviewed vendor letter, dated June 5, 1990, which documented the pneumatic control component testing of the 1B shutdown logic boards and verified that the shutdown logic board did not fail.

The pneumatic control system for each EDG is functionally tested during each refueling outage using 27563-C, Generator And Engine Control Panel Functional Test Procedure. Revision 1 of this procedure, approved February 20, 1990, was the version used prior to the March 1990 EDG failures. The inspectors reviewed 27563-C, Revision 1 and verified that the procedure performed a functional check of pneumatic control system start functions and engine protective trip functions.

The functional test of the pneumatic logic boards at refueling outage intervals met the requirements included in the Transamerica Delaval Incorporated Diesel Generator Owners Group Maintenance Matrix, Revision 3. The pneumatic control system functional tests were documented on MWOs. The inspectors reviewed completed functional tests documented in the following MWOs to determine if the testing identified poor performance of the pneumatic control logic.

MWO Nos.

29002105	29002102
19000095	19000094
19203296	19203299

Review of the six functional test MWOs identified one pneumatic logic or-gate which required cleaning. This repair MWO was 19001409 previously reviewed as part of pneumatic control system failure history. The only other problem discovered was in MWO 25002102 which identified a Timer/Not element on a logic board which required adjustment.

Based on the review of failure history and functional test results, the inspectors concluded that pneumatic logic board reliability has been acceptable. The licensee testing met vendor owners group requirements and verified pneumatic control system performance.

2.4 Pneumatic System Leakage

Pneumatic control system leakage was identified as a contributing factor to the EDG 1A and EDG 1B failures which occurred in 1990. The inspectors screened approximately 780 MWOs and 165 DCs from 1990 to the present to identify the MWOs associated with EDG pneumatic control system leakage. The following MWOs were reviewed:

29004795	29004733	29000182	19001185
19001404	19001433	19001435	19001537
19001576	19002289	19002711	19003164
19003510	19104783	19104997	19105032
19105050	29201061	19301705	29303314
19000016	19104772	19001629	19001511
19001683	191-303	190-154	191-293

The MWO review indicated that 59 percent of the leakage MWOs occurred in 1990 with 31 percent in 1991, 3 percent in 1992 and 7 percent in 1993. Fifty-five percent of the leakage was attributed to venting pneumatic trip switches. Twenty-four percent of the leakage was caused by component leaks and 21 percent caused by fitting leaks.

During 1990, the licensee performed functional testing including soap bubble leak checks of all fittings which were disassembled during testing. The functional testing was performed on a refueling outage interval in accordance with procedure 27563-C, Generator And Engine Control Panel Functional Test Procedure, Revision 1. No specific leakage acceptance criteria was utilized. Many of the pneumatic control system connections utilized Swagelock compression fittings. No procedure was used for these fitting connections during 1990. Training on proper Swagelock compression fitting installation was provided to plant personnel as part of job position training.

Revision eight of Procedure 27563-C was reviewed by the inspectors to assess present leakage control practices. This revision included detailed leakage measurement of the pneumatic system. A modification was implemented to add test valves to facilitate the leakage testing. The inspectors verified that test valves had been added to pneumatic trip sensor lines. Procedure 27563-C, revision eight was reviewed and the inspectors noted the detailed leakage checks and the specific leakage acceptance criteria.

Procedure 20440-C, Swagelock Fittings Replacement/Instruction, revision 1, was approved September 25, 1992, to control replacement and installation of Swagelock compression fittings. The reduction in the number of EDG control system leakage related MWOs indicated that the detailed leakage testing and Swagelock compression fitting procedure had improved the pneumatic control system pressure integrity.

The inspectors witnessed testing of EDG 2A on May 13, 1994, and EDG 1B on May 18, 1994. During both tests, the inspectors checked the pneumatic trip switches and none were found to be venting. Pneumatic tubing fittings inside the engine control panels and bulkhead fittings at the engines were checked for leaks. No leakage was detected at the engine bulkhead fittings or inside the engine control panels.

The inspectors concluded the pneumatic control system leakage occurred in 1990 and contributed to the EDG 1A and 1B failures in 1990. This leakage was discussed in NUREG 1410. Licensee actions have significantly improved pneumatic control system pressure integrity. An adequate program was established to routinely monitor and control system leakage. Present EDG reliability was not impacted by pneumatic system leakage.

2.5 System Air Quality

The inspectors reviewed the licensee's activities to maintain the air quality of the pneumatic control and protection system. The potential impact of air system moisture on EDG reliability was also reviewed. The EDG Vendor provided no specific criteria for moisture content. Acceptance criteria for air moisture content was provided by the licensee's response, dated February 17, 1989, to NRC Generic Letter 88-14, Instrument Air Supply System Problems Affecting Safety Related Equipment. The acceptance criteria was for a 50 °F dew point at 250 pounds (psig) air pressure.

2.5.1 Maintenance of Air Quality

Refrigerant compressor air dryers were used to remove moisture from compressed air and dew points were periodically monitored to verify the dew point criteria was maintained. EDG air start receiver dew points were measured every 28 days. The inspectors reviewed maintenance procedure SCL-00166, EDG Air Start Dryer Maintenance, revision 6. When a dew point was not within the acceptance criteria (32°F to 50°F), the procedure directed that the system engineer and operations be notified.

The receiver was not isolated unless periodic moisture checks indicated water in the control air system. Moisture checks were to be conducted every 12 hours at a control air test connection in the EDG control cabinet. The procedure specified opening the test connection valve "for a few seconds" to check for moisture. The inspectors noted that this blow down time may not be sufficient to determine if water was in the 250 psig piping outside the cabinet. The licensee initiated actions to revise the procedure to extend the blowdown time. With the exception noted, the inspectors concluded that the procedure provided adequate guidance for monitoring system dew point.

The inspectors reviewed the following MWOs which documented dew points outside the acceptance criteria between 1988 and 1994:

EDG 1A	EDG 1B	EDG 2A	EDG 2B
18806224	18905009	29104594	29200789
18809080	18808711	29200210	29303950
18900984	18906446	29200783	
19000899	19001770	29200951	
19001513	19002901	29201404	
19001651	19003585		
19102066	19102064		
19202414	19102968		
19303293	19103401		
19303295	19103676		
19400830	19104653		
	19300472		
	19303290		

Dew points outside the acceptance criteria indicated that the air dryers were not functioning correctly and the interim actions previously discussed were required to assure moisture was not introduced into the air system. Corrective actions were to repair the dryer and perform a feed and bleed on the receiver to reduce the dew point. The inspectors noted that the occurrences of dew points outside the acceptance criteria decreased after 1990, indicating improved performance in maintaining air dryer equipment.

In reviewing dew point analysis results, the inspectors noted that on January 19, 1994, six of eight air receiver dew point analyses indicated dew points outside the acceptance criteria. These results were documented on MWOs 19303293, 29303950, and 19303290. The interim actions required by the maintenance procedure, SCL-00166, performance of moisture checks every 12 hours, were not accomplished. Additionally, no further dew point analysis was accomplished until February 5, 1994. The February 5, 1994, analysis indicated that all receivers except receiver K02 on EDG 1A were within the acceptance criteria. In addressing this issue with the inspectors, the licensee stated that the dew point measuring and test equipment validity was suspect because the results were inconsistent with previous analysis and the analysis method used differed from previous methodology. The inspectors concluded that

although there was a basis to question the dew point analysis results, the interim actions of 12 hour moisture checks were required until the dew point conditions were verified within the acceptance criteria. This issue was identified as one example of NRC Violation 94-12-01, Failure to Follow Maintenance Procedures. An additional example is discussed in paragraph 2.7 of this report.

The inspectors reviewed EDG maintenance history to determine if out-of-tolerance dew point conditions resulted in detectable water formation or adverse operation of the pneumatic control and protection system. The troubleshooting MWOs related to the March 20, 1990, EDG 1A and May 23, 1990, EDG 1B failures were specifically reviewed. The maintenance documentation provided no indication that water had been detected in the control and protection portion of the air start system at any time. Discussions with the craft and engineering staff involved in the 1990 trouble shooting activities and current EDG maintenance also provided no indication that water had been detected in the air system. During the inspection, the inspectors observed dew point measurement on four air receivers. The analysis on a receiver on EDG 2B indicated a dew point which exceeded the acceptance criteria. The inspectors observed blowdowns on the 2B receivers and control air system. No detectable moisture was observed. The inspectors concluded that the out-of-tolerance condition did not result in detectable water formation in the control air system.

An additional factor which indicated that water formation in the control air system was unlikely was that dew point values decrease when the system pressure is reduced. The dew point of the 250-psig supply air will significantly decrease when the pressure is reduced to 60 psig by the control cabinet pressure regulator. This was confirmed by review of a psychrometric chart that plots dew point temperatures as a function of pressure. Using the chart, and assuming a worst case dew point of 85°F (29°C) at 250 psig, the equivalent dew point at 60 psig is approximately 50°F (10°C). The control cabinets are heated with resistance-type heaters and shield the control components from outside air drafts. All system orifices are located in the control cabinet. The minimum design temperature for the control cabinets is the same as for the EDG, 50°F (10°C). Consequently, even with the highest dew point conditions that have been measured to date, the dew point of the air in the control cabinets was only equal to the control cabinet ambient temperature. The inspectors concluded that probability of condensation within the 60 psig air supply in the control cabinets was not significant.

2.5.2 Potential Moisture Impact

The inspectors conducted a detailed review of the pneumatic control and protection system operation to assess the potential impact on EDG reliability from water in the system. The control logic component design is such that the presence of moisture in the air supply will not cause EDG trips during the startup phase of operation. The critical components for this condition would be the AND module (AND-14) and a Timer/NOT module (Timer/NOT-11), which were in the logic board. These

elements were included on Engine Control Panel Schematic 09-500-76021, sheet 1 Of 9, revision 9. If there were enough water to cause the Timer/NOT element to sense a false pressure signal, there would be a similar response at the AND module, which would result in pressurization of the B port of the P3 OR module. This would result in either the EDG tripping before 60 seconds, or the EDG not tripping at all. The timing of the EDG trips reviewed did not indicate this occurrence. The inspectors concluded that water had not been a contributor to these EDG trips.

There was a 5-micron air filter in the 250-psig air lines immediately before the 60-psig pressure regulator in the control cabinet. The purpose of the filter was to remove particulate from the air before it was admitted into the pneumatic control modules. If water were present in the 250-psig air supply line, the 5-micron filter in the control cabinet would atomize the water droplets into a fine mist. Assuming the water droplets were approximately 5 microns in diameter, the smallest orifice in the control system is 0.006 inch (152 microns), approximately 30 times larger than the atomized water droplets. Consequently, even if all of the air flowed through the 0.006-in orifice, the probability of choked flow is insignificant. Additionally, the majority of the control air bypasses the 0.006-inch orifice and pressurizes the A port in the P3 upstream OR gate. Consequently, the effect of moisture on the pressurization of the P3 switch OR gate ports was insignificant.

Water inside the control modules could cause corrosion of the metal parts inside the logic modules and inside the EDG instrumentation. This could affect the sensitivity of the instruments, and thereby affect the startup of the EDG. However, review of MWOs and DCs for the two units did not reveal any cases of corrosion caused by unknown sources of water. One MWO, 19104783, did state that the vendor introduced water into a sensor during a pneumatic leak test with a bubbler. The inspectors conclude that the presence of water in the control system air lines can not be confirmed by evidence of corrosion.

2.6 Modifications

The inspectors reviewed modifications to the pneumatic control and protection portion of the air start system to verify the completion of corrective actions and assess the impact on EDG reliability. Corrective actions for the March 20, 1990, EDG 1A failure included establishing the Loss of Offsite Power (LOSP) start as an emergency start and deleting the jacket water high temperature trip as an emergency mode trip. Additional modifications included changes to various orifice components.

The following modifications were related to corrective actions for the EDG 1A failures. Design Change Packages (DCPs) 90-V2N0137 and 90-V1N0133 were completed in August, 1990 and established the LOSP EDG start as an emergency mode start, i.e. EDG non-emergency trips disabled during LOSP start. The jacket water high temperature trips were disabled by installation of isolation valves in the sensor instrument lines on DCPs 90-V1N0138 and 90-V2N0166 in November, 1990.

modifications to the pneumatic logic to delete the jacket water high temperature trips, DCPs 91-V1N0113 and 91-V1N0114, were completed in 1991 for Unit 1 and 1992 for Unit 2.

The following modifications were related to changes in orifice components in the pneumatic control system. Minor Design Deviations (MDDs) 89-V1M194 installed 0.014 inch orifices in the lube oil pressure sensing lines where no orifice was previously installed. This was to assure establishing low lube oil protection for an emergency start following a normal shutdown and was completed in March 1990. In October 1990, MDDs 90-V2M193 and 90-V1M194 decreased the orifice size in the shutdown logic board from 0.028 to 0.020 inches. DCPs 91-V1N0113 and 91-V2N0114 discussed above also installed 0.006 inch orifices in the jacket water temperature sensor air supply lines similar to other non-emergency trip sensors. The inspectors' configuration walkdowns discussed in paragraph 2.7 of this report verified installed orifices were consistent with as-built drawings for the sample reviewed. The inspectors concluded that changes to the pneumatic control system appropriately implemented the design control process and contributed to increased EDG reliability.

2.7 EDG Pneumatic Control System Configuration

The inspectors reviewed MWOs, Deficiency Cards, and performed system walkdowns to determine if the EDG pneumatic control system configuration was maintained in accordance with system design drawings.

The MWO review identified a tagging concern related to the high temperature jacket water pneumatic trip switches and their respective test valves. MWOs 29004795, 19004621, 19004622, 29005610 and deficiency card 290-225 documented and resolved the tagging concern for all four EDGs.

MWO 19001219 documented problems with the pneumatic control system of EDG 1A noted during functional testing on March 9, 1990. The tubing to vibration trip switches was left disconnected which prevented the system from pressurizing properly. Once the tubing was connected, the EDG operated satisfactorily. The MWO review did not identify any instances of pneumatic tubing being connected to the incorrect sensor or component.

The inspectors performed a walkdown of portions of the EDG 1A and 1B pneumatic control systems. Plant configuration was checked against system design drawing, Engine Control Panel Schematic, drawing FW-700-7602, sheet 1 of 13, revision A, and Engine Pneumatic Schematic, drawing FW-700-7602, sheet 10 of 13, revision A.

On May 10, 1994, during system walkdown, the inspectors identified tubing connection E-14 capped and disconnected from the EDG 1A low pressure jacket water Calcon trip sensor, 1PSL19114. The trip sensor line was disconnected and capped during the performance of system functional testing which was performed each refueling in accordance with

procedure 27563-C, Generator and Engine Control Panel Functional Test, revision 8. On April 1, 1993, the line was disconnected during functional testing of EDG 1A. Step 4.2.57 of Standard Work Completion/Data Sign Off Sheet for procedure 27563-C required that tubing connection E-14 be reconnected. This procedure step was initialled as complete on April 1, 1993, but the line was left capped and not connected to 1PSL19114 as required.

The low pressure jacket water trip was disabled from April 1, 1993, until May 10, 1994. The low jacket water pressure trip was a non-emergency mode trip and it would not affect EDG operation in the emergency mode. The licensee initiated deficiency card 41975 to document the condition. The tubing was subsequently reconnected and EDG 1A was satisfactorily tested. The failure to properly reconnect EDG 1A tubing connection E-14 constituted a violation of NRC requirements and has been identified as one example of NRC Violation 50-424,425/94-12-01, Failure To Follow Maintenance Procedures. Another example was discussed in paragraph 2.5.1 of this report.

During the pneumatic system walkdowns, the inspectors noted no other problems with system configuration. On EDG 1A and 1B the inspectors traced the tubing lines from the high temperature jacket water sensors and engine low lube oil pressure sensors and verified that the tubing was properly connected at the engine and engine control panel bulkhead fittings. Additionally, the inspectors verified that tubing connections inside the engine control panel for these sensors and the P3 pressure switch were installed in accordance with the drawings. Selected pneumatic logic board fitting connections were verified. The pneumatic logic board identification numbers were checked against the drawing as well as selected logic board components. All the components inspected were found to be configured as shown on the system drawings.

Part of the corrective action for the EDG 1A and 1B failures which occurred in 1990 was replacement of Calcon pressure and vibration sensors. Calcon Model B4400 pressure sensors were replaced with Calcon Model B4400B pressure sensors and vibration sensors model E4600A with date codes earlier than May, 1989 were replaced with Model E4600A vibration sensors with date codes of May, 1989 or later. The inspectors verified that the following Calcon sensors had been replaced on the Unit 1 EDGs.

EDG 1A	EDG 1B
Pressure Sensor	Pressure Sensor
1PSL19114	1PSL19121
1PSL4749A	1PSL4859A
1PSL4749B	1PSL4859B
1PSL4749C	1PSL4859C
1PSL4749D	1PSL4859D
1PSL4749E	1PSL4859E

Vibration Sensor	Vibration Sensor
Left Bank Turbocharger	Left Bank Turbocharger
Left Bank Engine	Left Bank Engine
Right Bank Engine	Right Bank Engine

2.8 EDG Reliability

The inspectors reviewed the EDG demand and failure history to determine whether corrective actions for the 1990 EDG 1A instrument failures impacted EDG reliability. Additionally, the failures were reviewed to determine if the licensee's categorization of valid and invalid failures was consistent with Regulatory Guide 1.108, Periodic Testing of Diesel Generator Units Used as Onsite Electric Power Systems at Nuclear Power Plants, revision 1.

In 1990 there were a total of 32 EDG failures on the four Vogtle EDGs, nine were valid failures. Unit 1 reliability was 0.95 with an unavailability of 11.06 percent on EDG 1A and 2.67 percent on EDG 1B. Unit 2 reliability was 0.96 with an unavailability of 3.63 percent on EDG 2A and 2.51 percent on EDG 2B. For 1993, There was a total of 7 EDG failures, none were valid failures. Unit 1 reliability was 0.98 with an unavailability of zero percent for both EDG 1A and 1B. Unit 2 reliability was 0.99 with unavailability of 0.26 percent for EDG 2A and 0.38 percent for EDG 2B. These statistical values indicate an improvement in EDG reliability and availability since 1990. An additional indicator of the effectiveness of the corrective actions was that no EDG failures were attributable to pneumatic control system malfunctions after 1990. Review of EDG failures since 1990 indicated that the failures had been categorized in accordance with RG 1.108. The inspectors concluded that EDG performance history demonstrated that corrective actions from the March 1990, EDG 1A failures were effective in resolving pneumatic control system problems and improving EDG reliability.

3.0 Follow-up of Previous Enforcement Items (92702)

3.1 Violation 50-424,425/92-30-01, Failure To Identify Conditions Adverse To Quality For EDG 1A Failure Of November 18, 1992

This item addressed the licensee's failure to identify and investigate a valid EDG failure caused by an air start system component deficiency. The inspectors reviewed the corrective actions for this violation. The corrective actions included training, Operations policy changes, and procedure revisions.

Policy changes documented on Licensee Interoffice Correspondence dated December 30, 1992, specified that an extra plant equipment operator should be present at the EDG for testing. This correspondence also established the policy that the EDG testing be performed early on day shift. Licensee Interoffice Correspondence dated November 30, 1992, established policy that the Operations Manager be notified when

questions about operability or reliability of safety related equipment arise. Policy changes also included assignment of responsibility for EDG failure classification to engineering. The operating shift is required to notify licensee management and engineering for an operability evaluation when an EDG does not start.

Training included adding the EDG 1A failure issue to operator re-qualification training and an event review for shift supervisors. The inspectors reviewed Training Lesson Plan RQ-LP-63123-01, Revision 2, Licensed Operator Re-qualification, Current Events. The lesson plan included a description of the EDG 1A Failure Event of November 18, 1992, and a description of the air start system and the EDG control circuit start push-button and starting relays.

The licensee's EDG operability test procedure was revised. The inspectors reviewed procedure 14980-1/2, Diesel Generator Operability Test, Revision 31/17. The inspectors witnessed EDG tests of EDG 2A on May 13, 1994, and EDG 1B on May 18, 1994. The tests were conducted in accordance with the revised operations policy. Testing was performed early on day shift and included an additional plant equipment operator stationed at the EDG. The licensee's corrective action for Violation 50-424,425/92-30-01 was adequate. This item is closed.

3.2. Violation 50-424,425/92-30-02, Inadequate Procedural Acceptance Criteria For EDG Air Start Valve Maintenance

This item addressed the use of incorrect acceptance criteria for safety related maintenance troubleshooting. Two maintenance procedures were used on one MWO, each providing different acceptance criteria for the air start valve cap to piston clearance. The inspectors reviewed the corrective action for this violation. The corrective action consisted of procedure revision and a review of maintenance procedures. The licensee's review of maintenance procedures identified no other cases of inconsistent acceptance criteria.

The inspectors reviewed procedure 27562-C, Emergency Diesel Generator Maintenance, Revision 15 and procedure 27598-C, Emergency Diesel Generator Air Start Valve Maintenance, Revision 5. The inspectors verified that the two procedures incorporated the correct air start valve cap to piston clearance of .002 to .004 inches when new and a wear limit of .0055 inches. The corrective action for violation 50-424,425/92-30-02 was acceptable. This item is closed.

4.0 Followup on Previously Identified Inspection Findings (92701)

Inspector Followup Item (IFI) 50-424,425/92-30-03, EDG Local Load Monitoring

This item addressed the lack of procedural guidance to prevent EDG overload when operating in the local mode. The inspectors reviewed the licensee's actions to address this item. The licensee revised the procedure for EDG local operation to include a note directing the

operator to monitor the EDG phase ammeters during local operation. The note provided a maximum steady state ampere limit to prevent EDG overload. The inspectors reviewed abnormal operating procedure 18038-1, Operation From Remote Shutdown Panels, Revision 18 and verified the EDG overload guidance was included. The licensee's actions on IFI 50-424,425/92-30-03 were adequate. This item is closed.

5.0 Exit Meeting

The inspection scope and findings were summarized on May 20, 1994, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection findings listed below. No dissenting comments were received from the licensee. The licensee did not identify as proprietary any of the material provided to the inspectors.

(Open) Violation 94-12-01, Failure to Follow Maintenance Procedures

(Closed) Violation 92-30-01, Failure To Identify Conditions Adverse To Quality For EDG 1A Failure of November 18, 1992

(Closed) Violation 92-30-02, Inadequate Procedural Acceptance Criteria For EDG Air Start Valve Maintenance

(Closed) IFI 92-30-03, EDG Local Load Monitoring

5.1 Acronyms and Abbreviations

Calcon	California Controls (company)
DC	Deficiency Card
DCP	Design Change Package
DCR	Design Change Request
EDG	Emergency Diesel Generator
LOSP	Loss of Offsite Power
MDD	Minor Design Deviation
MWO	Maintenance Work Order
RER	Request for Engineering Review
VEGP	Vogtle Electric Generating Plant