UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
SAM NUNN ATLANTA FEDERAL CENTER
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ATLANTA, GEORGIA 30303-8931

September 15, 2005

Carolina Power and Light Company
ATTN: Mr. C. J. Gannon
Vice President
Brunswick Steam Electric Plant
P. O. Box 10429
Southport, NC 28461-0429

SUBJECT: BRUNSWICK STEAM ELECTRIC PLANT - NRC SPECIAL INSPECTION REPORT NOS. 05000325/2005010 AND 05000324/2005010

Dear Mr. Gannon:

On August 12, 2005, the U.S. Nuclear Regulatory Commission (NRC) completed a Special Inspection at your Brunswick Units 1 and 2 facility. The enclosed report documents the inspection findings, which were discussed on August 12 and September 25, 2005, with you and other members of your staff.

On August 5, 2005, all the emergency diesel generators (a total of four) were declared inoperable. The inoperable status was the result of two cases of an emergency diesel generator (EDG) lockout shortly after startup: EDG No. 4 on July 28, 2005, and EDG No. 2 on August 5, 2005. The lockouts were initiated by generator current differential relay operation.

These events were evaluated by the NRC in accordance with Management Directive 8.3, "NRC Incident Investigation Program," and accordingly the Special Inspection was initiated. This Special Inspection was chartered to inspect and assess the circumstances associated with the EDG lockouts. 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, conducted field walkdowns, observed activities, and interviewed personnel. The Special Inspection charter is an attachment to the enclosed inspection report.

Based on the results of this inspection, one finding of very low safety significance (Green) was identified. This finding was determined to involve a violation of NRC requirements. However, because of the very low safety significance and because it was entered into your corrective action program, the NRC is treating this finding as a non-cited violation (NCV) consistent with Section VI.A.1 of the NRC Enforcement Policy. If you contest this NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the 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 Brunswick Steam Electric Plant.

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

Sincerely,

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Victor M. McCree, Director
Division of Reactor Safety

Docket Nos.: 50-325, 50-324
License Nos: DPR-71, DPR-62

Enclosure: Inspection Report 05000325, 324/2005010
w/Attachments

Attachments: 1. Supplemental Information
2. Time Line of Events
3. Brunswick Special Inspection Charter

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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos:	50-325, 50-324
License Nos:	DPR-71, DPR-62
Report Nos:	05000325/2005010 and 05000324/2005010
Licensee:	Carolina Power and Light (CP&L)
Facility:	Brunswick Steam Electric Plant, Units 1 & 2
Location:	8470 River Road SE Southport, NC 28461
Dates:	August 9 - 12, 2005
Inspectors:	P. Fillion, Senior Reactor Inspector (Lead Inspector) N. Staples, Reactor Inspector M. Cain, Resident Inspector - V.C. Summer
Approved by:	Victor M. McCree, Director Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000325/2005010, 05000324/2005010; 8/9 - 12/2005; Brunswick Steam Electric Plant, Units 1 & 2; Carolina Power and Light Company; Special Inspection.

This Special Inspection was conducted by a Senior Reactor Inspector, a Reactor Inspector, both from the Region II office and a Resident Inspector using Inspection Procedure 93812 to investigate the result of lockouts on two emergency diesel generators due to problems in the electrical system. One Green non-cited violation was 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 3, dated July 2000.

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

Green. A non-cited violation (NCV) of 10CFR50, Appendix B, Criterion XVI was identified because **the licensee failed to promptly identify a condition adverse to quality in that** licensee personnel failed to generate an Action Request (A/R) for abnormal conditions identified in the comment section of work orders associated with OPM-GEN005, "Diesel Generator Electrical Inspections."

This finding is greater than minor because it is associated with the reactor safety Mitigating System Cornerstone and affects the configuration control attribute of the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). A phase one evaluation determined that the performance deficiency was of very low safety significance because the abnormal conditions did not effect the operability of the affected components. This finding also involved the cross-cutting aspects of problem identification and resolution (PI&R) in that the licensee failed to properly identify or address these issues in the corrective action system. (Section 4OA3.4)

B. Licensee Identified Violations

None

C. Other Special Inspection Conclusions

- The inspectors found the root cause analysis, the operability evaluations and the corrective actions to be reasonably comprehensive, and no obvious deficiencies in these were identified. The root cause evaluation reviewed by the inspectors had been signed by the root cause team. At the time of issuance of this inspection report the root cause evaluation had not yet been discussed at a Plant Nuclear Safety Committee (PNSC) meeting. Consequently it is possible that certain conclusions could be revised or the team tasked with further investigation.

- There was an unexplained delay of approximately two days before the root cause team began conducting the analysis, but the team proceeded expeditiously once the analysis started.

- The preventive maintenance program for the electric generator did not factor into the cause of the event, however an NCV was identified in the area of treatment of “as found” and “as left” conditions of the excitation system collector rings.

- The cause of the event did not have strong industry wide generic implications.

- A modification (changeout) of the EDG differential current relay in 1982 created the problem which resulted the spurious tripping of the relay.

REPORT DETAILS

Event Description

The Brunswick plant has four safety-related emergency diesel generators (EDGs) designated as EDG No. 1 through 4. On Thursday July 28, 2005, at 11:19 p.m. during a Technical Specification surveillance test run, EDG No. 4 locked out shortly after startup and before the generator circuit breaker closed. Initial investigation found that the generator current differential relay (87 device) had operated and the lockout relay (86 device) was in the tripped position. Troubleshooting ensued to find the cause of the 87 relay actuation. Technicians observed that carbon dust, which is somewhat conductive, was present on the excitation system collector ring. This observation led to the theory that the carbon dust on the collector ring insulating bolts created a leakage path for field current to ground. Engineers reasoned this leakage current was of sufficient magnitude that it increased total excitation system power to a level that the differential current, between the generator and load side of the electrical bus, was within the actuation threshold of the 87 relay. In addition, it was believed at the time that the collector ring to ground insulation resistance reading was 200 ohms which is significantly below the acceptance criterion. Later it was realized there was poor communication regarding the insulation resistance reading as the actual measured value was 270 k ohms, which is still below the acceptance criterion but not as strong of an indicator of the cause. In light of no other obvious cause found during the trouble shooting, conductive carbon dust on the collector rings became the apparent cause of the lockout.

Pursuant to Technical Specification (TS) 3.8.1, the licensee had 24 hours to perform an extent of condition evaluation or to test the other three EDGs. EDG No. 3 was inspected for carbon dust at the collector rings and cleaned and successfully run on July 30. The collector rings of EDG No. 1 and EDG No. 2 were not inspected with the rationale that they had been inspected on May 10 and June 16, 2005, respectively and therefore had not experienced sufficient starts since last cleaning to have a buildup of carbon dust. By Saturday, July 30, all four EDGs were considered operable. The original problem report was assigned a level of significance requiring a root cause analysis, and the root cause team began their work on Tuesday August 2. At the request of the root cause team, EDG No. 4 was run for the purpose of measuring the current seen by the 87 relay during startup and running of the EDG. This run took place on August 4, and the measurement showed the excitation system was drawing power at a level where the current seen by the 87 relay was at or very near the minimum pickup value of the percentage differential relay. At that point, the root cause team decided to verify if the level of power was normal for the excitation system or if a manifestation of some abnormal condition was within the excitation system of EDG No. 4. To help answer this question, on August 5, EDG No. 2 was run to measure the current to the 87 relay. During this run, the current to the 87 relay was found to be the same as seen for EDG No. 4. The 87 relay operated when the door was opened to remove the test leads. This was seen as probably due to the induction disk relay contacts being very near the close position, but the test did not give conclusive results. A few hours later, EDG No. 2 was run again for the purpose of reproducing the conditions. It again locked out. The conclusion drawn from this testing was that the cause of the July 28 event was that the 87 relay pickup value was set too close to the normal operating current for the startup mode of operation. This created a situation where intermittent operation of the 87 relay could occur during the unloaded mode of EDG operation. This was then seen as a problem common to all four EDGs. On August 5, at 6:40 p.m., all four EDGs were declared inoperable and shutdown of Units 1 and 2 commenced according to Technical Specifications.

On August 9, at 7:00 pm, the Plant Nuclear Safety Committee (PNSC) convened to hear and discuss the root cause team's operability evaluation for the EDGs. At that meeting three issues were discussed. The presentation may be summarized as follows. First, the problem of the 87 relay set point versus the normal no load mode of operation current as described above was resolved by replacing the relays and establishing a set point which would not cause spurious relay operation. Second, the current measurements described above appeared to indicate that the transformer which supplied power to the excitation system was overloaded from a kVA rating viewpoint. This issue was resolved by making temperature measurements of the surface of the transformer during EDG operation until the temperature stabilized. Analysis of this temperature data demonstrated that, even though overloaded from the kVA viewpoint, the transformer would operate within its rated temperature limits. As a precaution, administrative controls were put in place to cause temperature monitoring to take place when certain conditions were present during any running of the EDGs. Third, the issue of the carbon dust buildup on the collector ring insulation bolts mentioned above was addressed. The root cause investigation team told the PNSC that the carbon dust was the result of increased wear of the brushes during startup of an EDG caused by rust on the collector rings. This condition may be present after a period when the EDG sits idle, especially in humid ambient environments. Once the rust burns off, the brush wear returns to normal. The amount of dust generated during the startup time would not threaten EDG operation and dust would not continue to be generated after the brief period following startup. It was also presented at the PNSC meeting that General Electric Company, manufacturer of the electric generator, was consulted about these concepts and that they concurred with them. The NRC Special Inspection Team and the Senior Resident Inspector attended most of this meeting. They did not have any significant questions concerning the presentation. Following the meeting, operators declared the EDGs operable. On August 10 the Brunswick units were cleared for restart. The root cause analysis report was reviewed by the inspectors in the Region II office on September 13, 2005. This report was complete and signed by the root cause team, but not yet discussed by the PNSC.

Special Inspection Team Charter

Based on the criteria specified in Management Directive (MD) 8.3,"NRC Incident Investigation Program," a special inspection was initiated in accordance with Inspection Procedure 93812, Special Inspection. The objectives of the inspection, described in the charter, are listed below and are addressed in the identified sections:

(1) Develop a time line of events including management decision points from the initial failure on July 28 until the EDGs were returned to an operable status (Section 4OA3.1, 4OA3.2, and Attachment 2).

(2) Assess the timeliness and adequacy of the TS LCO 3.8.1.D required common cause determination conducted following the EDG No. 4 lockout on July 28 (Section 4OA3.1).

(3) Assess the timeliness and adequacy of the licensee's root cause determination and extent-of-condition review conducted subsequent to the July 28 lockout (Section 4OA3.2).

(4) Assess any past EDG differential over current relay modifications with respect to their impact on the differential over current lockout setpoint (Section 4OA3.3).

(5) Assess the adequacy of EDG-electrical preventive maintenance as it relates to accepting potential discrepant as-found conditions, instead of verifying equipment acceptance criteria to vendor recommendations (Section 4OA3.4).

(6) Review any past EDG differential over current lockouts to assess if prior opportunities existed to identify the common cause degraded condition (Section 4OA3.3 and Attachment 2).

4. OTHER ACTIVITIES

4OA3 Event Followup

.1 Assessment of Initial Licensee Response (Objectives 1 & 2)

a Inspection Scope

The inspectors reviewed Action Request (A/R) 165042 which was the corrective action program problem report initiated for the problem of EDG No. 4 failing to start and carry load during performance of surveillance testing on July 28, 2005. A copy of the documentation of the troubleshooting effort was reviewed. Operator logs covering the relevant time period were reviewed. Cognizant licensee personal were interviewed and the NRC Resident Inspectors, who had monitored the sequence of events and licensee events, were consulted.

b Observations

A/R 165042 was assigned a priority level of 1 when the operability review committee met on Monday August 1, which meant that a root cause evaluation would have to be performed. However, on July 29 the licensee needed to meet a Technical Specification requirement to determine if the other EDGs were inoperable due to possible common cause failure. The TS requirement had to be fulfilled within 24 hours. Either an apparent cause had to be determined and all four EDGs be evaluated for operability in light of that apparent cause or the other three EDGs had to be started to show their operability or the EDG had to be returned to an operable status. In an effort to determine the apparent cause of the 87 relay operation during startup of EDG No. 4, technicians performed troubleshooting and maintenance activities including but not necessarily limited to the following. Various components within the excitation system were checked for integrity. Insulation resistance readings of generator field and stator windings were made. The 87 relays were calibrated. Visual inspections, as could be made without major disassembly, were performed. However, the licensee did not perform any troubleshooting with the EDG in an operating status.

Three abnormal conditions were identified from the troubleshooting process: insulation resistance readings at the exciter field collector rings were below the acceptance criterion, significant amounts of carbon dust was found on the collector ring insulated

bolts, and an open fuse. When the insulation resistance of the collector ring to ground reading was communicated to engineers working on the apparent cause and extent of condition determinations, a mis-communication took place when the engineers recorded the value as 200 ohms rather than the actual measured value of 270 k ohms. The 200 ohm reading was significantly below the acceptance criterion of 5 M ohms. No evidence of flash over was found which would indicate a fault to ground observation. However, the engineers assumed that this kind of leakage path could result in an increase in excitation system power consumption to a level that exceeded the trip point of the 87 relay. There is a direct relationship between excitation system power and the 87 relay operating coil current while in no-load operation. This logic led the engineers to conclude they had identified the probable cause of the 87 relay operation. Based on this information the licensee determined that the cause of the EDG No. 4 lockout was excessive carbon buildup on the exciter collector rings that resulted in shorting out the generator field and the subsequent actuation of the 87 relay. In addition, to further support this conclusion on EDG No. 4, the licensee determined that although EDGs No. 1 and 2 had recent preventive maintenance (PM) conducted, PM on EDGs No. 3 and 4 had last been performed in mid-2004, thus providing more time for the excessive carbon to buildup. Due to the PM time frame similarity for EDGs No. 3 and 4, and that the licensee's investigation had revealed that EDG No. 3 had shown arcing in the brush and collector ring area during the last monthly load test, the licensee concluded EDG No. 3 was potentially vulnerable to the same (common-cause) failure. Therefore, as shown on the time line in Attachment 2, at 2030 on July 29, EDG No.3 was also declared inoperable. EDG No. 4 was subsequently declared operable at 2055 on July 29, after the collector rings were cleaned of carbon dust, and the EDG successfully started and loaded (EDG No. 4 had been declared inoperable on July 28, at 2319). PM was performed on EDG No. 3 and it was declared operable at 1030 on September 29. EDG No. 1 and EDG No. 2 remained operable using the rationale that the collector rings had been cleaned on May 10 and June 13 respectively, and therefore had not experienced sufficient starts since last cleaning to have a buildup of carbon dust. By Saturday, July 30, all the EDGs had been returned to operable status.

The open fuse mentioned above was in series with a transient voltage suppression device the purpose of which was to limit the transient voltage on the contacts which make and break the field flashing supply. There was no discussion in A/R 165042 about the open fuse. Later, the fuse was analyzed in the laboratory and found to be blown due to a broken connection rather than overcurrent, probably due to aging. It was not known how long the fuse had been open. A consequence of the open fuse was that the transient voltage suppression function had been lost. The licensee addressed this concern through appropriate testing of components and evaluation of the exciter/regulator circuit.

Due to both EDGs 3 and 4 being declared inoperable and returned to service at different times between July 28 and July 30, the inspectors reviewed licensee actions with respect to Technical Specification 3.8.1.D, which requires that within 24 hours, either the licensee determine that the three operable EDGs are not inoperable due to a common cause or the operable EDGs be started to demonstrate their operability. In either case, the Technical Specification also requires the effected EDG be returned to an operable status with 7 days. Since both EDGs 3 and 4 were returned to an operable status in

less than 24 hours, the exit requirements of Technical Specification 3.8.1.D. were met and the 24-hour common cause evaluation was not required.

The inspectors concluded that the apparent cause determination and extent of condition described above were flawed in the following ways: First, no evidence of a short-circuit at the collector rings was seen during troubleshooting. This was not consistent with the theory that leakage current reached a magnitude to trip the 87 relay. Second, the apparent cause determination was based on the understanding that the insulation resistance reading was 200 ohms when in fact it was actually 270 k ohms. Therefore, the apparent cause determination and the extent of condition evaluation determination which flowed from it were based on nonfactual information.

Later, the root cause investigation team rejected excessive carbon buildup on the exciter collector rings as the cause of the EDG No. 4 differential current lockout. The inspectors determined that by declaring EDGs No. 3 and 4 operable based on excessive carbon buildup, the licensee missed a reasonable opportunity to identify the actual cause of the EDG No. 4 lockout, a condition adverse to quality. The enforcement aspects of this missed opportunity are addressed in Section 4OA3.3

.2 Assessment of Operability Evaluations, Root Cause Determination and Corrective Actions (Objectives 1 & 3)

a Inspection Scope

The inspectors reviewed the operability evaluations which were performed by the licensee in support of declaring the EDGs operable on August 5, 2005, and attended PNSC meetings which discussed the evaluations. The inspectors interviewed the leader of the root cause investigation and other cognizant personnel. The time line of events was established and verified. Corrective actions were also evaluated.

b Observations and Findings

The licensee had to address three issues before the EDGs could be declared operable. First, the problem of the 87 relay setpoint being too close to the normal no-load current needed to be resolved. This was the cause of the July 28 event and is discussed below in terms of how this cause was determined. Second, the current measurements made during the root cause analysis indicated that the transformer which supplied power to the excitation system was overloaded from a kVA rating viewpoint. This issue was resolved by making surface temperature measurements on the transformer during EDG operation until the temperature stabilized. Analysis of this temperature data demonstrated that, even though overloaded from the kVA viewpoint, the transformer would operate within its rated temperature limits. As a precaution, administrative controls were established to monitor temperatures when certain conditions were present during any running of the EDGs. Third, the root cause investigation team told the PNSC that the carbon dust was the result of increased wear of the brushes during startup of an EDG. This was caused by rust on the collector rings which develops when the EDG sits idle for a period of time, especially in humid ambient conditions. Once the rust burns off, the brush wear returns to normal. The amount of dust generated during the startup time would not threaten EDG operation and dust would not continue to be generated

after the initial period following startup. It was also presented that General Electric Company, manufacturer of the electric generator, was consulted about these concepts and concurred with them.

The inspectors reviewed the methodology for making the temperature measurements at the power potential transformers (PPTs), and reviewed the data that was collected. Measurements were made at two points on each phase using an infrared camera having acceptable accuracy. Temperature data was recorded during EDG full and no-load modes of operation for sufficient time to allow the temperature to stabilize. Results indicated there was margin between measured temperatures and the insulation temperature rating (80 EC rise over 40 EC ambient). The licensee had not utilized any procedures or quantitative controls during the assessment of the insulation temperature rating. The inspectors commented to the licensee that the temperature measurement evolution could have been more rigorously controlled. However, this did not cause the team to question the validity of the conclusion.

The root cause team concluded that the cause of the July 28 lockout of EDG No. 4 and it's immediate shutdown after startup was due to two conditions. The first was that power consumption of the exciter was above the rating of the PPT which supplies power to the exciter. The second condition was the minimum pickup value of the generator current differential relay (87 relay) was essentially equal to exciter power consumption. These conclusions were reached using a fault tree analysis and by making current measurements as necessary. The rating of the PPTs on all four EDGs was 75 kVA and the measured load was 115 kVA. 115 kVA translates to 16 amperes of generator output current. This current flows through the operate coil of the 87 relay, and, at no-load operation, is also the current flowing though one of the restraint coils of the 87 relay (zero current flows through the second restraint coil). At these current levels, the trip set point of the 87 relay was 16 amperes primary current. However, since the relay was a percentage differential type of relay, as soon as the generator began to carry load the set point increased by 10 percent of that load current. Another important concept is that power through the PPT is not proportional to generator load. The power through the PPT is a maximum at no-load operation since there is no contribution to field current from the current boost transformers. These concepts explain why the lockout could only occur during a brief period, perhaps seconds, during EDG startup. The fact that the relay operated only rarely during startup is explained by the fact that the relay has a time delay and excitation power could vary sufficiently that, at times, it did not reach the 16 ampere setpoint.

The cause mechanism described above raises the question of whether the exciter power consumption measured at EDG No. 4 is normal or abnormal, especially because it was above the kVA rating of the PPT transformer. This question was addressed by measuring essentially the same exciter power consumption at EDG No. 2. In addition, General Electric Company calculated the expected power consumption for this model of exciter and size of generator. This confirmed that the expected power consumption was about 115 kVA, the same value as measured by the root cause team. The problem was resolved by replacing the electro-mechanical IJD52A relay (by General Electric Co.) with a solid state Type 87M relay (by Asea Brown Boveri). The inspectors reviewed the application, including the set point, of the new relay and found it to be acceptable in terms of avoiding spurious operation and adequate protection for faults.

The inspectors also concluded that the root cause evaluation team could have begun their evaluation earlier than performed. There did not appear to be any impediment to developing the charter over the weekend and starting work on Monday, August 8. To address this situation the licensee initiated A/R 166012 to evaluate the decision making process following the July 28 event. In conclusion, the inspectors found the root cause analysis, the operability evaluations and the corrective actions to be reasonably comprehensive, and no obvious deficiencies in these were identified. The root cause evaluation reviewed by the inspectors had been signed by the root cause team. At the time of issuance of this inspection report the root cause evaluation had not yet been discussed at a PNSC meeting, and consequently it is possible that certain conclusions could be revised or the team tasked with further investigation.

.3 Assessment of Design Modifications and Precursor Events (Objectives 4 & 6)

a Inspection Scope

The inspectors evaluated whether design modifications could have created the design problem which was the cause of the spurious EDG lockout, and also evaluated whether similar events occurred in the past.

b Observations

The inspectors became aware that the design problem which made the EDGs vulnerable to lockouts during startup was created by a modification implemented in 1982. In 1982, Plant Modification PM 82-059, replaced the generator current differential relays. The sole purpose of this modification was to replace the non-seismically qualified CFD relay with the seismically qualified 12IJD52A relay. Review of that modification package by the inspectors showed that the minimum pickup value of the original CFD relay was 0.2 amperes (or 32 amperes primary current). The package discussion section stated that the 12IJD52A relay had a non-adjustable minimum pickup value of 0.1 amperes (or 16 amperes primary current). There was no discussion of the ramifications of a lower minimum pickup value. However even if those applying the relay had addressed this topic at that time, it is possible they would have been misled by the rating of the PPT transformer. It is speculated that if a relay engineer had used the rating of the PPT as an indicator of the maximum current draw of the excitation system, that would have been appeared to be reasonable. The rating of the PPT at that time was 60 kVA, which corresponds to 8.3 amperes. Therefore the minimum pickup value of 16 amperes would have appeared to be acceptable.

The inspectors also became aware that, in addition to the EDG No. 4 overcurrent lockout (cause of the event resulting in this inspection), there had been at least four other cases in the past where the 87 relay had operated during startup of an EDG. Thus the licensee had multiple opportunities to identify the real cause of the 87 relay problem. One of these cases was documented in ACR 94-02118 and is discussed below. The licensee stated that evaluations for the three other cases of 87 relay operations attributed the cause to a failed component which was identified during the troubleshooting process.

The inspectors focused on three missed opportunities since 1982 to identify the problem with the 87 relay setpoint. These are described in the paragraphs below.

One of these missed opportunity events occurred in 1994 and was evaluated by ACR 94-02118. The inspectors reviewed the documentation of an action item from that ACR which evaluated the setpoint of the 87 relay. This evaluation included a consideration of the exciter current as compared to the relay setpoint. However, it stated that the PPT ratio was not known. Using measurements of field current and secondary PPT voltage, engineers erroneously concluded that the excitation system current was 4 amperes. Based on that value, it was concluded that the relay setpoint was adequate. The cause of the 87 relay operation was attributed to a failed component within the excitation system which caused a higher than normal current spike . This event and its analysis was a missed opportunity to identify the problem.

Another missed opportunity event occurred when one of the PPTs for EDG No. 2 failed in 2000. As a result of this failure, the PPT had to be replaced. The 60 kVA transformer was replaced with a 75 kVA transformer. PPTs for all EDGs were replaced at that time. As documented by A/R 17528, post-modification testing showed that the currents on the secondary side of the 75 kVA transformer were higher than expected. Secondary side currents were recorded to be 260 amperes which corresponds to 108 kVA. Similar currents were measured at other EDGs with the 60 kVA transformer still installed, which showed that the increase in current was not due to the new transformer. The A/R then addresses the issue of a transformer overloaded from the kVA viewpoint by making temperature measurements similar to what was done as part of the operability evaluations described above. The A/R does not recognize that 108 kVA corresponds to 15 amperes of generator current. This is very close to the setpoint of the 87 relay.

A third missed opportunity, as discussed in Section 4OA3.1, was the July 29, 2005, declaration that EDG No. 4 was operable, after incorrectly determining that the cause of the 87 relay actuation was due to excessive carbon buildup on the exciter collector rings. This carbon buildup resulted in shorting out the generator field and the subsequent actuation of the 87 relay.

c Findings

Introduction: A finding was identified for inadequate corrective action as required by Title 10 of the Code of Federal Regulations Part 50 (10 CFR 50), Appendix B, Criterion XVI, Corrective Action, in that there were three prior opportunities to identify a problem that could cause an EDG to lockout upon starting. This finding is unresolved pending NRC review of the final root cause report.

Description: As described in the Observations section above, and in other sections of this report, the EDG current differential relays had a minimum pickup setpoint that was essentially equal to the normal no-load current. This condition made the EDGs vulnerable to lockouts during the start sequence. The current differential relays operated during starting of an EDG five times since 1982 when a relay replacement modification created the problem. As described above, the inspectors reviewed at least two specific opportunities to identify the problem prior to the July 28 event which is the subject of this Special Inspection. In addition there was the initial troubleshooting which

took place following the event. There is a crosscutting aspect to this finding in that it involved a failure to adequately evaluate a potentially significant problem on at least two separate occasions. Also, there were repetitive indicators of the problem.

Analysis: The failure to promptly identify a problem affecting EDG reliability after multiple clear and documented opportunities is a performance deficiency. The finding is more than minor because it is associated with the reactor safety cornerstone of Mitigating Systems by virtue of the fact that the equipment performance attribute of the onsite emergency power was affected. It affected the objective of reliability of systems which respond to initiating events. A significance determination is pending review of the PNSC approved root cause analysis report.

Enforcement: 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, requires that measures shall be established to assure that conditions adverse to quality such as deficiencies be promptly identified. Contrary to the above, the actual cause of unplanned actuations of the 87 relay, was not promptly identified in that three reasonable opportunities to identify the correct cause of these actuations in1994, 2000 and on July 29, 2005, were missed prior to the correct cause being determined on August 5, 2005. Because the licensee's root cause analysis report has not been discussed at a PNSC meeting, and information upon which this report section are based could be revised, the issue is being treated as an unresolved item (URI) pending NRC review of the final report. It is identified as URI 05000325, 324/2005010-01, Failure to Identify a Vulnerability to Spurious Tripping of EDG During the Start Sequence.

.4 Assessment of the Maintenance Program

a Inspection Scope

The inspectors performed reviews of selected component's preventive-maintenance procedures, vendor documents, completed work orders, and A/Rs generated for nonconformances to verify that the EDG electrical system maintenance was based on vendor recommendations and appropriate industry operating experience. During these reviews, the inspectors focused on potential common mode failure vulnerabilities that could be introduced by maintenance activities. The team reviewed procedures used to tune the excitation system voltage regulator and to perform general maintenance on the collector rings, brushes and brush riggings for the generator. A search using key words was made of industry operating experience records to look for cases similar to this event. The inspectors interviewed responsible engineers, supervisors, and other cognizant personnel. The inspectors reviewed training matrixes pertaining to EDG excitation system maintenance to verify that the training was consistent with the procedures. Corrective actions taken were also evaluated.

b Observations

The inspectors found that the acceptance criteria defined in procedure OPM-GEN-005, "Diesel Generator Electrical Inspections" was vague. The criteria for expected wear on collector rings, brushes and brush riggings were not clearly defined, but was considered as skill of craft knowledge. The inspectors noted that the responsible field technicians made comments, on numerous occasions, concerning excessive carbon build-up and

excessive rust on collector rings in the appropriate section of work order documents. At the same, these as-found conditions were characterized as normal within the same work order. The inspectors could not identify any explanation as to how a condition could be characterized as both excessive and normal at the same time. Corrective action program documents (A/Rs) were not generated to resolve this apparent discrepancy. Examples of issues reviewed included out of tolerance conditions for voltage regulators, megger readings for collector rings, carbon buildup on insulators, and rust accumulation on collector rings.

c Findings

Introduction: A non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion XVI was identified because **the licensee failed to promptly identify a condition adverse to quality in that** licensee personnel failed to enter abnormal conditions identified in the comment section of work orders associated with procedure OPM-GEN005, "Diesel Generator Electrical Inspections" into the corrective action program.

Description: Licensee personnel identified, in the comment section of work orders associated with OPM-GEN005, the abnormal condition of carbon dust on the collector rings. However, these abnormal conditions were not entered into the corrective action program. A specific example is work order WO 739649-02 (Attachment 1 of OPM-GEN0005) which was completed on July 29, 2005. This finding also represents a problem identification and resolution (PI&R) crosscutting issue

Analysis: The failure to enter a problem affecting EDG reliability as documented in work orders into the corrective action program was a performance deficiency. The finding is greater than minor because it is associated with the reactor safety Mitigating System Cornerstone and affects the configuration control attribute of the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). A phase one evaluation determined that the performance deficiency was of very low safety significance because the abnormal conditions did not actually affect the operability of the EDGs.

Enforcement: 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, requires that measures shall be established to assure that conditions adverse to quality such as deficiencies be promptly identified and corrected. Contrary to this requirement the licensee failed to enter conditions adverse to quality identified on work orders into the corrective action program. Because this violation is of very low safety significance and has been entered into the licensee's corrective action program (A/Rs 165635 and 165628), this violation is being treated as an NCV, consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000325, 324/2005010-02, Failure to Generate an A/R for Abnormal Conditions Identified in Work Orders.

.5 Industry-Wide Generic Implications of the Root Cause

a Inspection Scope

The inspectors evaluated whether there could be industry-wide generic implications concerning the cause of the EDG failing to start and run.

b Observations

The exciter drawings furnished by General Electric Company identify the equipment as a "Shunt SCR Exciter/Regulator" and provide a number in the title block which appears to be a model number or shop order number: 3S7931SA340A1.

The undersized PPT only has a bearing on the issue to the extent that it would probably cause the relay engineer to underestimate the power consumption of the exciter. For another plant to have the same problem Brunswick experienced, a combination of parameters and circumstances would have to coincide. For instance, having a shunt type exciter, having an undersized PPT, and true exciter power matching the minimum pickup value of the generator current differential relay. In addition, the ratio of the current transformers used in the differential relay scheme would be influential. Also, there would have to be a situation where either the problem has not yet manifested itself or has occurred but was not properly diagnosed. For the example given, the inspectors concluded it unlikely this event at Brunswick has industry-wide generic implications.

4OA6 Meetings, Including Exit

On August 29 and September 15, 2005, the lead inspector presented the inspection results to Mr. C. J. Gannon, and other members of the licensee staff who acknowledged the findings. The inspectors reviewed proprietary information during the inspection, but such information is not specifically referenced in this report.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

L. Beller, Supervisor, Licensing
E. Browne, Engineer, Probabilistic Safety Assessment
B. Cowan, Engineer
C. Elberfeld, Lead Engineer
P. Flados, HPCI System Engineer
N. Gannon, Director, Site Operations
M. Grantham, Design
C. Hester, Operations Support
D. Hinds, Manager, Engineering
G. Johnson, NAS Supervisor
W. Leonard, Engineer
T. Mascareno, Operations Support
J. Parchman, Shift Technical Advisor, Operations
C. Schacher, Engineer
B. Stackhouse, Systems
H. Wall, Manager, Maintenance
K. Ward, Technical Services

NRC

H. Christensen, Deputy Director Division of Reactor Safety Region II
E. DiPaolo, Senior Resident Inspector
J. Austin, Resident Inspector

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

05000325, 324/2005010-01	URI	Failure to Identify a Vulnerability to Spurious Tripping of EDG During the Start Sequence.(Section 4OA3.3)

Opened and Closed

05000325, 324/2005010-02	NCV	Failure to Generate an A/R for Abnormal Conditions Identified in Work Orders. (Section 4OA3.4)

Discussed

None

LIST OF DOCUMENTS REVIEWED

DOCUMENTATION

Drawings

44C300736, Shunt SCR Exciter/Regulator, Sh. 3, Rev.5
44B334679, Power Potential Transformer Three Phase, Rev. 0

Procedures

0PIC-RLY026, Relay Calibration Using Relay Software and Pulsar Relay Tester, Rev.10
OPM-GEN-005, Diesel Generator Electrical Inspections, Rev. 17
OPM-GEN-009, Emergency Diesel Generator Voltage Regulator Calibration, Rev.2
OPS-NGGC-1305, Operability Determinations, Rev. 0

Calculations

WBN EEB-MS-TIO3-0012, Diesel Generator Loading Analysis, Current Rev. 59

Design Basis Documents

WB-DC-30-27, AC and DC Control Power Systems, Rev. 24
WB-DC-30-28, Low and Medium Voltage Power Systems, Rev. 19

Technical Specifications

Section 3.8.1 and Bases, AC Sources-Operating

Completed Surveillance Procedures, Preventive Maintenance (PM), and Test Records

W.O. 00311749-01, DG-2 Generator Brush Inspect, Meggering and Removal, August 7, 2003
W.O. 00456183-02, DG1 Voltage Manual Regulator, May 04, 2005
W.O. 00540269-01, 2-E4-AK2-87DP-A, -B, -C Calibrate Differential Relays, May 03, 2004
W.O. 00580291-02, DG2 Voltage Manual Regulator, March 30, 2005

Completed Work Orders (WOs) and Work Requests (WRs)

W.O. 00455813-01, 2-DG2-DC-REG, Replace D1P and D2P POTS, May 18, 2004
W.O. 00455813-02, 2-DG2-DC-REG, Replace D1P and D2P POTS, June 17, 2004
W.O. 00456178-01, 2-DG4-DC-REG, Replace D1P and D2P POTS, Sept. 22, 2003
W.O. 00555654-05, 2-DG2-AC-REG, Replace DG2 AutoVoltage Regulator, June 17, 2004
W.O. 00555654-01, 2-DG2-AC-REG, Replace DG2 AutoVoltage Regulator, May 27, 2004
W.O. 00739649-01, During S/U of DG No.4, Engine Tripped Test Relay, July 29, 2005

Problem Evaluation Reports

A/R 00017528, DG2 Excitation Transformer Current Measurement Concern, March 8, 2000
A/R 00017292, DG2 Tripped during System Operation, March 3, 2000
A/R 00057644, DG1 Insufficient KVAR, March 18, 2003
A/R 00099955, Erratic DG3 Voltage Regulator Operation, July 24, 2003
A/R 00021268, DG4 Manual Voltage Regualtor Failure, July 02, 2000
A/R 00023867, Discrepancies identified in Self-Assessment 99-12, March 11, 1994
A/R 00105640, DG4 Shunt-Regulating SCR Failure, September 26, 2003
A/R 00165042, EDG No.4 Trip/Lockout, Significant Adverse Condition Investigation, July 28, 2005
A/R 00165628, Review Standards for Determination Acceptance Criteria, August 4, 2005
A/R 00165635, Review Acceptance Criteria of OPM-GEN005, August 4, 2005
A/R 00165988, Declinging EDG Collector Ring Megohm Readings, August 9, 2005

Standards & Codes

IEEE STD C57.12.91.2001, Standard Test Code for Dry-Type Distribution and Power Transformers, Revision of IEEE Std C57.12.91-1995
IEEE STD C57.12.01.1998, Standard General Requirements for Dry-Type Distribution and Power Transformers Including those with Solid-Cast and/or Resin-Encapsulated Windings, Revision of IEEE Std C57.12.01-1989

Vendor Manual

FP-20326-VO1, Diesel Engine Aux Bullentins, EGR-NGGC-006, Rev. 8
FP-20322-VO1, Diesel Engine Instruction Manual, EGR-NGGC-006, Rev. 8
GEK-3695, Shunt SCR Excitation System

Other Documents

Purchase Order 1032497, Transformer, 4160V/240V, 3PH, Dry-Type
ESR No. 00-00131 Replace DG Excitation Potential Transformer, Rev. 4
OCR-NGGC-1305, OCR applies to EDGs DG1, DG2, DG3, DG4

LIST OF ACRONYMS

87	American National Standards Institute standard device number for a differential relay
A/R	action request (licensee's corrective action program document)
ADAMS	Agencywide Documents Access and Management System
CFR	Code of Federal Regulations
EDG	emergency diesel generator
IMC	Inspection Manual Chapter
kVA	kilo volt amperes
MD	Management Directive
NCV	non-cited violation
NRC	Nuclear Regulatory Commission

PARS	Publically Available Records
PI&R	problem identification and resolution
PM	preventive maintenance
PNSC	Plant Nuclear Safety Committee
PPT	power potential transformer
SDP	Significance Determination Process
TS	Technical Specification
URI	unresolved item

TIME LINE OF EVENTS

DATE-TIME	HISTORICAL DATA
1982	All EDG 87DP Differential Over current relays were replaced via plant modification PM-82-059 due to seismic concerns. The replacement of seismically qualified relays changed the full-load operating setpoint of the relay from 32 amps to 16 amps. This reduction in setpoint margin was never evaluated against normal operating parameters.
10/17/91	EDG No. 3 trips on 87DP Differential Over current. Cause indeterminate.
7/09/94 & 7/10/94	EDG No. 2 trips on 87DP Differential Over current twice. Cause attributed to loose wire on a capacitor.
7/18/94	EDG No. 2 trips on 87DP Differential Over current. Cause attributed to a faulty saturable reactor in the voltage regulator circuitry.
7/18/96	EDG No. 2 trips on 87DP Differential Over current. Cause attributed to a faulty SCR.
9/26/03	EDG No. 4 trips on 87DP Differential Over current. Cause attributed to a faulty SCR.

DATE-TIME	EVENTS
7/28/05	EDG No. 4 trips on 87DP Differential over current. Cause attributed to excessive carbon buildup on the exciter collector rings
7/28/05 - 2319	During the performance of 0PT-12.2.D, No. 4 Diesel Generator Monthly Load Test, EDG No. 4 experienced a 'C' phase differential over current trip of the 87DP relay and subsequently locked out the generator shortly after startup, but before the EDG output breaker was closed. Licensee initiated WO 739649 and AR 165042. EDG No. 4 declared inoperable and TS 3.8.1.D entered, which provides 7 days to recover the EDG or commence a Unit shutdown.

7/29/05 - 0300	Troubleshooting was initiated. Static checks of the EDG voltage regulator, 87DP relays, generator wiring, and the collector ring were performed. The licensee identified an open fuse in the thyristor circuitry of the voltage regulator as well as low meggar readings (~200K ohms) in the generator collector ring. Low meggar readings were attributed to excessive carbon dust buildup. Licensee's initial common cause determination concluded that the lockout of EDG No. 4 was due to excessive carbon buildup on the exciter collector rings that resulted in shorting out the generator field and the subsequent actuation of the 87DP relay. Corrective actions included the performance of cleaning the generator collector rings IAW station procedure 0PM-GEN005. Licensee's review of the last performance of this PM revealed that EDGs No. 1 and No. 2 were performed in May and June 2005 respectively. EDGs No. 3 and No. 4 had been performed in July and August 2004 respectively. Additional investigation revealed that EDG No. 3 had shown arcing in the brush and collector ring area during the last monthly load test, therefore, the licensee concluded EDG No. 3 was potentially vulnerable to a similar common-cause failure (see AR 165042).
7/29/05 - 2030	EDG No. 3 declared inoperable based on common-cause investigation and to perform collector ring/brush cleaning IAW OPM-GEN-005. With EDG No. 3 inoperable, TS TS 3.8.1.G entered which provides two hours to recover at least one EDG or commence a Unit shutdown.
7/29/05 - 2055	EDG No. 4 declared operable following successful post-maintenance testing. Exited TS 3.8.1.G (which also effectively exits TS 3.8.1.D also)
7/30/05 - 1030	EDG No. 3 declared operable following successful post-maintenance testing. Exited TS 3.8.1.D
7/30/05 - 0900	SRI discussed concerns about the adequacy of the common cause determination with the Operations Manager. His concerns were that no fault tree analysis was officially performed and the licensee had not explored any other causes of collector ring brush degradation such as low brush spring tension and collector ring irregularities. Licensee conducts a management conference call to discuss SRI's concerns.
8/01/05 - 0800	Resident inspectors questioned the Operations Manager as to whether the EDGs were degraded based on the common-cause determination of excessive carbon dust buildup. Licensee conducts a management conference call to discuss resident inspectors concerns.

8/1/05 - 0830	Normal monthly surveillance testing performed on EDG No. 1. Observed minor collector ring sparking on startup which subsequently subsided. Note that OPM-GEN-005 had been recently performed less than three months earlier. Approximately 1.5 hr into the run, 5"- 6" sparking was observed in the collector ring area for approximately 10 minutes. Sparking was attributed to a piece of 'loose debris' in the collector ring area. Surveillance run was completed satisfactorily.
8/01/05 - 1727	A conservative decision was made by licensee to run EDG No. 2 to observe for 'excessive' sparking. Only minor sparking was observed in the collector ring area. Run was completed satisfactorily.
8/01/05	Root cause charter letter drafted and signed by licensee management.
8/02/05	Root cause investigation team (RCT) was formed and begins to gather pertinent data.
8/03/05	RCT begins to question common-cause determination that carbon dust buildup initiated the differential over-current trip of EDG No. 4 on 7/28/05. They request to run EDG No. 4 while instrumented for data gathering, however, a previously scheduled Core Spray pump outage precludes any EDG testing for the day.
8/3/05	Resident inspectors again questioned the licensee's basis for why, based on the condition that the collector rings were noted not to be in accordance with the vendor technical manual (corroded), the EDGs were not in a degraded condition. More specifically, the inspectors questioned whether carbon buildup would continue to occur while the EDG was performing it's mission as opposed to only accumulating on startup as suggested by the licensee. The basis for the questioning was the condition of the collector rings, sparking being observed during startup and operation of EDGs No. 1 and No. 3 and the fact that other possible causes of carbon buildup were not ruled out by the licensee's troubleshooting efforts.
8/04/05 - 1500	Licensee initiates a degraded condition evaluation per OPS-NGGC-1305, for EDG No. 4 based on a shift in potential root cause of the 7/28/05 87DP relay trip and generator lockout.
8/05/05 - 0936	Licensee performed instrumented testing of EDG No. 4 and discovered unexpected high measured sensing current to the input of the 87DP relay (equivalent to 15.8 amps on the generator). Based on the current being so close to the relay setpoint of 16 amps, licensee declared the EDG degraded and directed Engineering to document an operability determination due by 1900 on 8/05/05.

8/05/05 - 1433	Licensee performs instrumented run of EDG No. 2 to obtain 87DP relay sensing current information. While manipulating test leads connected to the 87DP relay, EDG No. 2 trips on 'B' phase 87DP differential over-current along with the associated 86DP relay generator lockout. AR 165729 initiated.
8/05/05 - 1634	Licensee conducts additional testing of EDG No. 2 in an attempt to recreate previous trip conditions. While opening the associated EDG No. 2 cubicle door, they observe that the 'B' phase 87DP relay trip dial is partially rotated i.e. sensing amperage close to setpoint, when the EDG again trips on differential overcurrent.
8/05/05 - 1840	Based on data gathered from EDG No. 2 and No. 4, with both of the engines operating at or near the 87DP relay setpoint of 16 amps, licensee declares all four EDGs inoperable due to common mode failure potential and begins preparations to bring both units offline.
8/06/05 - 2041	Licensee runs EDG No. 3 for data gathering. Run is completed successfully with no trips.
8/07/05 - 1215	Operations informed that AR 165765 has been initiated by the RCT due to a review of recent EDG testing which revealed that the excitation potential transformer (PT) for the EDGs is supplying approximately 115 KVA unloaded and 100 KVA loaded, while the transformer rating is only 75 KVA. This condition could potentially limit the long term operation of the EDG.
8/08/05 - 1203	Licensee completes temperature rise testing for EDG No. 2 excitation potential transformer and forwards results to GE for vendor evaluation.
8/09/05 - 1900	GE provides licensee with potential transformer rating analysis which recommends operation of the system at no-load be kept at a minimum to reduce heating effects. For system runs greater than four hours, temperature monitoring should be initiated to ensure ambient temperature does not exceed 40C. GE also stated that system operation may be degraded at ambient temperatures over 40C.
8/10/05	Licensee completes Operability assessment for AR 165988, Declining Trend In EDG Collector Ring Megohm Readings. Per the assessment, even though recently recorded as-found resistance values fall well below procedure acceptance criteria as well as exhibit a declining trend, "there have been no recorded failures of an EDG to start (at BNP) due to collector ring insulation resistance conditions." "The 'low' resistance readings are not an operability issue."
8/10/05 - 0200	Licensee completes installation and testing of plant modification EC 61870, EDG 87DP Relay Replacement. All EDG 87DP relays were subsequently replaced with ABB Solid State Relays with a 10% differential setpoint.

8/10/05 - 0229	Unit No. 2 exited applicable EDG LCOs and returns EDG No. 3 & No. 4 to operable status.
8/10/05 - 0240	Unit No. 1 exited applicable EDG LCOs and returns EDG No. 1 & No. 2 to operable status.
8/10/05 - 1943	Unit No. 1 enters mode 1.
08/12/05 - 1733	Unit No. 2 enters mode 1.

BRUNSWICK SPECIAL INSPECTION CHARTER

ALL EMERGENCY DIESEL GENERATORS DECLARED INOPERABLE DUE TO A COMMON CAUSE DEGRADED CONDITION

Degraded Condition Description

On July 28, 2005, Brunswick emergency diesel generator (EDG) No. 4 experienced a lockout on generator differential over current during monthly surveillance testing. The lockout occurred on initial startup following field flashing. On July 29, the licensee conducted troubleshooting activities on the voltage regulator, generator cabling and the EDG exciter as possible causes of the differential current lockout. The licensee took certain actions to address the issue. Following successful post-maintenance testing, EDG No. 4 was declared operable on July 29. A root cause investigation team established on August 2, determined that additional equipment problems could have caused the differential over current lockout. The other potential causes included the proximity of EDG no-load operating current to the generator differential over current relay setpoint and degradation of voltage regulator components. During root cause data gathering on August 5, EDG No.2 experienced a lockout similar to that sustained by EDG No.4 on July 28. Because the data from this lockout was similar to data gathered from an EDG No.4 test also conducted on August 5, the licensee determined that the cause of the problem was related to the EDG differential over current relay. Therefore, based on this degraded condition being common to both EDG No.4 and No.2, the licensee declared all site EDGs inoperable, and shutdown Units 1 and 2 on August 6, in accordance with Technical Specifications (TS) requirements.

Objectives

The objectives of the Special Inspection are to:

88. Develop a time line of events including management decision points from the initial failure on July 28 until the EDGs were returned to an operable status [if EDGs are operable by the end of the inspection.

89. Assess the timeliness and adequacy of the TS LCO 3.8.1D required common cause determination conducted following the EDG No.4 lockout on July 28.

90. Assess the timeliness and adequacy of the licensee's root cause determination and extent-of-condition review conducted subsequent to the July 28 lockout.

91. Assess any past EDG differential over current relay modification with respect to their impact on the differential over current lockout setpoint.

92. Assess the adequacy of EDG-electrical preventive maintenance as it relates to accepting potential discrepant as-found conditions, instead of verifying equipment acceptance criteria to vendor recommendations (e.g., previously observed EDG collector ring arcing and physical condition, and its potential contribution to the EDG over current lockout problem).

93. Review any past EDG differential over current lockouts to assess if prior opportunities existed to identify the common cause degraded condition.

Additionally, an entrance and exit meeting will be conducted, and the inspection findings and conclusions documented in an inspection report within 30 days of the inspection exit.

Inspection Dates: August 9, 2005 until objectives are met.

Inspection Report Number: 05000324/200510, 325/200510

References:

1. NRC Inspection Procedure 93812, Special Inspection
2. Region II ROI 2296, Management Directive 8.3 Decision Documentation Form
3. Management Directive 8.3, NRC Incident Investigation Program
4. Manual Chapter 0612, Power Reactor Inspection Reports
5. Manual Chapter 0609, Significance Determination Process