



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

November 24, 2009

Mr. Benjamin C. Waldrep  
Vice President  
Carolina Power and Light Company  
Brunswick Steam Electric Plant  
P. O. Box 10429  
Southport, NC 28461

**SUBJECT: BRUNSWICK STEAM ELECTRIC PLANT - NRC SPECIAL INSPECTION  
REPORT 05000325/2009011 AND 05000324/2009011**

Dear Mr. Waldrep:

On October 20, 2009, the U.S. Nuclear Regulatory Commission (NRC) completed a special inspection at your Brunswick Unit 1 and 2 facilities. The inspection reviewed the circumstances surrounding the failure of Emergency Diesel Generator #4 to reach full test loading on September 18, 2009, and failure of Emergency Diesel Generator #4 to start during testing on September 19, 2009. A special inspection was warranted based on the risk and the deterministic criteria specified in Management Directive 8.3, "NRC Incident Investigation Program." The inspection started on September 27, 2009, and the preliminary inspection results were discussed with you and members of your staff on October 2, 2009. Subsequent in-office reviews were conducted and the enclosed inspection report documents the inspection results which were discussed with Mr. Mike Annacone on October 20, 2009.

The inspection was performed in accordance with Inspection Procedure 93812, "Special Inspection," and focused on the areas discussed in the inspection charter described in the report. The inspection examined activities conducted under your license as they relate to safety, compliance with the Commission's rules and regulations, and with the conditions of your license. The team reviewed selected procedures and records, conducted field walk downs, and interviewed personnel.

The report documents an NRC-identified finding of very low safety significance (Green). This issue was determined to involve a violation of NRC requirements. However, because of the very low safety significance and because it is entered into your corrective action program, the NRC is treating the finding as a non-cited violation (NCV) consistent with Section VI.A.1 of the NRC Enforcement Policy. If you contest this non-cited violation (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 Nuclear Plant. In addition, if you disagree with the characterization of the finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement to the Regional Administrator, Region II, and the NRC Resident Inspector at the Brunswick Nuclear Plant. The information you provide will be considered in accordance with Inspection Manual Chapter 0305.

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

Sincerely,

***/RA by Joel Munday for/***

Leonard D. Wert, Director  
Division of Reactor Projects

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

Enclosure: Inspection Report 05000325, 324/2009011  
w/Attachment: Supplemental Information

cc w/encl: (See page 3)

United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Brunswick Nuclear Plant. In addition, if you disagree with the characterization of the finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region II, and the NRC Resident Inspector at the Brunswick Nuclear Plant. The information you provide will be considered in accordance with Inspection Manual Chapter 0305.

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Letter to Benjamin C. Waldrep from Leonard D. Wert dated November 24, 2009

SUBJECT: BRUNSWICK STEAM ELECTRIC PLANT - NRC SPECIAL INSPECTION  
REPORT 05000325/2009011 AND 05000324/2009011

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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.: 05000325/2009011, 05000324/2009011

Licensee: Carolina Power and Light (CP&L)

Facility: Brunswick Steam Electric Plant, Units 1 & 2

Location: 8470 River Road, SE  
Southport, NC 28461

Dates: September 27, 2009 through October 20, 2009

Inspectors: P. O'Bryan, Senior Resident Inspector, Brunswick (Lead)  
R. Clagg, Resident Inspector, North Anna  
S. Walker, Senior Reactor Inspector

Approved by: Leonard D. Wert, Director  
Division of Reactor Projects

Enclosure

## SUMMARY OF FINDINGS

IR 05000325/2009011, 0500324/2009011; 09/27/2009 – 10/20/2009; Brunswick Steam Electric Plant Unit 1 and Unit 2; Special Inspection.

This report documents special inspection activities performed onsite and in the Region II office by a senior resident inspector, a senior reactor inspector and a resident inspector to review the circumstances surrounding the failure of Emergency Diesel Generator #4 to reach full test loading on September 18, 2009, and failure of Emergency Diesel Generator #4 to start during testing on September 19, 2009. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using IMC 0609, "Significance Determination Process" (SDP). The cross-cutting aspects were determined using IMC 0305, "Operating Reactor Assessment Program." Findings for which the SDP doesn't apply may be Green or be assigned a severity level after NRC management review.

### A. NRC-Identified and Self-Revealing Findings

Green. The inspectors identified a Green NCV of Technical Specification (TS) 5.4.1, Procedures, for inadequate cleanliness and flushing procedures for maintaining cleanliness during maintenance on the emergency diesel generator (EDG) governors. This procedural inadequacy resulted in a failure of the emergency diesel generator #4 governor on September 19, 2009. The licensee entered the issue into their corrective action program and replaced the failed governor.

The finding was determined to be more than minor because it is associated with equipment performance and procedure quality attributes of the Mitigating Systems Cornerstone. It also adversely affected 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). Specifically, the reliability of EDG #4 was reduced because it was susceptible to fouling due to the foreign material in the governor. The finding was evaluated for significance using NRC Manual Chapter 0609, Appendix A, Determining the Significance of Reactor Inspection Findings for At-Power Situations. Using Table 4a of Appendix A to MC 0609, the finding was determined to be of very low safety significance (Green) because the failure of EDG #4 did not represent a loss of safety function, did not represent a loss of EDG #4 operability for greater than its technical specification allowed outage time, and does not screen as potentially risk significant due to a seismic, flooding, or severe weather initiating event. The finding affects the cross-cutting area of human performance, resources component, complete and accurate documentation aspect because the licensee did not incorporate adequate guidance for maintaining cleanliness of the EDG governor in their maintenance procedures. (H.2(c))

### B. Licensee-Identified Violations

None.

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## REPORT DETAILS

### Summary of Plant Events

On September 18, 2009, following completion of planned maintenance activities, Emergency Diesel Generator #4 (EDG #4) was run for post-maintenance testing. This testing required that generator output be raised to 3850 kilowatts (kW), however, the licensee could not raise EDG #4 generator output above 3700 kW. After identifying the most likely cause as being the droop potentiometer setting on the governor, the licensee started EDG #4 for droop adjustment on September 19, 2009. The engine started normally, but after approximately 15 seconds began to coast down with no trip signal present. Subsequent troubleshooting by the licensee identified the most likely cause as a faulty pressure regulating valve in the diesel air system. Later, on September 19, 2009, following replacement of the suspect pressure regulating valve, EDG #4 failed to start. The licensee noted that the EDG #4 governor was not properly positioning the fuel rack, thus causing the fuel rack to remain in the no-fuel position. On September 20, 2009, the EDG #4 governor was removed from the engine and sent to Engine Systems Incorporated (ESI) and then to licensee facilities in New Hill, NC for inspection and testing. This inspection and testing revealed that several small metal particles were present in the area of the governor pilot valve and restricting its movement. Also, on September 20, 2009, another governor was installed on EDG #4. On September 21, 2009, the licensee attempted to run EDG #4 and received four over-speed trips which were determined to be caused by misalignment of the fuel rack no-fuel position. Following correction of this issue the licensee ran EDG #4 multiple times between September 22, 2009, and September 24, 2009, in preparation for returning the engine to service. On September 24, 2009, the licensee again replaced the EDG #4 governor with a refurbished governor to ensure it was free of foreign material. On September 27, 2009, the licensee satisfactorily completed post-maintenance testing of EDG #4 and returned it to operable status.

### Special Inspection Charter

#### a. Inspection Scope

Based on the deterministic and conditional risk criteria specified in Management Directive 8.3, NRC Incident Investigation Program, a Special Inspection was initiated in accordance with NRC Inspection Procedure 93812, Special Inspection Team. The inspection focus areas included the following special inspection charter items:

1. Develop a complete description of the problems experienced during return to service testing on the EDG #4. The description should include a timeline of the recent refurbishment history of the governor.
2. Assess common cause as it relates to the other three Brunswick EDGs.
3. Review the licensee's corrective actions (CAs), root cause analysis and extent of condition associated with the EDG #4 failure. Assess the adequacy of the licensee's implemented and/or planned CAs to address the root cause and the timeline for completing the CAs for the issue on both units.

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4. Assess the adequacy of the licensee's post-maintenance testing after replacement of the governor and control air pressure reducing valve on EDG #4, and the air start solenoid valves on all EDGs.
5. Review any vendor documents and/or support activities provided regarding the EDG #4 failure to determine if they were implemented effectively. Review industry operating experience (OE) and licensee's actions in response to any related OE items.
6. Review the licensee's actions with respect to compliance with Technical Specification (TS) requirements for inoperability of EDG #4 on September 20, 2009.
7. Assess common cause between the following events of EDG #4:
  - a. July 2005: EDG #4 trip during the monthly load test;
  - b. August 2007: EDG #4 tripped on reverse power during monthly load test; and
  - c. April 2009: EDG #4 failed to start during a LOOP/LOCA test.
8. Collect data necessary to develop and assess the safety significance of any findings in accordance with IMC 0609, "Significance Determination Process."
9. Identify any potential generic safety issues and make recommendations for appropriate follow-up actions (e.g., Information Notices, Generic Letters, and Bulletins).

#### 4. OTHER ACTIVITIES

40A5 Other Activities – Special Inspection (93812)

- .01 Description of the problems experienced during return to service testing on the EDG #4, including a timeline of the recent refurbishment history of the governor. (Charter Item 1)

##### Background Information

The failed governor, serial number (S/N) 1089071, on EDG #4 was last in service on EDG #1 in March 2006 when it operated properly and was removed as part of the licensee's preventative maintenance program. This governor was refurbished by ESI in January 2007. In the context of ESI, refurbishment includes a complete disassembly of the governor, cleaning of all parts and internal surfaces, any needed repairs/replacements, and flushing of the unit. In March 2007 the governor was installed on EDG #4 and subsequently removed when it failed testing due to erratic operation. The licensee shipped the governor to Fairbanks-Morse in April 2007 for independent failure analysis. Fairbanks-Morse determined that the sub-governor assembly was bad and installed a replacement. During this repair some parts were cleaned but no extensive cleaning or flushing took place. A licensee engineer was present during this work and reported that he verified proper cleanliness controls were in place to prevent

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introducing foreign material into the governor. Fairbanks-Morse could not determine a direct cause for the erratic operation. The governor was returned to the licensee in April 2007 and subsequently shipped to ESI in March 2008 to conduct new testing that the licensee had developed. In February 2009, ESI replaced a minor part on the governor and in March 2009 completed the additional testing requested by the licensee. This testing lasted for approximately 65 hours during which time the governor performed satisfactorily. No extensive cleaning or flushing was performed while the governor was at ESI. After this testing, the oil was drained out of the governor and the governor was shipped to the licensee in March 2009. In April 2009 the governor was installed, along with a replacement governor oil cooler, on EDG #4. Between its installation in April 2009 until being removed from service for maintenance on September 13, 2009, EDG #4 was run for over 40 hours with no issues noted by the licensee.

### Timeline

#### September 13, 2009 – September 18, 2009

EDG #4 was removed from service on September 13, 2009, and ran for approximately 13 hours prior to conducting hot web deflection measurements. No issues were noted by the licensee. During the week of September 13, 2009, the licensee conducted planned maintenance activities associated with the 6-year preventative maintenance for EDG #4. Among these activities were those that drained the governor oil, tested a sample of the drained oil, and refilled the governor with new oil. No abnormalities were noted by the licensee during the activities associated with the governor oil, and no other maintenance was performed on the governor. The licensee conducted a satisfactory post-maintenance run of the engine on September 18, 2009. Additional post-maintenance testing was started later on September 18, 2009, but was terminated when generator output could not be raised above 3700 kW in an attempt to reach the required 3850 kW. The licensee determined that a speed droop adjustment was required.

#### September 19, 2009

EDG #4 was restarted for speed droop adjustment. The engine reached rated speed and voltage, but began to coast down after approximately 15 seconds. Subsequent troubleshooting by the licensee identified the most likely cause as a faulty air pressure regulating valve (PRV). Later on September 19, 2009, following replacement of the suspect PRV, EDG #4 failed to start again. By video review and direct observation, the licensee identified that the EDG only reached 138 rpm and that the governor actuator arm produced minimal movement, most likely from servo booster input to the governor. The licensee determined that the fuel rack was not bound. Because the EDG did not reach 385 rpm, no power was supplied to the electrical portion of the governor (EGA), thus eliminating the EGA as a potential cause of the start failure.

#### September 20, 2009

The governor, S/N 1089071, was removed from EDG #4 and shipped to ESI. Governor, S/N 967468, was installed on EDG #4. The licensee flushed the servo booster,

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governor oil cooler, governor oil cooler manifold, and associated tubing with filtered air with no visible particulate observed.

September 21, 2009

The licensee attempted to run EDG #4 and received four over-speed trips which were subsequently determined to be caused by misalignment of the fuel rack no-fuel position. This condition was then corrected by the licensee.

September 22, 2009

The licensee replaced the servo booster on EDG #4, along with flushing the servo booster, governor oil cooler, governor oil cooler manifold, and associated tubing with filtered air with no visible particulate observed. The licensee then ran EDG #4 for approximately five hours while tuning the governor. Governor oil was then sampled with no visible particulate observed.

September 23, 2009

The licensee flushed oil through the governor, servo booster, governor oil cooler, governor oil cooler manifold, and associated tubing with no visible particulate observed. EDG #4 was then run for approximately 8 hours at varied loading levels. The governor oil was again sampled with no visible particulate observed.

September 24, 2009

The licensee performed LOOP/LOCA testing of EDG #4 and determined that the governor required further adjustment. After these adjustments were made, the licensee noted that the governor still exhibited small drifts while synchronized to the grid.

September 25, 2009

Governor S/N 967468 was removed and replaced with governor S/N 1213479, which was refurbished by ESI in January 2009. The licensee also replaced the servo booster, governor oil cooler, and governor oil cooler manifold. During the replacement of the governor oil cooler, while governor S/N 967468 was being replaced, a metallic particle was found inside the governor oil cooler manifold. During the pre-installation cleanliness inspection, a small metallic particle was found in the new governor oil cooler obtained from the licensee's warehouse.

September 27, 2009

The licensee satisfactorily completed the post-maintenance testing on EDG #4 and returned it to operable status.

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.02 Assess common cause as it relates to the other three Brunswick EDGs. (Charter Item 2)

a. Inspection Scope

The inspectors assessed common cause as it related to the other three EDGs from two different aspects. The first aspect being that the foreign material was introduced by the vendor, which was the initial conclusion by the licensee. The second aspect being that the foreign material was introduced by maintenance activities completed by the licensee. In assessing common cause from the aspect of vendor-induced foreign material, the inspectors reviewed selected corrective action documents, condition reports, action items, and work orders to independently assess the conclusions and recommended actions determined by the licensee. The inspectors also reviewed the licensee's programs and procedures relating to contract/purchase orders, specifically regarding cleanliness/foreign material control standards, vendor control and surveillance, supply chain receipt inspection, and warehouse storage. The inspectors reviewed purchase orders, covering the period January 2005-September 2009 related to maintenance and parts procurement for EDG governors, servo boosters, governor oil coolers, and governor oil cooler manifolds for cleanliness/foreign material control standards. The inspectors also reviewed the most recent vendor surveillance of ESI, completed for the licensee by the Nuclear Procurement Issues Committee (NUPIC) in August 2007. Additionally, the inspectors reviewed receipt inspections, covering the period January 2005-September 2009 for EDG governors, servo boosters, governor oil coolers, and governor oil cooler manifolds. The inspectors inspected the warehouse storage locations for the servo boosters, governor oil coolers, and governor oil cooler manifolds; and inspected selected components for cleanliness/foreign material control. An inspector also toured ESI facilities in Rocky Mount, NC and interviewed ESI officials about work practices and the work performed by ESI on the failed EDG #4 governor.

In assessing common cause from the aspect of licensee-induced foreign material, the inspectors reviewed selected corrective action documents, condition reports, action items, and work orders. The inspectors also reviewed the licensee's programs and procedures relating to the conduct of maintenance, cleanliness and flushing requirements, foreign material control, and foreign material control training. The inspectors reviewed work orders, specifically regarding cleanliness/foreign material control standards, for all maintenance covering EDG governors, servo boosters, governor oil coolers, and governor manifolds for the period August 2001-September 2009. This time period encompassed the installation of the EDG governor with the longest in-service life which was installed on EDG #3 in August 2001. Inspectors also observed several maintenance activities performed on EDG #4 including oil sampling, oil addition, oil cooler replacement, and EDG #4 performance testing.

b. Observations and Findings

No findings of significance were identified.

#### Common cause assessment of vendor-induced foreign material

Inspectors determined that normal vendor refurbishment practices are sufficient to preclude foreign material from being introduced into the EDG governors. A governor refurbishment includes disassembly, cleaning, and extensive oil flushes of all governor components, including the sub-governor. However, the failed EDG governor (S/N 1089071) was repaired at Fairbank-Morse and at ESI prior to installation into EDG #4 in April 2009 without a complete refurbishment. These repair activities included partial disassembly of the sub-governor, and did not include a sub-governor flush. The replacement governor installed on EDG #4 on September 25, 2009 (S/N 1213479), the governor installed on EDG #1 in March 2006, and the governor installed on EDG #2 in April 2008 all were flushed prior to installation. Therefore, a common cause failure of these governors due to vendor-induced foreign material is not a significant concern. The remaining installed governor, the EDG #3 governor, was installed in August 2001. The licensee has no records of a flush of this governor prior to installation. However, due to the significant run-time of this governor without a failure, it is unlikely that a vendor introduced foreign material into the sub-governor prior to its installation.

Additionally, inspectors also noted that the Progress Energy nuclear fleet procedure, MNT-NGGC-0007, Foreign Material Exclusion Program, Rev. 8 contains requirements that expectations for foreign material control be included in purchase orders and contracts. The inspectors determined that MCP-NGGC-0401, Material Acquisition (Procurement, Receiving, and Shipping), Rev. 26 contained requirements that appropriate foreign material control expectations be included in purchase orders for safety-related and critical non-safety related components. The inspectors identified that purchase orders relating to work done by ESI did not contain detailed guidance for excluding foreign material in accordance with the most recent revision of the licensee's procurement procedures. However, the purchase contracts in place for ESI were written in accordance with the procedure revision that was in place at the time the contracts were written. The licensee initiated Nuclear Condition Report (NCR) 357853 to address this issue.

#### Common cause assessment of licensee-induced foreign material

Inspectors determined that licensee maintenance practices created the potential for introducing foreign material into the EDG governors. Commonly during governor replacement, the licensee replaces the governor oil cooler and servo booster, which requires disassembly of the governor oil tubing and cooler manifold.

The licensee's procedure for controlling cleanliness during maintenance is OMMM-055, Cleanliness and Flushing Requirements, Rev. 12. Attachment 1 delineates the cleanliness classification of plant systems with a letter (A, B, C, or D) depending on the potential adverse impact of foreign material on the system. Specific cleanliness control requirements are then applied to maintenance on these systems depending on their classification. Inspectors noted that this procedure does not assign a cleanliness classification to EDG systems; therefore, maintenance personnel do not have detailed cleanliness control instructions when performing maintenance on the EDG systems. The inspectors also noted that rather than assigning a cleanliness classification to EDG

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systems, this attachment only references two notes. These notes contain information about water chemistry and oil type to be used in the EDG systems, but did not establish the cleanliness classification of the EDG. The licensee initiated NCR 357970 to address this issue. The inspectors also noted that Attachment 1 to OMMM-055 characterizes the EDG as a high risk system, although this characterization implements no detailed work instructions. Additionally, OMMM-055 requires single point accountability when conducting internal closing inspections following maintenance. Single point accountability requires that one individual complete and certify the inspections. The inspectors reviewed WO 01324731-01, EDG #4 Governor Assembly and identified that the single point accountability internal closing inspection was not conducted for miscellaneous oil lines on the EDG #4 governor. The inspectors assessed this issue as minor and licensee initiated NCR 357970 to address this matter.

Since licensee-induced foreign material is a potential common cause concern, inspectors evaluated the operating history of EDGs #1, #2, and #3 to determine the likelihood of foreign material in these governors causing a failure. The EDG #1 governor was installed in March 2006, the EDG #2 governor was installed in April 2008, and the EDG #3 governor was installed in August 2001. Because of the operating history of these governors without failure, and because the licensee has not performed any recent maintenance on the governors that would produce foreign material or relocate any foreign material that may exist, the inspectors determined that a failure of EDG #1, #2, or #3 due to licensee-induced foreign material is not likely.

.03 Review the licensee's corrective actions (CAs), root cause analysis and extent of condition associated with the problems associated with the EDG #4 failure. Assess the adequacy of the licensee's implemented and/or planned CAs to address the root cause and the timeline for completing the CAs for the issue on both units. (Charter Item 3)

a. Inspection Scope

The inspectors reviewed the significant adverse condition investigation performed as part of NCR 356076, EDG Failure to Start on September 19, 2009. The inspectors also reviewed selected corrective action documents, condition reports, action items, and work orders to independently assess the conclusions and recommended actions of the licensee investigation. The inspectors verified that the licensee investigation included the root cause of the event, extent of condition and an extent of cause evaluations, adequate corrective actions, and a reasonable timeline for completion of corrective actions.

b. Observations and Findings

.1 Root Cause

The licensee's select cause of EDG #4 failing to start on September 19, 2009, is failure of the EDG #4 governor due to the presence of foreign material in the governor oil that was introduced by vendor maintenance activities and not flushed during vendor maintenance restoration prior to the governor installation in April 2009. The licensee determined that this material was located in a position that did not impact the mechanical

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governor (EGB) performance until September 19, 2009. The licensee determined that the material most likely relocated after the oil was changed during maintenance activities performed during the week of September 13, 2009. The resultant relocation of the material resulted in the governor failure. The licensee concluded that the material was introduced by a vendor mainly because of three observations:

- 1) there are obstacles within the flow path through the sub-governor between the sub-governor pump and where the foreign material was found (the pilot spool),
- 2) the lack of markings on the sub-governor pump gears, and
- 3) the lack of any other foreign material in the flow path up to the pilot spool.

The licensee concluded that the metallic particles found on the pilot spool were not introduced via suction through the sub-governor pump, and must have been introduced into the pilot spool area when the governor was disassembled. The licensee designates this as the "select cause" and not the "root cause" because their investigation did not conclusively eliminate other sources of foreign material.

Inspectors determined that the licensee's select cause is plausible. However, the inspectors also found information which does not support the licensee's conclusion. In regard to observation number one (see preceding paragraph), inspectors determined that although there are obstacles in the flow path through the sub-governor, oil flow does exist from the governor sump, through the sub-governor pump, and through the pilot spool. This flow path includes a small amount of oil flow to the area where the foreign material was found on the pilot spool compensating land. Also, during interviews with ESI engineers, the inspectors found evidence that foreign material in at least one other industry governor failure event had migrated to the pilot spool compensating land from the governor sump.

In regard to observation number two, inspectors found that markings on the sub-governor pump were more likely to be present if large particles of foreign material had passed through the pump. Operating experience from other governor foreign material events is not directly analogous to this governor failure because the foreign material in the other events was much larger. The particles found in the governor in this instance were approximately 200 x 200 x 0.5 microns. Larger pieces of metal (for example, a nameplate in the case of one other licensee) have passed through the sub-governor pump and caused scoring on the pump gears. It is not clear if scoring of this kind is expected for smaller particles.

Last, in regard to observation number three, foreign material was found in the governor sump with similar material composition as that found in the pilot spool (aluminum, carbon steel, and low-alloy steel). Since the main oil flow path through the sub-governor is directed back to the governor sump, this material could have passed through the sub-governor and returned to the sump. Once the material passed back to the governor sump, it would have settled in the bottom of the sump where it was later found.

## .2 Extent of condition

The inspectors concluded that the condition of foreign material in the EDG sub-governor is not likely to currently exist in the other EDG governors or the governors used in other plant equipment. See the Common Cause section of this report for a discussion of the other EDG governors. Other plant governors use a different type of governor and use an oil filtering system, thus making them less susceptible to foreign material. Other plant governors have also not been recently repaired or refurbished. A potential extent of condition problem exists for foreign material being introduced via replacement parts during maintenance on EDG governor oil system components because the licensee's cleanliness procedures do not include specific instructions for EDG systems. The licensee has initiated corrective actions for this problem.

The EDG #4 control air pressure reducing valve, which was initially thought to be the cause of the EDG #4 failure on September 19, 2009, was found to be operating sluggishly due to corrosion products in the valve. The corrosion products were generated from a short run of carbon steel piping upstream of the valve and downstream of the control air filter. Since the potential for this condition to be present in the other EDG control air pressure reducing valves existed, the licensee disassembled, inspected and cleaned or replaced the valves in all of the EDG control air systems. The licensee also initiated long-term corrective actions to maintain this section of piping clean.

An additional extent of condition issue concerning air-start and turbo charger air-boost solenoid valves was also addressed during the two-unit outage. In August 2009 ESI issued a notification that the valves were potentially fabricated with a defect. This discovery was the result of an air-start valve failure at Brunswick. The licensee addressed the extent of condition concern by replacing all but one of the valves with valves known not have the defect. The valve not replaced was verified to not be defective. The licensee also confirmed that the valves are not used in any other plant equipment.

## .3 Corrective actions

Immediate corrective actions for the failure of EDG #4 included shutting down both units to cold shutdown, starting and running EDGs #1, #2, and #3 in order to confirm that a similar condition did not exist with those EDG governors, and performing repairs on EDG #4. Additional corrective actions planned to address procedural deficiencies include establishing standard Purchase Order guidelines for foreign material exclusion requirements, updating OMMM-055 to include EDG system cleanliness requirements including new component cleanliness requirements, and updating procedures to include detailed oil addition, sampling, analysis and trending instructions. Inspectors determined that these corrective actions, and the timeline for completing the actions, are adequate.

## .4 Inadequate Maintenance Instructions for Maintaining Cleanliness During Emergency Diesel Generator Governor Maintenance.

Introduction: NRC inspectors identified a Green NCV of Technical Specification (TS) 5.4.1, Procedures, for inadequate cleanliness and flushing procedures for maintaining

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cleanliness during maintenance on the emergency diesel generator (EDG) governors. On September 19, 2009, foreign material in the EDG #4 governor control oil subsystem caused EDG #4 to fail to start.

Description: The EDG #4 is a Woodward-type EGB governor that controls engine speed by adjusting the position of the engine fuel rack. The governor uses an electric signal to position a pilot valve that ports more or less control oil to other governor components which ultimately positions the fuel rack. This pilot valve operates with small clearances (approximately 12 microns) that must be free of foreign material so that the pilot valve moves freely. If the pilot valve does not move freely, the governor cannot control the engine fuel rack position and the engine will receive too much or too little fuel. Control oil is supplied to the pilot valve by a gear-driven pump that takes suction from the governor sump.

On September 19, 2009, while testing EDG #4 after a maintenance period that began on September 13, 2009, EDG #4 slowed and stopped after approximately 15 seconds of operation. Later on September 19, 2009, during a second test run of EDG #4, the engine failed to start. During the second test of EDG #4, licensee engineers observed that the EDG #4 governor failed to position the fuel rack properly, resulting in the fuel rack remaining in the no-fuel position. The governor was sent to Engine Systems Incorporated (ESI) in Rocky Mount, NC, where it was tested and partially disassembled. Prior to disassembly at ESI, the governor was operationally tested and the governor again failed to reposition properly. It was also noted that the pilot valve did not move freely when pressure was placed on it by hand. ESI technicians then freed the pilot valve by manually manipulating it and after this manipulation, the governor operated correctly. Upon partial disassembly of the governor at ESI, licensee and ESI engineers discovered that several small metal particles were present in the area of the pilot valve compensating land. Further disassembly at licensee facilities in New Hill, NC revealed additional metal particles between the pilot valve bushing and the pilot valve compensating land. The testing and inspections performed by ESI and the licensee demonstrated that the failures of EDG #4 on September 19, 2009, were caused by these metal particles restricting the movement of the pilot valve, thus preventing proper engine fuel rack positioning and causing insufficient fuel to be delivered to the engine.

While the exact source of the metal particles is unknown, there were multiple opportunities for the metal particles to be introduced into the governor (see the timeline in section 4OA5.01 of this report for a detailed history of the governor). Maintenance activities were performed on the governor by two different vendors prior to its installation on EDG #4 in April 2009. The first vendor completely disassembled, cleaned, and reassembled the governor. A licensee engineer was present during this work. The engineer's report stated that he verified proper cleanliness controls were in place to prevent introducing foreign material into the governor. The second vendor performed a minor repair to the governor and then tested the governor for over 65 hours. The governor performed satisfactorily during the testing. After this testing, the oil was drained out of the governor and the governor was shipped to the licensee. This portion of the governor's history suggests that the foreign material was not present in the governor when it was delivered to the licensee prior to its installation on EDG #4 in April 2009.

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In April 2009 the governor and the governor oil cooler were replaced on EDG #4 per procedure OCM-GOV500, Emergency Diesel Generator EGB Governor Hydraulic Actuator Replacement. This procedure directs that a flush be performed of the new cooler and associated tubing prior to installation. OCM-GOV500 also references procedure OMMM-055, Cleanliness and Flushing Requirements. However, neither of these procedures includes adequate directions for performing flushes to ensure that no foreign material is introduced into the EDG governor. In Attachment 1 of OMMM-055, each plant system is assigned a cleanliness category of A, B, C, or D depending on what level of cleanliness control is required to prevent foreign material from adversely impacting the operation of the system. However, despite being identified as equipment at high risk for foreign material impact, the EDGs are not assigned a cleanliness category and, unlike other high risk systems, plant engineers are not required to specify detailed instructions for ensuring the cleanliness of EDG governor components prior to installation and EDG governor reassembly. Lacking specific cleanliness instructions, mechanics have been inconsistent on the flushing methods used. Inspectors noted that mechanics used pressurized air and an oil squeeze bottle for flushing EDG components during EDG governor repairs the week of September 21, 2009. Inadequate flushing creates an opportunity for foreign material to be introduced into the EDG governor via the newly installed components. Inspectors noted that both the governor oil cooler and the governor oil servo boost cylinder cannot be adequately flushed using these flush methods because of low flow areas inside of the components.

Licensee discoveries between September 20, 2009, and September 25, 2009, further demonstrate that foreign material is not adequately removed by the licensee's maintenance practices. When the failed EDG governor was replaced on September 20, 2009, the oil cooler, the servo boost cylinder, and all associated tubing were flushed with pressurized air. However, when the licensee removed these components again on September 25, 2009, a metal chip was found in the cooler manifold. New governor oil system components were also found to be likely sources of foreign material. During the week of September 21, 2009, a licensee engineer performed an inspection which revealed that a new governor oil cooler located in the licensee warehouse contained metallic foreign material. Another new governor oil cooler was found to contain metallic foreign material on September 25, 2009, during a pre-installation inspection by maintenance technicians. Once the licensee realized that the oil cooler and the servo boost cylinder were not being adequately flushed, the licensee disassembled a new cooler and servo boost cylinder, cleaned the components, visually verified that no foreign material was present, then installed them on EDG #4.

Since the licensee's cleanliness and flushing procedures were not adequate, and new EDG governor oil components are sources of foreign material, the inspector's concluded that foreign material was likely introduced into the EDG governor during licensee maintenance activities in April 2009. However, the foreign material did not migrate into a position to cause the EDG #4 to fail until September 19, 2009, as a result of maintenance performed between September 14, 2009, and September 18, 2009. The governor maintenance performed during this week consisted of draining and refilling the governor oil. Draining and refilling the oil induces a significant oil flow and pressure transient in the EDG governor and likely repositioned the metallic particles so that they were subsequently transported from the governor oil sump, through the sub-governor oil

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pump, and into the pilot valve region of the governor. Once in the pilot valve area, the particles jammed the pilot valve and caused the governor to fail. Inspectors came to this conclusion partly because the governor performed satisfactorily during approximately 55 hours of EDG operation between April 2009 and September 2009. Although the foreign material was likely present during this time period, the foreign material did not cause the governor to malfunction. This is an indication that the foreign material had likely settled in a safe place until it was disturbed by the oil draining and refilling.

Analysis: The failure to implement an adequate cleanliness procedure for the EDG governor maintenance is a performance deficiency. This performance deficiency is more than minor because it is associated with equipment performance and procedure quality attributes of the Mitigating Systems Cornerstone. It also adversely affected 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). Specifically, the reliability of EDG #4 was reduced because it was susceptible to fouling due to the foreign material in the governor. The finding was evaluated for significance using NRC Manual Chapter 0609, Appendix A, Determining the Significance of Reactor Inspection Findings for At-Power Situations. Using Table 4a of Appendix A to MC 0609, the finding was determined to be of very low safety significance (Green) because the failure of EDG #4 did not represent a loss of safety function, did not represent a loss of EDG #4 operability for greater than its technical specification allowed outage time, and does not screen as potentially risk significant due to a seismic, flooding, or severe weather initiating event. The cause of the finding is related to the cross-cutting area of human performance, resources component, complete and accurate documentation aspect because the licensee did not incorporate adequate guidance for maintaining cleanliness of the EDG governor control oil in their maintenance procedures. (H.2(c))

Enforcement: TS 5.4.1, Procedures, requires that written procedures shall be established, implemented and maintained covering applicable procedures recommended in Regulatory Guide 1.33, Appendix A, November 1972 (Safety Guide 33, November 1972). Regulatory Guide 1.33, Section I (Safety Guide 33, November 1972) requires written procedures for maintenance that can affect the performance of safety-related equipment. Procedures CM-GOV500, Emergency Diesel Generator EG-B Governor Hydraulic Actuator Replacement and 0MMM-055, Cleanliness and Flushing Requirements were established to perform EDG governor maintenance. Contrary to the above, maintenance instructions 0CM-GOV500, Emergency Diesel Generator EG-B Governor Hydraulic Actuator Replacement and 0MMM-055, Cleanliness and Flushing Requirements did not contain adequate guidance for maintaining cleanliness during EDG governor maintenance. Because the finding is of very low safety significance and has been entered into the licensee's corrective action program (AR 356076), and consistent with the NRC Enforcement Policy, this violation is being treated as a non-cited violation, and is designated NCV 05000324,325/2009011-01, Inadequate Maintenance Instructions for Maintaining Cleanliness During Emergency Diesel Generator Governor Maintenance.

.04 Assess the adequacy of the licensee's post-maintenance testing after replacement of the governor and control air pressure reducing valve on EDG #4, and the air start solenoid valves on all EDGs. (Charter Item 4)

a. Inspection Scope

EDG Governor

The inspection team reviewed the licensee's maintenance activities and work orders associated with replacement of the EDG #4 governor to verify the adequacy of the licensee's post-maintenance testing. The team also reviewed maintenance activities and work orders associated with work done on the EDG #4 governor from 2006 to 2009, to verify if any maintenance activities had a consequential impact on the September 2009 diesel failure and should have been identified per post-maintenance testing. The team also reviewed the licensee's procedures for collecting and analyzing oil samples for the emergency diesel generator governor to verify if the licensee took appropriate action in accordance with licensee maintenance procedures and recommended vendor practices; as well as industry standards.

EDG Pressure Regulating Valves

The team reviewed the licensee's maintenance procedures and work orders associated with replacement of the EDG #4 Control Air Pressure Regulating Valve (PRV) 2-DSA-PRV-1251 following the September 2009 failure to verify the adequacy of the licensee's post-maintenance testing. The PRV was initially identified as a probable cause for the EDG #4 failure on September 19, 2009, due to its sluggish response during licensee testing. The team also reviewed the maintenance and work orders associated with inspection of the remaining three EDGs.

EDG Air Solenoid Valves

The team reviewed work orders and post-maintenance testing associated with the licensee's inspection and replacement of the EDG Air Start Solenoid Valves in response to a 10 CFR 21 report that was issued on September 3, 2009, from ESI describing faulty diesel air start solenoid valves.

b. Observations and Findings

No findings of significance were identified.

EDG Governor

Following the failure of the EDG #4 governor S/N 1089071 on September 19, 2009, the licensee replaced the failed governor with governor S/N 967468. In accordance with maintenance procedure 0CM-GOV500, Emergency Diesel Generator EGB Governor Hydraulic Actuator Replacement, the licensee flushed the servo booster; flushed all tubing with filtered air; flushed the manifold plate and governor oil cooler with filtered air; and made all necessary reconnections. Following this maintenance, EDG #4 was run

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for governor tuning and four engine over-speed trips occurred due to a fuel rack misalignment with the new governor. The licensee replaced the servo booster and flushed the governor oil due to concern with possible foreign material trapped in it. All other parts were flushed and inspected for foreign material; no concerns were identified by the licensee. The engine was subsequently run on September 22, 2009, and the oil was sampled. This sample indicated high particulate count in comparison with the historical data trend. The oil was flushed again based on recommendation from an onsite Woodward/ESI representative. Another oil sample was taken and results were within the acceptable range. A final oil sample was taken on September 23, 2009, also produced results within the acceptable range. On September 24, 2009, during post-maintenance, it was determined that the governor required adjustments. Following governor tuning, the EDG #4 was run again. It was also determined that due to the maintenance activities, OPT-12.2D, No. 4 Diesel Generator Monthly Load Test, also be performed. During this post-maintenance testing, the engine was observed to exhibit small drifts in loading while synchronized to the grid. Due to erratic behavior exhibited by governor 967468, the licensee replaced it with governor S/N 1213479 on September 24, 2009. The licensee also replaced the servo booster, governor oil cooler, and governor manifold. Procedure OPT-12.2D was performed again and the EDG #4 was successfully tested.

During the team's review of licensee's post-maintenance activities, specifically oil sample and analysis, it was discovered the licensee did not have a procedure to sample and analyze oil samples from the EDG governor prior to 2009. Previous oil samples were provided to the Preventative Maintenance group; however, procedural guidance was not provided, for example, for what actions to be taken based on results (i.e., high particulate count). The licensee had been tracking and trending oil samples and analysis results for several years. The team also determined that the failed governor (S/N 967468) had not had its oil flushed since 2007 when it failed due to erratic behavior and was subsequently sent for independent failure analysis.

#### Pressure Regulating Valve

The PRV was initially identified as a probable cause for the EDG #4 failure on September 19, 2009, due to its sluggish response during licensee testing. Following inspection on EDG #4 by the licensee, corrosion was found in the lines and valve. The licensee subsequently replaced the PRV and the associated piping. All three remaining EDGs were inspected for similar problems. As a result, EDG #3 had the PRV and piping replaced; EDG #1 had the PRV replaced but kept the same piping; and EDG #2 did not have any components that required replacement. Following inspection and maintenance, each PRV was tested and verified to have no leaks.

#### Air Start Solenoid Valves

ESI began a 10 CFR 21 deviation evaluation on August 17, 2009, after Brunswick Nuclear Plant (BNP) notified ESI of a failure of one of their air start solenoid valves (Magnatrol P/N 42A57AHT). The valve failure occurred on August 2, 2009, as indicated by a slow start of EDG #2 during a surveillance run. This caused EDG #2 to be declared inoperable. The licensee replaced all but one of the top covers of the solenoid actuated

valves on the EDGs as a result of the 10 CFR 21 report. The one not replaced was not subject to the 10 CFR 21 report deviation, and was inspected per the 10 CFR 21 report criteria and found to be acceptable. Post maintenance testing of the valves included running all of the EDGs and performing the applicable in-service testing of the associated turbocharger air boost valves. Inspectors concluded that all post maintenance testing performed by the licensee was adequate.

.05 Review any vendor documents and/or support activities provided regarding the EDG #4 failure to determine if they were implemented effectively. Review industry operating experience (OE) and licensee's actions in response to any related OE items. (Charter Item 5)

a. Inspection Scope

The team reviewed the reference manuals provided by the Woodward Governor Company for the governors installed on the EDGs at the Brunswick plant. Specifically, the team reviewed the manuals describing the EGB-10C Governor/Actuator (Manual 37708); and describing the Oils for Hydraulic Controls (Manual 25071). The team reviewed the licensee files of all correspondence from the EDG governor vendor (Woodward Co.) and the EDG vendor (ESI) related to lube oil cleanliness criteria, maintenance practices of governor oil, and null voltage drift on the electric governor controls. The team also reviewed correspondence from the Terry Turbine Users Group related to lube oil cleanliness. The team conducted searches of operating experience documents with the key words including, but not limited to, "governor foreign material" or "DG governor failure," the results of which the team reviewed. The team also searched the NRC's Operating Experience Community database on governors for EDGs. The team searched the NRC's database for event reports generated pursuant to 10 CFR 50.72, Licensee Event Reports, Information Notices, and other applicable regulatory correspondence. The team also reviewed corrective actions the licensee implemented following a prior EDG failure caused by foreign material intrusion in 2006.

b. Observations and Findings

No findings of significance were identified.

The OE review identified two events that were similar in general aspects to the problems which are the subject of this Special Inspection. One event involved an EDG which failed due to foreign material passing through the idle gear and sub-governor base causing the idler to seize and shearing of the drive shaft. Another event involved an EDG that demonstrated oscillations due to clogging of the Woodward hydraulic governor from foreign material (an aluminum label from a solenoid valve). Although these events involved some similar aspects to the BNP event, no actions would have been required by the licensee in response to these events.

The team reviewed the extent of condition and corrective actions taken by the licensee following an event at Brunswick in 2006 involving foreign material in the EDG. EDG #1 tripped on low lube oil pressure on November 2, 2006 (documented in IR 2007-08). The licensee discovered a large amount of fibrous material, later identified to be from a

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cleaning towel left in the lube oil system. The root cause evaluation determined inadequate foreign material exclusion (FME) controls was the primary cause. Even though many of the corrective actions focused on FME controls for the lube oil system and crankshaft, the licensee did change the EDG system to a “High Risk” system in procedure OMMM-055, Cleanliness and Flushing Requirements. However, specific foreign material controls for EDG governor oil components were not included (see finding in section 4OA5.03.4 of this report).

The EDG governor vendor manuals contained pages covering oil specifications and oil maintenance, including oil contamination. Manual 25071 provided the most discussion on proper oil maintenance. It states that the best time to change oil is just before the oil is worn out. This is best determined by oil analysis, and can be used to establish a proper maintenance schedule. It also states that anytime a known contaminant enters the governor, the governor should be drained, flushed, and refilled with clean oil as soon as possible. In addition, it states that if it is determined oil is contaminated, to drain the oil while it’s hot and agitated. Because the licensee did not proceduralize oil analysis until 2009, the vendor recommended practices had not been consistently utilized.

Brunswick and McGuire are the only two operators in the United States that utilize Nordberg EDGs in nuclear safety-related applications. Progress Energy and Duke Power Corporation are partnered with ESI as owners of the Nordberg nuclear EDG design and share information regarding the Nordberg EDGs. This provides Progress Energy with the availability of shared resources and access to a spare Nordberg diesel at the McGuire nuclear plant for training and troubleshooting. Also, operating experience gained from McGuire provides immediate feedback on key diesel issues or previous maintenance activities.

.06 Review the licensee’s actions with respect to compliance with Technical Specification (TS) requirements for inoperability of EDG #4 on September 20, 2009. (Charter Item 6)

a. Inspection Scope

The inspectors reviewed the TS, TS bases, NCRs, and operating logs to verify that the licensee complied with the TS requirements for the various EDG conditions between September 13, 2009, and September 21, 2009.

b. Findings

No findings of significance were identified.

EDG #4 was declared inoperable at the start of planned maintenance at 7:50 p.m. on September 13, 2009. TS LCO 3.8.1 requires that, with one EDG not operable, the licensee restore the EDG to an operable status within 7 days (i.e. by 7:50 p.m. on September 20, 2009), or shut down both units to mode 3 within 12 hours of the expiration of the 7 day period (i.e. by 7:50 a.m. on September 21, 2009), and cool down both units to mode 4 within 36 hours of the expiration of the 7 day period (i.e. by 7:50 a.m. on September 21, 2009). Since the licensee was unable to restore EDG #4 to an operable status by 7:50 p.m. on September 20, 2009, both units were shut down to

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mode 3 (Unit 1 at 10:22 p.m. on September 20, 2009, and Unit 2 at 4:21 a.m. on September 21, 2009), and cooled down to mode 4. Unit 1 reached mode 4 at 3:30 a.m. on September 22, 2009, and Unit 2 reached mode 4 at 10:06 p.m. on September 21, 2009. Therefore, the licensee complied with TS requirements.

.07 Assess common cause between the following events of EDG #4:

- a. July 2005: EDG #4 tripped during the monthly load test.
- a. August 2007: EDG #4 tripped on reverse power during the monthly load test.
- b. April 2009: EDG #4 failed to start during a performance of a LOOP/LOCA .

a. Inspection Scope

The team reviewed the circumstances surrounding three past events involving EDG #4 to determine if any common cause existed with the most recent EDG #4 event in September 2009. The team reviewed the cause evaluations, condition reports, maintenance work, and work orders associated with each of the events.

b. Findings

No findings of significance were identified.

On July 29, 2005, EDG #4 experienced a generator lockout due to over-current and subsequently tripped. It was later determined to have been caused by an excessive buildup of carbon on the exciter collector ring. There were no similarities identified between this event and the September 2009 EDG #4 failure.

On August 20, 2007, EDG #4 tripped on reverse power following closure of the generator breaker due to a human performance error. This event was reviewed and no similarities were identified between this event and the September 2009 EDG #4 failure.

On April 10, 2009, EDG #4 tripped due to a stuck open check valve (2-LO-V461, Overspeed Boost Cylinder). The stuck open check valve was later determined to be caused by a manufacturing defect. This event was reviewed and no similarities were identified between this event and the September 2009 EDG #4 failure.

.08 Collect data necessary to develop and assess the safety significance of any findings in accordance with IMC 0609, Significance Determination Process (Charter Item 8)

a. Inspection Scope

The inspectors reviewed licensee procedures, corrective action program documents, work orders, root cause evaluations, operability assessments, engineering evaluations, and operating experience information to gather data necessary to develop and assess the safety significance of any findings.

b. Findings

One NRC identified violation is listed in section 4OA5.03.4 of this report.

.09 Identify any potential generic safety issues and make recommendations for appropriate follow-up actions (e.g., Information Notices, Generic Letters, Bulletins) (Charter Item 9)

a. Inspection Scope

The inspectors reviewed the licensee's internal operating experience database, root cause evaluation, corrective action program documents, work orders, and the NRC Operating Experience (OpE) database to determine the potential for generic safety issues related to the problems with EDG governors or other EDG equipment.

b. Findings

No findings of significance were identified. Based on the information reviewed, the inspectors did not identify any generic safety issues.

4OA6 Meetings, Including Exit

On October 2, 2009, the special inspection team leader presented the preliminary inspection results to Mr. Benjamin C. Waldrep, Brunswick Steam Electric Plant Vice President, and members of his staff. Subsequently, additional in-office reviews were conducted and the final inspection results and preliminary significance determination were discussed with Mr. Annacone on October 20, 2009. The licensee acknowledged the inspection finding. No proprietary information is included in this inspection report.

ATTACHMENT: SUPPLEMENTAL INFORMATION

## **SUPPLEMENTAL INFORMATION**

### **KEY POINTS OF CONTACT**

#### **Licensee Personnel**

J. Anderson, Lead Diesel Generator System Engineer  
M. Annacone, Director of Site Operations  
W. Brewer, Manager – Maintenance  
B. Davis, Manager – Engineering  
S. Gordy, Manager – Operations  
F. Jefferson, Superintendent – Systems Engineering  
A. Pope, Supervisor – Licensing/Regulatory Programs  
W. Richardson, Diesel Generator System Engineer  
T. Sherrill, Licensing Senior Technical Specialist  
N. Smith, Supervisor – Electrical/I&C Systems  
B. Waldrep, Site Vice President  
E. Wills, Plant General Manager

#### **NRC Personnel**

Randall A. Musser, Chief, Reactor Projects Branch 4, Division of Reactor Projects Region II

### **LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED**

#### **Opened and Closed**

NCV 05000324,325/2009011-01	NCV	Inadequate Maintenance Instructions for Maintaining Cleanliness During Emergency Diesel Generator Governor Maintenance.
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#### **Closed**

None.

#### **Opened**

None.

## LIST OF DOCUMENTS REVIEWED

### Design Basis Documents and System Descriptions

SD-39, Emergency Diesel Generators, Rev. 7

### Procedures

0AI-144, Risk Management

0CM-GOV500, Emergency diesel generator EG-B governor hydraulic actuator replacement, Rev. 4

0CM-ENG510, Instructions for draining/refilling or flushing the governor of the emergency diesel generators, Rev. 0

0MST-DG501R3, Emergency diesel generators 72 month inspection, Rev. 24

0MMM-053, Equipment lubrication application guidance and lubricant listing, Rev. 57

0MMM-055, Cleanliness and flushing requirements, Rev. 12

0OP-50.1, Diesel Generator Emergency Power System Operating Procedure, Rev. 72

0PLP-20, Post Maintenance Testing Program, Rev. 34

0PT-12.2C, No. 3 Diesel Generator Monthly Load Test, Rev. 91

0PT-12.2D, No. 4 Diesel Generator Monthly Load Test, Rev. 97

ADM-NGGC-0006, Online EOOS Model, Rev. 6

ADM-NGGC-0101, Maintenance Rule Program, Rev. 20

ADM-NGCC-0104, Work Management Process, Rev 32

EGR-NGGC-0005, Engineering Change, Rev. 28

EGR-NGGC-0011, Engineering Product Quality, Rev. 12

MNT-NGGC-0007, Foreign material exclusion program, Rev. 8

MNT-NGGC-1000, Conduct of maintenance, Rev. 0

MCP-NGGC-0401, Material acquisition (procurement, receiving, and shipping), Rev. 26

MCP-NGGC-0402, Material management (storage, issue, and maintenance), Rev. 18

MCP-NGGC-0406, Supplier qualification, surveillance, and audits, Rev. 11

NGGM-PM-0020, Vendor quality program for critical equipment and major purchases, Rev. 6

NUPIC joint audit of Engine Systems, Inc. September 11, 2007

OPS-NGGC-1305, Operability Determinations, Rev. 1

OPS-NGGC-1307, Operational Decision Making, Rev. 2

### Completed Test Procedures

0PT-12.2C, No. 3 Diesel Generator Monthly Load Test, performed December 1, 2008

0PT-12.2D, No. 4 Diesel Generator Monthly Load Test, performed November 13, 2008

0PT-12.2D, No. 4 Diesel Generator Monthly Load Test, performed September 26, 2009

0PT-12.2D, No. 4 Diesel Generator Monthly Load Test, performed September 23, 2009

0PT-12.2D, No. 4 Diesel Generator Monthly Load Test, performed September 19, 2009

0PT-12.2D, No. 4 Diesel Generator Monthly Load Test, performed August 16, 2009

0PT-12.2D, No. 4 Diesel Generator Monthly Load Test, performed July 20, 2009

0PT-12.2D, No. 4 Diesel Generator Monthly Load Test, performed June 21, 2009

0PT-12.2D, No. 4 Diesel Generator Monthly Load Test, performed May 25, 2009

OPT-12.2D, No. 4 Diesel Generator Monthly Load Test, performed April 26, 2009  
 OPT-12.2D, No. 4 Diesel Generator Monthly Load Test, performed April 13, 2009  
 OPT-12.2D, No. 4 Diesel Generator Monthly Load Test, performed April 10, 2009

#### Corrective Action Documents

NCR 00357866, DG4 EGB S/N 967468 tuning difficulties, September 29, 2009  
 NCR 00357054, FME identified in DG4 governor oil cooler preinstall flush, September 25, 2009  
 NCR 00357028, Findings from disassembly and inspections of DG4 components, September 25, 2009  
 NCR 00356546, Foreign material identified in spare EGB components, September 23, 2009  
 NCR 00356193, Parts quality concerns with BNP EDGs, September 21, 2009  
 NCR 00356290, 2-DG-4 EGB tuning resulted in 4 engine over-speeds, September 21, 2009  
 NCR 00357853, Purchase order FME controls, September 29, 2009  
 NCR 00357970, 0MMM-055 implementation, September 30, 2009  
 NCR 00165042, Unplanned LCO Entry – EDG 4 Locked Out and Unavailable, July 29, 2005  
 NCR 00243589, EDG 4 Lock-Out on Reverse Power, August 20, 2007  
 NCR 00330193, Unexpected Trip of EDG 4, April 10, 2009  
 NCR 00356076, EDG 4 Failure to Start Event on September 19, 2009

#### Work Orders

WO01338195-01, Inspect new DG governor cat id 73764, April 24, 2008  
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