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Gary J. Taylor
Vice President
Nuclear Operations

February 26, 1998
RC-98-0036

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Gentlemen:

Subject: VIRGIL C. SUMMER NUCLEAR STATION
DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12
LICENSEE EVENT REPORT (LER 98-002)

Attached is Licensee Event Report (LER) No. 98-002 for the Virgil C. Summer Nuclear Station. This report is submitted pursuant to the requirements of 10 CFR 21.21(a)(1).

Should you have any questions, please call Mr. Michael J. Zaccone at (803) 345-4328.

Very truly yours,

Gary J. Taylor

GJT/mjz
Attachment

c: J. L. Skolds
W. F. Conway
R. R. Mahan (w/o attachment)
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Files (818.07, 818.18)
DMS (RC-98-0036)

NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 04/30/98

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

# LICENSEE EVENT REPORT (LER)

| FACILITY NAME (1) | DOCKET NUMBER (2) | PAGE (3) |
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TITLE (4)

10 CFR Part 21 Report on failed electrical governor (EG-A) on the "A" Emergency Diesel Generator

| EVENT DATE (5) | | | LER NUMBER (6) | | | REPORT DATE (7) | | | OTHER FACILITIES INVOLVED (8) | |
|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | DAY | YEAR | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | MONTH | DAY | YEAR | FACILITY NAME | DOCKET NUMBER |
| | | | | | | | | | | 05000 |
| 01 | 09 | 98 | 98 | -- 002 -- | 0 | 02 | 26 | 98 | FACILITY NAME | DOCKET NUMBER |
| | | | | | | | | | | 05000 |

| OPERATING MODE (9) | 1 |
|---|---|
| POWER LEVEL (10) | 100 |

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

| | | | | | |
|---|---|---|---|---|---|
| 20.2201(b) | | 20.2203(a)(2)(v) | | 50.73(a)(2)(i) | 50.73(a)(2)(viii) |
| 20.2203(a)(1) | | 20.2203(a)(3)(i) | | 50.73(a)(2)(ii) | 50.73(a)(2)(x) |
| 20.2203(a)(2)(i) | | 20.2203(a)(3)(ii) | | 50.73(a)(2)(iii) | 73.71 |
| 20.2203(a)(2)(ii) | | 20.2203(a)(4) | | 50.73(a)(2)(iv) | X OTHER |
| 20.2203(a)(2)(iii) | | 50.36(c)(1) | | 50.73(a)(2)(v) | Specify in Abstract below |
| 20.2203(a)(2)(iv) | | 50.36(c)(2) | | 50.73(a)(2)(vii) | or in NRC FORM 366A |

LICENSEE CONTACT FOR THIS LER (12)

| NAME | TELEPHONE NUMBER (Include Area Code) |
|---|---|
| A. R. Rice, Manager, Nuclear Licensing & Operating Experience | (803) 345-4232 |

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

| CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO NPRDS | CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO NPRDS |
|---|---|---|---|---|---|---|---|---|---|
| X | EK | DG | C470 | Y | | | | | |
| | | | | | | | | | |

SUPPLEMENTAL REPORT EXPECTED (14)

| | YES (If yes, complete EXPECTED SUBMISSION DATE). | X | NO |
|---|---|---|---|

| EXPECTED SUBMISSION DATE | MONTH | DAY | YEAR |
|---|---|---|---|
| | | | |

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)


This notification is made pursuant to 10 CFR Part 21.

On January 9, 1998, Condition Evaluation Report (CER) 98-0038 and Non-Conformance Notice (NCN) 98-0038 reported the failure of EG-A control, serial number 1425251. Due to potential applications in the industry and the safety significance of its application as a governor control for Emergency Diesel Generators (EDGs), this failure is considered to be reportable under 10 CFR Part 21. In this case, V. C. Summer Nuclear Station ensured that adequate on site testing had been performed to the associated EG-A to verify its operable status. The vendor, Engine Systems, Incorporated (ESI), has been notified of this situation and understands that a Part 21 notification is being submitted based on their certification of the EG-A (with inadequate post-refurbishment bench testing by the vendor), that did not identify intermittent failures in electrical components (such as potentiometers and zener diodes).

A team from VCSNS procurement engineering visited the vendor's repair facility (Woodward Governor Company) in Fort Collins, CO, to evaluate their repair program. Future purchase requisitions for EG-A repair/refurbishment will include requirements for an extended burn-in period and bench testing of the EG-A control for detection of intermittent failures.

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**TEXT** *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

This notification is made pursuant to 10 CFR Part 21.

PLANT IDENTIFICATION:

Westinghouse - Pressurized Water Reactor

EQUIPMENT IDENTIFICATION:

"A" Train Emergency Diesel Generator (XEG0001A) - EIIS - EA

The defective governor component is a Woodward model EGA electrical governor.

IDENTIFICATION OF EVENT:

On January 9, 1998, Condition Evaluation Report (CER) 98-0038 and Non-Conformance Notice (NCN) 98-0038 reported the failure of EG-A control, serial number 1425251. Due to potential applications in the industry and the safety significance of its application as a governor control for Emergency Diesel Generators (EDGs), this failure is considered to be reportable under 10 CFR Part 21. In this case, V. C. Summer Nuclear Station ensured that adequate testing had been performed on site to the associated EG-A to verify its operable status. The vendor, Engine Systems, Incorporated (ESI), has been notified of this situation and understands that a Part 21 notification is being submitted based on their certification of the EG-A (with inadequate post-refurbishment bench testing by the vendor), that did not identify intermittent failures in electrical components (such as potentiometers and zener diodes).

A team from VCSNS procurement engineering visited the vendor's repair facility (Woodward Governor Company) in Fort Collins, CO, to evaluate their repair program.

EVENT DATE:

January 9, 1998

REPORT DATE:

February 26, 1998

This Licensee Event Report (LER) was initiated by Condition Evaluation Report (CER) 98-0038.

CONDITIONS PRIOR TO EVENT:

Mode 1 - Reactor Power 100%.

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**TEXT** *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

DESCRIPTION OF EVENT:

On January 9, 1998, Condition Evaluation Report (CER) 98-0038 and Non-Conformance Notice (NCN) 98-0038 reported the failure of EG-A control, serial number 1425251. Due to potential applications in the industry and the safety significance of its application as a governor control for Emergency Diesel Generators (EDGs), this failure is considered to be reportable under 10 CFR Part 21. In this case, V. C. Summer Nuclear Station ensured that adequate testing had been performed on site to the associated EG-A to verify its operable status. The vendor, Engine Systems, Incorporated (ESI), has been notified of this situation and understands that a Part 21 notification is being submitted based on their certification of the EG-A (with inadequate post-refurbishment bench testing by the vendor), that did not identify intermittent failures in electrical components (such as zener diodes).

VCSNS sent EG-A serial number 1425251 to the vendor for repair, due to intermittent spiking problems. Following vendor refurbishment and testing, VCSNS tests showed that the problem still existed. The EG-A unit was sent back to the vendor, where they again performed their required tests with satisfactory results. They next duplicated our test by monitoring the device output over a period of time to look for intermittent output problems. At this point, the vendor observed the problem and replaced two additional components.

Intermittent failures of this type can result in operation of components outside of their design basis requirements. The diesel's design basis function is to carry its associated 7.2 kV bus, without being paralleled to the off-site grid. In this configuration, EG-A control output spiking results in diesel speed (frequency) changes. Adverse affects resulting from spurious speed changes can include:

1. The ready for load permissive will not allow diesel breaker closure if the frequency is below 58.8 hertz. (Ref. DG DBD section 3.9.4)
2. Plant ESF motors are not required by design, to accelerate equipment to rated speed if the frequency is more than 5% below rated (i.e. 57 hertz). (Ref. FSAR section 8.3.1.1.4.2)
3. When ESF sequencer load blocks are loaded on the diesel, frequency is required to remain above 55.5 hertz. (Ref. FSAR section 8.3.1.1.2.4)
4. When ESF sequencer load blocks are loaded on the diesel, frequency is required to return to within 2% of 60 hertz within 2 seconds. (Ref. FSAR section 8.3.1.1.2.4)
5. Motor speeds vary in direct proportion to engine frequency; and systems with centrifugal pumps experience flow changes in direct proportion to speed changes. Therefore, frequency dips could decrease system flows below their design requirements.
6. The diesel generator, step-down transformers, and motors could exceed their design volts/hertz limits. As frequency drops, the voltage regulator tends to maintain voltage, so the volts per hertz ratio increases. If this ratio gets above the flux saturation limit for the iron in the device, excessive heating and premature failure can occur.

The EG-A spikes and erratic changes varied in magnitude and duration. Therefore, it is very hard to put a bound on the lower limit of possible frequency dips. Increases in frequency would be bounded by the mechanical governor speed setting.

This programmatic repair/testing deficiency creates the potential for common mode failures and operation outside of the plant design basis. Therefore, based on the above affects, a substantial safety hazard could be introduced.

A team from VCSNS procurement engineering visited the vendor's repair facility (Woodward Governor Company) in Fort Collins, CO, to evaluate their repair program. It was determined that inadequate post-refurbishment bench testing by the vendor was being conducted. Future purchase requisitions for EG-A repair/refurbishment will include requirements for an extended burn-in period and bench testing of the EG-A control for detection of intermittent failures.

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**TEXT** *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

CAUSE OF EVENT:

The cause of the "A" EDG frequency oscillations was inadequate post-refurbishment bench testing by the vendor, that did not identify intermittent failures in electrical components (such as potentiometers and zener diodes). Follow-up testing by the governor manufacturer showed the EG-A unit was unstable. Additional vendor evaluation is ongoing to include possible enhancements to their test program. Future SCE&G purchase requisitions for diesel generator EG-A repair/refurbishment will include requirements for an extended burn-in period and bench testing of the EG-A control for detection of intermittent failures.

ANALYSIS OF EVENT:

A team from VCSNS procurement engineering visited the vendor's repair faciiity (Woodward Governor Company) in Fort Collins, CO, to evaluate their repair program. The cause of the "A" EDG frequency oscillations was inadequate post-refurbishment bench testing by the vendor, that did not identify intermittent failures in electrical components (such as potentiometers and zener diodes). Future SCE&G purchase requisitions for EG-A repair/refurbishment will include requirements for an extended burn-in period and bench testing of the EG-A control for detection of intermittent failures.

There are no adverse consequences for the event. The defective EG-A was discovered by on site bench testing which was confirmed at the vendor's facility. The replacement EG-A was satisfactorily tested prior to installation on "A" EDG.

IMMEDIATE CORRECTIVE ACTIONS:

- The vendor, Engine Systems, Incorporated (ESI), was notified of this situation and understands that a Part 21 notification has been made.
- Vendor satisfactorily repaired and tested the associated EG-A.

ADDITIONAL CORRECTIVE ACTIONS:

- Future purchase requisitions for EG-A repair/refurbishment will include requirements for an extended burn-in period and bench testing of the EG-A control for detection of intermittent failures.
- SCE&G is continuing to monitor vendor evaluation of this event. Any additional recommended corrective actions by the vendor will be reviewed for applicability to the V. C. Summer Nuclear Station.

PRIOR OCCURRENCES:

None.