



444 South 16th Street Mall  
Omaha NE 68102-2247

August 28, 2003  
LIC-03-0114

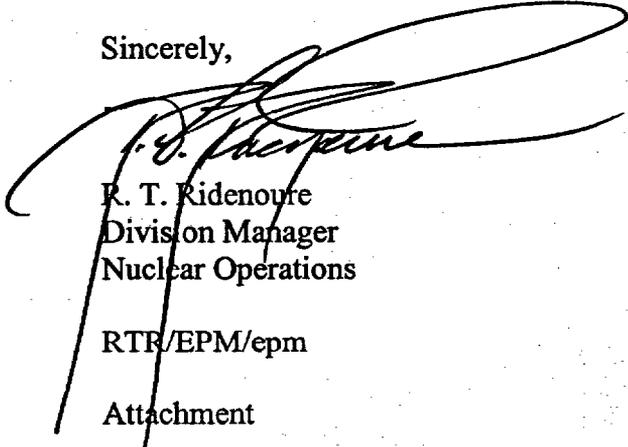
U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555-0001

Reference: Docket No. 50-285

**Subject: Licensee Event Report 2003-002 Revision 0 for the Fort Calhoun Station**

Please find attached Licensee Event Report 2003-002, Revision 0, dated August 28, 2003. This report is being submitted pursuant to 10 CFR 50.73(a)(2)(i)(B).

Sincerely,



R. T. Ridenoure  
Division Manager  
Nuclear Operations

RTR/EPM/epm

Attachment

c: T. P. Gwynn, Acting NRC Regional Administrator, Region IV  
A. B. Wang, NRC Project Manager  
J. G. Kramer, NRC Senior Resident Inspector  
INPO Records Center

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Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

**LICENSEE EVENT REPORT (LER)**

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME Fort Calhoun Nuclear Station Unit Number 1		2. DOCKET NUMBER 05000285	3. PAGE 1 OF 4	
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4. TITLE  
Inadequate Testing of Diesel Generators Due to Air Start Systems Unique Design

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
07	07	2003	2003	002	0	08	28	2003		05000
									FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE 1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)			
	20.2201(b)	20.2203(a)(3)(ii)	50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)
10. POWER LEVEL 100	20.2201(d)	20.2203(a)(4)	50.73(a)(2)(iii)	50.73(a)(2)(x)
	20.2203(a)(1)	50.36(c)(1)(i)(A)	50.73(a)(2)(iv)(A)	73.71(a)(4)
	20.2203(a)(2)(i)	50.36(c)(1)(ii)(A)	50.73(a)(2)(v)(A)	73.71(a)(5)
	20.2203(a)(2)(ii)	50.36(c)(2)	50.73(a)(2)(v)(B)	OTHER
	20.2203(a)(2)(iii)	50.46(a)(3)(ii)	50.73(a)(2)(v)(C)	Specify in Abstract below or in NRC Form 366A
	20.2203(a)(2)(iv)	50.73(a)(2)(i)(A)	50.73(a)(2)(v)(D)	
	20.2203(a)(2)(v)	X 50.73(a)(2)(i)(B)	50.73(a)(2)(vii)	
	20.2203(a)(2)(vi)	50.73(a)(2)(i)(C)	50.73(a)(2)(viii)(A)	
	20.2203(a)(3)(i)	50.73(a)(2)(ii)(A)	50.73(a)(2)(viii)(B)	

12. LICENSEE CONTACT FOR THIS LER

NAME Erick Matzke	TELEPHONE NUMBER (Include Area Code) (402) 533-6855
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13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED		15. EXPECTED SUBMISSION DATE		MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).	X NO					

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

On June 10, 2003 NRC Resident Inspectors discussed diesel generator (DG) surveillance testing with the DG system engineer. A Condition Report (CR) was generated as a result of that discussion. On June 11, 2003, the NRC notified the Nuclear Licensing Department that they believed there was a concern with surveillance testing of the DGs at Fort Calhoun Station (FCS). Another CR was generated to investigate the concern. On July 7, 2003, the NRC informed FCS that, following review of this item, the NRC believed FCS to be in violation of technical specification (TS) 3.0.5 (missed surveillance TS). An additional CR was generated as a result of the last discussion. FCS entered TS 3.0.5 and completed the required actions. On July 7, 2003, a review of the reportability of this event was completed and it was determined to be reportable.

The root cause analysis determined that this is a historical issue, and that the DGs have been tested in much the same manner for the life of the plant. Therefore, it is not possible to determine the root cause of this inadequate test of the DGs.

The DGs were tested in accordance with the 184 day frequency "full start" TS requirement on July 7, 2003. The surveillance tests have been modified to ensure that all monthly testing is performed on the primary air start system. The operability guidance for the DGs has also been modified to credit only the primary air start system for operability of the DGs.

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

**BACKGROUND**

The Fort Calhoun Station (FCS) diesel generators (DGs) are designed to furnish reliable in-plant AC power adequate for safe plant shutdown and for operation of Engineered Safeguards, when no energy is available from the off-site systems. For adequate reliability two units, designated diesel generator 1 (DG-1) and diesel generator 2 (DG-2), are provided. One unit is connected to each of the two separate 4.16-kV systems between which Engineered Safeguards and other essential auxiliaries are divided. The division of loads is such that operation of either system alone provides minimum Engineered Safeguards required for the Design Basis Accident. The two DGs are similar in design and characteristics. Each unit is complete with all auxiliaries necessary for operation and for ensuring quick starts. No auxiliaries are shared, and no energy source external to the units, other than DC control power, is required for starting or subsequent operation.

The DGs are started with stored pressurized air. Each DG is provided with duplicate systems, both driven by electric motors and a diesel driven emergency compressor which is capable of charging either the primary or secondary receivers. The primary and secondary air receivers are normally supplied by plant instrument air which is maintained in the range of 200 to 240 psig by booster compressors. The emergency compressor uses ambient air in the event that power or the instrument air header is not available. Each of the DG starting air systems has capacity for five starts. One pair of air-start motors (upper and lower) is located on each side of the generator end of the engine, below the deck plates. The respective starting air valve and its relay valve are immediately upstream of the air-start motors.

Other auxiliaries that are duplicated for each unit include the fuel oil systems between the day tank and engine fuel line, and fuel transfer pumps.

The DG engine control subsystem provides a start signal to the air-start solenoid valve for the primary air-start bank. Two air-start banks form a redundant system for starting the DG engine. The engine control subsystem will automatically actuate the secondary air-start bank if the primary air-start bank fails to function properly.

Technical Specification (TS) 3.7(1) states, in part:

- a. Each diesel engine shall be started at least once per 31 days on a staggered basis. The engine shall be run with all protective devices operable. The test shall verify that:
  - i. The diesel starts and accelerates to idle speed. Following a warm-up period as recommended by the manufacturer, the diesel generator will be accelerated to rated speed and voltage.

However, at least once per 184 days in these surveillance tests, the diesel generator shall demonstrate that it can be started and accelerated to rated speed and voltage in less than or equal to 10 seconds without a prior warm-up.

The signal initiated to start the diesel shall be varied from one test to another to verify all manual and auto start circuits.(1)

Technical Specification (TS) 3.0.5 states:

If it is discovered that a Surveillance was not performed within its specified surveillance interval, then compliance with the requirement to declare the OPERABILITY requirements for the Limiting Condition for Operation not met may be delayed, from the time of discovery, up to 24 hours or up to the limit of the specified surveillance interval, whichever is greater. This delay period is permitted to allow performance of the Surveillance. A risk evaluation shall be performed for any Surveillance delayed greater than 24 hours and the risk impact shall be managed.

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

**FCS Test Practices:**

The testing practice at FCS is to perform "idle speed starts" utilizing different starting signals each month. In addition to the alternating use of starting signals, FCS also tests the primary and secondary starting air systems on an alternating basis, utilizing the primary air start system one month and the secondary air start system the next month. (NRC contends that this practice is not allowed by FCS plant TS.) The semi-annual full speed starts are also performed utilizing primary starting air for one of the tests and secondary starting air for the next test in an alternating fashion. During the full speed testing of the secondary air start system a DC circuit breaker is placed in the open position in order to simulate a condition where the secondary air start system would be the only operable air start system, such as during maintenance on the primary air start system.

DG testing is performed using OP-ST-DG-0001 for DG-1 and OP-ST-DG-0002 for DG-2. There are eight attachments to these two procedures, each of which performs an engine start followed by a one hour loaded engine run. The starting signals in the eight attachments vary from local starting pushbuttons, control room pushbuttons, and test switches. Two of the attachments perform the full speed starts, one using primary starting air and the other using secondary starting air.

**EVENT DESCRIPTION**

On June 10, 2003, NRC Resident Inspectors discussed diesel generator surveillance testing with the DG system engineer. Condition Report (CR) 200302189 was generated as a result of that discussion. On June 11, 2003, the NRC notified the Nuclear Licensing Department that they believed there was a concern with surveillance testing of the DGs at FCS. Condition Report 200302206 was generated to investigate the concern. On July 7, 2003, the NRC informed FCS that following review of this item, the NRC believed FCS to be in violation of TS 3.0.5 (missed surveillance TS). CR 200302557 was generated as a result of the last discussion.

To alleviate any immediate operability concerns, FCS entered TS 3.0.5 and performed the required surveillance test within 24 hours, completing the required actions.

The current surveillance test (OP-ST-DG-0001/0002) requires that the DG be started on the primary air start system on one test and the secondary air start system on the next test. Following either test the system is returned to its normal lineup with the primary air starting motor being the final position of the Starting Motor Selector Switch (SMSS). Alternating the air start systems is done to ensure that either of the air start systems can successfully start the DG, while minimizing the number of starts to the DG. In addition, the 184 day test to ensure that the DG will start within 10 seconds is also done with the primary on one test and the secondary on the next. The 2 second time delay is disabled whenever the secondary air start system is credited for operability, and also when the DG test is performed using the secondary air start system.

Disabling this feature to demonstrate that a DG may be started within 10 seconds and then returning the DG to the normal configuration with the primary air start in service has been determined to not be an adequate implementation of the TS required 184 day surveillance test.

On July 7, 2003, a review of the reportability of this event was completed. This is being reported pursuant to 10 CFR 50.73(a)(2)(i)(B).

On August 12, 2003 a conference call was conducted between members of FCS staff and NRC Technical Specification branch of NRR. FCS personnel initiated the conference call to seek clarification on the use of the secondary air start system to meet the requirements of TS 3.7. Following a discussion of the design of the DG air start system and the method that FCS had been using to accomplish the monthly and semi annual DG testing, the NRR personnel determined that it would be satisfactory to use either the primary or secondary air start systems to perform the monthly test of the DG, however, the semiannual test would have to be performed using the primary air start system.

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

**SAFETY SIGNIFICANCE**

Failure to perform testing at the required interval would not directly cause a failure of the DG. While failure to test the DG at the required interval may increase the possibility that a failure would be detected, it would not cause a failure. The failure of a diesel to start has been anticipated and is analyzed in the plant's safety analysis. The failure of the diesel's air start system is only one of several mechanisms that could result in a failure of the diesel to start in the required time. Since the failure of a diesel is anticipated in the analysis and accounted for in the design of the plant, this issue has a negligible impact on the health and safety of the public.

**CONCLUSION**

In completing the root cause analysis, it was determined that this is a historical issue, and that the DGs have been tested in much the same manner for the life of the plant. The practice of testing each of the air start systems in the current manner has been in place since at least 1973. The individuals that made the decision to test the DGs in this manner cannot be identified and interviewed. Therefore, it is not possible to determine the root cause of this inadequate test of the DGs.

While the root cause of this problem cannot be determined with any certainty, it is assumed that the designers of the test were trying to ensure the highest reliability of the DGs without starting the machines more than necessary.

In the 1980's the NRC recognized that cold starting DGs reduced the reliability of the units and contributed to increased maintenance of the DGs. This understanding resulted in Generic Letter (GL) 84-15 being issued by the NRC. TS 3.7.1 was revised to reduce the number of cold starts on the DGs from monthly to semi-annually (184 days) along with other measures to improve DG reliability. These actions probably reinforced the understanding that the number of starts (cold or otherwise) of the DG should be minimized.

NRC inspectors have been present and performed inspections that included the DG surveillances since 1973. This reinforced plant staff's confidence that the testing, as designed, in the early 1970's was acceptable.

**CORRECTIVE ACTIONS**

The DGs were tested in accordance with the 184 day frequency "full start" TS requirement on July 7, 2003.

OP-ST-DG-0001 and OP-ST-DG-0002 have been modified to ensure that all monthly testing is performed on the primary air start system. The operability guidance for the DGs has also been modified to only credit the primary air start system for operability of the DGs.

Other corrective actions will be completed in accordance with the plants corrective action system.

**SAFETY SYSTEM FUNCTIONAL FAILURE**

This event did not result in a safety system functional failure in accordance with NEI 99-02.

**PREVIOUS SIMILAR EVENTS**

FCS has not had any previous similar events.