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James J. Fisicaro
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March 14, 1996

U.S. Nuclear Regulatory Commission
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Washington, D.C. 20555

Subject: River Bend Station - Unit 1
Docket No. 50-458
License No. NPF-47
Licensee Event Report 50-458/96-009-00
File Nos. G9.5, G9.25.1.3

RBG-42620
RBF1-96-0071

Gentlemen:

In accordance with 10CFR50.73, enclosed is the subject report.

Sincerely,

James J Fisicaro

JJF/WJF/kvm
enclosure

cc: U. S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011

NRC Sr. Resident Inspector
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St. Francisville, LA 70775

INPO Records Center
700 Galleria Parkway
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Louisiana Department of Environmental Quality
Radiation Protection Division
P.O. Box 82135
Baton Rouge, LA 70884-2135
ATTN: Administrator

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)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
River Bend Station	05000-458	1 of 6

TITLE (4) **Diesel Generator Overspeed Trip Due to Field Flash Relay Failure**

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
									N/A	05000
02	14	96	96	-- 009 --	00	03	14	96	FACILITY NAME	DOCKET NUMBER
									N/A	05000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
POWER LEVEL (10)	059	20.2201(b)	20.2203(a)(2)(v)	X 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 or in NRC Form 366A
		20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
D. N. Lorfing, Supervisor - Licensing	504-381-4157

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
F	EGA	GENERA	C634	YES						

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

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

On February 14, 1996, while attempting to perform a Division II Diesel Generator operability surveillance test, the diesel started and accelerated through the running speed and continued until the overspeed trip speed was reached. The diesel generator responded to the overspeed condition per design and a normal shutdown occurred. This noncompliance is reportable pursuant to 10CFR50.73(a)(2)(i)(B). In addition, the report fulfills the requirements of Technical Specification 5.6.9.1 as a diesel generator Special Report.

Subsequent troubleshooting revealed that the field flash relay had failed resulting in the diesel generator receiving no field flash on the start attempt. The first root cause was determined to be an engineering assumption for the maximum temperature reached during an excitation cabinet overheating event which resulted in less-than-adequate corrective actions. The second root cause was technical errors in the surveillance procedures which resulted in both a latch and reset signal to the K-1 relay simultaneously. Contributing factors included less-than-adequate technical reviews of design analysis/change implementation and untimely completion of a previous corrective action. In addition, this event was complicated by the overspeed trip that resulted from less-than-adequate guidance on setting the diesel's mechanical governor. Corrective actions include an in-depth evaluation of maximum temperatures reached in the excitation cabinet during the January 29th event, immediate and scheduled parts replacements, readjustment of the mechanical speed governor, procedure revisions, and training on lessons learned from this event. This event was of minimum safety significance.

REPORTED CONDITION

On February 14, 1996, with the plant in mode 1 at 59% power, it was discovered during the performance of a surveillance test, that the Division II diesel generator was inoperable due to a failed field flash relay circuit. Upon test initiation, the diesel started and accelerated through the running speed of 450 revolutions per minute (rpm) and continued until the overspeed trip of 517 rpm was reached. The diesel generator responded to the overspeed condition per design and a normal shutdown occurred. This noncompliance is reportable pursuant to 10CFR50.73(a)(2)(i)(B) as a condition prohibited by River Bend Technical Specification 3.8.1.2. In addition, the report fulfills the requirements of Technical Specification 5.6.9.1 as a diesel generator Special Report.

INVESTIGATION

At 0845 on February 14, 1996, the Division II Diesel Generator was being tested per surveillance test procedure (STP)-309-0202. During the start attempt for this test, the diesel generator started and accelerated through the running speed of 450 rpm and continued until the overspeed trip speed of 517 rpm was reached. The diesel generator responded to the overspeed condition per design and a normal shutdown occurred.

A multi-discipline team was established to determine the cause of the start failure and the root cause. Initial data indicated that the most probable cause of the start failure and overspeed trip was that the diesel generator voltage was slow to build up. This lead initial investigation to the exciter cabinet, particularly the field flash relay and associated circuitry.

Related events leading up to the Division II Diesel Generator field flash relay failure include repeated failures of the excitation circuitry K-1 relay, investigation and identification of root cause, and the overheating of the Division II excitation cabinet which took place on January 29, 1996. Past K-1 relay failures included three during refueling outage #6 (RF-6), which was completed on February 1996. The three K-1 relay failures during RF-6 include one on the Division I Diesel Generator and two ne Division II Diesel Generator. Review of the K-1 relay failures identified two surveillance test procedures which energized both the latch and reset coils of the K-1 relay at the same time. This review also identified a recent modification which installed a K-1 relay status light, as passing enough current to maintain the field flash relay picked-up and the field excitation circuitry energized.

By design, the Division I and II Diesel Generator field flash is provided for about 1 to 4 seconds during a diesel start to provide a fast voltage build up. Normally about 7 to 8 seconds are required to attain stable rated voltage. With no field flash, the generator will build up voltage at a slower rate due to residual magnetism. Therefore, a diesel generator experiencing a field flash relay failure will still attain rated voltage and frequency and is expected to be capable of accepting load, but not within technical specification time limits. The time required for the diesel generator to attain rated voltage is a function of time since the last diesel generator operation and the level of residual magnetism.

Subsequent to the overheating event, the Division II Diesel Generator had four successful starts - one on January 31, 1996, for the 24 hour surveillance run and three on February 4, 1996, as part of the Division II Emergency Core Cooling System surveillance testing. No potential or actual indication of system trouble was observed during the four subsequent starts.

The electrical governor is the primary engine speed control and the mechanical governor is a backup. The mechanical governor is set at a higher rpm than the electrical governor to prevent the mechanical governor from competing with the electric governor. During post-maintenance testing on January 27, 1996, the Division II Diesel Generator mechanical and electrical governors were adjusted. Initial adjustments set the mechanical governor to control engine speed at 470 rpm and the electrical governor to control speed at 450 rpm. Later in the testing procedure, after the engine was started and loaded, it was evident that the electrical and mechanical governors were conflicting with one another. After conferring with the vendor and at the direction of the System Engineer, the mechanical governor setting was changed to 480 rpm. This change eliminated the conflict between the two governors. However, during the event of February 14, 1996, the mechanical governor did not respond quickly enough to prevent the overspeed condition. The overspeed trip device is separate from the governors and is set at 517$\pm$3 rpm. The overspeed trip is not bypassed during an emergency or normal start of the diesel generator.

Investigation of this start failure revealed that the field flash relay had failed. The relay pickup was observed to be slow and only one of four sets of contacts would close. All four contacts must close in order for the field flash to be applied to the generator field. The failure of the field flashing circuit resulted in a slower than normal buildup of generator voltage which reduced the time available for the electrical governor to establish control of the diesel generator speed. The mechanical governor was observed to respond quickly during the overspeed event, immediately cutting the fuel to zero as the engine reached its 480 rpm control setting. However, it takes a short time for the engine's 100 rpm per second acceleration rate to decay. The momentum of the rotating flywheel and generator causes the speed to briefly overshoot the governor setting then decrease to where the governor resumes control. The mechanical governor speed setting at 480 rpm was high enough so that the mechanical governor could not keep the overshoot speed low enough to prevent the overspeed trip.

After troubleshooting, the only component observed to have failed was the field flash relay. The field flash relay was replaced. The mechanical governor speed setting was successfully reduced to 472 rpm after the field flash relay was replaced and the diesel generator was declared operable the evening of February 14, 1996. The K-1 relay which had previously failed to electrically reset was also replaced.

The field flash relay which had been removed was sent to an off-site independent consultant to determine its failure mode. The result was that failure was due to internal distortion of the molded plastic case of the relay which caused misalignment of the contacts. The contacts, being misaligned, created a high resistive current

path and overheated to the point of melting. The evaluation further concluded that the relay case distortion was the result of the relay being exposed to a high heat environment and not one of a manufacturing defect.

An in-depth evaluation was performed of other components located in close proximity to the field flash resistor, which might have been subjected to higher temperatures during the January 29th event. These components included the remote gate firing module, the voltage relays, the rectifier assembly, the voltage regulator, surge arrestor, and the excitation panel wiring. These components were either accepted or scheduled for replacement in accordance with the River Bend corrective action program.

The investigation also identified a previous condition report which was initiated on June 3, 1994, to document a failure of the K-1 relay on the Division I Diesel Generator. This failure occurred during a post maintenance run of the engine when the generator had failed to build voltage. A causal factor was identified in that the possibility existed that one or more loop calibration procedures could place the circuitry in a configuration which energized both the latch and reset coils of the K-1 relay at the same time. During an audit in March, 1995, quality assurance identified that the condition report was closed prior to corrective action items being assigned to address the issue. A revision to the original condition report was then initiated to impose additional corrective action items. One of the corrective actions required the System Engineer to review and correct the Instrumentation and Controls (I&C) preventive maintenance tasks which could cause both the latch and reset coils of the K-1 relay to both be energized at the same time. This corrective action item had an original due date of June 15, 1995, but had been extended four times and remains an open item. While this corrective action did not identify STPs as a target for investigation, its completion would have provided another opportunity to identify and correct the associated STPs.

A similar overheating event occurred in the Division I Diesel Generator excitation cabinet in October, 1984. During this event, the field flash resistor was energized for greater than 30 minutes. The evaluation and inspection results contained vendor recommendations to replace several components, including the field flash resistors. However, the components were not replaced until the June - July, 1985, time frame, seven to eight months after the overheating event occurred. During the time period between the overheating event and the replacement of the components, the diesel was started 35 consecutive times with no failures.

ROOT CAUSE

Two root causes were identified for this event. The first was an engineering assumption made for the maximum temperature reached in the cabinet. As a result, operation of the field flash relay above design maximum was not recognized, the field checks were narrowly focused on the field flash resistor with heat effects on other devices in the panel not adequately examined and corrective actions were less-than-adequate. The second root cause was errors in the surveillance procedure. The surveillance procedure had inadequate precautions in that it is a reasonable precaution to open the field flash breaker to prevent generator and associated equipment damage when providing a start signal to a EDG that has had its start inhibited. This was not included in the procedure. The surveillance procedure also had technical errors

in that it provided both a latch and reset signal to the K1 relay simultaneously. A relay subject to this condition is expected to fail. The lockout operability STP places the K1 relay in a condition where both the latch and reset coils are simultaneously energized. This results in chattering of the relay until the reset coil fails.

Two contributing causes were identified. The first was less-than-adequate technical reviews of design analysis/change implementation for the modification which installed the 'field flash ready' indicating light in the circuit. With this light installed in the circuit, coupled with the K-1 relay latch coil being disabled for the surveillance test, the field flash relay was picked up for an extended period of time, causing the overheating of the excitation panel on January 29th. The second contributing cause was the untimely completion of the condition report corrective action which had an original due date of June 12, 1995. In addition, this event was complicated by the overspeed trip that resulted from the less-than-adequate guidance on setting the diesel's mechanical governor. The lack of guidance allowed the mechanical governor to be set at 480 rpm as a response to the conflict between the mechanical governor and the electrical governor. Having the mechanical governor set at 480 rpm allowed the diesel enough momentum to reach the overspeed trip point of 517 rpm before the mechanical governor could gain control of the diesel's speed.

CORRECTIVE ACTIONS

The failed field flash relay was replaced, the K-1 relays for both the Division I and Division II diesels were changed out and the mechanical governor speed setting on the Division II diesel was readjusted. An in-depth evaluation was also performed on the effects of maximum temperature in the cabinet during the January 29th event. Component replacement recommendations were provided and will be tracked per the River Bend corrective action program.

A detailed review of surveillance procedures and preventive maintenance tasks associated with the diesel generator control circuitry will be conducted to identify conditions which may simultaneously energize both the latch and reset coils. Procedures will be revised as necessary to correct identified deficiencies. The field flash ready light will be changed out to one that has a higher resistive value and engineering will receive "case study" training on this event to highlight lessons learned. Also, the process of granting corrective action extensions will be reviewed for possible improvements.

SAFETY ASSESSMENT

Section 8.3.1.2.1.2 (7) of the RBS USAR states: "The AC diesel generator system is designed so that with loss of any one of three diesel generators the remaining generators are capable of supplying power to sufficient equipment for a safe shutdown of the unit under normal or accident conditions." Since the other two diesel generators were available, this event was of minimum safety significance.

Additional Information

Length of time diesel generator was out-of-service: 10.1 hours

Current surveillance intervals:

Division I : monthly

Division II : monthly

Division III: monthly

Test intervals conform to Technical Specifications?: Yes

Failures for division I:

1 valid failure in the last 25 valid tests

2 valid failures in the last 100 valid tests

Failures for division II:

3 valid failure in the last 25 valid tests

4 valid failure in the last 100 valid tests

Failures for division III:

0 valid failures in the last 25 valid tests

0 valid failures in the last 100 valid tests

Cumulative failures for all River Bend Station diesel generators:

4 valid failures in the last 100 valid tests