ENTERGY

Entergy Operations, Inc.
River Bend Station
P.O. Box 220
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January 18, 1994
RBG- 39922
File Nos. G9.5, G9.25.1.3

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

SUBJECT: River Bend Station - Unit 1
Docket No. 50-458
License No. NPF-47
Licensee Event Report 50-458/93-024-01

Gentlemen:

In accordance with 10CFR50.73(a)(2)(iv), enclosed is the subject supplemental report concerning a reactor scram due to the failure of relay contacts to open during turbine testing.

Very truly yours,

James J Fisicaro

James. J. Fisicaro
Manager - Safety Assessment
and Quality Verification
River Bend Nuclear Group

Enclosure

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NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 5/31/95

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), 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	05000458	1 OF 7

TITLE (4) Reactor Scram During Turbine Testing due to Failure of Relay Contacts to Open

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
10	14	93	93	-- 024 --	01	01	18	94	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	1
POWER LEVEL (10)	95

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

20.402(b)	20.405(c)	X 50.73(a)(2)(iv)		73.71(b)
20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)		73.71(c)
20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)		OTHER
20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)		(Specify in Abstract below and in Text, NRC Form 366A)
20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)		
20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
DAVID N. LORFING, SUPERVISOR - NUCLEAR 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

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 October 14, 1993, at 0842, with the plant at 95 percent power (Operational Condition 1) for the performance of routine turbine testing, a turbine trip and reactor scram occurred due to the failure of relay contacts to open per design. This report is submitted pursuant to 10CFR50.73(a)(2)(iv), as an automatic actuation of an engineered safety feature (ESF).

Entergy has concluded that this event was caused by the failure of the K15-1 relay contacts to open. During troubleshooting, the failure of the K15 relay could not be recreated. Following troubleshooting, the K15 relay was replaced and successfully tested. The plant was safely brought to the Hot Shutdown condition. The relay was subsequently tested in the relay shop and all test results were satisfactory. The failure mode could not be identified.

REPORTED CONDITION

On October 14, 1993, at 0842, with the plant at 95 percent power (Operational Condition 1) for the performance of routine turbine (*TRB*) testing, a turbine trip and reactor (*RCT*) scram occurred due to the failure of relay contacts to open per design. This report is submitted pursuant to 10CFR50.73(a)(2)(iv), as an automatic actuation of an engineered safety feature (ESF).

INVESTIGATION

The turbine trip and reactor scram occurred while operations personnel were performing the upper thrust bearing wear detector test as a part of routine turbine testing. During this test, the operator correctly pushed the "Test Upper" pushbutton. The reactor scram signal was generated due to the fast closure of the main turbine control valves (*PCV*) with reactor power greater than 40 percent. The only condition that could allow the turbine trip to occur during this test is a failure of the contacts of the K15 relay (*3*) to open during the test.

The investigation and troubleshooting that followed to determine the cause of the relay failure were inconclusive. The K15 relay was replaced and successfully tested several times.

With the exception of the "A" reactor recirculation system flow control valve (*FCV*), which did not "runback" to reduce flow, all systems functioned as designed during this transient. The failure of the "A" flow control valve to "runback" was due to a mispositioned valve on the hydraulic power unit (HPU). This did not affect the safe shutdown of the plant. The valve is located on the front panel of a skid located adjacent to a walkway, and thus, could have been inadvertently moved.

Testing of the the relay in the relay shop included testing for proper pickup and dropout voltage, correct operation of the normally closed and normally open contacts, resistance of contacts, and pickup and dropout at low voltages. The results of each of these tests were satisfactory. There is no indication of the failure mode of the relay.

A similar event which occurred in 1989 is described in LER 89-008. In this event, a turbine trip and reactor scram occurred during testing of the thrust bearing wear detector. As a result of this transient, a modification (MR 89-0046) was implemented which added a "Turbine Trip Bypass" switch to be used during turbine testing to temporarily bypass turbine trips which may be inadvertently caused by spurious relay actuations. Following review of recommendations by the Nuclear Safety Assessment Group in a 1991 Special Analysis, System Engineering personnel recommended that Operations cease the use of the bypass switch. The NSAG report had revealed that the bypass switch was not capable of bypassing the "Close Valves" signal which would be generated due to a spurious turbine trip signal.

Even though the bypass switch bypassed the turbine trip function, a reactor scram would still occur due to the closure of the turbine stop valves or turbine control valves when the "Close Valves" signal would be generated. Thus, if the bypass switch had been used, it would not have prevented this event. This represents a missed opportunity to properly implement corrective actions for the event documented in LER 89-008.

The investigation of the adequacy of the corrective actions for LER 89-008 has revealed that the modification specified was inadequate to prevent recurrence. This modification focused on preventing the trip signal. The assumptions used in the development of this modification carried over to the post-modification testing. The testing only demonstrated that the trip signal did not cause the trip solenoids to actuate. Bypassing the "Close Valves" signal was not tested. In addition, three additional issues have been identified which could have acted as barriers to prevent recurrence of this event, as follows:

- The Special Analysis by NSAG in 1991 included a recommendation to eliminate use of the bypass switch or modify the switch. NSAG reports typically provide detailed recommendations for corrective actions. It has been NSAG practice to allow some latitude in its recommendations to permit effective alternatives, when possible. The portion of the recommendation which suggested elimination of the bypass switch was written for two reasons. First, the bypass switch design was ineffective, in that the "close valves" signal was not bypassed, and a turbine trip could still occur during testing if the same relay failed. Second, if the switch was inadvertently left in bypass, some protective trips would be bypassed, reducing protection of the turbine without a compensating increase in security against inadvertent trips during testing. NSAG recommended that the bypass switch be modified so it would work properly. The recommendation was worded so that this option would be used if no other equally effective option was available, such as increasing relay reliability to assure reliable bypass. In this case, there was no alternative that provided equivalent protection, so the recommendation from NSAG was ambiguous.

- The two remaining issues concerned the identification of a commitment from LER 89-008 and the commitment review during the revision of the turbine test procedure. In revising the turbine test procedure, Operations personnel relied on a memorandum from System Engineering which recommended that use of the bypass switch be discontinued due to the

"Close Valves" signal that is generated to backup the main turbine trip signal. Therefore, Operations personnel had an engineering justification to stop using the trip bypass switch that was indicated in the commitment tracking database as having been installed. While the commitment implied that the bypass switch needed to be used, it would not have been obvious during the review of the commitment that the issue needed to be re-opened to assure adequate corrective actions, due to the engineering justification. In addition, the commitment identified from LER 89-008 did not include an adjacent statement which required the switch to be utilized during weekly turbine testing. As stated in the corrective action section, Entergy is reviewing a sampling of LER commitments for adequacy of commitment identification and verification of commitment completion.

ROOT CAUSE

Entergy has concluded that this event was caused by the failure of the K15-1 contacts to open, since this is the only possible failure mode. During troubleshooting, the failure of the K15 relay could not be recreated. Subsequent testing of the relays has not revealed the failure mode.

Inadequate corrective actions to address the scram documented in LER 89-008 included the failure of MR 89-046 to prevent recurrence. An HPES evaluation has been performed on the development of MR 89-046. The results of this review has revealed that the design engineer missed a circuit path identified on the drawings, which could cause a turbine trip. Causal factors identified are:

1) The appropriate level of work organization/planning was not applied, since an insufficient number of trained or experienced workers were assigned to the task, placing the entire design planning and workload on one individual.

2) The design engineer had not received specific training on that system.

3) The design drawings are difficult for unfamiliar users to interpret due to poor quality, formatting and multiple sheet cross-referencing and branching of the information presented.

4) Inattention to detail, since the design engineer and the independent reviewer failed to identify the correct circuit path.

5) Supervisory methods, since the design engineer's supervision was directly involved in the MR development.

Contributing factors to the inadequate corrective actions to address the previous scram were the ambiguity in the NSAG recommendation and documentation of relevant commitments from LER 89-008.

CORRECTIVE ACTION

The K15 relay was replaced and successfully tested. In addition, a modification of the "Turbine Trips Bypass" switch was implemented which assures that the "Close Valves" signal is also blocked when the switch is in the bypass position. This change effectively inhibits any undesired turbine control system response due to spurious signals which could be generated during turbine trip system testing. The post-modification testing tested the tripping signal and the effect of the bypass switch by ensuring that the electronic signal was blocked as well as verifying that the valves did not close when a trip signal was present and the switch was in bypass. All operations personnel were notified of this modification via Night Orders.

The procedure used for routine turbine testing has been revised to require placement of the "Turbine Trips Bypass" switch in bypass during turbine testing.

All NSAG engineers have been briefed concerning the importance of using clear and unambiguous language in recommendations.

Actions that address the inadequacies in MR 89-046 include the following:

- Following the installation of MR 89-046, specific training was provided to four engineers in Plant Engineering on the electro-hydraulic control system.

- To simplify the drawings for the EHC system the training instructor bound and arranged them in sequential order, and identified each by function (i.e., flow, pressure, etc.) and presented this learing aid in the training course to make it easier for the trainees to understand the sequence of signals. In addition, a binder with descriptions of each of the circuit boards and their component structure and function was prepared and furnished to each trainee. These drawings are used as a tool by the trained engineers to understand the relationship of the EHC circuits. The existing "official work documents" will be arranged in the same manner (sequential order, identified by function). This rearrangement will be completed by November 1, 1994.

Training concerning the specific requirements of the independent review process has been provided for those engineers qualified to perform independent reviews of modifications.

Modification process improvements were implemented in 1991, after the development of MR 89-046. Changes to the River Bend Station design and modification request control plan as described in Engineering procedure, ENG 3-006, require (1) a cross-disciplinary design requirements and objective summary meeting to provide a modification conceptual review, prior to proceeding with the detailed design, and (2) a cross-disciplinary post-design review and adverse impact meeting to assess the potential for adverse impacts and to assure that the design implements requirements and reflects the original intent of the change.

Engineering Department management is adopting an approach to improve the quality of time-critical modifications. This approach uses a "maximum effort" methodology to perform these modifications instead of a "round the clock" method. The "maximum effort" method is based on using a single engineer to manage the overall design effort with other engineers providing input for specific portions. Training will be provided to engineering personnel on the "maximum effort" philosophy in engineering continuing training, offered during the first quarter of this year. Experience with the "maximum effort" method to date has been successful in providing high quality modification requests in a short time.

The statement in LER 89-008 regarding usage of the bypass switch has been added to the commitment tracking database. Sufficient guidance exists concerning the identification of commitments. However, to fully investigate the extent of similar cases, GSU will review a sampling of NRC commitments identified in LERs. This will include a review of a sampling of LERs for adequacy of commitment identification and a verification of commitment completion. This review will be complete by February 28, 1994.

The corrective action to address the mispositioned valve on the HPU was to place a restraining device on the valve handle to assure that it cannot be accidently moved out of position. System Operating Procedure (SOP) - 003, "Reactor Recirculation," including Attachment 1B, "Valve lineup for HPU Hydraulics", has been revised to indicate that the mispositioned HPU valve has been sealed. This corrective action was implemented for a total of 12 HPU valves that were located such that they could be accidently mispositioned.

SAFETY ASSESSMENT

The thrust bearing wear detector is provided for the protection of the turbine in the event of a thrust bearing failure. This device is designed to sound an alarm and trip the turbine if either of the thrust plates wears more than approximately 0.035 of an inch. The turbine trip and subsequent reactor scram were the result of turbine testing. No actual wear of the thrust bearing plates was detected. The plant was safely brought to the Hot Shutdown condition.