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November 29, 2004

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

Subject: Licensee Event Report 50-458 / 04-002-00
River Bend Station – Unit 1
Docket No. 50-458
License No. NPF-47

File Nos. G9.5, G9.25.1.3

RBG-46366
RBF1-04-0224

Ladies and Gentlemen:

In accordance with 10CFR50.73, enclosed is the subject Licensee Event Report.

Sincerely,

David N. Lorfing
Manager – Licensing (acting)
DNL/dhw
enclosure

IE22

cc: U. S. Nuclear Regulatory Commission
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NRC Sr. Resident Inspector
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NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 06/30/2007

Estimated burden per response to comply with this mandatory 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 and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@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 an 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	2. DOCKET NUMBER	3. PAGE
River Bend Station, Unit 1	05000 458	1 of 4

4. TITLE

Automatic Reactor Scram and System Actuations Due to Insulator Flashover in Switchyard

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
10	01	2004	2004	- 002 -	00	11	29	2004	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE

1

10. POWER LEVEL

100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
David N. Lorfing, Manager – Licensing (acting)	225-381-4157

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
C	FK	INS	Ohio Brass	Y					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

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

On October 1, 2004, at 7:17 a.m., with the plant operating at 100% power, a loss of power to the Division 1 standby switchgear caused the automatic start of the Division 1 diesel generator. Some non-safety switchgear were also deenergized by this event. At 7:30 a.m., an automatic reactor scram was initiated by a main turbine trip. Both of these events were caused by the flashover of high-voltage insulator strings in the station transformer yard. During the event, all main reactor feedwater pumps shut down, main condenser vacuum was lost, and the standby service water system initiated. The reactor core isolation cooling (RCIC) turbine steam supply valve isolated during the pressure transient associated with the main turbine trip. Operators manually started the high pressure core spray (HPCS) system to provide water to the reactor. A momentary low reactor water level caused a primary containment isolation signal. This is being reported in accordance with 10CFR50.73(a)(2)(iv)(A) as an event that resulted in the automatic actuation of the reactor protection system, Division 1 diesel generator, and standby service water system; an automatic isolation of primary containment; and the manual actuation of the RCIC and HPCS systems. There were no safety systems out of service at the time of the first event. Mitigating safety systems responded as designed. This event is bounded by the River Bend safety analysis, and was thus of minimal safety significance.

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
River Bend Station Unit 1	05000-458	2004	- 002	- 00	2 OF 4

REPORTED CONDITION

On October 1, 2004, at 7:17 a.m., a flashover occurred in the 230kV station transformer yard across a post insulator (**INS**). This caused the loss of Reserve Station Service (RSS) No. 1, which interrupted power to the Division 1 standby bus. The Division 1 diesel generator (**DG**) started automatically, and restored power to the bus. This event also interrupted power to the "A" reactor protection system (RPS) bus. Operators responded to this event by restoring power to the "A" RPS bus and resetting the half scram. An actuation of Division 1 containment isolation valves occurred due to loss of power to the affected isolation control circuitry, and restoration procedures were initiated.

At 7:30 a.m., a second flashover occurred across a 230kV post insulator on the main generator line, resulting in a main generator trip and main turbine trip. The main turbine trip initiated the reactor scram as designed.

The main generator trip combined with the loss of RSS no. 1 resulted in the trip of two main condensate pumps and one main feedwater pump. The remaining two feedwater pumps tripped on low suction pressure following the loss of the condensate pumps. Ten main steam safety relief valves (SRVs) actuated automatically during the pressure transient resulting from the main turbine trip. SRVs were subsequently cycled manually to control reactor pressure and to aid in achieving cold shutdown.

The reactor core isolation cooling (RCIC) turbine steam supply valve (**ISV**) automatically isolated during the pressure transient associated with the main turbine trip. Operators manually started the high pressure core spray system (HPCS) to provide makeup water for the reactor. Low reactor water level (Level 2) was reached for approximately one minute due to the pressure transient associated with the manual closure of an SRV. This occurred approximately 42 minutes after the scram. The Level 2 condition also initiated general containment isolation signals and the trip of the "B" reactor recirculation pump. The "A" reactor recirculation pump had tripped due to the loss of power.

The standby service water system actuated as designed due to a low pressure signal resulting from the loss of power to the normal service water pumps. Two of the three main condenser circulating water pumps in service before the event shut down due to loss of power. The output of the remaining pump was short-cycled through the discharge of the idle pumps due to the loss of power to their discharge valves, diverting flow from the main condenser. It was not possible to maintain main condenser vacuum, and the operators manually closed the outboard main steam isolation valves, and then cycled SRVs as needed to control reactor pressure.

Following the scram, it was determined that the isolation signal to the RCIC turbine steam supply valve was not valid, and efforts were begun to restore the system to

service. RCIC was placed in its standby condition at 8:24 a.m. It was later started in the recirculation mode to assist in reactor pressure control.

When efforts to restore the main condenser to service were not successful, a reactor cooldown was initiated. Cold shutdown was reached at 11:35 p.m. that evening.

CAUSAL ANALYSIS

The flashover on the insulators in the transformer yard was caused by the presence of contaminants in conjunction with a heavy fog at the time of the event. The contaminants on the insulators were the result of a buildup over time of solids carried by cooling tower drift. This buildup was worsened by the abnormally low rainfall in the three months preceding the event which resulted in little or no natural cleaning of the insulators.

The cooling tower drift was determined to be higher than normal due to degradation of the fasteners which hold the drift eliminators in place, and subsequent failure of a portion of the drift eliminators on two of the four cooling towers. The failed drift eliminators were towards the top of the towers which has the greatest impact on drift carryover.

The automatic isolation of the RCIC turbine steam supply valve resulted from a false high flow signal in the leak detection instrumentation which monitors the steam flow for indication of a line break outside the primary containment. The specific transmitter (**FT**) involved is in the Division 2 isolation circuitry. At the time of the main turbine trip, the associated steam pressure transient caused this instrument to exceed its trip setpoint. The redundant Division 1 channel also sensed the pressure transient, but with a lower magnitude and opposite polarity, and thus did not trip. The Division 1 signal was affected by the presence of a small amount of non-condensable gasses in the high side sensing line which caused the magnitude of the transient to be reduced and the polarity to be reversed, i.e. the sensed pressure transient was in the negative or decreasing direction. The most likely cause of the Division 2 trip was the presence of a partial blockage in the low-pressure sensing line, which had the effect of delaying the sensed pressure transient in the low side of the transmitter. The high side of the transmitter sensed the pressure transient before the low side, resulting in an apparent high flow signal. The low side sensing line tap for these transmitters is located on the bottom side of the flow elbow used for sensing the steam flow. This piping configuration makes this installation more susceptible to debris introduction into the sensing line. It is postulated that debris was partially blocking the orifice in the low side sensing line resulting in a delay in the hydraulic pressure transient sensed by the low side of the transmitter.

IMMEDIATE CORRECTIVE ACTIONS

The insulators in the transformer yards where the RSS no. 1 and main generator lines terminate were either cleaned, or, for those damaged by the event, replaced as necessary.

The sensing lines for the RCIC high steam flow transmitters were high velocity flushed and the high points were vented to remove any blockage and non-condensable gases. The calibration of the transmitters was checked, and they were found to be operating correctly.

CORRECTIVE ACTIONS TO PREVENT RECURRENCE

Degraded drift eliminators in the cooling towers were replaced during the subsequent refueling outage that began on October 21, 2004. Additionally, insulators in the RSS no. 2 transformer yard were replaced.

Dummy insulators were mounted in several areas near the switchyard to allow monitoring for deposition of residue carried by cooling tower drift.

Regarding the trip of the RCIC steam supply valve, maintenance procedures have been revised to assure that the sensing lines on the affected high steam flow instruments are flushed during every cold shutdown.

PREVIOUS OCCURRENCE EVALUATION

No previous reactor scrams or actuations of standby diesel generators have been caused at River Bend by the insulator flashover mechanism that initiated this event.

SAFETY ANALYSIS

This event is bounded by the main generator load reject scenario, as documented in the River Bend Updated Safety Analysis Report.

The invalid automatic isolation of the RCIC turbine steam supply isolation valve at the time of the main turbine trip is not safety significant, as the RCIC system is not credited for mitigation of any analyzed event. All other safety systems operated as designed.

Although reactor water level reached Level 2 for approximately one minute, a significant margin to the top of active fuel was maintained.

(NOTE: Energy Industry Component Identification codes are annotated as (**XX**).)