Entergy Operations, Inc.
River Bend Station
5485 U.S. Highway 61N
St. Francisville, LA 70775
Tel 225-381-4157

William F. Maguire
Site Vice President

RBG-47679

April 25, 2016

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

Subject: Licensee Event Report 50-458 / 2016-005-00
River Bend Station – Unit 1
Docket No. 50-458
License No. NPF-47

RBF1-16-0051

Dear Sir or Madam:

In accordance with 10 CFR 50.73, enclosed is the subject Licensee Event Report. This document contains no commitments. If you have any questions, please contact Mr. Joseph Clark at 225-381-4177.

Sincerely,

WFM / dhw

Enclosure

cc: U. S. Nuclear Regulatory Commission
Region IV
1600 East Lamar Blvd.
Arlington, TX 76011-4511

NRC Sr. Resident Inspector
P. O. Box 1050
St. Francisville, LA 70775

INPO
(via ICES reporting)

IE22
NRR

Central Records Clerk
Public Utility Commission of Texas
1701 N. Congress Ave.
Austin, TX 78711-3326

Department of Environmental Quality
Office of Environmental Compliance
Radiological Emergency Planning and Response Section
Ji Young Wiley
P.O. Box 4312
Baton Rouge, LA 70821-4312

NRC FORM 366 (11-2015) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2018

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@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 Page 2 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

Potential Loss of Safety Function of Onsite AC Sources and Operations Prohibited by Technical Specifications Due to Uncorrected Circuit Breaker Control Logic Design Causing Intermittent Failure to Close

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
02	24	2016	2016	005	00	04	25	2016	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*			
4	☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
10. POWER LEVEL	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☑ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(C)	☐ 73.77(a)(1)
0	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(D)	☐ 73.77(a)(2)(i)
	☐ 20.2203(a)(2)(vi)	☑ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(ii)
		☐ 50.73(a)(2)(i)(C)	☐ OTHER Specify in Abstract below or in NRC Form 366A	

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT	TELEPHONE NUMBER *(Include Area Code)*
Joseph A. Clark, Manager - Regulatory Assurance	(225) 381-4177

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
(see text)									

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

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

On February 24, 2016, with the plant in cold shutdown, the operations shift manager was made aware of a notification regarding a certain model of Masterpact 480-volt circuit breakers that described a failure mode that could potentially prevent the automatic closure of the breakers. Assessment of this information determined that the susceptible breakers included those powering the emergency ventilation fans in the Division 1 and 2 emergency diesel generator rooms and two auxiliary building unit coolers. This condition required that both diesel generators and both trains of shutdown cooling and to be declared inoperable. This constituted a condition that could potentially prevent fulfillment of the safety function of onsite AC power sources and decay heat removal. The Division 2 residual heat removal loop was operating in shutdown cooling, satisfactorily maintaining reactor coolant temperature. The cause of the event is that station personnel failed to recognize the breakers' vulnerability to this failure mode. This directly resulted in the failure to take corrective action prior to this industry notification. The cause of the untimely corrective actions is that the breakers were incorrectly determined to be operable in 2014 when the condition was discovered. All the affected breakers were modified to eliminate the failure mode prior to the subsequent plant startup.

NRC FORM 366A (11-2015) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2018

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LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

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River Bend Station - Unit 1	05000- 458	2016	- 005	- 00

NARRATIVE

REPORTED CONDITION

On February 24, 2016, with the plant in cold shutdown, the operations shift manager was made aware of a notification regarding a certain model of Masterpact 480-volt safety-related circuit breakers (**BKR**) that described a failure mode that could potentially prevent the automatic closure of the breakers. The initial information regarded the emergency ventilation fans in the Division 1 and 2 emergency diesel generator rooms. These fans are not in Technical Specifications, but they provide a support function to the emergency diesel generators (**DG**). This condition required that both diesel generators to be declared inoperable. This constituted a condition that could potentially prevent fulfillment of the safety function of onsite AC power sources [ED].

Later on the same date, further evaluation of the notification identified four other circuit breakers affected by the same condition. These breakers supply power to Division 1 and 2 containment unit coolers and the Division 1 and 2 auxiliary building 141 ft. elevation general area unit coolers. The auxiliary building unit coolers are not in Technical Specifications, but they provide a support function to the electrical distribution system. The required action in Technical Specification is to declare both trains of the residual heat removal system (shutdown cooling mode) [BO] inoperable. This inoperability constituted a condition that could have potentially prevented the fulfillment of the decay heat removal safety function. Division 2 residual heat removal was operating in shutdown cooling, satisfactorily maintaining reactor coolant temperature. The affected breakers can be manually operated to start/stop their associated equipment, if necessary for operation

INVESTIGATION AND IMMEDIATE ACTIONS

Masterpact breakers were installed at RBS as replacements for obsolete General Electric AKR breakers. Subsequently, at RBS and elsewhere, there were isolated failures of the breakers to close upon demand. Failure analyses had been conducted by both the vendor and the utilities, but no such analyses determined that a potentially generic problem existed.

In 2014, the breaker vendor issued a non-conformance report that concluded that the closure failures were from intermittent mechanical binding of the anti-pump mechanism. The binding was the result of a "standing close signal," which is the condition where the relay that actuates the closing mechanism remains energized, either indefinitely or for a defined period of time following a closure actuation. The control logic for any given breaker is an inherent design feature of the circuitry of the switchgear, not internal to the breaker itself. It was eventually determined by the vendor that this condition could cause any Masterpact breaker to intermittently fail to close. The vendor indicated that the failure mode could not be predicted, but was repeatable, and occurred on both new and old breakers.

When RBS evaluated the vendor's nonconformance report, a population of affected circuit breakers was identified, and the served systems were evaluated for adverse effects on their ability to perform their safety functions. The operational history of the breakers was examined, and it was determined that the observed increase in failure rate was not statistically significant. The affected systems were determined to be operable.

The nonconformance report stated that the failure mode could be averted by pressing the PUSH TO OPEN button on the front of the breaker after remote opening. This information was used to develop an Operations Standing Order, and this action was performed after every breaker opening for any of the affected breakers during power operations or hot

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shutdown until the modification to remove the standing close signal was installed. No failures of these breakers occurred when standing order was utilized.

Isolated failures occurred in breakers serving the control building air conditioning system in the refueling outage in 2015, and vendor recommendations for modifying the breaker control circuitry were implemented. Those modifications were limited, however, to breakers with continuously energized closure relays.

In the February 2016 notification, the vendor provided information regarding the identification of a potential defect, with a recommendation that Masterpact breakers designed for electrical closing operation be evaluated. The vulnerable breakers identified in connection with the notification were not surfaced during previous extent-of-condition reviews due to being limited to the population with the continuously energized closing relay. The new information provided in February 2016 revealed that even breakers with a time-delayed removal of power from the closing relay could be vulnerable while the relay was energized.

CAUSAL ANALYSIS

The first direct cause of the event is that station personnel failed to recognize the breaker vulnerability to this failure mode. As a result, an additional population of breakers that had a time-delayed de-energization of the closing relay was identified in February 2016. These additional breakers included components that supported the emergency diesel generators and portions of the safety-related AC distribution system in the auxiliary building.

The second direct cause of the untimely corrective actions is that the breakers were incorrectly determined to be operable when the original condition with Masterpact breakers was discovered in 2014. Specifically, the procedure for development of operability determinations contained inadequate guidance on the use of reliability-based evaluations.

One contributing cause of the event was the insufficient detail in the procedure regarding distribution of OE information for screening. This caused the component engineer for circuit breakers to be bypassed in the OE review cycle, likely preventing early detection of the condition. Additionally, the OE notices did not contain detailed information regarding the failure mode.

CORRECTIVE ACTIONS TO PREVENT RECURRENCE

The following actions have been completed to prevent recurrence of the reported condition.

- All safety-related Masterpact circuit breakers with the control circuit configuration that applied a standing close signal have been modified to eliminate this condition.
- The fleet procedure for operability evaluations has been revised to address conditions involving reduced reliability of safety-related components.

PREVIOUS OCCURRENCE EVALUATION

The reported condition resulted from a very specific design feature of a certain model of circuit breakers. No previous event reports regarding this condition have been submitted by RBS in the last three years.

SAFETY SIGNIFICANCE

NRC FORM 366A
(11-2015)

U.S. NUCLEAR REGULATORY COMMISSION

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The plant was in cold shutdown when the vendor notification was received. Technical Specification limiting condition for operations for the affected system were entered, and the required actions were completed. Dedicated operators were assigned to implement the standing order to mitigate the failure mode. All safety-related Masterpact circuit breakers with the control circuit configuration that applied a standing close signal were modified to eliminate this condition prior to plant startup.

A probabilistic risk analysis of this condition has concluded that this condition was of very low risk significance.

(NOTE: Energy Industry Identification System component function identifier and system name of each component or system referred to in the LER are annotated as (**XX**) and [XX], respectively.)