



**Entergy.**

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

William F. McGuire  
Site Vice President

**RBG-47679**

**April 25, 2016**

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

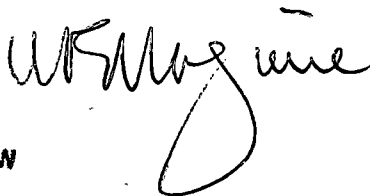
**Subject: Licensee Event Report 50-458 / 2016-005-00  
River Bend Station – Unit 1  
Docket No. 50-458  
License No. NPF-47**

**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  
NRK**

**RBG-47679**  
**April 25, 2016**  
**Page 2 of 2**

**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**



**LICENSEE EVENT REPORT (LER)**  
(See Page 2 for required number of digits/characters for each block)

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 [Infocollections.Resource@nrc.gov](mailto:Infocollections.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.

**1. FACILITY NAME**

River Bend Station - Unit 1

**2. DOCKET NUMBER**

05000 458

**3. PAGE**

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 |
| 02            | 24  | 2016 | 2016          | 005               | 00      | 04             | 25  | 2016 |                              | 05000         |
|               |     |      |               |                   |         |                |     |      | 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                 | <input type="checkbox"/> 20.2201(b)   | <input type="checkbox"/> 20.2203(a)(3)(i)             | <input type="checkbox"/> 50.73(a)(2)(ii)(A)           | <input type="checkbox"/> 50.73(a)(2)(viii)(A) |
|                   | <input type="checkbox"/> 20.2201(d)   | <input type="checkbox"/> 20.2203(a)(3)(ii)            | <input type="checkbox"/> 50.73(a)(2)(ii)(B)           | <input type="checkbox"/> 50.73(a)(2)(viii)(B) |
|                   | <input type="checkbox"/> 20.2203(a)(1)  | <input type="checkbox"/> 20.2203(a)(4)                | <input type="checkbox"/> 50.73(a)(2)(iii)             | <input type="checkbox"/> 50.73(a)(2)(ix)(A)   |
|                   | <input type="checkbox"/> 20.2203(a)(2)(i)   | <input type="checkbox"/> 50.36(c)(1)(i)(A)            | <input type="checkbox"/> 50.73(a)(2)(iv)(A)           | <input type="checkbox"/> 50.73(a)(2)(x)       |
| 10. POWER LEVEL   | <input type="checkbox"/> 20.2203(a)(2)(ii)  | <input type="checkbox"/> 50.36(c)(1)(ii)(A)           | <input checked="" type="checkbox"/> 50.73(a)(2)(v)(A) | <input type="checkbox"/> 73.71(a)(4)          |
|                   | <input type="checkbox"/> 20.2203(a)(2)(iii)   | <input type="checkbox"/> 50.36(c)(2)                  | <input type="checkbox"/> 50.73(a)(2)(v)(B)            | <input type="checkbox"/> 73.71(a)(5)          |
|                   | <input type="checkbox"/> 20.2203(a)(2)(iv)  | <input type="checkbox"/> 50.46(a)(3)(ii)              | <input type="checkbox"/> 50.73(a)(2)(v)(C)            | <input type="checkbox"/> 73.77(a)(1)          |
|                   | <input type="checkbox"/> 20.2203(a)(2)(v)   | <input type="checkbox"/> 50.73(a)(2)(i)(A)            | <input type="checkbox"/> 50.73(a)(2)(v)(D)            | <input type="checkbox"/> 73.77(a)(2)(i)       |
|                   | <input type="checkbox"/> 20.2203(a)(2)(vi)  | <input checked="" type="checkbox"/> 50.73(a)(2)(i)(B) | <input type="checkbox"/> 50.73(a)(2)(vii)             | <input type="checkbox"/> 73.77(a)(2)(ii)      |
|                   | <input type="checkbox"/> 50.73(a)(2)(i)(C)  | <input type="checkbox"/> OTHER                        | Specify in Abstract below or in NRC Form 366A         |   |

**12. LICENSEE CONTACT FOR THIS LER**

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

**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 |
|------------|--------|-----------|--------------|--------------------|-------|--------|-----------|--------------|--------------------|
| (see text) |        |           |              |                    |       |        |           |              |                    |

|   |                                     |       |     |      |
|---|-------------------------------------|-------|-----|------|
| <b>14. SUPPLEMENTAL REPORT EXPECTED</b>   | <b>15. EXPECTED SUBMISSION DATE</b> | MONTH | DAY | YEAR |
| <input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> 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



**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

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](mailto: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.

|   |                                |               |                          |               |
|---|--------------------------------|---------------|--------------------------|---------------|
| 1. FACILITY NAME<br>River Bend Station - Unit 1 | 2. DOCKET NUMBER<br>05000- 458 | 3. LER NUMBER |                          |               |
|   |                                | YEAR<br>2016  | SEQUENTIAL NUMBER<br>005 | REV NO.<br>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

## LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

|                             |                         |                      |      |                   |         |
|-----------------------------|-------------------------|----------------------|------|-------------------|---------|
| <b>1. FACILITY NAME</b>     | <b>2. DOCKET NUMBER</b> | <b>3. LER NUMBER</b> |      |                   |         |
| River Bend Station - Unit 1 | 05000-                  | 458                  | YEAR | SEQUENTIAL NUMBER | REV NO. |
|                             |                         |                      | 2016 | 005               | 00      |

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

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

| 1. FACILITY NAME            | 2. DOCKET NUMBER | 3. LER NUMBER |                   |         |
|-----------------------------|------------------|---------------|-------------------|---------|
|                             |                  | YEAR          | SEQUENTIAL NUMBER | REV NO. |
| River Bend Station - Unit 1 | 05000- 458       | 2016          | 005               | 00      |

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.)