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GNRO-2016/00025

May 16, 2016

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555-0001

SUBJECT: Licensee Event Report (LER) 2016-001-00, Valid Engineered Safety Feature  
Actuation and Temporary Loss of Shutdown Cooling  
Grand Gulf Nuclear Station, Unit 1  
Docket No. 50-416  
License No. NPF-29

Dear Sir or Madam:

Attached is Licensee Event Report (LER) 2016-001-00, Valid Engineered Safety Feature Actuation and Temporary Loss of Shutdown Cooling. This report is submitted in accordance with Title 10 Code of Federal Regulations. The automatic start of the Standby Diesel Generator is being reported pursuant to 50.73(a)(2)(iv)(A) and the temporary loss of Residual Heat Removal (Shutdown Cooling) is being reported pursuant to 10 CFR 50.73(a)(2)(v)(B).

This letter contains no new regulatory commitments. Should you have any questions regarding this submittal, please contact Mr. James J. Nadeau at 437-2103.

Sincerely,

A handwritten signature in black ink, appearing to read "J. Nadeau", written in a cursive style.

JJN/sas

Attachment: Licensee Event Report (LER) 2016-001-00

cc: U.S. Nuclear Regulatory Commission  
ATTN: Mr. Jim Kim, NRR/DORL (w/2)  
Mail Stop OWFN 8 B1  
Rockville, MD 20852-2738

U.S. Nuclear Regulatory Commission  
ATTN: Mr. Marc Dapas (w/2)  
Regional Administrator, Region IV  
1600 East Lamar Boulevard  
Arlington, TX 76011-4511

Mr. B. J. Smith  
Director, Division of Radiological Health  
Mississippi State Department of Health  
Division of Radiological Health  
3150 Lawson Street  
Jackson, MS 39213

NRC Senior Resident Inspector  
Grand Gulf Nuclear Station  
Port Gibson, MS 39150

Attachment to GNRO-2016/00025

Licensee Event Report (LER) 2016-001-00



## 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

Grand Gulf Nuclear Station (GGNS), Unit 1

## 2. DOCKET NUMBER

05000 416

## 3. PAGE

1 OF 1

## 4. TITLE

Valid Engineered Safety Feature Actuation and Temporary Loss of Residual Heat Removal

| 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 |
| 03                | 17  | 2016 | 2016  | 001   | 0                              | 05   | 16  | 2016  | N/A                          | 05000 N/A     |
| 9. OPERATING MODE |     |      | 11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) |   |                                |  |   |   |                              |               |
| 5                 |     |      | <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 checked="" 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 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 checked="" 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 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

James Nadeau / Manager, Regulatory Assurance

## TELEPHONE NUMBER (Include Area Code)

(601) 437-2103

## 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 |
|-------|--------|-----------|---------------|--------------------|-------|--------|-----------|---------------|--------------------|
| N/A   | N/A    | N/A       | N/A           | N/A                | N/A   | N/A    | N/A       | N/A           | N/A                |

## 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)

At 1515 [CDT] on March 17, 2016, with Unit 1 in Mode 5 for a refueling outage, Grand Gulf Nuclear Station (GGNS) experienced an electrical fault and subsequent undervoltage condition on the 115kV offsite power source supplying the onsite Division 2 Engineered Safety Feature (ESF) transformer, ESF 12, and bus. The fault was present long enough to cause an actuation of the Division 2 Load Shedding and Sequencing (LSS) System and subsequent start of the Division 2 Standby Diesel Generator (SDG). The in-service B train of Residual Heat Removal (RHR) was load shed, as designed, and, within 7 seconds, the Division 2 SDG restored power to the Division 2 bus. RHR B was restored within 3 minutes and 13 seconds. Core alterations, in progress at the time, were suspended and fuel bundles were placed in their proper positions. The ESF 11 transformer was paralleled with SDG 2. The Division 2 bus was then placed back to the ESF 11 offsite electrical feed and the Division 2 SDG was secured. The apparent cause was determined to be that the 115kV line was not equipped with pilot scheme protective relaying. Protective relaying is scheduled to be installed in 2017.

Alternate Heat Decay Removal (ADHR) remained available throughout this time period. No changes in Spent Fuel Pool or Reactor Cavity temperature were observed. All safety systems operated as expected for the loss of power to ESF12 and Division 2 LSS System. The automatic start of the Division 2 Standby Diesel Generator is being reported pursuant to 10 CFR 50.73(a)(2)(iv)(A) and the temporary loss of RHR (Shutdown Cooling) is being reported pursuant to 10 CFR 50.73(a)(2)(v)(B).

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                   | 2. DOCKET NUMBER   | 3. LER NUMBER  |   |   |
|------------------------------------|--|--|---|---|
| Grand Gulf Nuclear Station, Unit 1 | 05000-<br><div style="border: 1px solid black; width: 100px; height: 30px; margin: 0 auto; text-align: center; line-height: 30px;">416</div> | YEAR<br><div style="border: 1px solid black; width: 40px; height: 30px; margin: 0 auto; text-align: center; line-height: 30px;">2016</div> | SEQUENTIAL<br>NUMBER<br><div style="border: 1px solid black; width: 60px; height: 30px; margin: 0 auto; text-align: center; line-height: 30px;">001</div> | REV<br>NO.<br><div style="border: 1px solid black; width: 40px; height: 30px; margin: 0 auto; text-align: center; line-height: 30px;">0</div> |

### NARRATIVE

#### A. Initial Conditions:

At the time of the event, Grand Gulf Nuclear Station (GGNS) was in Mode 5 for Refueling Outage RF20. The station was in a shutdown condition with the reactor cavity flooded and the spent fuel pool gates not installed. System lineups were as follows:

- Engineered Safety Feature (ESF) Transformers [XFMR], ESF 11 and ESF 12, were available from offsite electrical feeders
- Division 1 bus was being supplied by ESF 11
- Division 2 and 3 buses were being supplied by ESF 12
- Division 1 and Division 2 Standby Diesel Generators (SDGs) [EK] were available for onsite electrical feeders
- Residual Heat Removal (RHR) [BO] 'B' was in Shutdown Cooling mode supplied by the Division 2 bus
- Alternate Decay Heat Removal (ADHR) was available

#### B. Description of Events:

At approximately 15:15, on March 17, 2016, an electrical fault occurred on the 115kV feeder supplying the GGNS ESF 12 transformer. The fault caused an undervoltage condition in the GGNS switchyard which was present long enough to generate a valid actuation signal to the Division 2 Load Shedding and Sequencing (LSS) [JE] System and the Division 2 Standby Diesel Generator (SDG). RHR 'B' was load shed and the Division 2 SDG started. The SDG automatically sequenced to the Division 2 bus, restoring power as designed, within 7 seconds. Core alterations, in progress at the time, were suspended and fuel bundles were placed in their proper positions. RHR 'B' was restored by SDG 2 within 3 minutes and 13 seconds. The ESF 11 transformer was then paralleled with SDG 2. The Division 2 bus was then placed back to the ESF 11 offsite electrical feed and the Division 2 SDG was secured. ADHR remained available throughout the event and no changes in Spent Fuel Pool or Reactor Cavity temperature were observed.

Severe weather was present at the time of the event and high winds were suspected to have initiated the transient. Transmission personnel performed a walkdown and investigation of the Baxter Wilson to Port Gibson 115kV transmission line. In an area where the 115kV transmission line crosses an 8kV distribution line, burn marks were identified on two of the three phase conductors ('A' and 'B' phases). The lines either came into contact with one another or came within close proximity to one another. A subsequent review of the data recorded during the event revealed that there was initially a single phase fault ('B' to phase-to-ground) and evolved into a phase-to-phase fault ('A' phase-to-'B' phase-to-ground). This was determined to be the direct cause of the event.

The Port Gibson switchyard is fed from both the Baxter Wilson and Natchez transmission lines. Due to the location of the fault on the Baxter Wilson line, 2.1 miles from Baxter Wilson, and the current protective relaying design, the Baxter Wilson breaker opened instantaneously (zone 1 fault). Opening of the Port Gibson breaker is delayed 30 cycles (~0.5 seconds), per design, for the given fault distance (zone 2). After the fault was present for the required 30 cycles, the breaker opened within 5-6 cycles. In total, the fault was present on the line for .58 seconds. With the Natchez line feeding the Port Gibson switchyard, the fault caused the yard voltage to drop approximately 21kV phase-to-ground (~31% of the nominal 67kV phase-to-ground) for the duration of the fault until the Port Gibson breaker opened. Although the feeder from the Port Gibson yard to GGNS remained intact, this degraded voltage condition was detected by the Division 2 LSSS which load shed and, in turn, initiated the ESF actuation .46 seconds later. All onsite and offsite equipment operated as expected for the current design. GGNS personnel responded in accordance with Off Normal Event Procedures and appropriate actions were taken.

The apparent cause was determined to be that the Baxter Wilson to Port Gibson 115kV line does not have pilot scheme protection. The phase-to-phase fault would have cleared sooner with protective relaying. A project is planned, in 2017, to upgrade the Baxter Wilson to Port Gibson transmission line with a fiber optic pilot scheme.

## LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

| 1. FACILITY NAME                   | 2. DOCKET NUMBER | 3. LER NUMBER |                               |                   |
|------------------------------------|------------------|---------------|-------------------------------|-------------------|
| Grand Gulf Nuclear Station, Unit 1 | 05000- 416       | YEAR<br>2016  | - SEQUENTIAL<br>NUMBER<br>001 | - REV<br>NO.<br>0 |

Event Notification No. 51800 was made to the NRC Operations Center for both the declaration of a valid ESF actuation and a loss of Shutdown Cooling in accordance with 10CFR50.72(b)(3)(iv)(A) and 10CFR50.72(b)(3)(v)(B), respectively.

### C. Cause of Event:

The apparent cause was determined to be that the Baxter Wilson to Port Gibson line does not have pilot scheme protection. The phase-to-phase fault would have cleared sooner with protective relaying.

### D. Extent of Condition:

A ground fault similar to the one described here could potentially occur on any of the four qualified GGNS electrical feeder lines. Investigation revealed that the Baxter Wilson line is the only line that experiences a delayed breaker clearing upon receipt of a ground fault condition. The other three lines are all protected by pilot scheme protective relaying which allows for nearly instantaneous clearing which would prevent actuation of load shedding on a perceived loss of offsite power. It was also determined that, in order for the event described here to occur, the ground fault would have had to be at a distance greater than 80% of the way from Port Gibson to Baxter Wilson, which was the case. Implementation of pilot scheme protective relaying would also prevent actuation of load shedding anywhere that a ground fault occurs on the line.

### E. Corrective Actions:

The immediate action was to clear the fault and re-energize the Baxter Wilson to Port Gibson 115kV line.

A longer term corrective action is to implement pilot scheme protective relaying. Work is planned and expected to be completed in July of 2017.

### F. Previous Similar Events:

CR-GGN-2003-1128 documented an event in April of 2003 where a fault occurred on the 115kV Natchez to Port Gibson line during severe weather. The fault occurred between the Port Gibson substation and GGNS, at a distance that would have allowed nearly instantaneous clearing of the Port Gibson breaker. At the time of the fault, no plant equipment was being supplied by the Natchez line. The line was re-energized and no further corrections were initiated. Because of the location of the fault, the fact that the plant was not being supplied by the Natchez line and the fact that there was no plant response, this event would not have been a learning for GGNS. Also, of note, the Natchez line now has pilot scheme protection.

### F. Safety Significance:

At the time of the event, GGNS Unit 1 was in Mode 5 for a Refueling Outage. The Division 2 LSSS and SDG automatically load shed and re-energized the Division 2 bus. Shutdown Cooling was temporarily lost but was returned within 3 minutes and 13 seconds. ADHR was available for the duration of the event. All systems operated as designed and GGNS personnel took appropriate actions. There was no change in Spent Fuel Pool or Reactor Cavity temperature. The Unit remained in Mode 5 and offsite power was restored. The safety significance is considered to be low and there were no actual nuclear safety consequences.

### G. Basis of Reportability:

This LER is being submitted pursuant to Title 10 Code of Federal Regulations 10 CFR 50.73(a)(2)(iv)(A) for the actuation of an Engineered Safety Feature (SDG) and 10 CFR 50.73(a)(2)(v)(B) temporary loss of RHR (Shutdown Cooling).