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Kent Scott
Site Vice President

RBG-48111

10 CFR 50.73

August 16, 2021

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

Subject: Licensee Event Report 50-458 / 2021-04-00, "Core Monitoring System Software Modeling Error Resulted in Conditions Prohibited by Technical Specifications"

River Bend Station – Unit 1
NRC Docket No. 50-458
Renewed Facility Operating License No. NPF-47

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. Tim Schenk at 225-381-4177.

Respectfully,

A handwritten signature in black ink, appearing to be "KCS", written over a faint circular stamp.

KCS/dmw

Enclosure: Licensee Event Report 50-458 / 2021-04-00, "Core Monitoring System Software Modeling Error Resulted in Conditions Prohibited by Technical Specifications"

cc: NRC Regional Administrator - Region IV
NRC Project Manager - River Bend Station
NRC Senior Resident Inspector - River Bend Station
Louisiana Department of Environmental Quality
Public Utility Commission of Texas

Enclosure

RBG-48111

Licensee Event Report 50-458 / 2021-04-00, "Core Monitoring System Software Modeling Error Resulted in Conditions Prohibited by Technical Specifications"



LICENSEE EVENT REPORT (LER)

(See Page 3 for required number of digits/characters for each block)
(See NUREG-1022, R.3 for instruction and guidance for completing this form
<https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

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, Library, and Information Collection Branch (T-6 A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street NW, Washington, DC 20503; e-mail: ora_submission@omb.eop.gov. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

1. Facility Name River Bend Station, Unit 1	2. Docket Number 05000 - 458	3. Page 1 of 3
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4. Title
Core Monitoring System Software Modeling Error Resulted in Conditions Prohibited by Technical Specifications

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
06	17	2021	2021	-004 -	00	08	16	2021	N/A	05000 N/A
									N/A	05000 N/A

9. Operating Mode 1	10. Power Level 100
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11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)

10 CFR Part 20	20.2203(a)(2)(vi)	50.36(c)(2)	50.73(a)(2)(iv)(A)	50.73(a)(2)(x)
<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	10 CFR Part 73
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.69(g)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(4)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.71(a)(5)
<input type="checkbox"/> 20.2203(a)(2)(i)	10 CFR Part 21	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(1)(i)
<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 21.2(c)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(i)
<input type="checkbox"/> 20.2203(a)(2)(iii)	10 CFR Part 50	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	<input type="checkbox"/> 73.77(a)(2)(ii)
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)	

Other (Specify here, in Abstract, or in NRC 366A).

12. Licensee Contact for this LER

Licensee Contact Tim Schenk, Manager Regulatory Assurance	Phone Number (Include Area Code) (225)-381-4177
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13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable To IRIS	Cause	System	Component	Manufacturer	Reportable To IRIS
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

14. Supplemental Report Expected <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (If yes, complete 15. Expected Submission Date)	15. Expected Submission Date	Month N/A	Day N/A	Year N/A
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16. Abstract (Limit to 1560 spaces, i.e., approximately 15 single-spaced typewritten lines)

On June 17, 2021, with River Bend Station (RBS) operating at 100 percent power, Entergy received a letter from GE Hitachi issuing SC 21-04, Revision 1, "Fuel Support Side Entry Orifice Meta-Stable Flow for 2 Beam Locations in the BWR/6 Reactors," identifying that the Global Nuclear Fuels (GNF) model for fuel affected by the Side Entry Orifices did not accurately account for the loss coefficients at those core locations causing a local overprediction in Minimum Critical Power Ratio (MCPR) margin. This resulted in the determination by Entergy that a condition prohibited by Technical Specifications (TSs) had existed at RBS and this report being made in accordance with 10 CFR 50.73(a)(2)(i)(B).

The cause of the event was GNF had not accurately accounted for the loss coefficients at applicable core locations causing a local overprediction in MCPR margin resulting in exceeding the MCPR TS limit.

Corrective actions include implementing a penalty to Operating Limit MCPR (OLMCPR) in the core monitoring system via an update to the databank to include all penalties associated with GEH letter SC 21-04, Revision 1, and an update to the current Core Operating Limits Report (COLR).

There were no consequences to the general safety of the public, nuclear safety, industrial safety, nor radiological safety.



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

(See NUREG-1022, R.3 for instruction and guidance for completing this form
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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
River Bend Station, Unit 1	05000 - 458	YEAR	SEQUENTIAL NUMBER	REV NO.
		2021	- 004	- 00

NARRATIVE

Plant Conditions:

River Bend Station (RBS) Unit 1 was operating at 100 percent power in MODE 1. There were no Structures, Systems, or Components that were inoperable that contributed to this event.

Event Description:

On June 17, 2021, with RBS operating at 100 percent power, Entergy received a letter from GE Hitachi (GEH) concerning a Part 21 Report. This Part 21 Report was transmitted to Entergy and the NRC documenting an update on the issue related to an underprediction of the Side Entry Orifice (SEO) loss coefficients in core analyses, resulting in a local overprediction in MCPR margin.

Specifically, Global Nuclear Fuels (GNF) identified the SEO loss coefficients for fuel bundle locations adjacent to 2-beam (corner) locations may potentially be higher than the current design basis value that is applied. The MCPR impact on potentially affected bundles that are near limits can potentially reduce this margin by greater than 0.01 in Critical Power Ratio. GEH has completed the evaluation of the condition to determine reportability under 10 CFR Part 21 and is a reportable condition under 10 CFR Part 21.21(a)(2) and a transfer of information under 10 CFR 21.21(b). The basis for reportability is that the change in MCPR associated with this issue could contribute to the exceeding of a Safety Limit, as defined in the RBS TSs.

The history of variable Maximum Fraction of Limiting Core Power Ratio (MFLCPR) for the last 3 years was reviewed. The objective was to identify any period where the MFLCPR (corrected for SC 21-04) exceeded 1.0 for more than 6 hours. During Cycle 20 (May 2018 through March 2019) and Cycle 21 (May 2019 through February 2021) there were multiple periods where MFLCPR was greater than 1.0 for longer than 6 hours. During these instances, the requirements of TS 3.2.2 were not met; however, during this time period there were no limiting transients that would be a challenge to the Safety Limit and there were no Safety Limit violations.

RBS previously performed an Operability Evaluation for SC 21-04 Revision 0 in CR-RBS-2021-3221 CA-01, which resulted in the implementation of a compensatory measure for tracking CR-RBS-2021-03221. To ensure compliance until the new COLR is approved, the site issued a standing order to implement the reduced administrative MFLCPR. The site's review of SC 21-04 Revision 1 was performed and based on that review; the standing order was updated to add additional conservatism.

The BWR/6 plant design has supporting cross beams that form a grid structure underneath the core plate. The orientation of SEO's relative to the beams produces different losses due to the difference in upstream flow areas. These variations influence the SEO flow patterns and the potential for a meta-stable pressure loss. Because the frequency at which meta-stable losses may occur has not been determined, RBS was evaluated using a bounding loss coefficient (1.9 times the current loss value) at the 2-beam locations. Results show the potential MCPR impact at limiting locations can be greater than 0.01 and will vary by plant and power/flow condition. The MCPR impact is greater than the 0.01 criterion that GEH has historically applied for reporting that a TS Safety Limit (as found in TS 2.1) could have been exceeded as defined under 10 CFR Part 21. If the MCPR impact is greater than 0.01 due to possible meta-stable losses at the 2-beam locations, and if not addressed, the condition could occur at a limiting bundle location and reduce transient margin. This could have resulted in exceeding the Safety Limit Minimum Critical Power Ratio (SLMCPR) if a limiting transient were to have occurred.



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River Bend Station, Unit 1	05000 - 458	2021	- 004	- 00

Safety Assessment:

There were no actual consequences for this event. The RBS Operating Limit MCPR (OLMCPR) is set such that if the plant is operating within this limit, the most limiting operational transient for the cycle will not result in violation of the SLMCPR. The site reviewed the unit operating history for limiting transients and other analyzed transients that are close to being limiting in the Supplemental Reload Licensing Reports. This review concluded that, for the period reviewed, the limiting transients were turbine trip without bypass, feedwater controller failure, generator load reject without bypass, rod withdrawal error, and loss of feedwater heating.

Because these limiting transients were not identified in the period reviewed, the margin between the SLMCPR and OLMCPR was adequate for continued SLMCPR protection. The SLMCPR was not exceeded in previous analyzed cycles and the margin between SLMCPR and OLMCPR was sufficient to accommodate the penalty evaluated in SC 21-04, Revision 1. As a result, there was no impact to the health and safety of the public or plant personnel from this condition. In addition, this event does not meet the criteria for a Safety System Functional Failure.

Event Cause(s):

Based on the Entergy internal review, it was determined that the cause of this event was: GNF did not accurately account for loss coefficients at those core locations causing a local overprediction in MCPR margin resulting in exceeding the MCPR TS limit.

These occurrences of exceeding the MCPR TS limit were beyond the control of Entergy to predict or prevent because it is a legacy design calculation error. Entergy does not have the capability to check these calculations, nor does Entergy have the resources to perform an independent review of all GNF calculations. The methodology used in the reload process has been accepted by Entergy and we do not check underlying calculations that have existed unchanged for multiple cycles. Entergy will credit actions taken by GNF as part of the Part 21 notification, including actions they are taking for extent of condition in their calculations. This would include the results of any technical audit they are performing. Entergy Supplier Quality Assurance was notified of this Part 21 for follow-up on the GNF corrective action.

Corrective Actions:

To ensure compliance with the MCPR TS, RBS issued the standing order as described above. Complete.

RBS will implement a penalty to OLMCPR in the core monitoring system through an update to the databank to include all penalties associated with GEH letter SC 21-04, Revision 1. Completion tracked by Corrective Action Program.

RBS will update the current COLR and associated documents to account for all penalties associated with GEH letter SC 21-04, Revision 1. Completion tracked by Corrective Action Program.

Entergy's Supplier QA has added CR-HQN-2021-01048 and SC 21-04 R1 to the Qualified Supplier List comments sections for GEH/GNF Fuels for follow-up in the next audit. Complete.

Previous Similar Events:

None.