Entergy

Entergy Operations, Inc.
P. O. Box 756
Port Gibson, MS 39150

Marty L. Richey
Director, Nuclear Safety Assurance
Grand Gulf Nuclear Station
Tel. (601) 437-6787

GNRO-2012/00084

August 13, 2012

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

SUBJECT: Licensee Event Report 2012-005-00 Average Power Range Monitors Inoperable in Excess of Technical Specification Allowances in Mode 2
Grand Gulf Nuclear Station, Unit 1
Docket No. 50-416
License No. NPF-29

Dear Sir or Madam:

Attached is Licensee Event Report (LER) 2012-005-00 which is a final report. This report is submitted in accordance with 10 CFR 50.73(a)(2)(i)(B).

This letter does not contain any commitments. Should you have any questions regarding the attached report, please call Christina L. Perino at 601-437-6299.

Sincerely,

MLR/cjj

Attachment: Licensee Event Report (LER) 2012-005-00

cc: (see next page)

cc: Mr. Elmo Collins
Regional Administrator, Region IV
U. S. Nuclear Regulatory Commission
1600 East Lamar Boulevard
Arlington, TX 76011-4511

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

U. S. Nuclear Regulatory Commission
ATTN: Mr. A. B. Wang, NRR/DORL (w/2)
Mail Stop OWFN 8 B1
Washington, DC 20555-0001

Attachment
To
GNRO-2012/00084

Licensee Event Report (LER) 2012-005-00

NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2013

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 Section (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 reverse for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Grand Gulf Nuclear Station, Unit 1	05000 416	1 OF 3

4. TITLE

Average Power Range Monitors Inoperable in Excess of Technical Specification Allowances in Mode 2

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
									N/A	N/A
06	13	2012	2012	– 005	– 00	08	13	2012	FACILITY NAME: N/A	DOCKET NUMBER: N/A

9. OPERATING MODE

1

10. POWER LEVEL

014

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)*
Christina Perino / Licensing Manager	601-437-6299

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
N/A	N/A	N/A

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

On June 13, 2012, during startup activities for Unit 1 with the reactor in Mode 1 operating at approximately 12 – 15 percent (%) power, it was identified that the Average Power Range Monitor (APRMs) were indicating reactor power level lower than expected for the plant condition. Investigation identified that during Refueling Outage 18 (RF18) the APRMs were set to indicate flux lower than the actual power level. This resulted in the system being inoperable during Mode 2 due to the APRM setdown high flux scram setpoint being outside of Technical Specification (TS) 3.3.1.1 Reactor Protection System (RPS) Instrumentation limits. This condition existed when Mode 2 was entered initially on June 6, 2012 until Mode 1 was entered on June 13, 2012.

The apparent cause of this condition was differing operating characteristics between the old system and the new system that were not noted during the Engineering Change (EC) process, and therefore they were not adequately addressed by procedure revisions/work order instructions. This condition was limited to the Power Range Neutron Monitoring (PRNM) system. This issue was related to the installation of the new system, future outages will only involve detector replacements and will not involve transferring settings from an existing analog system to a replacement digital system. During startup in Mode 2, the intermediate range monitors (IRM) and the high reactor pressure trip functions were operable. Therefore reactor power transients would have been mitigated by these functions. The APRM Neutron Flux High (Setdown) function is not directly credited in any safety analyses, this event did not adversely affect plant safety or the health and safety of the public.

A. REPORTABLE OCCURRENCE

This LER is being submitted pursuant to 50.73(a)(2)(i)(B) for a condition prohibited by Technical Specification (TS) Limiting Condition of Operation (LCO) 3.3.1.1, Reactor Protection System (RPS) Instrumentation for the Inoperable Average Power Range Monitor (APRM) [IG] Function. As the LCO was not entered, the condition existed for a time period beyond TS allowances and 50.73(a)(2)(v) for an Event or Condition That Could Have Prevented Fulfillment of a Safety Function.

B. INITIAL CONDITIONS

On June 13, 2012 the date of event discovery, the reactor was in Mode 1 operating at approximately 12 – 15 percent (%) Rated Thermal Power (RTP). There were no additional inoperable structures, systems, or components at the start of the event that contributed to this event. The reportable event occurred from the time the reactor was placed into Mode 2 on June 6, 2012 until the reactor was placed into Mode 1 on June 13, 2012.

C. DESCRIPTION OF OCCURRENCE

The APRM channels receive input signals from the Local Power Range Monitors (LPRMs) [IG] channels and provide a continuous indication of average reactor power from a few percent to greater than rated reactor power. The APRM channels average these LRPM signals to provide a continuous indication of average reactor power from a few percent to greater than RTP. In Mode 2, the intermediate range monitors (IRM) and the APRM channels provide separate trip signals to the reactor protection system (RPS) for reactor power transients. Additionally, reactor vessel high pressure is an independent variable and for this condition provides diverse trip initiating circuits for the protective action (scram).

During startup from Refueling Outage 18 (RF18) the APRMs were set to indicate flux lower than the actual power level resulting in the system being inoperable during Mode 2 due to the APRM setdown high flux scram setpoint being outside of TS limits.

In RF18 Grand Gulf Nuclear Station (GGNS) upgraded the Power Range Neutron Monitoring (PRNM) [IG] system to a new, digital, General Electric-Hitachi (GEH) designed Nuclear Measurement Analysis & Control (NUMAC) system as part of the Extended Power Uprate (EPU) station upgrades. Included in this upgrade was the installation of new equipment, initial setup, and document/procedure revisions.

After entering Mode 1 during startup from RF18 it was noted that the APRM flux indication did not match what the heat balance was indicating. While the APRMs were indicating approximately 6.5% flux, other indications showed that Core Thermal Power (CTP) was actually at approximately 12 – 15% RTP. PRNM receives inputs from the LPRMs installed in the core and it applies a gain to the signals to indicate the local power. The gain applied at this point is referred to as the LRPM gain. These signals are then averaged and another gain is applied to have the output collate with CTP. This gain is referred to as the APRM gain.

After noting the discrepancy, actions were taken to validate the heat balance inputs. After the heat balance inputs were confirmed as accurate, the APRM gains were adjusted such that indicated flux matched the measured heat balance. APRM gains are adjusted to within +/- 2% of the heat balance per TS Surveillance Requirement 3.3.1.1.2.

Because the APRM gains were set such that APRM flux was non-conservatively measured throughout Mode 2, the setdown high flux scram set at 15% flux would not have caused a scram until after exceeding the TS allowable limit.

D. APPARENT CAUSE

The apparent cause of this condition was the differing operating characteristics between the old system and the new system that were not noted during the Engineering Change (EC) process, therefore they were not adequately addressed by procedure revisions/work order instructions. This is a knowledge based task, and thus considered a human performance error. The personnel responsible for the procedure revision and the associated technical review were working for the EPU project as contractors and are no longer on site.

Additionally, there were two contributing causes to this event:
1. Multiple LPRMs were failed downscale and were not bypassed.
2. LPRM gains for new detectors were set slightly lower than the value recommended by GEH.

E. CORRECTIVE ACTIONS

Immediate Corrective Actions:
1. Any LPRMs reading downscale were bypassed (06/17/2012).
2. Perform a Traversing In-core Probe (TIP) set (06/21/2012).
3. Applied a generic Gain Adjustment Factor (GAF) to all the LRPMs. This increased each LRPM flux while keeping them proportional to one another. This allowed APRM gains to then be adjusted to match CTP (06/18/2012).

Corrective Actions to Prevent Recurrence:
1. Revise procedure to set the APRM gains to the maximum level (3.000) prior to entering Mode 2 (08/31/2012).
2. Revise procedure to incorporate initial LRPM gain setting for detector replacements (08/31/2012).

F. SAFETY ASSESSMENT

During Mode 2 the intermediate range monitors (IRMs) are required to be operable. One of the design functions of the IRMs is to generate a reactor trip signal on high neutron flux to prevent fuel damage resulting from anticipated or abnormal operational transients that may occur while operating in the intermediate (heating) range of reactor power. Therefore, during Mode 2 we are required to have two neutron monitoring systems capable of causing a reactor trip, both of which are designed to prevent fuel damage due to transient conditions. Although the APRMs were not properly configured to cause a scram prior to the Technical Specification allowable value, the IRMs were capable of causing a reactor trip at their calibrated values throughout Mode 2. The PRNM system was capable of sending a scram signal to the reactor protection system at all times. Additionally, reactor vessel high pressure is an independent variable and for this condition provides diverse trip initiating circuits for the protective action (scram).

During startup in Mode 2, the IRM and the high reactor pressure trip functions were operable. Therefore reactor power transients would have been mitigated by these functions. The APRM Neutron Flux High (Setdown) function is not directly credited in any safety analyses this event did not adversely affect plant safety or the health and safety of the public.

G. ADDITIONAL INFORMATION

Previous Occurrences – A search of the Paperless Condition Reporting System (PCRS) for the last five years revealed no prior or similar events were the APRMs were set to indicate flux lower than actual power. No License Event Reports (LERs) have been submitted for a similar event in the last five years.