UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 12, 2019

Vice President, Operations
Entergy Operations, Inc.
Grand Gulf Nuclear Station
P.O. Box 756
Port Gibson, MS 39150

SUBJECT: GRAND GULF NUCLEAR STATION, UNIT 1 – ISSUANCE OF AMENDMENT TO MODIFY THE UPDATED SAFETY ANALYSIS REPORT TO REPLACE TURBINE FIRST STAGE PRESSURE SIGNALS WITH POWER RANGE NEUTRON MONITORING SYSTEM SIGNALS (EPID L-2018-LLA-0072)

Dear Sir or Madam:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 217 to Renewed Facility Operating License No. NPF-29 for the Grand Gulf Nuclear Station, Unit 1. This amendment consists of changes to the Updated Final Safety Analysis Report (UFSAR) in response to your application dated March 26, 2018.

The amendment revises the UFSAR descriptions for the replacement of Turbine First Stage Pressure output signals with Power Range Neutron Monitoring System output signals.

A copy of the related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

Lisa M. Regner, Senior Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-416

Enclosure:
1. Amendment No. 217 to NPF-29
2. Safety Evaluation

cc: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

ENTERGY OPERATIONS, INC.

SYSTEM ENERGY RESOURCES, INC.

COOPERATIVE ENERGY, A MISSISSIPPI ELECTRIC COOPERATIVE

ENTERGY MISSISSIPPI, LLC

DOCKET NO. 50-416

GRAND GULF NUCLEAR STATION, UNIT 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 217
Renewed License No. NPF-29

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Entergy Operations, Inc. (the licensee), dated March 26, 2018, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, by Amendment No. 217, Renewed Facility Operating License No. NPF-29 is hereby amended to authorize revision to the Grand Gulf Nuclear Station, Unit 1, Final Safety Analysis Report as set forth in the licensee's application dated March 26, 2018, and evaluated in the NRC staff's evaluation enclosed with this amendment.

3. This license amendment is effective as of its date of issuance and shall be implemented within 90 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert J. Pascarelli, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Date of Issuance: March 12, 2019

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 217 TO

RENEWED FACILITY OPERATING LICENSE NO. NPF-29

ENTERGY OPERATIONS, INC., ET AL.

GRAND GULF NUCLEAR STATION, UNIT 1

DOCKET NO. 50-416

1.0 INTRODUCTION

By letter dated March 26, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18085A579), Entergy Operations, Inc. (Entergy, the licensee), submitted a license amendment request (LAR) to revise the Updated Final Safety Analysis Report (UFSAR) for Grand Gulf Nuclear Station, Unit 1 (GGNS). The proposed change would support the replacement of Turbine First Stage Pressure (TFSP) signals with Power Range Neutron Monitoring System (PRNMS) signals. Portions of the letter dated March, 26, 2018, contain sensitive unclassified non-safeguards information (proprietary) and, accordingly, have been excluded from public disclosure.

2.0 REGULATORY EVALUATION

2.1 System Description

The reactor protection system (RPS) is designed to initiate a rapid, automatic shutdown of the reactor to reliably prevent or limit damage to fuel barriers, thus preventing or limiting the release of radioactive materials during abnormal operational transients. The RPS system is comprised of instrumentation and controls to monitor essential variables and respond to protect fuel barriers. Nuclear safety systems provide signals to the RPS instrumentation and controls and function when needed to prevent or mitigate damage. Safety system settings are determined by conservative analyses, and are set to ensure limiting safety system settings are not exceeded and to prevent inadvertent initiation of the safety action.

The RPS monitors reactor power to automatically initiate a rapid shutdown to ensure that design limits are not exceeded, and to initiate operation of safety systems if conditions indicate an accident.

2.2 Regulatory Requirements and Guidance

Title 10 to the *Code of Federal Regulations* (10 CFR), Section 50.36, requires that technical specifications (TSs) include limiting conditions for operation (LCOs) for any structure, system, or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety. Section 50.36 of 10 CFR also requires surveillance requirements (SRs), which relate to tests, calibrations, or inspections to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the LCO will be met.

The following General Design Criteria (GDC) in 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," were used by the U.S. Nuclear Regulatory Commission (NRC) staff to determine regulatory compliance of the proposed TFSP plant modification:

> *Criterion 13—Instrumentation and control.* Instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems. Appropriate controls shall be provided to maintain these variables and systems within prescribed operating ranges.
>
> *Criterion 20—Protection system functions.* The protection system shall be designed (1) to initiate automatically the operation of appropriate systems including the reactivity control systems, to assure that specified acceptable fuel design limits are not exceeded as a result of anticipated operational occurrences and (2) to sense accident conditions and to initiate the operation of systems and components important to safety.
>
> *Criterion 21—Protection system reliability and testability.* The protection system shall be designed for high functional reliability and inservice testability commensurate with the safety functions to be performed. Redundancy and independence designed into the protection system shall be sufficient to assure that (1) no single failure results in loss of the protection function and (2) removal from service of any component or channel does not result in loss of the required minimum redundancy unless the acceptable reliability of operation of the protection system can be otherwise demonstrated. The protection system shall be designed to permit periodic testing of its functioning when the reactor is in operation, including a capability to test channels independently to determine failures and losses of redundancy that may have occurred.
>
> *Criterion 22—Protection system independence.* The protection system shall be designed to assure that the effects of natural phenomena, and of normal operating, maintenance, testing, and postulated accident conditions on redundant channels do not result in loss of the protection function, or shall be demonstrated to be acceptable on some other defined basis. Design techniques, such as functional diversity or diversity in component design and principles of operation, shall be used to the extent practical to prevent loss of the protection function.

Regulatory Guide (RG) 1.105, Revision 3, "Setpoints for Safety-Related Instrumentation," dated December 1999 (ADAMS Accession No. ML993560062), describes a method that the NRC staff finds acceptable for use in complying with the NRC's regulations in ensuring that setpoints for safety-related instrumentation are initially within, and will remain within, the TS limits. RG 1.105 endorses Part I of the Instrument Society of America Standard 67.04-1994, "Setpoints for Nuclear Safety-Related Instrumentation," subject to NRC staff clarifications. The staff used this guide to establish the adequacy of the licensee's setpoint calculation methodologies and the related plant surveillance procedures.

3.0 TECHNICAL EVALUATION

3.1 Background

In 2014, the licensee implemented an engineering change to replace the TFSP output signals with PRNMS output signals. This modification was installed into the GGNS, and plant operations were resumed.

On December 9, 2016, the NRC issued NRC Inspection Report 05000416/2016007 (ADAMS Accession No. ML16348A222), which documented a non-cited violation for the licensee's failure to obtain a license amendment prior to implementing the engineering change as required by 10 CFR 50.59, "Changes, tests, and experiments." The licensee submitted an application to revise the GGNS UFSAR to reflect the changes made to the plant as a result of these findings with the objective of resolving the performance deficiency.

The LAR included the following supporting documentation:

- Attachment 1: Licensee evaluation of proposed change;
- Attachment 2: Marked-up pages of the UFSAR showing the change;
- Attachment 3: Marked-up pages of the GGNS TS Bases showing the change; and
- Attachments 4 (proprietary version) and 5 (non-proprietary version): General Electric Hitachi (GEH) report, "Technical Justification of the Grand Gulf Nuclear Station Modification to Operational Bypass Signal, Replacing Turbine First Stage Pressure with APRM [Average Power Range Monitor] Neutron Flux."

3.2 Licensee Description and NRC Evaluation of Proposed Change

The proposed amendment would revise the GGNS UFSAR to reflect the permanent replacement of TFSP output signals with the PRNMS neutron flux signals. These signals control the following safety-related functions:

- Low Power Setpoint (LPSP),
- High Power Setpoint (HPSP),
- Turbine Stop Valve (TSV) closure,
- Turbine Control Valve (TCV) fast closure scram enable/bypass, and
- End of Cycle Recirculation Pump Trip (EOC-RPT) enable/bypass.

The following nonsafety-related functions would also use PRNMS signals instead of TFSP signals:

- Feedwater Low Power Set-Down,
- Hydrogen Water Chemistry Trips, and
- Main and Reheat Steam Systems.

The NRC staff noted that the nonsafety-related functions were included for information only and are not considered in the staff's evaluation of the proposed amendment.

The licensee stated that the purpose of the plant modification was to eliminate the potential for a transient caused by the mechanical failure of the TFSP sensing lines and instruments. This engineering change also eliminated process delays in the steam lines because PRNMS voltage output signals provide a more direct measurement of reactor power than do the TFSP signals.

The licensee also stated that PRNMS signals are divisionally separated, safety-related, and provide a greater degree of reliability, quality and defense-in-depth than the TFSP instruments. The replacement of the TFSP output signals with the PRNMS output signals is therefore intended to enhance plant safety and improve reliability.

3.2.1 NRC Evaluation of UFSAR Changes

The licensee requested approval of the following changes to the GGNS UFSAR; the changes reflect the permanent plant modification.

Section 7.1.2.7, "Safety System Settings"

The following statements were added to this section of the UFSAR to explain that the diversity between TFSP and APRM is not applicable as it pertains to GGNS, because it is not credited in the GGNS UFSAR.

> Entergy Letter GNR0-2010/0056 identified that the instrument setpoint methodology currently implemented at GGNS is based on Instrument Society of America (ISA) Standard 67.04 Part II, 1994, "Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation," and the General Electric Hitachi (GEH) Instrument Setpoint Methodology (ISM) specified in NEDC-31336P-A, "General Electric Instrument Setpoint Methodology." Additionally, in the NRC safety evaluation [SE] for Amendment No. 191, the NRC states: "Entergy stated that its setpoint calculations in support of the EPU [extended power uprate] LAR were based on NEDC-31336P-A, 'General Electric Instrument Setpoint Methodology,' September 1996 (Reference 120), which includes the NRC-approved SE dated November 6, 1995." GEH NEDC-31336 P-A, Section 3.25, states, in part:
>
> > Turbine first stage pressure has been historically used as the parameter to approximate reactor power and effect the actual trip bypass. The Reactor Protection System (RPS) design purposely chooses this parameter, as opposed to the more direct measurement of power such as neutron flux, in order to assure diversity between the TSVC [turbine stop valve closure] and

> TCVFC [turbine control valve fast closure] scram functions and the neutron flux scram function.
>
> This statement is not completely applicable as it pertains to GGNS because the UFSAR (Section 7.2.1.1.4.2 paragraph d and e) does not credit the neutron flux scram for diversity from the TSVC and TCVFC scrams. Rather, it credits the reactor vessel high-pressure trip signal. As such, Section 3.25 of NEDC-31336 P-A is considered not applicable based on the current design and licensing basis for the GGNS.

To support this change, the licensee contracted with the Nuclear Measurement, Analysis, and Control (NUMAC) system Vendor (GEH), to perform an analysis of the effects of the design change that replaces TFSP signals with neutron flux signals from the PRNMS. The results of this analysis were provided as Attachments 4 and 5 of the LAR.

The analysis identified several technical advantages of using neutron flux signals instead of the TFSP signals to accomplish Power Bypass (P-Bypass) functions. The analysis also provided historical information including an explanation of why TFSP was originally selected as the preferred parameter to control P-Bypass functions. This explanation included the cited statement derived from the GEH Nuclear Energy, "General Electric Instrument Setpoint Methodology," NEDC-31336P-A.

While this modification reduces the level of diversity between the TSVC and TCVFC scram functions and the neutron flux scram function, the GGNS design as discussed in Section 7.2.1.1.4.2 of the UFSAR does not credit this diversity as a required means of ensuring plant safety.

> Diversity of trip initiation for increases in reactor vessel pressure due to termination of steam flow by turbine stop valve or control valve closure is provided by reactor vessel high-pressure trip signals. A closure of the turbine stop valves or control valves at steady-state conditions would result in an increase in reactor vessel pressure. If a scram was not initiated from these closures, a scram would occur from high reactor vessel pressure. Reactor vessel high pressure is an independent variable and for this condition provides diverse trip initiating circuits for the protective action (scram).

Because the reactor vessel high-pressure scram functions are not impacted by the subject TFSP P-Bypass modification, the required diversity between the TSVC and TCVFC scram functions and the reactor vessel high-pressure scram function is retained and the modification will not reduce the level of diversity required by the plant's current license basis.

The GEH analysis shows that signals derived from the PRNMS will have a significantly higher degree of reliability and lower failure rates than the TFSP signals used in the original design. The information used to provide this justification was derived from plant operational data collected over an extended period of time.

The licensee identified in its technical evaluation of the engineering change that failure modes of the neutron flux signal are the same as the failure modes of the TFSP signals. The licensee explained that while "mechanisms which can cause APRM signal failures are different than those which can cause TFSP signal failures, the results are the same."

The NRC staff determined that diversity between the TSVC and TCVFC scram enabling functions and the neutron flux scram function is not a required diversity measure nor is this diversity credited in the current GGNS UFSAR. Therefore, elimination of this diversity as has been done in the subject TFSP P-Bypass engineering change, does not pose a safety hazard to the operation of GGNS, and is acceptable. The NRC staff further concludes that benefits provided by using a high reliability signal from the PRNMS, support a determination that the modification to replace TFSP signals with neutron flux signals for the purpose of performing the P-Bypass functions does not result in more than a minimal increase in the likelihood of malfunction of the signal to the bypass.

The NRC staff reviewed the licensee's technical evaluation of the engineering change and determined the evaluation demonstrates that failure modes of the neutron flux signal are the same as the failure modes of the TFSP signals. Therefore, the diversity, reliability, and failure mode criteria of GDC 21, and GDC 22, have not been impacted by the TFSP PRNMS modification performed by the licensee.

Section 7.2.1.1.4.4.2, "Turbine Stop Valve and Turbine Control Valve Fast Closure"

The description of the TSV and TCV fast closure functions was changed to reflect the modifications that were made to the plant. References to "Turbine First Stage Pressure" were changed to the "Neutron Monitoring System" and reference to the four pressure transmitters associated with TFSP was replaced with "four independent reactor power signals associated with the four divisions of the Power Range Neutron Monitoring System." The following paragraph was also added to replace the description of the TFSP function.

> Reactor power is sensed by four physically separate and independent divisions of the Power Range Neutron Monitoring System. Redundancy has been achieved by connecting one reactor power output signal in parallel with each of the turbine stop valve and turbine control valve fast closure trip contacts in each of the four scram trip logics.

The NRC staff evaluated these changes by comparing them to the engineering change descriptions provided in the LAR and determined that revised UFSAR Section 7.2.1.1.4.4.2 accurately describes the modified plant design.

The number of signals performing the TFSP functions is not changed. PRNMS channels are also independent from one another. Therefore, the redundancy criteria of GDC 22 continue to be met.

Section 7.2.2.1.2.3.1.2, "Single Failure Criterion (IEEE [Institute of Electrical and Electronics Engineers] Std. 279-1971, paragraph 4.2)"

The description of the pressure transmitters associated with the TFSP signals was replaced with the following:

> Reactor power is sensed by four physically separate and independent divisions of the Power Range Neutron Monitoring System (PRNMS). Wiring from the PRNMS is routed to the RPS cabinets and divisional separation is maintained along the route.

The NRC staff evaluated this UFSAR change by comparing the revised description to the engineering change description provided in the LAR and determined that revised UFSAR Section 7.2.2.1.2.3.1.2 accurately describes the modified plant design.

Because the technical evaluation of the engineering change demonstrates that failure modes of the neutron flux signal are the same as the failure modes of the TFSP signals, the NRC staff concludes that single failure criterion of GDC 22 has not been impacted. Therefore, the criteria of GDC 22 continue to be met.

Section 7.2.2.1.2.3.1.8, "Derivation of System Inputs (IEEE Std. 279-1971, paragraph 4.8)"

The reference to TFSP was replaced with a reference to PRNMS reactor power and a description of how TFSP is used to approximate reactor power level was deleted.

The NRC staff determined that the reference change was consistent with the modified plant design. Deletion of the discussion of reactor power level approximation is also acceptable because the direct measurement of power provided by neutron flux measurement within the APRM system eliminates the need to approximate power level using an indirect measurement.

Section 7.2.2.1.2.3.1.10, "Capability for Test and Calibration (IEEE Std. 279-1971, paragraph 4.10)"

A reference to the TFSP within the discussion of periodic test requirements was replaced with a reference to reactor power. This change transfers the requirement for placing the associated trip unit in the calibration mode during periodic test performance.

The NRC staff determined that the reference change is acceptable because it retains the necessary administrative controls as well as periodic test requirements for the reactor power instruments and is consistent with the modified plant design. Further, the appropriate controls continue to be in place to assure that variables actuate within prescribed limits.

Table 7.2-1 (sheet 2 of 2), "Reactor Protection System Instrumentation Specifications"

The Instrument parameter for the TSV and TCV fast closure trip bypass function in Table 7.2-1 was modified to replace the Pressure Transmitter with Reactor Power(4) and the range associated with this instrument was changed from 0 to 100 percent to 0 to 125 percent. A new Note 4 was added, which states, "[r]eactor power signals derived from the Power Range Neutron Monitoring System."

The NRC staff determined that the parameter change is acceptable because the new reactor power range covers the previous TFSP range and accurately reflects the use of reactor power instrumentation including its range, and is consistent with the modified plant design.

Figure 7.2-001 B

The "PERMISSIVE IF TURBINE 1st STAGE ≤ SET POINT OF EQUIVALENT REACTOR POWER" block was replaced with a similar block stating "PERMISSIVE IF REACTOR POWER ≤ SET POINT." These blocks also identify the signal source, which was changed from "PIS N652A / Local" to "PRNMS / CR."

The NRC staff determined that this figure change is acceptable because it accurately reflects the use of reactor power instrumentation, including its signal source, and is consistent with the modified plant design.

Figure 7.2-001 C

The components associated with TFSP instruments including pressure transmitters, associated sensing lines and pressure indicating switches were deleted from Figure 7.2-001 C (Zone B-9).

The NRC staff determined that this figure change is acceptable because TFSP instruments are not needed, it accurately reflects the removal of TFSP instrumentation, and is consistent with the modified plant design.

Section 7.6.1.7.3, "Equipment Design"

A description of the method of measuring reactor power level was changed to state that power level is derived directly from the PRNMS.

The NRC staff determined that this change is acceptable because it accurately reflects the change in the method of determining reactor power level which is consistent with the modified plant design.

Section 7.6.1.8.3.2, "Logic"

A description of the method of indicating reactor power level was changed to state that power level is indicated by the PRNMS.

The NRC staff determined that this change is acceptable because it accurately reflects the change in the method of indicating reactor power level which is consistent with the modified plant design.

Section 7.7.1.5.3.4.3, "Turbine Generator to Reactor Protection System Interface"

The description of the method of bypassing the stop valve closure and control valve fast closure inputs at low power levels was changed to state that the PRNMS reactor power signals are provided to perform this function.

The NRC staff determined that this change is acceptable because it accurately reflects the change in the method of bypassing the stop valve closure and control valve fast closure inputs at low power levels, which is consistent with the modified plant design.

Section 15.2.3.2.2.3, "Turbine Trip at Low Power w/o Bypass"

The reference to TFSP was replaced with a reference to the PRNMS.

The NRC staff determined that the reference change is consistent with the modified plant design and is therefore acceptable.

Section 15.2.3.3.3.3, "Turbine Trip w/o Bypass, Low Power"

The reference to TFSP was replaced with a reference to the PRNMS.

The NRC staff determined that the reference change is consistent with the modified plant design and is therefore acceptable.

3.2.2 NRC Evaluation of Setpoint Changes

The modification to replace TFSP signals with neutron flux signals from the PRNMS affects all functions that previously received TFSP input. As a result, instrument loop uncertainty and setpoint calculations were changed for the functions listed below due to the fact that the instrument uncertainties associated with the new APRM inputs are different than those of the TFSP signals.

- Rod Control and Information System (RCIS) Rod Pattern Controller, Banked Rod Withdrawal and Rod Worth Limiter Functions, LPSP;
- RCIS Rod Pattern Controller, Rod Worth Limiter Function, HPSP;
- RCIS TSV Closure Scram, TCV Fast Closure Scram and EOC-RPT Bypass RPS Trip Bypass.

In the LAR, the licensee provided summaries and the results for each of these revised calculations under the section "Instrument Changes and Uncertainties."

The licensee stated that loop uncertainties were reduced since the APRMs provide a more direct measurement of reactor power. Additionally, the APRM signals are not subject to errors introduced by factors such as turbine bypass valve leakage, steam flow in turbine reheaters, reduced feedwater heating or changes in condenser vacuum, all of which can alter the heat balance relationship between the TFSP and actual reactor power. Since the analytical values are based on the reactor power measurement, the reduced uncertainties of the APRM support the revised setpoints as further discussed below.

The calculation summaries refer to a setpoint methodology that considers factors that have the potential to affect the instrument uncertainties. The APRM and signal converter contribution to instrument loop uncertainties are included. Other factors considered in the method include instrument drift, measurement and test equipment insulation resistance effects, repeatability, and the effects of radiation on instrument performance. The NRC staff determined the methods described in the "Instrument Changes and Uncertainties" section of the LAR to be compliant with the criteria of RG 1.105. Therefore, the licensee used an acceptable process for determining setpoints associated with the affected TFSP functions.

RCIS Rod Pattern Controller, Banked Rod Withdrawal and Rod Worth Limiter Functions, LPSP

The revised calculation for this function supports the existing Allowable Values (AVs) with the existing setpoint methodologies. The lower and upper AVs are therefore not changed.

Parameter	Existing Setpoint	New Setpoint
RCIS LPSP AV Upper Limit	≤ 35%	≤ 35% (Unchanged)
RCIS LPSP AV Lower Limit	≥ 10%	≥ 10% (Unchanged)

The Analytical Limit (AL) for this function was changed so that the modified system could be calibrated within AVs in consideration of the PRNMS and signal converter uncertainties as follows:

Parameter	Existing Setpoint	New Setpoint
RCIS LPSP AL Upper Limit	≤ 36%	≤ 38%
RCIS LPSP AL Lower Limit	≥ 8%	≥ 5%

Justifications for the above AL changes were provided in the LAR. Since these new ALs increase the margin between the AL and AV setpoints, an additional safety margin to the AVs is established.

GDC 13 requires that appropriate controls to maintain variables within prescribed operating ranges be established. The NRC staff determined the AV settings are acceptable, based upon margins established by the uncertainty calculations performed by the licensee. The criteria of GDC 13, which provide appropriate controls to maintain variables within prescribed operating ranges, therefore, continue to be met.

RCIS Rod Pattern Controller, Rod Worth Limiter Function, HPSP

The revised calculation for this function resulted in a revised AV to account for the uncertainties associated with the PRNMS and the new signal converters. The nominal trip setpoint (NTSP) was also increased to provide improved operating margin.

Parameter	Setpoint Established
RCIS LPSP AV	66%
RCIS LPSP NTSP	62%

Note: The pre-modification setpoints for RCIS LPSP AV and RCIS LPSP NTSP were not provided by the licensee. Those setpoints were determined by instrument uncertainties associated with the TFSP signals, which are no longer used. Since the newly established setpoints are not affected by the TFSP uncertainties, it was not necessary for the NRC staff to review the previous setpoints or evaluate the differences between these setpoints.

The AL for this function was not changed.

Parameter	Existing Setpoint	New Setpoint
RCIS HPSP AL Upper Limit	> 70%	> 70% (Unchanged)

The changes made to the AVs and NTSP setpoints for this function reduce the effective margin to the AL, which is not being changed. The calculation summary provided by the licensee established an acceptable basis for this reduction of margin. The NRC staff determines that this

is acceptable because it was developed using an acceptable methodology and because it provides an adequate safety margin to the AL beyond the established instrument total loop uncertainty.

RCIS TSV Closure Scram, TCV Fast Closure Scram and EOC-RPT Bypass System (RPS Trip Bypass)

The revised calculation for this function resulted in a revised AV to account for the uncertainties associated with the PRNMS and the new signal converters.

Parameter	Setpoint Established
RPS Trip Bypass AV	≤ 32%
RPS Trip Bypass NTSP	26%

Note: The pre-modification setpoints for RPS Trip Bypass AV and RPS Trip Bypass NTSP were not provided by the licensee. Those setpoints were determined by instrument uncertainties associated with the TFSP signals, which are no longer used. Since the newly established setpoints are not affected by the TFSP uncertainties, it was not necessary for the NRC staff to review the previous setpoints or evaluate the differences between these setpoints.

The AL for this function was not changed.

Parameter	Existing Setpoint	New Setpoint
RPS Trip Bypass AL	> 35.4%	> 35.4% (Unchanged)

The changes made to the AV setpoints for this function reduce the effective margin between the AV and the AL, which is not being changed. The calculation summary provided by the licensee established an acceptable basis for this reduction of margin. The NRC staff determines this setting to be acceptable because it was developed using an acceptable methodology and because it provides an adequate safety margin to the AL beyond the established total loop instrument uncertainty.

GDC 13 requires that appropriate controls to maintain variables within prescribed operating ranges be established. The NRC staff determined the AV settings are acceptable based upon margins established by the uncertainty calculations performed by the licensee. The criteria of GDC 13, which provide appropriate controls to maintain variables within prescribed operating ranges, therefore, continue to be met.

3.3 Technical Conclusion

The NRC staff evaluated the licensee's application pertaining to the plant modification that replaces TFSP signals with neutron flux signals from the APRM system. As discussed above, the NRC staff determined that replacement of TFSP signals with neutron flux signals for the purpose of performing P-Bypass functions reduces the likelihood of malfunction of the signal to the bypass when compared to the original system design. The NRC staff evaluated the proposed UFSAR changes by comparing the revised UFSAR to the engineering change description provided in the LAR and determined that revised sections of the GGNS UFSAR accurately describe the modified plant design and are, therefore, acceptable.

The NRC staff determined that APRM instrumentation is appropriately designed to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions to assure adequate safety. Appropriate controls are provided to maintain protection system functions. The revised design therefore meets the criteria of GDC 13.

The NRC staff determined that the revised GGNS protection system is designed to initiate automatically the operation of appropriate systems including the reactivity control systems, to assure that specified acceptable fuel design limits are not exceeded as a result of anticipated operational occurrences and is designed to sense accident conditions and to initiate the operation of systems and components important to safety. The revised design therefore meets the criteria of GDC 20.

The NRC staff determined that the GGNS protection system is designed for high functional reliability and in service testability that is commensurate with the safety functions performed. The degree of redundancy and independence of the GGNS protection system was found to be sufficient to assure that; no single failure will result in a loss of the protection function, and that removal from service of any component or channel of the protection system will not result in loss of the required redundancy. The NRC staff also determined that the GGNS protection system is designed to permit periodic testing of its functions when the reactor is in operation. The revised design therefore meets the criteria of GDC 21.

The NRC staff determined that the GGNS protection system, as revised, is designed to assure that the effects of natural phenomena, and of normal operating, maintenance, testing, and postulated accident conditions on redundant channels do not result in loss of the protection function. The revised design therefore meets the criteria of GDC 22.

The NRC staff reviewed the setpoint calculations associated with the TFSP – PRNMS modification and determined that the TSs, including the associated LCOs, for plant instrumentation remain acceptable. The NRC staff also determined that existing SRs relating to the modification continue to assure the necessary quality of applicable systems and components, that facility operation will continue to be within safety limits, and that the GGNS LCOs will continue to be met. The criterion of 10 CFR 50.36 for establishing and maintaining plant operating parameters will, therefore, continue to be met.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Mississippi State official was notified of the proposed issuance of the amendment on August 16, 2018. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, published in the *Federal Register* on June 5, 2018 (83 FR 26115), and there has been no public comment on such finding. Accordingly, the

amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: Richard Stattel
Gursharan Singh

Date: March 12, 2019

SUBJECT: GRAND GULF NUCLEAR STATION, UNIT 1 – ISSUANCE OF AMENDMENT TO MODIFY THE UPDATED SAFETY ANALYSIS REPORT TO REPLACE TURBINE FIRST STAGE PRESSURE SIGNALS WITH POWER RANGE NEUTRON MONITORING SYSTEM SIGNALS (EPID L-2018-LLA-0072) DATED MARCH 12, 2019

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