ATTACHMENT 5

GNRO-2010/00040

RESPONSE TO RAI No. 5

GE HITACHI NUCLEAR ENERGY REPORT 0000-0102-0888-R1

GRAND GULF NUCLEAR STATION - PLANT-SPECIFIC RESPONSES REQUIRED BY NUMAC PRNM RETROFIT PLUS OPTION III STABILITY TRIP FUNCTION TOPICAL REPORT (NEDC-32410P-A)

HITACHI

GE Hitachi Nuclear Energy

0000-0102-0888-R1
GEH DRF 0000-0098-4327
Class III
June 2010

Grand Gulf Nuclear Station

Plant-Specific Responses Required By NUMAC PRNM Retrofit Plus Option III Stability Trip Function Topical Report (NEDC-32410P-A)

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The section numbers and Utility Actions Required listed below are from the NUMAC PRNM Retrofit Plus Option III Stability Trip Function Topical Report NEDC-32410P-A including Supplement 1.

Section No.	Utility Action Required	Response
2.3.2	Option III Stability Implementation Not a required specific LTR response Confirm that the actual plant Option III configuration is included in the variations covered in the Power Range Neutron Monitor (PRNM) Licensing Topical Report (LTR) [NEDC-32410P-A, Volumes 1 & 2 and Supplement 1].	The GGNS Option III implementation is in accordance with the LTR Requirements of section 2.3.2 with the exception of 2 deviations from the BWROG Option III Topical Report. Justification for these deviations is provided separately (GEH document 0000-0107-7607-P-R0, September 2009).
2.3.4	Plant Unique or Plant-Specific Aspects Confirm that the actual plant configuration is included in the variations covered in the Power Range Neutron Monitor (PRNM) Licensing Topical Report (LTR) [NEDC-32410P-A, Volumes 1 & 2 and Supplement 1], and the configuration alternative(s) being applied for the replacement PRNM are covered by the PRNM LTR. Document in the *plant-specific licensing submittal* for the PRNM project the actual, current plant configuration of the replacement PRNM, and document confirmation that those are covered by the PRNM LTR. For any changes to the plant operator's panel, document in the submittal the human factors review actions that were taken to confirm compatibility with existing plant commitments and procedures.	The actual, current plant configuration and the proposed replacement PRNM are included in the PRNM LTR as follows: (Applicable LTR sections are listed.) Current / Proposed APRM 2.3.3.1.1.3 / 2.3.3.1.2.2 RBM 2.3.3.2.1.2 / 2.3.3.2.2.2 Flow Unit 2.3.3.3.1.3 / 2.3.3.3.2.2 Rod Control 2.3.3.4.1.3 / 2.3.3.4.2.3 ARTS 2.3.3.5.1.5 / 2.3.3.5.2.3 Panel Interface 2.3.3.6.1.2 / 2.3.3.6.2.1 Human Factors Engineering review will be performed as part of the normal design process. The actual PRNMS System to be installed at GGNS contains 3 deviations from the system design as described in the LTR. Justification for these deviations is provided as Appendix A.
3.4	System Functions As part of the *plant-specific licensing submittal*, the utility should document the following: 1) The pre-modification flow channel configuration, and any changes planned (normally changes will be either adding two channels to reach four or no change planned) NOTE: If transmitters are added, the requirements on the added transmitters should be: • Non-safety related, but qualified	1) The current flow channel configuration consists of four flow channels, eight transmitters. Thus, the current configuration meets the requirements described in LTR Section 3.2.3.2.2, therefore no changes will be made.

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3.4 (cont.)	environmentally and seismically to operate in the application environment. • Mounted with structures equivalent or better than those for the currently installed channels. • Cabling routed to achieve separation to the extent feasible using existing cableways and routes.	
	2) Document the APRM trips currently applied at the plant. If different from those documented in the PRNM LTR, document plans to change to those in the LTR.	2) The new and existing APRM trip functions are listed below. The "post-modification" trips will be the same as those identified in the LTR. • The Neutron Flux – High, Setdown function (APRM Function 2.a) has been retained as described in LTR paragraphs 3.2.4 and 8.3.1.4. • The Fixed Neutron Flux-High function (APRM Function 2.b) has been retained as described in LTR paragraph 3.2.5). • The Inop function (APRM Function 2.c) has been retained as described in LTR paragraph 3.2.10. • The Flow Biased Simulated Thermal Power – High function (APRM Function 2.d) has been retained as described in LTR paragraph 3.2.5. • The 2-Out-of-4 Voter function (APRM Function 2.e) has been added as described in as described in LTR paragraphs 3.2.2 and 8.3.2.4. • The OPRM Upscale function (APRM Function 2.f) has been added as described in LTR paragraph 8.4.1.2.
	3) Document the current status related to ARTS and the planned post modification status as: • ARTS currently implemented, and retained in the PRNM • ARTS will be implemented concurrently with the PRNM (reference ARTS submittal) • ARTS not implemented and will not be implemented with the PRNM • ARTS not applicable	3) ARTS is not applicable to GGNS because Grand Gulf is a BWR6.

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4.4.1.11	Regulatory Requirements of the Replacement System – System Design This section identifies requirements that are expected to encompass most specific plant commitments relative to the PRNM replacement project, but may not be complete and some may not apply to all plants. Therefore, the utility must confirm that the requirements identified here address all of those identified in the plant commitments. The plant-specific licensing submittal should identify the specific requirements applicable for the plant, confirm that any clarifications included here apply to the plant, and document the specific requirements that the replacement PRNM is intended to meet for the plant.	A review of the GGNS requirements confirms that the regulatory requirements addressed in the LTR encompass the related GGNS requirements. Part of the normal design process confirms that the detailed PRNM design meets the applicable detailed GGNS technical and licensing requirements.
4.4.2.2.1.4	Regulatory Requirements for the Replacement System -Equipment Qualification - Temperature and Humidity Plant-specific action will confirm that the maximum control room temperatures plus mounting panel temperature rise, allowing for heat load of the PRNM equipment, does not exceed the temperatures presented in the PRNM LTR, and that control room humidity is maintained within the limits stated in the PRNM LTR. This evaluation will normally be accomplished by determining the operating temperature of the current equipment which will be used as a bounding value because the heat load of the replacement system is less than the current system while the panel structure, and thus cooling, remains essentially the same. Documentation of the above action, including the specific method used for the required confirmation should be included in *plant-specific licensing submittals.*	The PRNM control room electronics are qualified for continuous operation under the following temperature conditions: 5 to 50 °C [41 to 122 °F]. The GGNS control room temperature range is 60°F to 90°F. This is within the range for which PRNM equipment is qualified. The design process includes actions to confirm that the PRNM equipment, as installed in the plant, is qualified for the environmental limits, including temperature rise measurements. The PRNM control room electronics are qualified for continuous operation under the following relative humidity conditions: 10 to 90% (non-condensing). The GGNS control room humidity range is 20% to 50%. This is within the range for which PRNM equipment is qualified. The qualification results will be documented in a plant unique "Qualification Summary".
4.4.2.2.2.4	Regulatory Requirements for the Replacement System -Equipment Qualification - Pressure Plant-specific action will confirm that the maximum control room pressure does not exceed the limits presented in the PRNM LTR. Any pressure differential from inside to outside the mounting panel assumed to be negligible since the panels are not sealed and there is no forced cooling or ventilation. Documentation of this action and the required confirmation should be included in *plant-specific licensing submittals.*	The PRNM control room electronics are qualified for continuous operation under the following pressure conditions: 13 - 16 psia. The GGNS control room pressure range is 0.1 to 1.0 in. wg. This is within the range for which PRNM equipment is qualified. The qualification results will be documented in a plant unique "Qualification Summary".

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4.4.2.2.3.4	Regulatory Requirements for the Replacement System -Equipment Qualification -Radiation Plant-specific action will confirm that the maximum control room radiation levels do not exceed the limits presented in the PRNM LTR. Documentation of this action and the required confirmation should be included in *plant-specific licensing submittals.*	The PRNM control room electronics are qualified for continuous operation under the following conditions: Dose Rate $\leq$ 0.001 Rads (carbon)/hr and Total Integrated Dose (TID) $\leq$ 1000 Rads (carbon). The GGNS control room dose rate is 0.5 mRad/hr gamma. The control room Total Integrated Dose is 1.8 x 10^2 Rads gamma. This is within the range for which PRNM equipment is qualified. The qualification results will be documented in a plant unique "Qualification Summary.
4.4.2.3.4	Regulatory Requirements for the Replacement System -Seismic Qualification Plant-specific action or analysis will confirm that the maximum seismic accelerations at the mounting locations of the equipment (control room floor acceleration plus panel amplification) for both OBE and SSE spectrums do not exceed the limits stated in the PRNM LTR. Documentation of this action and the required confirmation should be included in *plant-specific licensing submittals.*	Evaluations to confirm that the maximum seismic accelerations at the mounting locations of the equipment do not exceed qualification limits of the equipment is completed as part of the normal design change process. The seismic qualification results will be documented in "Qualification Summary".
4.4.2.4.4	Regulatory Requirements for the Replacement System -EMI Qualification The utility should establish or document practices to control emission sources, maintain good grounding practices and maintain equipment and cable separation.	
	1) Controlling Emissions a) Portable Transceivers (walkie-talkies): Establish practices to prevent operation of portable transceivers in close proximity of equipment sensitive to such emissions. (NOTE: The qualification levels used for the NUMAC PRNM exceed those expected to result from portable transceivers, even if such transceivers are operated immediately adjacent to the NUMAC equipment.)	1) Controlling Emissions a) The qualification levels used for the NUMAC PRNM system exceed those expected to result from portable transceivers, even if such transceivers are operated immediately adjacent to NUMAC equipment. GGNS generally prohibits operation of portable transceivers near sensitive equipment, and if warranted, requires positioning of warning signs at critical locations throughout the plant. Placement of warning signs is evaluated as part of the modification process. (NOTE: The GGNS control room is a radio exclusion area.)

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4.4.2.4.4 (cont.)	b) ARC Welding: Establish practices to assure that ARC welding activities do not occur in the vicinity of equipment sensitive to such emissions, particularly during times when the potentially sensitive equipment is required to be operational for plant safety. (NOTE: The qualification levels used for NUMAC PRNM minimize the likelihood of detrimental effects due to ARC welding as long as reasonable ARC welding control and shielding practices are used.)	b) The qualification levels used for the NUMAC PRNM system minimize the likelihood of detrimental effects due to ARC welding as long as reasonable ARC welding control and shielding practices are used. ARC welding is only performed at GGNS with specific work orders and directions, and is known to have the potential to affect operation of I&C equipment at a number of locations in the plant. Therefore, ARC welding activity is only performed when any potential effect on I&C equipment is tolerable relative to plant operation.
	c) Limit Emissions from New Equipment: Establish practices for new equipment and plant modifications to assure that they either do not produce unacceptable levels of emissions, or installation shielding, filters, grounding or other methods prevent such emissions from reaching other potentially sensitive equipment. These practices should address both radiated emissions and conducted emissions, particularly conducted emissions on power lines and power distribution systems. Related to power distribution, both the effects of new equipment injecting noise on the power system and the power system conducting noise to the connected equipment should be addressed. (NOTE: For the qualification of the PRNM equipment includes emissions testing.)	c) EMI emissions from new equipment installed at GGNS are evaluated as part of the normal design modification process described in GGNS procedures.
	2) Grounding Practices Existing Grounding System: The specific details and effectiveness of the original grounding system in BWRs varied significantly. As part of the modification process, identify any known or likely problem areas based on previous experience and include in the modification program either an evaluation step to determine if problems actually exist, or include corrective action as part of the modification. (NOTE: The PRNM equipment is being installed in place of existing PRM electronics which is generally more sensitive to EMI than the NUMAC equipment. As long as the plant has experienced no significant problems with the PRM, no problems are anticipated with the PRNM provided grounding is done in a comparable manner.)	2) Grounding Practices The PRNM system equipment is being installed in place of existing Power Range Monitor (PRM) system electronics. The replacement system interfaces with the same cables and wiring at the panel interfaces as the current system, including ground bus connections. No problems have been identified with the current PRM system related to grounding or grounding practices. The original installation included specific grounding practices designed to minimize performance problems. The replacement PRNM system is less sensitive to grounding issues than is the current system and includes specific actions in the wiring inside the panel to maximize shielding and grounding effectiveness.

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4.4.2.4.4 (cont.)	Grounding Practices for New Modifications: New plant modifications process should include a specific evaluation of grounding methods to be used to assure both that the new equipment is installed in a way equivalent to the conditions used in the qualification. (NOTE: NUMAC PRNM equipment qualification is performed in a panel assembly comparable to that used in the plant.)	
	3) Equipment and Cable Separation • Cabling: Establish cabling practices to assure that signal cables with the potential to be "receivers" are kept separate from cables that are sources of noise. (NOTE: The original PRM cable installation requirements met this objective. The replacement PRNM uses the same cable routes and paths, so unless some specific problem has been identified in the current system, no special action should be necessary for the PRNM modification.) • Equipment: Establish equipment separation and shielding practices for the installation of new equipment to simulate that equipment's qualification condition, both relative to susceptibility and emissions. (NOTE: The original PRM cabinet design met this objective. The replacement PRNM uses the same mounting cabinet, and used an equivalent mounting assembly for qualification. No special action should be necessary for the PRNM modification.) The *plant-specific licensing submittals* should identify the practices that are in place or will be applied for the PRNM modification to address each of the above items.	3) Equipment and Cable Separation The original PRM system cable installation requirements met this objective. The replacement PRNM system uses the same cable routes and paths at comparable energy levels where feasible. Because no specific problem has been identified in the current system, no special action is necessary for the PRNM modification. The existing system cabling complies with applicable GGNS cable routing and separation requirements. Additionally, the modification process is performed in accordance with the existing separation criteria.

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6.6	System Failure Analysis The utility must confirm applicability of the failure analysis conclusions contained in the PRNM LTR by the following actions: 1. Confirm that the events defined in EPRI Report No. NP-2230 or in Appendices F and G of Reference 11 of the PRNM LTR, encompass the events that are analyzed for the plant; 2. Confirm that the configuration implemented by the plant is within the limits described in the LTR; and 3. Prepare a plant-specific 10CFR50.59 evaluation of the modification per the applicable plant procedures. These confirmations and conclusions should be documented in the *plant-specific licensing submittals* for the PRNM modification. [Reference 11 of the LTR is NEDC-30851P-A, "Technical Specification Improvement Analysis for BWR Reactor Protection System", Licensing Topical Report, GE Nuclear Energy, Class III (proprietary), dated March 1988.	1. The GGNS Technical Specification Surveillance Requirements for the Reactor Protection System (RPS) are based on Reference 11 of the PRNM LTR as discussed in the GGNS Technical Specification Bases (Section 3.3.1.1, Reactor Protection System Instrumentation, Reference 9 in GGNS TS Bases). Therefore, the Reference 11 failure analysis is applicable to GGNS. The overall redundancy and diversity of sensors available to provide trip signals in the RPS meets NRC-approved licensing basis requirements. 2. The proposed PRNM configuration is included among the configurations described in the PRNM LTR, as itemized under Section 2.3.4 above. The proposed configuration is being designed by GEH and is within the limits described in the LTR. 3. The requirements of 10CFR50.59 applies to the PRNMS modification in accordance with applicable plant procedures.
7.6	Impact on UFSAR The plant-specific action required for FSAR updates will vary between plants. In all cases, however, existing FSAR documents should be reviewed to identify areas that have descriptions specific to the current PRNM using the general guidance of Sections 7.2 through 7.5 of the PRNM LTR to identify potential areas impacted. The utility should include in the *plant-specific licensing submittal* a statement of the plans for updating the plant FSAR for the PRNM project.	Applicable sections of the FSAR are reviewed and appropriate revisions of those sections are prepared and approved as part of the normal design process. Following implementation of the design modification, and closure of the design package, the FSAR revisions are included in the updated FSAR as part of the periodic 10 CFR 50.71(e) FSAR update submittal.

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8.3.1.4	APRM-Related RPS Trip Functions - Functions Covered by Tech Specs	
	1. Delete the APRM Downscale function, if currently used, from the RPS Instrumentation "function" table, the related surveillance requirements, and, if applicable, the related setpoint, and related descriptions in the bases sections.	1. GGNS does not have an "APRM Downscale" RPS Trip Function Tech Spec.
	2. Delete the APRM Flow-biased Neutron Flux Upscale function, if currently used, from the RPS Instrumentation "function" table, the related surveillance requirements, and, if applicable, the related setpoint, and related descriptions in the bases sections. Replace these with the corresponding entries for the APRM Simulated Thermal Power - High and the APRM Neutron Flux - High functions. Perform analysis necessary to establish setpoints for added trips.	2. APRM Flow Biased Simulated Thermal Power - High and the APRM Fixed Neutron Flux - High functions have been retained.
	3. Add the APRM Neutron Flux - High (Setdown) function, if not currently used, to the RPS Instrumentation "function" table, add the related surveillance requirements, and, if applicable, the related setpoints, and related descriptions in the bases sections. Perform analysis necessary to establish setpoints for added trips.	3. The current APRM Neutron Flux – High, Setdown function has been retained.
8.3.2.4	APRM-Related RPS Trip Functions - Minimum Number of Operable APRM Channels	
	1. For the 4-APRM channel replacement configuration, revise the RPS Instrumentation "function" table to show 3 APRM channels, shared by both trip systems for each APRM function shown (after any additions or deletions per PRNM LTR Paragraph 8.3.1.4). Add a "2-out-of-4 Voter" function with two channels under the "minimum operable channels". For plants with Tech Specs that include a footnote calling for removing shorting links, remove the references to the footnote related to APRM (retain references for SRM and IRM) and delete any references to APRM channels in the footnote. For smaller core plants, delete the notes for and references to special conditions related to loss of all LPRMs from the "other" APRM.	1. The PRNM modification and the proposed Tech Spec and Bases change implement the changes as described in the PRNM LTR for a BWR6 plant. GGNS Tech Specs do not include notes related to APRMs that call for removal of shorting links or references to special conditions related to loss of all LPRMs from the "other" APRM. Therefore, no related note changes are required. A "2-out-of-4 Voter" function with two channels under the "minimum operable channels" have been added as Function 2.e.

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8.3.2.4 (cont.)	2. Review action statements to see if changes are required. If the improvements documented in Reference 11 have not been implemented, then changes will likely be required to implement the 12-hour and 6-hour operation times discussed above for fewer than the minimum required channels. If Improved Tech Specs are applied to the plant, action statements remain unchanged.	2. Action statement changes in the proposed Tech Spec change are consistent with the PRNM LTR described changes for plants with Improved Tech Specs. GGNS has previously switched to the ISTS format.
	3. Revise the Bases section as needed to replace the descriptions of the current 6- or 8-APRM channel systems and bypass capability with a corresponding description of the 4-APRM system, 2-out-of-4 Voter channels (2 per RPS system), and allowed one APRM bypass total.	3. The proposed Tech Spec Bases changes include revisions to the descriptions of the architecture, consistent with the PRNM LTR.
8.3.3.4	<u>APRM-Related RPS Trip Functions - Applicable Modes of Operation</u>	
	1) <u>APRM Neutron Flux - High (Setdown)</u> Change Tech Spec "applicable modes" entry, if required, to be Mode 2 (startup). Delete references to actions and surveillance requirements associated with other modes. Delete any references to notes associated with "non-coincidence" mode and correct notes as required. Revise Bases descriptions as required.	1) Tech Spec and Bases changes are consistent with the PRNM LTR.
	2) <u>APRM Simulated Thermal Power - High</u> Retain as is unless this function is being added to replace the APRM Flow-biased Neutron Flux Trip. In that case, add requirement for operation in Mode 1 (RUN) and add or modify Bases descriptions as required.	2) The APRM <u>Flow Biased Simulated Thermal Power - High</u> function has been retained and is consistent with the PRNM LTR.
	3) <u>APRM Neutron Flux - High</u> Retain as is unless this function is being added to replace the APRM Flow-biased Neutron Flux Trip. In that case, add requirement for operation in Mode 1 (RUN) and add or modify Bases descriptions as required.	3) The APRM <u>Fixed Neutron Flux - High</u> function has been retained and is consistent with the PRNM LTR.
	4) <u>APRM Inop Trip</u> Delete any requirements for operation in modes other than Mode 1 and Mode 2 (RUN and STARTUP). Revise the Bases descriptions as needed.	4) The current GGNS TS require this function only in Modes 1 and 2.

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8.3.4.1.4	APRM-Related RPS Trip Functions - Channel Checks/ Instrument Checks a) For plants without Channel Check requirements, add once per 12 hour or once per day Channel Check or Instrument Check requirement for the three APRM flux based functions. No Channel Check requirements are added for APRM Inop function. Plants with once per 12 hour or once per shift requirements may change them to once per day. b) For plants with 4 full recirculation flow channels and with Tech Specs that call for daily or other channel check requirements for flow comparisons under APRM Flow Biased Simulated Thermal Power Trip, delete those requirements. Move any note reference related to verification of flow signals to Channel Functional Test entry.	a) The GGNS Technical Specifications currently include a once-per-shift Channel Check requirement for the APRM Functions (except for Inop). The APRM Function Channel Check requirement has been changed from once per 12 hours to once per day (24 hours). The new Channel Check SR 3.3.1.1.19 with a frequency of 24 hours has been added to TS 3.3.1.1 and applies to Functions 2.a, 2.b, 2.d, 2.e, and 2.f. b) GGNS currently uses 8 recirculation flow transmitters. Associated surveillances have been included in those for the APRM Flow Biased Simulated Thermal Power – High and the OPRM Upscale functions (the latter because of the OPRM trip enable function). The proposed Technical Specification and Bases changes for the recirculation flow related SRs are consistent with the PRNM LTR but with some expansion to clarify that the recirculation flow functions also support the OPRM Upscale function trip enable.
8.3.4.2.4	APRM-Related RPS Trip Functions - Channel Functional Tests a) Delete existing channel functional test requirements and replace with a requirement for a Channel Functional Test frequency of each 184 days (6 months) [delete any specific requirement related to startup or shutdown except for the APRM Neutron Flux - High (Setdown) function as noted in Paragraph 8.3.4.2.2(1) of the PRNM LTR. Add a notation that both the APRM channels and the 2-out-of-4 Voter channels are to be included in the Channel Functional Test. b) Add a notation for the APRM Simulated Thermal Power - High function that the test shall include the recirculation flow input processing, excluding the flow transmitters. CAUTION: Plants that have not implemented the APRM surveillance improvements of Reference 11 of the PRNM LTR, or those that have continued to use a weekly surveillance of scram contactors, may need to implement or modify surveillance actions to continue to	a) The proposed Technical Specification and Bases changes related to Channel Functional Tests are consistent with the PRNM LTR. b) The proposed Technical Specification and Bases changes to Channel Functional Test for the APRM functions include a notation, applicable to the Flow Biased Simulated Thermal Power – High (Function 2.d) and the OPRM Upscale (Function 2.f), consistent with the PRNM LTR requirements, that the SR includes the recirculation flow input processing, excluding the flow transmitters. However, the PRNM LTR includes this notation only in the Bases. For the GGNS Technical Specification, the Channel Functional Test has been added as

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8.3.4.2.4 (cont.)	provide a once per week functional test of scram contactors. (Prior to changes defined in Reference 11, the weekly APRM functional test also provides a weekly test of all automatic scram contactors.)	SR 3.3.1.1.20, and has been expanded to also apply to the OPRM Upscale function (to cover OPRM Upscale trip enable). The functional test procedure will be established to test all of the hardware required to produce the trip functions, but not to directly re-test software-only (firmware-only) logic. The APRM automatic self-test function monitors the integrity of the EPROMs storing all of the firmware so that if a hardware fault results in a "change" to the firmware (software), that fault will be detected by the self-test logic. The continued operation of the self-test procedures is monitored by the built-in "watch-dog timer" function, so if for some unforeseen reason the self-test function (lowest priority in the instrument logic) stops running, that failure also will be detected automatically. To provide further assurance that the self-test function continues to operate, a step will be included in the APRM Channel Check surveillance to confirm that self-test is still running.
8.3.4.3.4	APRM-Related RPS Trip Functions - Channel Calibrations a) Replace current calibration interval with either 18 or 24 months except for APRM Inop. Retain Inop requirement as is (i.e., no requirement for calibration). b) Delete any requirements for flow calibration and calibration of the 6 second time constant separate from overall calibration of the APRM Simulated Thermal Power – High function.	a) The proposed Technical Specification and Bases changes related to Channel Calibration has been changed to 24-month interval, with no calibration required for the Inop Function, consistent with the PRNM LTR. b) Consistent with the PRNM LTR requirements, the proposed Technical Specification and Bases changes add a notation applicable to the Channel Calibration for the APRM Flow Biased Simulated Thermal Power – High function to exclude requirements to calibrate the recirculation flow transmitters. However, the PRNM LTR includes this notation only in the Bases. For the GGNS Technical Specification, the notation has been included in Channel Calibration SR 3.3.1.1.10. In addition, current SRs 3.3.1.1.16, which verifies the simulated thermal power time constant, and 3.3.1.1.18, which adjusts the flow control reference card, have been deleted.

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8.3.4.3.4 (cont.)	c) Replace every 3 day frequency for calibration of APRM power against thermal power with a 7 day frequency if applicable. d) Revise Bases text as required.	c) The current GGNS Technical Specifications include a "weekly" frequency for the verification of APRM power versus calculated plant thermal power so no change in that frequency is required to be consistent with the PRNM LTR. d) The proposed Technical Specification Bases changes related to Channel Calibrations are consistent with the PRNM LTR.
8.3.4.4.4	APRM-Related RPS Trip Functions - Response Time Testing Delete response time testing requirement from Tech Specs or plant procedures, as applicable, for the APRM functions. Replace it with a response time testing requirement for the 2-out-of-4 Voter "pseudo" function, to include the output solid-state relays of the voter channel through the final RPS trip channel contactors. Frequency of response time testing shall be determined using four 2-out-of-4 Voter channels, but tests may alternate use of 2-out-of-4 Voter outputs provided each APRM/RPS interfacing relay is tested at least once per eight refueling cycles (based on a maximum 24 month cycle), and each RPS scram contactor is tested at least once per four refueling cycles. Each 2-out-of-4 Voter output shall be tested at no less than half the frequency of the tests of the APRM/RPS interface relays. Tests shall alternate such that one logic train for each RPS trip system is tested every two cycles.	The proposed Technical Specification and Bases changes related to Response Time Testing (new SR 3.3.1.1.22 and Table 3.3.1.1-1) are consistent with the justification in the PRNM LTR Supplement 1. Consistent with the PRNM LTRs, the only APRM Function to which the SR applies is Function 2.e (voter). However, while the PRNM LTRs justified reduced response time testing frequency for Function 2.e, no TS markups were included to implement an "n" greater than 4 (the total number of voter channels). Therefore, a note has been added to the GGNS SR Table 3.3.1.1-1 to define that "n=8" for Function 2.e. The PRNM LTR Supplement 1 justified response time testing at a rate that tested one RPS Interface relay every plant operating cycle, with tests using the APRM output for one cycle and the OPRM output for the next cycle. This yields a testing rate once per 8 operating cycles for each RPS interface relay and once per every 16 operating cycles for the APRM or OPRM output. The PRNM modification includes redundant APRM trip and redundant OPRM trip outputs from each 2-Out-Of-4 Voter channel. One of the OPRM outputs and one of the APRM outputs are connected in series to the coil of one RPS interface relay. The second OPRM output and the second APRM output from the 2-Out-Of-4 Voter channel are connected in series with the coil to a second RPS interface relay. There are 8 total RPS interface relays.
8.3.5.4	APRM-Related RPS Trip Functions - Logic System Functional Testing (LSFT) Revise Tech Specs to change the interval for LSFT from 18 months to 24 months unless the utility elects to retain the 18-month interval for plant scheduling purposes. Delete any LSFT requirements associated with the APRM	The GGNS Technical Specifications have been changed to delete the LSFT requirement from the existing APRM Functions 2.a, 2.b, 2.c, and 2.d. New SR 3.3.1.1.21 with a 24-month interval, has been added to TS 3.3.1.1 and applied to the new 2-Out-of-4 Voter function,

Section No.	Utility Action Required	Response
8.3.5.4 (cont.)	channels and move it to the 2-out-of-4 Voter channel. Include testing of the 2-out-of-4 voting logic and any existing LSFTs covering RPS relays.	APRM Function 2.e.
8.3.6.1	APRM-Related RPS Trip Functions - Setpoints Add to or delete from the appropriate document any changed RPS setpoint information. If ARTS is being implemented concurrently with the PRNM modification, either include the related Tech Spec submittal information with the PRNM information in the plant-specific submittal, or reference the ARTS submittal in the PRNM submittal. In the *plant-specific licensing submittal,* identify what changes, if any, are being implemented and identify the basis or method used for the calculation of setpoints and where the setpoint information or changes will be recorded.	ARTS is not applicable at GGNS. PRNM setpoints and Allowable Values are re-calculated or confirmed using approved setpoint methodology. The Allowable Values for the APRM RPS Functions are included in the Technical Specifications or the COLR, comparable to what is currently in the GGNS Technical Specifications and consistent with the PRNM LTR.
8.4.1.4	OPRM-Related RPS Trip Functions - Functions Covered by Tech Specs Add the OPRM Upscale function as an "APRM function" in the RPS Instrumentation "function" table. Also add the related surveillance requirements and, if applicable, the related setpoint, and the related descriptions in the bases sections. Perform analysis necessary to establish setpoints for the OPRM Upscale trip. Add discussions related to the OPRM function in the Bases for the APRM Inop and 2-out-of-4 Voter functions. NOTE: The markups in Appendix H of Supplement 1 to the PRNM LTR show the OPRM Upscale as an APRM sub-function. However, individual plants may determine that for their particular situation, addition of the OPRM to the RPS Instrumentation table separate from the APRM, or as a separate Tech Spec, better meets their needs. In those cases, the basis elements of the Tech Spec as shown in this Supplement would remain, but the specific implementation would be different.	An OPRM Upscale Function has been added to the GGNS Technical Specification as an "APRM Function" (Function 2.f) consistent with PRNM LTR Supplement 1, Appendix H. Additions to the Technical Specification Bases for Function 2.f have also been incorporated consistent with the PRNM LTR. The PRNM LTR Supplement 1 included some additional wording for Function 2.e (voter) to address independent voting of the OPRM and APRM signals.
8.4.2.4	OPRM-Related RPS Trip Functions - Minimum Number of Operable OPRM Channels For the OPRM functions added (Section 8.4.1), include in the OPRM Tech Spec a "minimum operable channels" requirement for three OPRM channels, shared by both trip systems.	A minimum operable channels requirement of three, shared by both trip systems has been included in the Technical Specification for the OPRM Upscale Function (Function 2.f). This addition, as well as addition of Required Action statements and Bases descriptions, is consistent with the PRNM LTR and LTR Supplement 1.

Section No.	Utility Action Required	Response
8.4.2.4 (cont.)	Add the same action statements as for the APRM Neutron Flux - High function for OPRM Upscale function. In addition, add a new action statement for OPRM Upscale function unavailable per Paragraph 8.4.2.2 of the PRNM LTR. Revise the Bases section as needed to add descriptions of the 4-OPRM system with 2-out-of-4 output Voter channels (2 per RPS Trip System), and allowed one OPRM bypass total.	However, to make the Required Action statements more consistent with the intent of the LTR, a note has been added to Required Action J.2 stating that LCO 3.0.4(c) is applicable. LCO 3.0.4 was revised in GGNS Technical Specifications Amendment 175 to reflect NRC-approved changes regarding Mode change limitations via BWROG TSTF-359, "Increased Flexibility in Mode Restraints." Although applying LCO 3.0.4(c) is not included in the NUMAC PRNM LTR Supplement 1, it is consistent with the intent of Required Action J.2. Inclusion of Action J.2 is intended to allow orderly identification and Implementation of a resolution plan for an unanticipated design problem with the OPRM system without undue impact on normal plant operation. The LCO 3.0.4(c) application does not eliminate the requirement to restore the OPRM Upscale function to OPERABLE status within a 120—day period. Applying LCO 3.0.4(c) does, however, allow the plant to start up with the alternate detect and suppress provision of Action J.2 in effect during the 120-day period.
8.4.3.4	OPRM-Related RPS Trip Functions - Applicable Modes of Operation Add the requirement for operation of the OPRM Upscale function in Mode 1 (RUN) when Thermal Power is $\geq$ 25% RTP, and add Bases descriptions as required.	A GGNS-specific Modes of Operation requirement of $\geq$ 24% RTP, consistent with the PRNM LTR Supplement 1 has been included in the Technical Specification along with associated Bases descriptions.
8.4.4.1.4	OPRM-Related RPS Trip Functions - Channel Check Add once per 12 hour or once per day Channel Check or Instrument Check requirements for the OPRM Upscale function.	A new Channel Check requirement of once per day (24 hours), SR 3.3.1.1.19, has been added. It is applied to the OPRM Upscale function, consistent with the PRNM LTR.
8.4.4.2.4	OPRM-Related RPS Trip Functions - Channel Functional Test Add Channel Functional Test requirements with a requirement for a test frequency of every 184 days (6 months), including the 2-out-of-4 Voter function.	A new Channel Functional Test requirement with a test frequency of every 184 days (Table 3.3.1.1-1) has been added to TS 3.3.1.1 as SR 3.3.1.1.20 for the OPRM Upscale and 2-Out-Of 4 Voter Functions consistent with the PRNM LTR, Supplement 1. The third note to SR 3.3.1.1.20 (not included in the PRNM LTR)

Section No.	Utility Action Required	Response
8.4.4.2.4 (cont.)		clarifies that the SR also applies to the flow input function, except the flow transmitters.
8.4.4.2.4 (cont.)	Add a "confirm auto-enable region" surveillance on a once per outage basis up to 24 month intervals.	New "confirm auto-enable region" surveillance requirement, SR 3.3.1.1.23, has been added to TS 3.3.1.1 to require confirmation that the OPRM Upscale trip output auto-enable (not bypassed) setpoints remain correct. The SR Bases wording is consistent with the LTR.
8.4.4.3.4	OPRM-Related RPS Trip Functions - Channel Calibration Add calibration interval requirement of every 24 months for the OPRM Upscale function. Revise Bases text as required.	Channel Calibration SR 3.3.1.1.10 has been applied to the OPRM Upscale function to be consistent with the PRNM LTR Supplement 1. The frequency of SR 3.3.1.1.10 has been changed from 184 days to 24 months, consistent with the LTR.
8.4.4.4.4	OPRM-Related RPS Trip Functions - Response Time Testing Modify as necessary the response time testing procedure for the 2-out-of-4 Voter function to include the Voter OPRM output solid-state relays as part of the response time tests, alternating testing of the Voter OPRM output with the Voter APRM output.	See response to 8.3.4.4.4. That response also addresses OPRM.
8.4.5.4	OPRM-Related RPS Trip Functions - Logic System Functional Testing (LSFT) Add requirement for LSFT every refueling cycle, 18 or 24 months at the utility's option based on which best fits plant scheduling.	The LSFT surveillance (new SR 3.3.1.1.21) for the OPRM Upscale Function is a test of the 2-Out-Of-4 Voter only, consistent with the PRNM LTR. Consistent with the PRNM LTR Supplement 1, revision of the related plant procedures to include testing of the OPRM Upscale trip outputs from the 2-Out-Of-4 Voter is required. The procedure changes are made as part of the normal modification process.
8.4.6.1	OPRM-Related RPS Trip Functions - Setpoints Add setpoint information to the appropriate document and identify in the plant-specific submittal the basis or method used for the calculation and where the setpoint information will be recorded.	There are four "sets" of OPRM related setpoints and adjustable parameters: a) OPRM trip auto-enable (not bypassed) setpoints for STP and drive flow; b) period based detection algorithm (PBDA) confirmation count and amplitude setpoints; c) PBDA tuning parameters; and d) growth rate algorithm (GRA) and amplitude based algorithm (ABA) setpoints. The first set, the setpoints for the "auto-enable" region for OPRM, as discussed in the Bases for Function 2.f, will be treated as nominal setpoints with no additional margins added. The

Section No.	Utility Action Required	Response
8.4.6.1 (cont.)		deadband for these setpoints is established so that it increases the enabled region once the enabled region is entered. The settings are defined plant procedures. The second set, the PBDA trip setpoints, will be established in accordance with the BWROG LTR 32465-A methodology, previously reviewed and approved by the NRC, and will be documented in the COLR. The third set, the PBDA "tuning" parameter values, will be established in accordance with and controlled by GGNS procedures, within the limits established in the BWROG LTRs, or as documented in this submittal, and documented in the GGNS Core Operating Limits Report. The fourth set, the GRA and ABA setpoints, consistent with the BWROG submittals, will be established as nominal values only, and controlled by GGNS procedures.
8.5.1.4	APRM-Related Control Rod Block Functions - <u>Functions Covered by Tech Specs</u> If ARTS will be implemented concurrently with the PRNM modification, include or reference those changes in the *plant-specific PRNM submittal.* Implement the applicable portion of the above described changes via modifications to the Tech Specs and related procedures and documents. In the *plant-specific submittal,* identify functions currently in the plant Tech Specs and which, if any, changes are being implemented. For any functions deleted from Tech Specs, identify where setpoint and surveillance requirements will be documented. NOTE: A utility may choose not to delete some or all of the items identified in the PRNM LTR from the plant Tech Specs.	ARTS is not applicable at GGNS. GGNS Technical Specifications currently do not contain any APRM rod block functions.
8.5.2.4	<u>APRM-Related Control Rod Block Functions - Minimum Number of Operable Control Rod Block Channels</u> Change the minimum number of APRM channels to three, if APRM functions are retained in Tech Specs. No additional action is required relative to minimum operable channels' beyond that required by Paragraph 8.5.1.4 of the PRNM LTR.	See 8.5.1.4 above. No additional confirmation of action required relative to minimum operable channels as shown in the Technical Specifications beyond that required by 8.5.1.4 above.

Section No.	Utility Action Required	Response
8.5.3.4	APRM-Related Control Rod Block Functions - Applicable Modes of Operation No action required relative to modes during which the function must be available beyond that required by Paragraph 8.5.1.4 of the PRNM LTR unless APRM functions are retained in Tech Specs and include operability requirements for Mode 5. In that case, delete such requirements.	See 8.5.1.4 above. No additional confirmation of action required relative to applicable modes of operation as shown in the Technical Specifications beyond that required by 8.5.1.4 above.
8.5.4.1.4	APRM-Related Control Rod Block Functions - Required Surveillances and Calibration - Channel Check Delete any requirements for instrument or channel checks related to RBM and, where applicable, recirculation flow rod block functions (non-ARTS plants), and APRM functions. Identify in the plant-specific PRNM submittals if any checks are currently included in Tech Specs, and confirm that they are being deleted.	GGNS Technical Specifications currently do not contain any APRM rod block functions, or any Channel Check requirements for the RBM rod block functions. Therefore, no change to GGNS Technical Specifications is required to implement the PRNM LTR requirements. The RBM is not applicable to GGNS.
8.5.4.2.4	APRM-Related Control Rod Block Functions - Required Surveillances and Calibration - Channel Functional Test Change Channel Functional Test requirements to identify a frequency of every 184-days (6 months). In the *plant-specific licensing submittal,* identify current Tech Spec test frequencies that will be changed to 184 days (6 months).	GGNS Technical Specifications currently do not contain any APRM rod block functions.
8.5.4.3.4	APRM-Related Control Rod Block Functions - Required Surveillances and Calibration - Channel Calibrations Change channel calibration requirements to identify a frequency of every 24 months. In the *plant-specific licensing submittal,* identify current Tech Spec test frequencies that will be changed to 24 months.	GGNS Technical Specifications currently do not contain any APRM rod block functions
8.5.4.4.4	APRM-Related Control Rod Block Functions - Required Surveillances and Calibration - Response Time Testing None.	GGNS Technical Specifications currently do not contain any APRM rod block functions.
8.5.5.4	APRM-Related Control Rod Block Functions - Required Surveillances and Calibration - Logic System Functional Testing (LSFT) None.	GGNS Technical Specifications currently do not contain any APRM rod block functions.

Section No.	Utility Action Required	Response
8.5.6.1	APRM-Related Control Rod Block Functions - Required Surveillances and Calibration - Setpoints Add to or delete from the appropriate document any changed control rod block setpoint information. If ARTS is being implemented concurrently with the PRNM modification, either include the related Tech Spec submittal information with the PRNM information in the *plant-specific submittal,* or reference the ARTS submittal in the PRNM submittal. In the *plant-specific submittal,* identify what changes, if any, are being implemented and identify the basis or method used for calculation of setpoints and where the setpoint information or changes will be recorded.	ARTS is not applicable to GGNS.
8.6.2	Shutdown Margin Testing - Refueling As applicable, revise the Shutdown Margin Testing - Refueling (or equivalent Tech Spec) LCO(s), action statements, surveillance requirements and Bases as required to be consistent with the APRM Tech Spec changes implemented for PRNM.	Technical Specification and Technical Specification Bases changes to Specification 3.10.8, Shutdown Margin (SDM) Test – Refueling have been made by adding APRM Function 2.e to LCO 3.10.8 and SR 3.10.8.1. .
None	Specification 3.4.1, Recirculation Loops Operating No action identified in the PRNM LTR.	Changes are included in the proposed Tech Spec Bases for LCO 3.4.1. Deleted statements related to Fraction of Core Boiling Boundary and PBDS and Reference 4 (NEDO 32339-A). These changes, although not directly addressed in the PRNM LTR, are consistent with the remainder of the PRNM modification and implementation of the Option III Stability Solution.
None	Core Operating Limits Report Reporting requirements Section 5.6.5 does not currently address the OPRM.	Specification 5.6.5 has been modified to require the setpoints for APRM Function 2.f (OPRM Upscale) to be included in the COLR.
9.1.3	Utility Quality Assurance Program As part of the *plant-specific licensing submittal,* the utility should document the established program that is applicable to the project modification. The submittal should also document for the project what scope is being performed by the utility and what scope is being	Quality assurance requirements for work performed at GGNS are defined and described in GGNS Quality Assurance Program Manual. For the PRNM modification, GGNS has contracted with GEH to include the following PRNM scope: 1) design, 2) hardware/ software, 3) licensing support, 4) training, 5) O&M

Section No.	Utility Action Required	Response
9.1.3 (cont.)	supplied by others. For scope supplied by others, document the utility actions taken or planned to define or establish requirements for the project, to assure those requirements are compatible with the plant-specific configuration. Actions taken or planned by the utility to assure compatibility of the GEH quality program with the utility program should also be documented. Utility planned level of participation in the overall V&V process for the project should be documented, along with utility plans for software configuration management and provision to support any required changes after delivery should be documented.	manuals and design documentation, 6) EMI/RFI qualification of equipment, and 7) PRNMS setpoint calculations. On-site engineering work to incorporate the GEH provided design information into an Engineering Change (EC) or to provide any supporting, interface design changes will be performed per requirements of applicable GGNS procedures. Modification work to implement the design change will be performed per GGNS procedures or GGNS-approved contractor procedures. GGNS participates in appropriate reviews of GEH's design and V&V program for the PRNM modification. For software delivered in the form of hardware (EPROMs), GGNS intends to have GEH maintain post delivery configuration control of the actual source code and handle any changes. GGNS handles any changes in the EPROMs as hardware changes under its applicable hardware modification procedures.

Appendix A

Grand Gulf Nuclear Station
NUMAC PRNM LTR Deviations

Grand Gulf Nuclear Station NUMAC PRNM LTR Deviations

Grand Gulf Nuclear Station (GGNS) will be submitting a license application for the implementation of Power Range Neutron Monitor (PRNM). The bases for the license application are the referenced documents in the relevant licensing topical reports (Reference 1-3).

The PRNM developed for GGNS has three deviations from the referenced documents. These are summarized in Table 1 and discussed in detail below. The licensing topical reports explicitly allow for plant-to-plant variation of some features. These are not addressed herein.

Table 1. GGNS NUMAC PRNM LTR Deviations

	Function/ Equipment	PRNM Licensing Basis	GGNS Design	Justification
a.	APRM Upscale / OPRM Upscale / APRM Inop Function Logic	OPRM Upscale function voted separately from the APRM Inop function	OPRM Upscale function voted with the APRM Inop function	Improved operating flexibility
b.	OPRM Pre-Trip Alarm	Alarm if any instability algorithm exceeds defined alarm setpoints.	Alarm if the period based algorithm exceeds defined alarm setpoints.	Delete function that does not afford timely operator action.
c.	Recirculation Flow Processing	The PCI uses 2 Total Flow signals for the Flow Comparison.	The PCI uses 4 Total Flow signals for the Flow Comparison.	Safety functions are not affected; design was reviewed and approved for all plants in original report.

Technical Justifications

a. APRM Upscale / OPRM Upscale / APRM Inop Function Logic

Licensing Topical Report NEDC-32410P-A Supplement 1 (Reference 3) Section 8.4.1.3 describes the logic wherein the OPRM Upscale function is voted separately from the APRM Inop function. That is, an APRM Inop in one APRM channel and an OPRM Upscale in another will result in two half-trips in each of the 2-out-of-4 voter channels, but no RPS trips.

Designed this way, when an APRM chassis keylock switch is placed in the "INOP" position, the APRM upscale trip signal sent to the 2-out-of-4 voter channels is set to trip. However, the OPRM trip output from that chassis continues to be processed normally. Typically this logic is of no consequence because if an APRM chassis (affecting both the APRM and OPRM channels) is declared inoperable, the APRM bypass can be used to bypass both the APRM and OPRM trips from that channel, which in turn modifies the logic in the 2-out-of-4 voter to be a 2-out-of-3 vote of both the APRM and OPRM trips from the remaining 3 channels. However, if the need to declare a second APRM/OPRM channel inoperable arises when another APRM/OPRM channel is already bypassed (and cannot be returned to service within the allowed out of service time), it is necessary to place the APRM and OPRM outputs from the second channel in the tripped condition to satisfy Technical Specification requirements. If the APRM channel is still sufficiently functional to process trip outputs, placing the keylock switch in the INOP position will force a trip for the APRM channel, but not for the OPRM channel. Other action, such as disconnecting a fiber-optic cable to the 2-out-of-4 voters or removing power from the APRM chassis, is necessary to satisfy the requirement to place the OPRM channel in the tripped condition.

The automatic APRM Inop trip is intended to provide a trip when the APRM channel is known to be incapable of providing a trip based on normal functions. This trip occurs immediately even though the Technical Specification requirements allow a period of time for action. The automatic trip is provided to assure that conditions that may disable the APRM trip function do not go undetected. Since the OPRM trip function is implemented in the same equipment as the APRM trip function, conditions that could disable the APRM trip function would likely disable the OPRM trip function as well.

For the Grand Gulf PRNM, the OPRM Upscale function is combined with the APRM Inop function as the OPRM channel input to be voted. That is, an APRM Inop in one APRM channel and an OPRM Upscale in another will result in RPS trip outputs from all four 2-out-of-4 voter channels. Again this logic is typically of no consequence because if an APRM chassis (affecting both the APRM and OPRM channels) is declared inoperable, the APRM bypass can be used to bypass both the APRM and OPRM trips from that channel, which in turn modifies the logic in the 2-out-of-4 voter to be a 2-out-of-3 vote of both the APRM and OPRM trips from the

remaining 3 channels. This design allows using the APRM chassis keylock switch to place APRM and OPRM outputs from a second channel in the tripped condition when another APRM/OPRM channel is already bypassed (and cannot be returned to service within the allowed out of service time) without having to resort to other actions such as disconnecting a fiber-optic cable to the 2-out-of-4 voters or removing power from the APRM chassis.

For the GGNS PRNM, the Supplement 1 (Reference 3) Bases are changed as follows.

1. Page H-12: change the second paragraph as shown below.

The APRM System is divided into four APRM channels and four 2-out-of-4 voter channels. Each APRM channel provides inputs to each of the four voter channels. The four voter channels are divided into two groups of two each, with each group of two providing inputs to one RPS trip system. The system is designed to allow one APRM channel, but no voter channels, to be bypassed. A trip from any one unbypassed APRM will result in a "half-trip" in all four of the voter channels, but no trip inputs to either RPS trip system. ~~APRM trip Functions 2.a, 2.b, 2.c, and 2.d are voted independently from OPRM Upscale Function 2.f. Therefore, any Function 2.a, 2.b, 2.c, or 2.d trip from any two unbypassed APRM channels will result in a full trip in each of the four voter channels, which in turn results in two trip inputs into each RPS trip system logic channel (A1, A2, B1, and B2). Similarly, a Function 2.f trip from any two unbypassed APRM channels will result in a full trip from each of the four voter channels.~~ Three of the four APRM channels and all four of the voter channels are required to be OPERABLE to ensure that no single failure will preclude a scram on a valid signal. In addition, to provide adequate coverage of the entire core, consistent with the design bases for the APRM Functions 2.a, 2.b, and 2.d, at least [20] LPRM inputs, with at least [three] LPRM inputs from each of the four axial levels at which the LPRMs are located, must be operable for each APRM channel. For the OPRM Upscale, Function 2.f, LPRMs are assigned to "cells" of [4] detectors. A minimum of [later] cells, each with a minimum of [2] LPRMs, must be OPERABLE for the OPRM Upscale Function 2.f to be OPERABLE.

Replaced deleted text with the following:

Since APRM trip Functions 2.a, 2.b, 2.d and 2.f are implemented in the same hardware, these trip Functions are combined with APRM Inop trip Function 2.c. Any Function 2.a, 2.b, 2.c or 2.d trip from any two unbypassed APRM channels will result in a full trip in each of the four voter channels, which in turn results in two trip inputs into each RPS trip system logic channel (A1, A2, B1, and B2). Similarly, any Function 2.c or 2.f trip from any two unbypassed APRM channels will result in a full trip from each of the four voter channels.

2. Page H-13: For Function 2.e, change the 1st sentence of the 3rd paragraph to the following. "The 2-Out-Of-4 Voter Function votes APRM Functions 2.a, 2.b, and 2.d independently of Function 2.f."

b. OPRM Pre-Trip Alarms

Licensing Topical Report NEDC-32410P-A (Reference 1) paragraph 3.3.3.1.2 states that the OPRM provides an oscillation pre-trip alarm when one of the instability algorithms (period based, amplitude based, or growth based) for an operable OPRM cell has exceeded user defined setpoints. The GGNS PRNM design will provide the OPRM pre-trip alarm when the Period Based Algorithm for an operable OPRM cell has exceeded user defined setpoints.

The pre-trip Alarms are intended to alert the operator of a developing instability event so that manual actions to avoid a reactor scram can be attempted. The OPRM Licensing Topical Reports (References 4-6) do not require pre-trip alarms.

For Option III, the OPRM cell signals are analyzed by the Period Based Algorithm (PBA), the Amplitude Based Algorithm (ABA), and the Growth Rate Algorithm (GRA). Automatic protection is actuated if any one of the three algorithms meets its trip conditions. However, only the PBA is required to provide protection of the Safety Limit Minimum Critical Power Ratio (SLMCPR) for anticipated reactor instabilities. The other two algorithms (ABA and GRA) are included as defense-in-depth.

The PBA amplitude trip setpoint is the relative power level, or peak over average (P/A), at which the OPRM cell generates a trip signal, provided the required number of Successive Confirmation Counts (SCCs) has been reached. The following two conditions must both be met for at least one cell in an OPRM channel to result in a PBA-based channel trip.

1. The Successive Confirmation Count (SCC) reaches or exceeds the SCC trip setpoint.

2. The cell relative power level, or peak over average (P/A), signal reaches or exceeds the amplitude trip setpoint.

The GRA and ABA are designed to detect large, fast growing oscillations. Unlike the PBA, the ABA and GRA trips do not require a minimum number of SCCs to generate a trip signal. During fast growing oscillation events, the trips will occur very early in the event with little time for effective operator action. Consequently, GRA and ABA pre-trip alarms are not provided in the GGNS PRNM design.

c. Recirculation Flow Processing

Licensing Topical Report NEDC-32410P-A Volume 1 (Reference 1) and Supplement 1 (Reference 3) Section 3.2.3.2.2 provide a Description of (flow processing) Logic in the PRNM System for plants with 4 Flow Channels and 8 Transmitters. Statement (c) explains that each APRM sends its total flow signal to two PRNM Communication Interface (PCI) chassis for the BWR6. Statement (d) explains that the PCI chassis compares two total flows, one from each of two APRMs, and that alarms are issued if the flow differs by more than a user-entered value.

In the replacement system at GGNS, each PCI will compare all four total flows. One total flow signal is from the APRM chassis in the same channel and one is from the LPRM in the other channel belonging to the same RPS trip system. The other two flow signals are provided by the other PCI chassis When the PCI determines that the flow differs by more than the user-entered value, it will transmit this status to its associated APRM, which will issue the alarm as described.

In order to make all four total flow signals available at each PCI chassis, fiber optic communication between all four PCI chassis will be established. Licensing Topical Report NEDC-32410P-A Supplement 1 (Reference 3) Figure E.1.7 (BWR 6, Larger Core), which illustrates the APRM/PCI configuration block diagram, is amended to include a dotted line (fiber-optic) network between the PCI chassis. Additionally, Figure E.1.7 is also amended to show that each APRM chassis communicates with the PCI in the same channel, and each LPRM chassis communicates with the PCI belonging to the other channel in the same RPS trip system. There is no effect on any APRM hardware.

By using all four total flow signals, the logic is the same as that described in Reference 1 for all plants with a similar configuration (4 Flow Channels and 8 Transmitters), and in Reference 3 for non-BWR6 plants with a similar configuration. The communication network between the PCI chassis agrees conceptually with Figure E.3.6 of Reference 3. Additionally, by providing all four flow signals for comparison, the logic satisfies what is discussed in Licensing Topical Report NEDC-32410P-A (Reference 1) Section 8.3.4.1.2, where it is explained that any requirement for a daily flow comparison check is deleted from surveillances and replaced by the automatic comparison of all four total recirculation flow values. It is noted that the justification (Section 8.3.4.1.3) explicitly calls out comparison logic that includes all four channels.

Incorporating this logic has no affect on any safety functions.

References

1. NEDC-32410P-A Volume 1, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function," October, 1995.

2. NEDC-32410P-A Volume 2 -- Appendices, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function," October, 1995.

3. NEDC-32410P-A Supplement 1, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function," November, 1997.

ATTACHMENT 7

GNRO-2010/00040

RESPONSE TO RAI No. 6

This is a non-proprietary version from which the proprietary information has been removed. Portions of the enclosure that have been removed are indicated by an open and closed bracket as shown here [[ ]].

Response to RAI No. 6

The response to RAI #1 provides the information necessary to evaluate the equipment configuration (e.g., identify the revisions/version of hardware, programmable devices, software) for the Grand Gulf PRNM system. The remainder of this response provides information that reconciles differences between the specific plant design, which is a BWR6 for Grand Gulf, and the topical report design description, whose supporting analysis is largely non-BWR6 based. Reconciliation of the differences between the plant specific and topical report designs is provided by showing additions to or deletions from the descriptions of References 6-1 and 6-2.

2.1.2 Hardware Impact

Amend the first paragraph of the base report as follows to clarify the plant computer and AC power source interface for GGNS (additions shown in *italics*):

[[

]]

Amend the third paragraph of the base report as follows to discuss the addition of "PCI" chassis for GGNS (additions shown in *italics*):

[[

]]

Modify the sixth paragraph of the base report as follows to clarify the AC power source interface for GGNS (additions shown in *italics* and deletions shown as ~~strikethrough~~):

[[

]]

Amend the last paragraph of the base report as follows to discuss the addition of "PCI" chassis for GGNS (additions shown in *italics* and deletions shown as ~~strikethrough~~):

[[

]]

2.3.3 Plant-Specific Configuration Variations

Modify the list of configurations in the base report after the first paragraph to reflect the GGNS configuration (additions shown in *italics* and deletions shown as ~~strikethrough~~):

[[

]]

3.2.3.2.2 PRNM System – 4 Flow Channels

Modify the text of the base report as follows to reflect the GGNS configuration (additions shown in *italics* and deletions shown as ~~strikethrough~~):

[[

]]

5.3.1 Major System Level Hardware

Modify the text of the base report as follows to reflect the GGNS configuration (additions shown in *italics* and deletions shown as ~~strikethrough~~):

[[

]]

5.3.2.1 Average Power Range Monitor (APRM) Chassis

Modify the second paragraph of the base report as follows to reflect the GGNS configuration (additions shown in *italics* and deletions shown as ~~strikethrough~~):

[[

]]

5.3.2.2 *Power Range Neutron Monitor (PRNM) Communication Interface (GGNS)* ~~Rod Block Monitor (RBM) Chassis (not applicable to BWR6)~~

Replace Section 5.3.2.2 of the base report with the following to reflect the GGNS configuration (additions shown in *italics* and deletions shown as ~~strikethrough~~):

[[

]]

5.3.2.3 Two-Out-Of-Four Logic Module

(1) 2-Out-Of-4 Voting Logic and Interface for APRM/OPRM Outputs to the RPS

Clarify the *GGNS* ~~BWR6~~ voting logic for Inop conditions of the base report by adding a new 7th paragraph (ahead of the last paragraph) under subheading (1) as follows:

[[

]]

5.3.2.6 Quad Low Voltage Power Supply Chassis

Modify the second, third and fourth paragraphs of the base report as follows to reflect the GGNS configuration (additions shown in *italics* and deletions shown as ~~strikethrough~~):

[[

]]

5.3.2.7 Fiber-Optic Network

Modify the second paragraph of the base report as follows to reflect the GGNS configuration (additions shown in *italics* and deletions shown as ~~strikethrough~~):

[[

]]

5.3.2.8 Electrical Connections

Clarify the GGNS configuration of the base report by replacing all occurrences of "RBM" with "PCI".

5.3.3 Modules Used in PRNM

Clarify the GGNS configuration of the base report by deleting the 11th bullet (Remote I/O), replacing all other occurrences of "RBM" with "PCI" and adding a 16th bullet "Low Voltage Power Supplies (PCI only)".

5.3.3.1 386SX Computer Modules

Clarify the GGNS configuration of the base report by replacing all occurrences of "RBM" with "PCI".

5.3.3.2 Display Controller Module

Clarify the GGNS configuration of the base report by replacing all occurrences of "RBM" with "PCI".

5.3.3.5 Open Drain I/O Module

Modify the first sentence of the first paragraph of the base report as follows to reflect the GGNS configuration (additions shown in *italics* and deletions shown as ~~strikethrough~~):

[[

]]

Amend the third paragraph of the base report as follows to reflect the GGNS configuration (additions shown in *italics*):

[[

]]

5.3.3.7 16-Channel Analog Output Module

Replace Section 5.3.3.7 of the base report with the following to reflect the GGNS configuration:

[[

]]

5.3.3.8 Analog Module

Clarify the first paragraph of the base report as follows to reflect the GGNS configuration by replacing all occurrences of "RBM" with "PCI".

5.3.3.9 FDDI Comm Module

Replace Section 5.3.3.9 of the base report with the following to reflect the GGNS configuration (additions shown in *italics* and deletions shown as ~~strikethrough~~):

[[

]]

5.3.3.10 GE I/O Communication Module

Replace Section 5.3.3.10 of the base report with the following to reflect the GGNS configuration (additions shown in *italics* and deletions shown as ~~strikethrough~~):

[[

]]

5.3.3.12 GEDAC Module

Clarify the GGNS configuration of the base report by replacing all occurrences of "RBM" with "PCI".

5.3.3.13 Broadcaster Module

Clarify the GGNS configuration of the base report by replacing all occurrences of "RBM" with "PCI".

5.3.3.14 Display Module

Clarify the GGNS configuration of the base report by replacing all occurrences of "RBM" with "PCI".

5.3.3.15 Front Panel

Clarify the GGNS configuration of the base report by replacing all occurrences of "RBM" with "PCI".

5.3.3.16 Low Voltage Power Supply (LVPS) Modules

Replace Section 5.3.3.16 of the base report with the following to reflect the GGNS configuration (additions shown in *italics* and deletions shown as ~~strikethrough~~):

[[

]]

5.3.5.1 APRM/OPRM/*PCI* ~~RBM~~/Plant Computer

Replace Section 5.3.5.1 of the base report with the following to reflect the GGNS configuration (additions shown in *italics* and deletions shown as ~~strikethrough~~):

[[

]]

5.3.5.2 LPRM Detectors to APRM

Clarify the GGNS configuration of the base report by deleting the third sentence ("The detectors typically...") and all following text.

5.3.5.3 Flow Transmitters to APRM

Clarify the GGNS configuration of the base report by deleting the fourth sentence ("In some cases...") and all following text.

5.3.7 Equipment Interchangeability

Clarify the GGNS configuration of the base report by replacing "Both RBM" with "All PCI" in the second paragraph, and by replacing the remaining occurrence of "RBM" with "PCI."

5.3.8.1 Loss of Input Power

Clarify the treatment of AC power input for GGNS of the base report by adding a new second paragraph and modifying the first, third and fourth paragraphs as follows (additions shown in *italics* and deletions shown as ~~strikethrough~~):

[[

]]

5.3.8.2 Abnormal Conditions Leading to Inoperative Status

Clarify the GGNS configuration of the base report by deleting "and RBM" in the first sentence and modifying a note at the end of the section as follows:

[[

]]

5.3.8.3 Abnormal Conditions Leading to Alarms

Clarify the GGNS configuration of the base report by replacing "RBM" with "PCI" in the fourth bullet, and deleting the seventh and eighth bullets.

5.3.12 Testability and Self-Test Capability

Clarify the GGNS configuration of the base report by replacing "RBM" with "PCI" in the title of Section 5.3.11.1 as follows (additions shown in *italics* and deletions shown as ~~strikethrough~~):

5.3.11.1 APRM AND *PCI* ~~RBM~~ CHASSIS TESTING

Clarify the GGNS configuration of the base report by replacing all occurrences of "RBM" with "PCI".

5.3.11.3 Interface and Overlap Testing

Clarify the GGNS configuration of the base report by replacing "RBM" with "PCI" in the first paragraph.

Clarify the last paragraph of the base report as follows to reflect the GGNS configuration (additions shown in *italics* and deletions shown as ~~strikethrough~~):

[[

]]

5.3.12 Calibration

Clarify the GGNS configuration of the base report by replacing "RBM" with "PCI".

Clarify the GGNS configuration of the base report by replacing all occurrences of "RBM" with "PCI" in the title of Section 5.3.12.1 and following text.

5.3.12.3 APRM Power Calibration

Clarify the GGNS configuration of the base report by replacing all occurrences of "RBM" with "PCI".

5.3.13 Security Considerations

Clarify the GGNS configuration of the base report by replacing all occurrences of "RBM" with "PCI".

5.3.16.1 Mechanical Design Aspects/Packaging

Clarify the GGNS configuration of the base report by replacing "Each APRM, RBM" with "Each APRM, PCI " in the first sentence.

5.3.16.2 Weight

Clarify the GGNS configuration of the base report by replacing "Each APRM, RBM" with "Each APRM, PCI" in the first sentence.

5.3.16.3 Mounting

Clarify the GGNS configuration of the base report by replacing "Each APRM, RBM" with "Each APRM, PCI" in the first sentence.

5.3.16.4 Front Panel

Clarify the GGNS configuration of the base report by replacing "Each APRM, RBM" with "Each APRM, PCI," in the first sentence.

5.3.17.1 Input Power Supplies

Clarify the GGNS configuration of the base report by amending the subsection as follows (additions shown in *italics*, deletions shown as ~~strikethrough~~):

[[

]]

5.3.17.3.2 Digital Output Signals

Clarify the GGNS configuration of the base report by amending the 9th bullet as follows (additions shown in *italics*, deletions shown as ~~strikethrough~~):

[[

]]

Clarify the GGNS configuration of the base report by amending the 11th bullet as follows (additions shown in *italics*, deletions shown as ~~strikethrough~~):

[[

]]

5.3.17.3.3 Digital Multiplexed Signals (Fiber-Optic)

Clarify the GGNS configuration of the base report by amending the text as follows (additions shown in *italics*, deletions shown as ~~strikethrough~~):

[[

]]

5.3.17.3.4 Digital Multiplexed Signals (non-Fiber-Optic)

Clarify the GGNS configuration of the base report by replacing the entire section with the following:

[[

]]

5.3.17.6 Analog Input Signals, Electrical Characteristics

Clarify the GGNS configuration of the base report by replacing "RBM" with "PCI" in item 2.

5.3.17.7 Analog Output Signals, Electrical Characteristics

Clarify the GGNS configuration of the base report by replacing "RBM" with "PCI" in item 2.

5.3.18 User Interface and Controls

Clarify the GGNS configuration of the base report by replacing "RBM" with "PCI" in the first paragraph.

5.3.19 Single Failure Considerations

Clarify the GGNS configuration of the base report by replacing "RBM" with "PCI".

5.3.20 Replacement PRNM Installation

Clarify the GGNS configuration by amending the first sentence of the second paragraph of the base report as follows (additions shown in *italics*, deletions shown as ~~strikethrough~~):

[[

]]

APPENDIX E

PRNM BLOCK DIAGRAMS

Replace Figures E.1.7, E.2.1, E.2.2, E.3.6 and E.5.6 of the base report with the following:

E.1 APRM/PCI Configuration Block Diagrams

[[

{3}]]

Figure E.1.7 - Replacement 4 APRM Configuration, Grand Gulf

E.2 Replacement 2-Out-Of-4 Output Logic Interface Block Diagrams

[[

{3}]]

Figure E.2.1 - Replacement PRNM General Block Diagram, Grand Gulf

E.2 Replacement 2-Out-Of-4 Output Logic Interface Block Diagrams (Continued)

[[

{3}]]

Figure E.2.2 - Replacement APRM / RPS Interface Block Diagram, Grand Gulf

E.3 APRM/Flow Interface Block Diagrams

[[

{3}]]

Figure E.3.6 - 4 APRM Replacement Configuration, Grand Gulf

(See Figure E.1.7 for PCI Connections)

E.5 Power Distribution/Interface Interface Block Diagrams

[[

{3}]]

Figure E.5.6 - Replacement Configuration, Grand Gulf

References

6-2. GE Nuclear Energy, Licensing Topical Report (LTR) NEDC-32410P-A Volume 1 and NEDC-32410P-A Volume 2 -- Appendices, *Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function*, October 1995 (ADAMS Ascension No. ML9605290009 includes NRC SE).

6-2. GE Nuclear Energy, LTR NEDC-32410P-A Supplement 1, *Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function,* November 1997 (ADAMS Ascension No. ML9806120242 includes NRC SE).

ATTACHMENT 9

GNRO-2010/00040

RESPONSE TO RAI No. 10

(NON-PROPRIETARY VERSION)

This is a non-proprietary version from which the proprietary information has been removed. Portions of the enclosure that have been removed are indicated by an open and closed bracket as shown here [[ ]].

Response to RAI No. 10

Setpoint Methodology -- non-OPRM

GEH setpoints are calculated using the NRC approved methodology contained in NEDC-31336P-A (Reference 10-1). Conceptually, the GEH method is based on ISA Method 2, but leads to more conservative setpoints and is referred to as "Method 2 plus". According to this NRC approved methodology, the setpoints are calculated from the Analytic Limit (AL) using a top down approach, and margin is calculated by methodology:

- Between the AL and the Allowable Value (AV),
- Between the AL and the Nominal Trip Setpoint (NTSP), and
- Between the AV and the NTSP.

The margin between the AL and the final NTSP is at least equal to, and generally greater than required.

GEH's setpoint methodology for operating plants uses single-sided distributions in the development of AVs and NTSPs for instrument channels that provide trips when the process variable being measured approaches the setpoint in one direction, as described in ISA Standard 67.04 Part II. Each of the setpoint functions for the GGNS PRNMS provide trips where the setpoint is approached in only one direction. Per the Safety Evaluation (SE) from the NRC for Reference 10-1:

> "The GE methodology utilizes single-sided distributions in the development of trip setpoints and allowable values. ... The staff has stated that this methodology is acceptable provided that a channel approaches a trip in only one direction."

GEH's setpoint methodology for operating plants uses vendor instrument error specifications conservatively to provide setpoints that meet margin requirements to a high degree of confidence. This was demonstrated by actual data analysis during licensing of the GEH methodology (Reference 10-1). GEH's Instrument Setpoint Methodology was approved by the NRC in November 1995 while Regulatory Guide (RG) 1.105, Revision 2 was in use. RG 1.105 Revision 3 was introduced in December 1999, but the revised content, that quantified the confidence level to be 95%, did not invalidate or affect the approved GEH Setpoint Methodology. Per the SE from the NRC for Reference 10-1:

> "... the BWROG presented data to show that although the GE setpoint methodology does not produce results with a defined confidence level, it was shown that the data analysis can produce results that have a high degree of confidence (95 percent confidence limits). ... By establishing that the 95 percent confidence intervals are bounded by the design allowances developed per NEDC-31336, GE has shown that the results produced by the GE setpoint methodology can be established with high confidence."

The AL is a process parameter value used in the safety analysis and represents a limiting value for the automatic initiation of protective actions. From the AL, an AV is first calculated which has margin to the AL based on all measurement errors except drift. [[

]] All random errors are combined using Square Root of the Sum of the Squares (SRSS) method, and non-conservative bias errors are added algebraically. The AV represents the limiting value to which a setpoint can drift (as determined from surveillance) and still assure that the AL is protected. [[

]] The AV is the value specified in the Technical Specifications, and is an AL surrogate that assures the AL is protected if the setpoint does not exceed it.

[[

]]

Figure 10-1

The approved GEH setpoint methodology basically results in two calculated NTSPs as shown in Figure 10-1. [[

]] This setpoint is called "**NTSP1**" and the AL/NTSP1 margin is based on all errors (PMA, PEA, A_T, C, and Drift (D)), where A_T is the instrument accuracy under Trip conditions. NTSP1 is the Limiting Trip Setpoint (LTSP), as the instrument setting can be no closer to the AL than NTSP1. However NTSP1 generally does not have the margin to the AV required by GEH methodology, and so is seldom the final adjusted NTSP, called **NTSP(Adj)**, the second NTSP. [[

]] Relevant equations are shown below. [Notes: $\Re$ refers to the random component for each error. The subscript L refers to the error for the whole instrument loop, and the errors are based on a one-sided approach to the setpoints.]

[[ ]]

AV = AL – AVMARGIN (for an increasing setpoint)

[[ ]]

NTSP1 = AL – NTSPMARGIN (for an increasing setpoint)

= Limiting Trip Setpoint (LTSP)

Per NEDC-31336P-A (Reference 10-1), the errors used in the AV and NTSP calculations include errors for the Calibration Tools, the Standards used to calibrate the Calibration Tools, and the calibration procedure error tolerances (i.e., As Left Tolerances; ALTs). As shown in Figure 10-1, the Calibration Errors are included in the AV and NTSP1 calculations, and are also considered in the AV to NTSP(Adj) margin. All setpoints are reset to the NTSP, within the ALT, after calibration. The AV/NTSP margin additionally considers the Leave Alone Tolerances (LATs) (the tolerance within which calibration need not be performed), along with the Calibration errors discussed above (also see the equation below). All LATs are equal to their associated ALTs. Relevant equations are shown below.

[[ ]] (calculated for each instrument in the instrument loop)

LAT = ALT

[[

]]

If the margin is not sufficient, the NTSP is adjusted to provide added margin.

[[

]]

If the NTSP has sufficient margin to meet these requirements for LAT, no adjustment to NTSP is required. However, if margin is not sufficient, the NTSP adjusted to provide added margin. This adjusted NTSP is "NTSP(Adj)", and it is also checked for LER avoidance.

Setpoints -- non-OPRM - GGNS Specific

Two sets of Average Power Range Monitor (APRM) setpoint calculations were performed to support installation of PRNMS at GGNS. The first set of calculations was based on the implementation of PRNM at the current licensed thermal power. In this set of calculations, the APRM Flow Biased Simulated Thermal Power-High setpoint was calculated because the function of this setpoint changed from supporting a stability solution to power excursion mitigation with the implementation of the Oscillation Power Range Monitor (OPRM) subsystem of Power Range Neutron Monitoring System (PRNMS) (discussed in the next section). A second set of calculations was performed to support Extended Power Uprate (EPU). In this set of calculations, the Neutron Flux-High (Setdown), Fixed Neutron Flux-High, Flow Biased Simulated Thermal Power-High, and APRM Downscale were calculated. Both sets of calculations included scrams and rod blocks. All calculations were based on the error terms associated with the upgraded PRNMS equipment. As Left Tolerances (ALTs) (the tolerance within which the device calibration reading is left after calibration) were considered in the calculations; these tolerances were based on the existing Recirculation Loop flow transmitters, and PRNMS flow and power electronics. The AV/NTSP margin includes instrument loop accuracy under calibration conditions, instrument calibration errors, and instrument drift errors. [[

]]

Table 10-1 summarizes the ALs (AVs if no ALs) associated with the PRNMS setpoint calculations for GGNS. Columns for both CLTP and EPU values are shown. If a setpoint is not credited in a safety evaluation, there is no applicable AL, per GEH setpoint methodology.

Table 10-1

Setpoint Function	PRNMS-CLTP (% RTP)	PRNMS-EPU (% RTP)	Source / Basis
APRM Neutron Flux Scram **AL**	122	122	Protects against fast reactivity transients (EPU: Reference 10-2)
APRM Flow Biased Simulated Thermal Power Scram † **AVs**	TLO: $0.65\ W_d + 62.9$ SLO: $0.65\ W_d + 42.3$	TLO: $0.58\ W_d + 59.1$ SLO: $0.58\ W_d + 37.4$	Protects against slow reactivity transients (EPU: Reference 10-2)
APRM Flow Biased Simulated Thermal Power Rod Block † **AVs**	TLO: $0.65\ W_d + 59.9$ SLO: $0.65\ W_d + 39.3$	TLO: $0.58\ W_d + 56.1$ SLO: $0.58\ W_d + 34.4$	Prevents rod withdrawal and alerts the operator if the power is significantly above licensed power level; the rod block function precedes a flow-biased Scram (EPU: Reference 10-2)
APRM Setdown Scram † **AV**	20	20	Provides a redundant Scram (in addition to IRM High Flux) for reactivity transients in the Startup mode. (EPU: Reference10-2)
APRM Setdown Rod Block † **AV**	14	14	Prevents rod withdrawal and alerts the operator for reactivity transients in the startup mode; the rod block function precedes a Scram. (EPU: Reference 10-2)

† An AL is not applicable because this setpoint function is not used in any safety or transient analyses.

As an example, the following table provides a comparison of the calculated results in units of percent Rated Thermal Power (RTP) for the GGNS APRM Neutron Flux Scram, per GEH Instrument Setpoint Methodology. Note as stated earlier, the NTSP(Adj) is further away from the AL than NTSP1, the Limiting Trip Setpoint (LTSP).

Parameter	% RTP
AL	122
AV	119.3
NTSP1 (LTSP)	118.9
NTSP(Adj)	117.3

References 10-3 and 10-4 provide calculation summaries and are available for NRC review.

Setpoints -- OPRM

As described in Sections 4.4.2.8 and 4.4.3.7 of the License Amendment Request (LAR), the Oscillation Power Range Monitor (OPRM) setpoints are the nominal setpoints which are established using a comprehensive BWR Owners' Group (BWROG) methodology for stability analysis approved by the NRC (Reference 10-5). There is no Analytical Limit (AL) or Allowable Value (AV) with defined instrument error margins to the Nominal Trip Setpoint (NTSP) for the OPRM setpoints. Note that OPRM setpoints are not considered to be Limiting Safety System Settings (LSSSs) since stability is a special event and not an Anticipated Operational Occurrence (AOO) which define LSSSs.

The OPRM Period Based Detection Algorithm setpoints (Oscillation Amplitude and Successive Confirmation Counts setpoints) are not in the Technical Specifications, consistent with the sample Technical Specification approved in Reference 10-6. These setpoints are established as nominal values based on cycle specific reload stability analysis in accordance with Reference 10-5 and included in the Core Operating Limits Report (COLR).

The OPRM Upscale function auto-enable (not bypassed) region is established generically to correspond to reactor power greater than or equal to 30% of rated, and core flow (implemented as Recirculation drive flow) less than or equal to 60% of rated per Reference 10-5. Note that it is conservative to use Recirculation drive flow in place of core flow for the OPRM Upscale function auto-enable region boundary. The Current Licensed Thermal Power (CLTP) at Grand Gulf is 1.7% higher than the Original Licensed Thermal Power (OLTP). The OPRM Upscale function auto-enable region boundary is scaled such that the setpoint at the CLTP conditions is at the same absolute power as in the OLTP conditions (i.e., at 29% of CLTP).

OPRM Upscale function auto-enable (not bypassed) power and core flow setpoints are permissive setpoints. These setpoints are not explicitly modeled in stability analyses. Because permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy.

Use of nominal setpoints for the OPRM Upscale function has been addressed during the licensing of the PRNMS at Browns Ferry Unit 1 (Reference 10-7) and at Monticello (Reference 10-8) previously. Note also that the OPRM trip setpoints are not listed in the BWR/6 Standard Technical Specifications (STS, Reference 10-9).

Demonstration calculations for the nominal setpoints of the OPRM Upscale function are available for review.

REFERENCES

10-1. NEDC-31336P-A, "General Electric Instrument Setpoint Methodology," September 1996.

10-2. NEDC-33004P-A, "Constant Pressure Power Uprate," Revision 4, July 2003.

10-3 GEH Report, 0000-0102-8815-R1, "Instruments Limits Calculation, Entergy Operations, Inc., Grand Gulf Nuclear Station, Average Power Range Monitor, Power Range Neutron Monitoring System (NUMAC)-CLTP Operation," Revision 1, May 2010.

10-4. GEH Report, 0000-0109-0169-R0-Draft A, "Instruments Limits Calculation, Entergy Operations, Inc., Grand Gulf Nuclear Station, Average Power Range Monitor, Power Range Neutron Monitoring System (NUMAC)-EPU Operation," Revision 0, January 2010.

10-5. NEDO-32465-A, "Licensing Topical Report, Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications, Licensing Topical Report," August 1996.

10-6. NEDC-32410P-A Supplement 1, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function," Class III, November 1997.

10-7. TVA to NRC, "Browns Ferry Nuclear Plant (BFN) - Unit 1, Technical Specifications (TS) Change TS-3 - Request for Additional Information (RAI) Regarding Oscillation Power Range Monitor (OPRM) - (TAC No. MC9565)," NA-BFN-TS-443, October 2, 2006.

10-8. MNGP to NRC, "Response to Requests for Additional Information for License Amendment Request for Power Range Neutron Monitoring System Upgrade (TAC No. MD8064)," September 16, 2008.

10-9. "BWR/6 Standard Technical Specifications and Bases," NUREG 1434, Revision 3.1 Volumes 1 and 2.

ATTACHMENT 10

GNRO-2010/00040

AFFIDAVIT SUPPORTING REQUEST TO WITHHOLD INFORMATION FROM PUBLIC DISCLOSURE

PROVIDED BY
GE-HITACHI NUCLEAR ENERGY AMERICAS, LLC
3901 CASTLE HAYNE ROAD
WILMINGTON, NC 28401

GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, Edward Schrull, state as follows:

(1) I am the Vice President, Regulatory Affairs, Services Licensing, GE-Hitachi Nuclear Energy Americas LLC (GEH), and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in Enclosure 1 of GEH letter, GG-PRNM-168777-EC066, Edward Cooper (GEH) to Jon Langberg (Entergy), "Responses to Request for Additional Information - 4, 6, and 10," dated June 2, 2010. The GEH proprietary information in Enclosure 1, which is entitled "Responses to Request for Additional Information 4, 6, and 10," is enclosed by double square brackets. [[This sentence is an example.{3}]]. Figures containing GEH proprietary information are identified with double square brackets before and after the object. In each case, the superscript notation {3} refers to Paragraph (3) of this affidavit that provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner or licensee, GEH relies upon the exemption from disclosure set forth in the Freedom of Information Act (FOIA), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for trade secrets (Exemption 4). The material for which exemption from disclosure is here sought also qualifies under the narrower definition of trade secret, within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975 F2d 871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704 F2d 1280 (DC Cir. 1983).

(4) The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. Some examples of categories of information that fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GEH's competitors without license from GEH constitutes a competitive economic advantage over GEH and/or other companies.

b. Information that, if used by a competitor, would reduce their expenditure of resources or improve their competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product.

c. Information that reveals aspects of past, present, or future GEH customer-funded development plans and programs, that may include potential products of GEH.

d. Information that discloses trade secret and/or potentially patentable subject matter for which it may be desirable to obtain patent protection.

(5) To address 10 CFR 2.390(b)(4), the information sought to be withheld is being submitted to the NRC in confidence. The information is of a sort customarily held in confidence by GEH, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GEH, not been disclosed publicly, and not been made available in public sources. All disclosures to third parties, including any required transmittals to the NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary and/or confidentiality agreements that provide for maintaining the information in confidence. The initial designation of this information as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure are as set forth in the following paragraphs (6) and (7).

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, who is the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or who is the person most likely to be subject to the terms under which it was licensed to GEH. Access to such documents within GEH is limited to a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist, or other equivalent authority for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GEH are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary and/or confidentiality agreements.

(8) The information identified in paragraph (2) above is classified as proprietary because it contains details developed by GEH from NEDC-32410P-A, "Nuclear Measurement Analysis and Control Power Range Neutron (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function," dated October 1995. Development of the NUMAC PRNM, and information related to the design, modification, analyses methodologies and processes related to the NUMAC PRNM was achieved at a significant cost to GEH. The development of the evaluation process along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes a major GEH asset.

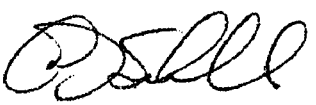
(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GEH's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GEH's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GEH. The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial. GEH's competitive advantage will be lost if its competitors are able to use the results of the GEH experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GEH would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GEH of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed on this 2nd day of June 2010.



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ATTACHMENT 11

GNRO-2010/00040

LICENSEE-IDENTIFIED COMMITMENTS

LICENSEE-IDENTIFIED COMMITMENTS

The following table identifies those actions committed to by Entergy in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
Entergy will provide a schedule to the NRC for responding to RAI Nos. 1, 2, and 3 by June 18, 2010.	√		6/18/2010
RAI No.5 Entergy will: (1) Confirm the worst-case environmental conditions in which the PRNM System equipment is required to remain operable for temperature, humidity, pressure, and radiation have been enveloped by equipment qualification or analysis. (2) Provide documentation to the NRC that confirms qualification actions for seismic conditions and EMI compatibility have taken place.	√		1/17/2011
RAI No.7 Entergy will provide the requested human factors evaluation information to the NRC on or before June 30, 2011.	√		6/30/2011
RAI No.8 Entergy will provide a table reflecting failure rate data for a BWR/6 PRNM System design to the NRC on or before September 30, 2010.	√		9/30/2010
RAI No. 9 The key for the APRM OPERATE-INOP keylock switch will be controlled by Operations in accordance with plant procedures.		√	Prior to startup from the 2012 refueling outage

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
RAI No. 9 The password that is used to access the OPERATE-SET mode of the APRM channels for gain adjustments will be controlled by Operations in accordance with plant procedures.		√	Prior to startup from the 2012 refueling outage
RAI No.10 Per the guidance provided in TSTF-493, Rev. 4, Entergy will set the as-found tolerance equal to the Square Root Sum of the Squares (SRSS) combination of as-left tolerance and the projected drift. The as-found and as-left tolerances will be reflected in the associated surveillance test procedures.	√		Prior to startup from the 2012 refueling outage