LICENSE AMENDMENT REQUEST TO CHANGE TECHNICAL SPECIFICATIONS IN SUPPORT OF PRNM AND ARTS / MELLLA IMPLEMENTATION
Enclosure 2 – Attachment 8

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

October 2011

(non-proprietary version)

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GE Hitachi Nuclear Energy

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Columbia Generating Station

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

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Table of Contents

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 CGS Option III implementation is in accordance with the LTR Requirements of section 2.3.2.
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 the PRNM LTR covers those. 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 2.3.3.1.1.2 / 2.3.3.1.2.1 RBM 2.3.3.2.1.1 / 2.3.3.2.2.1 Flow Unit 2.3.3.3.1.2 / 2.3.3.3.2.2 Rod Control 2.3.3.4.1.2 / 2.3.3.4.2.2 Panel Interface 2.3.3.6.1.1 / 2.3.3.6.2.1 Human Factors Engineering is part of the CGS design process consistent with NUREG-0700.. See discussion on Human Factors Evaluation in the License Amendment Request (LAR). The actual PRNMS System to be installed at CGS contains three deviations from the system design as described in the LTR. Justifications for these deviations are provided as Enclosure 1.
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:	1) The current flow channel configuration consists of eight flow transmitters (LTR Section 3.2.3.1.1). Thus, the current configuration meets the requirements described in LTR Section 3.2.3.2.2.

Section No.	Utility Action Required	Response
	• Non-safety related, but qualified 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. 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	2) APRM trips currently applied at the plant are listed below along with changes planned. The "post-modification" trips will be the same as those identified in the LTR. • "Inop" Retained, except the logic is modified slightly (same as described in LTR paragraph 3.2.10). • "Fixed Neutron Flux-High" is modified to "Neutron Flux-High" (as described in LTR paragraph 3.2.5). • "Flow Biased Simulated Thermal Power-High" is modified to Simulated Thermal Power-High" (as described in LTR paragraph 3.2.5). • "APRM Neutron Flux – High (Setdown) is retained as described in LTR paragraphs 3.2.4 and 8.3.1.4. • Add 2-Out-of-4 Voter as described in LTR paragraphs 3.2.2 and 8.3.2.4. 3) ARTS will be implemented concurrently with the PRNM and is part of this submittal
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	A review of the CGS requirements confirms that the regulatory requirements addressed in the LTR encompass the related CGS requirements. Regulatory and licensing requirements are evaluated in the CGS Digital I&C-ISG-06 Compliance document (NEDC-33685P).

Section No.	Utility Action Required	Response
	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.	
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 CGS control room temperature range is: 40 - 104 °F (72-78 °F normal). 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 CGS relative humidity requirement for control room equipment is: 10 - 60%, which is within the range for which the PRNM equipment is qualified. The qualification results have been 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 CGS normal ambient atmospheric pressure is approximately 14.43 psia (nominally 14.0-15.0 psia), and is within these limits. The qualification results have been documented in a plant unique "Qualification Summary."
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 CGS control room dose rates and Total Integrated Dose (TID) over 40 years are within the qualified ranges. The qualification results have been documented in a

Section No.	Utility Action Required	Response
		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 are completed as part of the CGS normal design change process. The seismic qualification results have been 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.) 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.) 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	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. CGS generally prohibits operation of portable transceivers near sensitive equipment, and if warranted, requires positioning of warning signs at critical locations throughout the plant. Placements of warning signs were evaluated as part of this modification process. 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 CGS 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) EMI emissions from the new PRNM equipment were evaluated as part of the normal design modification process described in CGS procedures.

Section No.	Utility Action Required	Response
	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.)	
	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.) 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.)	2) The PRNM system equipment is being installed in place of existing Neutron Monitoring System (NMS) electronics. The replacement system will interface 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 NMS 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.
	3) Equipment and Cable Separation a. Cabling: Establish cabling practices to assure that signal cables with the potential to be "receivers" are kept	3) Equipment and Cable Separation The original NMS cable installation requirements met this objective. The replacement PRNM system uses the same cable routes and paths at comparable energy

Section No.	Utility Action Required	Response
	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.) b. 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.	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 CGS cable routing and separation requirements. Additionally, the modification process is performed in accordance with the existing separation criteria.
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	1. The CGS Technical Specification (TS) Surveillance Requirements for the Reactor Protection System (RPS) are based on Reference 11 of the PRNM LTR as discussed in the CGS Technical Specification Bases (Section 3.3.1.1, Reactor Protection System Instrumentation). Therefore, the Reference 11 failure analysis is applicable to CGS. 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.

Section No.	Utility Action Required	Response
	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.]	3. The requirements of 10CFR50.59 will be applied 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.
8.3.1.4	APRM-Related RPS Trip Functions - Functions Covered by Technical Specifications 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. 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. 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.	1. CGS does not have an "APRM Downscale" RPS Trip Function Technical Specifications. 2. CGS currently uses a "Flow Biased Simulated Thermal Power-High," RPS trip function. This function is renamed to "Simulated Thermal Power-High". The "Fixed Neutron Flux-High" is retained as "Neutron Flux-High". 3. The current APRM Neutron Flux - High (Setdown) function is retained

Section No.	Utility Action Required	Response
	Perform analysis necessary to establish setpoints for added trips.	
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 Technical Specifications 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. 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 Technical Specifications (IST) are applied to the plant, action statements remain unchanged. 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.	1. The PRNM modification and the proposed Technical Specifications and Bases change implement the changes as described in the PRNM LTR for a "larger core" plant. CGS Technical Specifications 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. Revised RPS functions to indicate that the required number channels per a trip system is 3 APRM channels. "2-out-of-4 Voter" function with two channels under the "minimum operable channels" has been added as Function 2.e. 2. Action statement changes in the proposed Technical Specifications change are consistent with the PRNM LTR described changes for plants with Improved Technical Specifications. CGS had previously switched to the IST format. 3. The proposed Technical Specifications Bases changes include revisions to the descriptions of the architecture, consistent with the PRNM LTR.
8.3.3.4	APRM-Related RPS Trip Functions - Applicable Modes of Operation 1) APRM Neutron Flux - High (Setdown) Change Technical Specifications "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) Technical Specifications and Bases changes are consistent with the PRNM LTR.

Section No.	Utility Action Required	Response
	2) APRM Simulated Thermal Power - High 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 Flow Biased Simulated Thermal Power - High Technical Specification is retained however, the name is changed to "APRM Simulated Thermal Power – High," consistent with the PRNM LTR.
	3) APRM Neutron Flux - High 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 Fixed Neutron Flux - High Technical Specification and Bases is retained however, the name is changed to "APRM Neutron Flux – High," consistent with the PRNM LTR.
	4) APRM Inop Trip 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 CGS Technical Specifications require this Function, only in Modes 1 and 2.
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.	a) The CGS Technical Specifications currently include a once-per-shift Channel Check requirement for the APRM Functions (except for Inop). The APRM Function Channel Check requirements are maintained at once per 12 hours, consistent with the remainder of the RPS Technical Specifications. The proposed Technical Specification and Bases changes for the Channel Check SR are consistent with the PRNM LTR.
	b) For plants with 4 full recirculation flow channels and with Technical Specifications 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.	b) CGS currently has 8 flow transmitters. Associated surveillances have been included in those for the APRM 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.

Section No.	Utility Action Required	Response
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.	a) The proposed Technical Specification and Bases changes related to Channel Functional Tests are consistent with the PRNM LTR.
	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 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.)	b) The proposed Technical Specification and Bases changes to Channel Functional Tests for the APRM Functions include a notation, applicable to the Simulated Thermal Power – High (Function 2.b) 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 CGS Technical Specification, the Channel Functional Test has been added as SR 3.3.1.1.16 and has been expanded from that in the LTR 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.

Section No.	Utility Action Required	Response
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).	a) The proposed Technical Specification and Bases changes related to Channel Calibration for the APRM Functions include a 24-month interval, with no calibration required for the Inop Function, consistent with the PRNM LTR.
	b) Delete any requirement for flow calibration and calibration of the 6 second time constant separate from overall calibration of the APRM Simulated Thermal Power Upscale Trip.	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 Simulated Thermal Power – High and OPRM Upscale Functions to include requirements for calibration of the recirculation flow transmitter and flow processing function. However, the PRNM LTR includes this notation only in the Bases. For the CGS Technical Specification, the notation has been included in the Channel Calibration SR (Table 3.3.1.1-1), and has been expanded from that in the LTR to also apply to the OPRM Upscale Function (to cover OPRM Upscale trip enable).
	c) Replace every 3 day frequency for calibration of APRM power against thermal power with a 7 day frequency if applicable.	c) The current CGS 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) Revise Bases text as required.	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 Technical Specifications 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	The proposed Technical Specification and Bases changes related to Response Time Testing (3.3.1.1.15 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 will apply is Function 2.e (voter). However, while the PRNM LTRs justified reduced response time testing frequency for Function 2.e, no technical specification markups were included to implement an "n" greater than 4 (the total number of voter channels). Therefore, a note is added to the CGS SR 3.3.1.1.15 to define that "n=8" for Function 2.e. The PRNM LTR Supplement 1 justified response time testing at a rate that tested one

Section No.	Utility Action Required	Response
	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.	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 Technical Specifications 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 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.	The CGS Technical Specifications include a SR for LSFTs for the APRM related functions. These will be deleted, except for the new 2-Out-Of-4 Voter, Function 2.e, the LSFT will be added. The LSFT requirement for that Function is at a 24-month interval.
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 Technical Specifications 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 applicable at CGS. CGS has performed setpoint calculations for the ARTS submittal. The results of the ARTS calculations were used for the PRNM modification. 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 CGS Technical Specifications and consistent with the PRNM LTR.
8.4.1.4	OPRM-Related RPS Trip Functions - Functions Covered by Technical Specifications 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.	An OPRM Upscale Function is added to the CGS 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

Section No.	Utility Action Required	Response
	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 Technical Specification, better meets their needs. In those cases, the basis elements of the Technical Specifications as shown in this Supplement would remain, but the specific implementation would be different.	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 Technical Specifications a "minimum operable channels" requirement for three OPRM channels, shared by both trip systems. 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. The NRC SER states the OPRM function will be monitored during the first fuel cycle to ensure the OPRM algorithms perform according to the design specifications. During this monitoring period the OPRM trip capabilities would be disabled. Upon completion of this initial monitoring period, the OPRM trip function would be enabled.	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. Regarding the initial monitoring period, the GEH NUMAC OPRM system can be installed and activated immediately without an initial monitoring period because: 1) The operating experience of the GEH NUMAC OPRM system in general is sufficient, 2) The GEH NUMAC OPRM system is replacing the current Option III OPRM system, and 3) The data received during the initial monitoring period for the currently "armed" and operating digital OPRM system demonstrated that the algorithm was robust and not sensitive to system settings within the range of values described in NEDO-32465-A.
8.4.3.4	OPRM-Related RPS Trip Functions - Applicable Modes of Operation	A Modes of Operation requirement consistent with the PRNM LTR Supplement 1 has been

Section No.	Utility Action Required	Response
	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.	included in the Technical Specification along with associated Bases descriptions. The OPRM operability value has been selected to provide the same margin (5%) between the OPERABILITY requirement and the auto-enable setpoint (see response to 8.4.6.1 below) as the margin included in the PRNM LTR. The OPRM operable and enabled values are core specific, the actual values used can be the ones specified in the cycle specific COLR.
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 Channel Check requirement of once per 12 hours is included for the OPRM Upscale Function, consistent with the PRNM LTR Supplement 1.
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. Add a "confirm auto-enable region" surveillance on a once per outage basis up to 24 month intervals.	A Channel Functional Test requirement with a test frequency of every 184 days (Table 3.3.1.1-1) has been added as SR 3.3.1.1.16 for the OPRM Upscale and 2-Out-Of 4 Voter Functions consistent with the PRNM LTR, Supplement 1. Note, SR 3.3.1.3 has been removed, including the previously existing OPRM instrumentation section. A second note to SR 3.3.1.1.16 (not included in the PRNM LTR) is included to clarify that the SR also applies to the flow input function, except the transmitters. A "confirm auto-enable region" surveillance requirement 3.3.1.1.17, Table 3.3.1.1-1, is added 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. The sample Technical Specifications in the LTR include the generic 30% power, and 60% flow values for the auto-enable setpoints as well as the 25% OPRM operable value. The reload stability analysis includes a confirmation that the auto-enable region bounds the part of the power flow map where the plant may be susceptible to an instability event. If this confirmation is not successful, the region boundaries will have to be expanded for that cycle. Similar to the other cycle specific values referenced in the Technical Specifications, the flow and power values defining the auto-enable region boundaries, and

Section No.	Utility Action Required	Response
		the OPRM operable region are specified in COLR. These values are referenced in the Technical Specifications. Note that the cycle specific auto-enable region boundaries are at least as large as the generic auto-enable region boundaries.
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.	A Channel Calibration requirement for the OPRM Upscale Function references the existing 24-month frequency of SR 3.3.1.1.10 PRNM LTR Supplement 1.
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. Current CGS Technical Specification SR 3.3.1.1.15 is modified to address response time testing for APRM and 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 (Table 3.3.1.1-1) for the OPRM Upscale Function is the same as for the APRM, a test of the 2-Out-Of-4 Voter only. Consistent with the PRNM LTR Supplement 1, the only change required to implement the OPRM "LSFT" is the addition of "and OPRM" in the Technical Specification Bases and revision of the related plant procedures to include testing of the OPRM Upscale trip outputs from the 2-Out-Of-4 Voter. The procedure changes will be 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) period based detection algorithm 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, discussed in the Bases for Function 2.f, will be treated as nominal setpoints

Section No.	Utility Action Required	Response
		with no additional margins added. The deadband for these setpoints is established so that it increases the enabled region once the enabled region is entered. The settings are specified in the COLR from the 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 CGS procedures, within the limits established in the BWROG LTRs, or as documented in this submittal. The fourth set, the GRA and ABA setpoints, consistent with the BWROG submittals, will be established as nominal values only, and controlled by CGS procedures.
8.5.1.4	APRM-Related Control Rod Block Functions - Functions Covered by Technical Specifications 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 Technical Specifications and related procedures and documents. In the *plant-specific submittal,* identify functions currently in the plant Technical Specifications and which, if any, changes are being implemented. For any functions deleted from Technical Specifications, 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 Technical Specifications.	ARTS will be implemented concurrently with the PRNM modification at CGS. CGS Technical Specifications currently do not contain any APRM rod block functions. These have been moved to the CGS LCS.
8.5.2.4	APRM-Related Control Rod Block Functions - Minimum Number of Operable Control Rod Block Channels Change the minimum number of APRM channels to three, if APRM functions are retained in Technical Specifications. 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. The APRM rod block functions are listed in the LCS. In the LCS, the minimum number of APRM channels is four and will be changed to three.

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 Technical Specifications 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. The APRM rod block functions are listed in the LCS. There are no operability requirements in Mode 5 for the APRM rod block functions in the LCS, consistent with the PRNM LTRs.
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 Technical Specifications, and confirm that they are being deleted.	CGS 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 CGS Technical Specifications is required to implement the PRNM LTR requirements. The LCS currently includes no Channel Check requirements for the APRM rod block functions.
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 Technical Specification test frequencies that will be changed to 184 days (6 months).	CGS Technical Specifications currently do not contain any APRM rod block functions. The Channel Functional Test frequency for the APRM rod block functions is changed to once per 184 days in the LCS.
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 Technical Specification test frequencies that will be changed to 24 months.	CGS Technical Specifications currently do not contain any APRM rod block functions. The Channel Calibration frequency for the APRM rod block functions is once per 184 days, which is changed to 18 months per the LTR.
8.5.4.4.4	APRM-Related Control Rod Block Functions - Required Surveillances and Calibration - Response Time Testing None.	CGS Technical Specifications currently do not contain any APRM rod block functions. Response time testing is not required for these functions per the CGS licensing basis.
8.5.5.4	APRM-Related Control Rod Block Functions - Required Surveillances and Calibration - Logic System Functional Testing (LSFT) None.	CGS Technical Specifications currently do not contain any APRM rod block functions. Logic System Functional testing is currently included in the LCS at a frequency of 24 months.
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	ARTS will be implemented concurrently with the PRNM modification at CGS. APRM rod block setpoints are based on setpoint calculations using approved setpoint methodology. The actual Allowable Values and setpoints are defined in the LCS. Setpoint

Section No.	Utility Action Required	Response
	concurrently with the PRNM modification, either include the related Technical Specifications 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.	changes (if any) that will be implemented due to ARTS/PRNM submittal will be identified.
8.6.2	Shutdown Margin Testing - Refueling As applicable, revise the Shutdown Margin Testing - Refueling (or equivalent Technical Specifications) LCO(s), action statements, surveillance requirements and Bases as required to be consistent with the APRM Technical Specification changes implemented for PRNM.	Added function 2.e to SR 3.10.8.1. Technical Specification or Technical Specification Bases changes to Specification 3.10.8, Shutdown Margin (SDM) Test – Refueling and its associated bases were modified consistent with the APRM Technical Specification changes implemented for PRNM.
None	Core Operating Limits Report Reporting requirements Section 5.6.3 does not currently address the OPRM.	Specification 5.6.3 has been modified to require that the Period Based Detection Algorithm (PBDA) setpoints be included in the COLR to support LCO 3.3.1.1.
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 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-I 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.	Quality assurance requirements for work performed at CGS are defined and described in Energy Northwest "Operational Quality Assurance Program Description (EN-QA-004)" (OQAPD), LDN-OQAPD-OQAPD-01. Note: The OQAPD applies to all activities associated with structures, systems, and components, which are safety related or controlled by 10 CFR 72. The OQAPD also applies to transportation packages controlled by 10 CFR 71. The OQAPD implements 10 CFR 50 Appendix B, 10 CFR 71 Subpart H, and 10 CFR 72 Subpart G. It is implemented by site procedures and instructions. For the PRNM modification, CGS has contracted with GEH to include the following PRNM scope: 1) design, 2) hardware/ software, 3) licensing support, 4) training, 5) O&M 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 CGS

Section No.	Utility Action Required	Response
		procedures. Modification work to implement the design change will be performed per CGS procedures or CGS-approved contractor procedures. CGS has participated and will continue to participate in appropriate reviews of GEH's design and V&V program for the PRNM modification. For software delivered in the form of hardware (EPROMs), CGS intends to have GEH maintain post delivery configuration control of the actual source code and handle any changes. CGS will handle any changes in the EPROMs as hardware changes under its applicable hardware modification procedures.

Enclosure 1

Columbia NUMAC PRNM LTR Deviations

Columbia NUMAC PRNM LTR Deviations

Energy Northwest will be submitting a license application for the implementation of Power Range Neutron Monitor (PRNM) using the Long Term Stability Solution Option III at the Columbia Generating Station. The bases for the license application are the referenced documents in the relevant licensing topical reports (References 1-3).

The PRNM developed for Columbia has three (3) deviations from the referenced documents. They 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 plant-to-plant variations are not addressed herein, just the one deviation.

Table 1. Columbia NUMAC PRNM LTR Deviations

	Function/ Equipment	PRNM Licensing Basis	Columbia 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.	Time to Calculate Flow-biased Trip Setpoint	Total time to calculate STP Trip Setpoint, including sensor processing, is 600 ms after change to flow	PRNM takes 300 ms, but the flow transmitter alone may take over 600 ms.	Inconsequential
c.	Abnormal Conditions Leading to Inoperative Status	Any missing module in a chassis causes an INOP Trip.	Any missing module in a chassis causes an alarm but not necessarily a trip.	Not required by Technical Specifications

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.

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 Columbia 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 Columbia 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.c, 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.c and 2.f are implemented in the same hardware, these trip Functions are combined with APRM Inop trip Function 2.d. 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.d 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.c independently of Function 2.f."

b. Time to Calculate Flow-biased Trip Setpoint

Licensing Topical Report NEDC-32410P-A Volume 1 (Reference 1) Section 3.3.2 describes the processing time for calculating flow-biased setpoints as follows.

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The Average Power Range Monitor (APRM) Simulated Thermal Power (STP) high trip is the only trip function with a setpoint that is calculated based on recirculation flow. [[

]] The flow transmitters, which are unaffected by a PRNM retrofit, also perform signal processing and their filters have time constants that are adjustable from 0.2 and 2 seconds. Allowing 5 constants to settle on a new value, the response time for the transmitters takes between 1 and 10 seconds. Thus, the response of the recirculation flow system alone exceeds what is described in Reference 1. When combined with the PRNM response, the total time could be as high as just over 10 seconds. For the reasons discussed below, this is inconsequential.

Most importantly, the Safety Analysis does not take credit for the STP high trip in any of the design basis events. Therefore, the conclusions of the Safety Analysis are not called into question in any way.

The Safety Analysis mentions the flow-biased STP trip in the context of protection against transients such as the Loss of Feedwater Heating *where thermal power increases slowly.* In this type of scenario, the thermal power and flow rates change gradually, over tens of seconds. Even if the longest setpoint calculation time is assumed, the setpoint will track closely with the ideal value (i.e., the value based on actual flow rate). Furthermore, when the initial condition is at or near rated power, the STP trip setpoint does not even vary with flow because it is clamped.

In summary, due to processing in the recirculation flow transmitters, the time for the recirculation flow system to calculate the APRM STP trip setpoint is longer than what is stated in Reference 1. However, the performance does not present any safety risks, and is acceptable.

c. Abnormal Conditions Leading to Inoperative Status

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The way the system is designed meets the Technical Specification Requirements. Specifically, if the channel is found to be inoperative, a limiting condition for operation (LCO) exists, and the Technical Specifications allow time to correct the problem or to place the channel in INOP. Therefore, it is not necessary to cause an immediate, automatic trip if a module is determined to be missing from the chassis. [[

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Reference 1 Section 3.2.10.1 discusses the purpose of the APRM INOP trip, and provides insight. Quoting in part from that section, [[

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If the system were designed as described in Reference 1 Section 5.3.8.2 and [[

]] This is well beyond the intent of the APRM INOP trip, and is not required by the Technical Specifications. Similar reasoning applies to the RBM. Therefore, the present design is acceptable.