Updated Issues List for August 16, 2016

Public Teleconference between

PSEG LLC and the Nuclear Regulatory Commission

Hope Creek Generating Station (HCGS)

Power Range Neutron Monitoring (PRNM) System Digital Upgrade

License Amendment Request

HCGS NUMAC Upgrade – Open Items

DOC-0006-2118 R5

HCGS NUMAC Upgrade – Open Items

No.	Resp.	Issue Description	Status	RAI No.	PSEG Response
1.	EICB	System Description Appendix R provides responses to plant specific responses to the NUMAC LTR. The response to LTR 2.3.4 identifies the configuration for HCGS to be 4 APRM channels with one APRM chassis and one LPRM chassis. However the LTR and Appendix A system architecture do not describe this. Appendix A describes a master/slave APRM instrument, but the LTR describes a LPRM unit not clear how these two concepts relate, if they do. Provide a figure showing the system architecture for the HCGS PRNMS.	Close	No	LTR 5.3.1 first bullet discusses APRM chassis and (for large cores) LPRM chassis. NEDC-33864P Appendix A refers to these two chassis as APRM-Master and Slave. Master refers to the APRM chassis and Slave refers to the LPRM chassis. These terms are used interchangeably. NEDC-33864P Appendix A page A-11 shows the system level architecture.
2.	EICB	System Description Appendix A seems to describe the generic PRNM system architecture and not the architecture for HCGS. What is different between this description and the one provided in the LTR? Also there are system differences, which are described in Appendix J. How do these modules work and fit in the system architecture for HCGS?	Close	No	The LTR describes variants of PRNM system architecture, depending on whether the target application (plant) has a large or small core, and whether it is BWR6 or non-BWR6. Appendix A provides additional details about large core, non-BWR6, such as Hope Creek. The differences described in Appendix J are not architectural differences.
3.	EICB	System Description Appendix J identifies Hope Creek deviations from the approved generic	Close	No	NRC update 03022016: NRC will identify the documents to be placed in the portal. a)

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		NUMAC PRNM system. This is required in ISG-06 Section D.8. a) Table 1 lists these deviations and provide justifications for such. Please provide additional information for the following items: • Column Reference Document – what are these documents? • Item 2 – Why the modification for time to calculate flow-biased trip setpoint is a clarification? It seems that the total time for the Hope Creek Design has changed. • Item 5 – What higher level of security was applied and to what activities? b) Section 4.2 describes the relay logic for HCGS. Please clarify how the improved relay logic module relates to the new relay logic card to be included in the Hope Creek PRNM system.			• These are GEH references pointing to where the support for the justification is stored in the GEH document system. The following two referenced documents can be placed in reading room upon request. • Item 2 - 001N5637 PRNM Time to Calculate Flow-biased Trip Setpoint • Item 5 - 001N5640 PRNM Increased Instrument Security b) "Relay Logic Module" and "Relay Logic Card" refer to the same thing. Hope Creek will receive the new design.
4.	EICB	Software Development Plans The plans submitted describe GEH processes, but they do not include the activities to be performed by the licensee, such as oversight. Please describe the activities and processes for which PSEG is responsible.	Close	No	NRC update 03022016: NRC will identify the documents to be placed in the portal. PSEG is required to create or acquire a number of documents from vendors providing safety related equipment per IT-AA-101. The purpose of many of these documents is to ensure the vendor has a quality process in place for software and

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					product design and that the process and design are accurately documented and tested. The required documents include a configuration management plan, a problem management and reporting process, a disaster recovery process, documented functional requirements, a documented technical design, a verification and validation plan, testing reports, user documentation, code review process and documentation and a traceability matrix to ensure all requirements are tested. In addition, CC-AA-103-1007 responsibilities state: Lead Responsible Engineers (LREs) are responsible for ensuring DCPs with digital devices are provided to DTS Design Engineer for review. DTS Design Engineers are responsible for reviewing Design Change Packages (DCP) with digital devices ensuring an adequate Critical Digital Review (CDR) is performed and documented. The DTS Engineer determines the scope and breadth of the CDR for the particular application. A critical digital review is a review of a vendor's software QA processes and a technical review (EMI/RFI, failure analysis) of the design, documentation, and testing of a digital device determining the software/hardware's suitability for

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					purchase and installation at PSEG Nuclear facilities. PSEG personnel participated in critical digital review that was led by ProDesCon on the GEH Power Range Neutron Monitoring System (also refer to LAR Attachment 1 Section 3). The CDR report pointed out that GEH has an established regulatory approved Appendix B quality program and that they're processes are suitable to ensure the quality of the design, configuration control, Part 21 reportability and the system maintenance throughout the life cycle. The CDR included a high-level review of the overall system design, focusing on the safety functions of the system and how digital design principles indicative of highly reliable digital systems were applied to the PRNM system. PSEG has reviewed and commented on software lifecycle documentation produced by GEH throughout the project. In addition PSEG has performed two audits (reference Survey numbers NOV2116-014 and NOD-15-038) thus far on GEH to help ensure product reliability. These audits focused on GEH audits performed on subcontractor Gavial, the GEH actions and process to correct identified issues, QA hold points placed on the purchase order, overall test plans and completed testing, restrictions placed

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					on the Gavial subcontractor, cyber security aspects of the project and the GEH engineering change process. PSEG also plans to witness continued factory testing with the quality assurance department.
5.	EICB	Software Development Plans The proprietary markings in the appendices are inconsistent. For example, information in Sections 4.2 and 4.3 in Appendix B is not marked proprietary, but this same information is also provided in Sections 4.2 and 4.3 of Appendix D, where is marked as proprietary.	Close 6/9/2016 Since we are not asking for additional information, this does not need to be an RAI. Just reclassify the information already provided. Please provide expected completion date.	No	6/21/2016 The information has been re-classified in Appendix B. The NEDC and NEDO versions of Appendix B with the re-classified sections will be docketed with the PRNM Phase 2 Supplement in September 2016. If desired the two Appendix B versions can be placed in the PRNM Reading Room portal in advance of the September submittal. 4/19/2016 A complete replacement of Appendix B proprietary and non-proprietary with the corrected pages will be provided. 2/16/2016 Appendix B Sections 4.2 and 4.3 should be marked proprietary to match Appendix D. Updated copies of Appendix B proprietary and non-proprietary can be provided.
6.	EICB	Appendix E, PRNM System Management Plan	Close	EICB RAI-1	

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		a) Section 2.3 describes how project management will be performed. This section refers to critical-to-quality features to be part of the management process. However, this plan does no define these features. Since these features are part of project oversight, please describe these features and in which document will they be recorded?	Close 6/9/2016 Is the HCGS Project Work Plan available for NRC review?	EICB RAI-1a	6/21/2016 The System Management Plan (SyMP), Appendix E of the Phase one submittal NEDC-33864P, contains non-commercial information, complementary to what is contained in the Hope Creek PRNM Upgrade PWP. The SyMP does not contain Project-specific CTQ's, which are in Appendix C of the PWP. Those CTQs are: • GEH (internal) CTQ's: o No non-compliance condition report initiate on Project. Comply with GEH policies and procedures, including the requirements described in the project planning documents specified in Section 3. o Adhere to GEH policies of Integrity, Safety culture principles, Quality and Outputs (ISQO). o Meet customer's expectations, achieve T-NPS score greater or equal to 8. o Utilize human performance (HU) tools. o Execute the project in accordance with the Project schedule and meet the established Engineering Deliverables (ED) and Customer Deliverables (CD) promise dates. o Report or escalate to the Engineering Manager and/or PM any issues related to integrity and safety using the issue resolution process

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					(Section 4.2). Safety means both occupational safety and the requirements that will impact the safety functions and operation of the system being design and developed. • Customer CTQ's o Meet project milestones specified in GEH-KT0-182455-005 (Reference B.2.12). o Timely escalate issues to PM using the escalation process. <u>2/16/2016</u> A Project Work Plan (PWP) is required by GEH policies and procedures. As stated in Appendix B Section 3.1.1.5, the PWP contains personnel and commercial information, including project budgetary information that is classified as GEH Proprietary Class III (confidential). The PWP is created and maintained by the Project Manager to manage the commercial aspects of the project. Critical to quality features are project specific and are listed in the PWP. For Hope Creek, these are listed in Appendix C3 of the Hope Creek PRNM Upgrade PWP.
		b) Section 2.4.1 describes the secure development environment. This section states the control employs in the system development should be in	Close	EICB RAI-1b	A collection of administrative procedures covers specific topics related to the secure development environment: • Asset Identification • Secure Development Network

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		accordance with GEH established procedures, consistent with guidance provided in RG 1.152. Please describe the GEH procedures to be followed for secure development environment.			• Physical Security • Malicious Code Protection • Patch Management • Server and Computer Hardening • Threat Analysis • Software Usage • Electronic Access Control • Log Management • Personnel Security and Segregation of Duties • Production Deployment • Product Handling and Delivery • Incident Response • Contingency Planning • Security Control Review • Changes to Physical, Logical, or Programmatic Controls
		c) Section 3.1 describes the need to establish project quality metrics. However, this section does not identify the project quality metrics.	Close	EICB RAI-1c	3/15/2016 Supplemental Response NRC Clarification BTP 7-14 requires the applicant identify the metrics to track progress and determine appropriateness of its software development process. The NRC staff needs a clear description on how the licensee is using configuration reviews and technical reviews to measure success or failure of the software development process. This item is identified in open items: 6c, 7g, 8a, and 11e Response

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					The software development process includes a series of technical design reviews and baseline reviews. At the end of each of these reviews, a review report and a scorecard will be issued by the review chair. The review report summarizes the results of the review. The scorecard evaluates the content of the review material and the performance of the design team based on pre-established criteria also known as metrics, e.g., "Did the design team resolve action items assigned at previous reviews, or are acceptable plans in place?" A successful review will require a passing grade of 75%. However, any grade below 90% would result in action items to correct the deficiency in the design or in the compliance with the design process. Condition reports will be issued in accordance with GEH problem reporting procedure should a design fail any of the reviews. <u>2/16/2016</u> The Design Review Summary Report and Design Review Scorecard provide a record of quality metrics applied by the Chief Engineer's Office. A copy of a scorecard can be placed in the Reading Room upon request.

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7.	EICB	Appendix B, PRNM Systems Engineering Development Plan	Close	EICB RAI-2	
		a) Section 2.4.1 of Appendix K states the verification of the design documents is performed by the design team prior to IVV activities. But section 2.3 seems to imply that these reviews are performed by a team independent of the design team. In addition, section 4.2 of Appendix B also describes an independent review team who perform the technical design review. Please clarify what group (in the GEH organization) performs these independent reviews.	Close	EICB RAI-2a	When the design team prepares and releases design artifacts, GEH procedures require the Design team to perform verification of documents prior to the document release. The released document is then provided to the IVV team who conducts the independent verification in accordance with the SyIVVP. Conducting the IVV activities defined in the SyIVVP (Section 3.0) constitutes the Technical Design Review, which is performed by the IVV team and is supervised by the Chief Engineers Office.
		b) Section 2.4.1 describes the technical design reviews. This section states the design team is responsible for resolving issues identified during these reviews. How are these issues being recorded and tracked? Section 4.5 of this appendix describes how deficiencies or discrepancies could be tracked, and Section 7.0 states they could use engineering change order to handle problems encountered during product development. But these statements are not specific. In addition, it seems that these	Close	EICB RAI-2b	3/15/2016 Supplemental Response NRC Clarification BTP 7-14 requires the applicant identify how anomalies are identified, documented, tracked and resolved. The staff needs a clear description on how PSEG and GEH are performing these activities during the design and development, V&V, and testing, and then after the system is installed in HCGS. This item is identified in open items: 7b, 8a, 8b, and 11f GEH Response

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		options are used after delivery of the NUMAC system. Please explain what method will be used to identify and track problems identified during the technical design reviews. Also, explain the process to approve the resolution of these problems.			During design & development of the PRNM system for PSEG, the IVV Team would review and provide comments about design artifacts at each phase. The comments and resolutions are archived in the design records in accordance with GEH procedures. The comments, resolutions and any open items are also reported and tracked in Appendix A of the SyVV Task Report or SySA Task Report for each phase as discussed in Section 4.4 of the SyEDP, SyIVVP and SyQAP. During IVV team testing, when anomalies are observed, they are recorded in the control copy of the test datasheets. The anomalies and the resolutions, which may include changes or corrections to the design, are discussed in the test reports. An independent engineer is responsible to verify that the content of test report is consistent with the test data sheets. The technical design reviews and baseline reviews will confirm that the acceptance of the resolution and the closure of the anomalies or open items. Resolution of all anomalies and closure of all open items are required before the system can be delivered to PSEG. After GEH delivers the system to PSEG, if an anomaly is discovered it would be tracked in the GEH Corrective Action Program.

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					PSEG Response As discussed in the response to Open Item (OI) #4, PSEG will continue oversight and audit activities during the design, development, V&V, and testing of the PRNM system. The processes discussed in OI#4 will disposition any anomalies identified. This will include, as appropriate, resolution in the PSEG Corrective Action Program (CAP) -LS-AA-125 - and in the Engineer of Choice (EOC) corrective action program (for the vendor performing the design change package for the PRNM upgrade – Sargent and Lundy). During installation and acceptance testing, and after installation, both the PSEG CAP and EOC CAP will be used to identify, document, track and resolve anomalies. 2/16/2016 Project specific issues that remain open across project phases are tracked in the task reports. See Section 4.4.2 of the NUMAC Systems Engineering Development Plan. Closure of open items is reviewed as part of subsequent Baseline reviews; open items are

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					resolved and closed prior to completion of the final Baseline review.
		c) Section 4.3 states the baseline review team would also review and approve development tools. Was this necessary for the HCGS PRNM system?	Close	EICB RAI-2c	The SyQA Functional Configuration Audit Checklist (NUMAC System Quality Assurance Plan Section 4.4.1) lists tools that were approved for the associated baseline. A SyQA Functional Configuration Audit Checklist is developed for each Baseline. Tools are approved for use via the Baseline review process for application to a specific project. Tools were used for the HCGS PRNM system development.
		d) Section 5.0 describes the use of development tools. BTP 7-14, Section B.3.1.2.3 requires licensee to provide a description of software tools to be used. Please identify the software development tools.	Close	EICB RAI-2c	3/15/2016 Supplemental Response NRC Clarification BTP 7-14 requires the applicant identify the software tools used for the development of the system. The NRC staff needs a list and reference of the software tools being used for the development of the HCS NUMAC. During the call, the licensee noted these tools were described in previous license amendments, if this is the case, then the staff needs the references or ML numbers for the documents that described the software tools. This item is identified in open items: 7d and 9b Response

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					The Hope Creek PRNM system has similar hardware and software designs as previously approved PRNM projects, e.g., Grand Gulf and Columbia. Therefore, the software tools for the HCGS PRNM are the same as those previously described for Columbia in NEDC-33685P Revision 2 (ML12040A074) Section 4.4.6. 2/16/2016 Tools are selected and approved for use throughout the various phases of project. The approved tools are documented in the SyQA Functional Configuration Audit Checklists (NUMAC System Quality Assurance Plan Section 4.4.1). GEH provided details on software tools during previous (Grand Gulf and Columbia) projects. See RAI #3 in GNRO-2011/00038 (ML111370259) and Section 4.4.6 in NEDC-33685 (ML12040A074).
		e) Section 6.0 describes the secure development and operational environment. This section states access to the NUMAC lab is controlled and monitored. But it does not provide details on how these are perform. Please provide detail explanation.	Close	EICB RAI-2d	GEH has a procedure for controlling access to the NUMAC lab; see response to Open Item 6.b.
		f) Section 6.0 describes the secure development and operational environment. This section states	Close	EICB RAI-2d	GEH has a procedure for access control of the secure server, see response to Open Item 6.b.

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		the code is maintained in the secure server. How is access granted to this server?			
		g) Section B.3.1.2.2 of BTP 7-14 requires licensee to identify the indicators to determine the success or failure of the development processes. This information was not provided in the engineering development plan. In addition, Appendix A in Appendix K identifies the alignment to NUMAC documents. This table identifies that this information in SyMP (See open item 6.c). Please provide this information.	Close	EICB RAI-1c	3/15/2016 Supplemental Response See open item 6.c. 2/16/2016 Success or failure is indicated by the Design Review Summary Report and Design Review Scorecard.
8.	EICB	Appendix C, NUMAC Systems Quality Assurance Plan	Close	EICB RAI-3	
		a) General comment: This plan does not cover all the activities identified in section B.3.1.3 of the BTP 7-14. Specifically, this plan does not describe the corrective action program, description of QA procedures, and indicators to determine software quality.	Close	EICB RAI-3a and see EICB RAI-1c	3/15/2016 Supplemental Response See open item 6.c and open item 7.b. 2/16/2016 The NUMAC plans augment and supplement the GEH QA Program. As stated in Section 1.0 of the NUMAC Systems Quality Assurance Plan, the GEH Quality Assurance Program encompasses quality assurance related activities such as audits, supplier control, and archiving of quality records. Although not explicitly mentioned, the corrective action program is a component of the GEH Quality Assurance Program.

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		b) Section 3.0 states unresolved configuration items is grounds for failure. How are these issues identified, recorded and tracked? Who is responsible for approving resolution of these issues? (see open item 7.b)	Close	EICB RAI-3b	3/15/2016 Supplemental Response See open item 7.b. 2/16/2016 Open items are listed in the System Quality Assurance Configuration Audit Checklist and tracked in the System Configuration Management Task report (SyEDP 4.4.2). The checklist and task report are part of the Baseline Review Records. These records are approved by the baseline review team, which is chaired by the Chief Consulting Engineer.
		c) Section 4.4.1 describes the oversight activity associated with quality assurance. Is the activity described in this section the only oversight activity to be performed? (This section is marked proprietary so the specific activity is not identified in the question). What happens if problems are identified during this oversight activity?	Close	No See EICB RAI-3a	As discussed in response to Question 8.a, the GEH Quality Assurance Program has other activities. Problems are tracked in accordance with GEH procedures.
9.	EICB	Software Integration Plan (SIntP) GEH did not submit a separate plan for this. However, GEH (Appendix K) identified the NUMAC documents that cover the requirements for this plan (BTP 7-14, Section B.3.1.4). Based on this	Close	EICB RAI-4	

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		information, the staff identified the following questions:			
		a) Section B.3.1.4.2 identifies the implementation characteristics of the SIntP. His section requires description of the software integration activities. GEH references SyEDp for this, but SyEDP does not provide enough information about the software integration process. Please provide this information.	Close 6/9/2016 This response does not address the lack of integration activity detailed in the SyEDP.	EICB RAI-4	6/21/2016 As discussed in NEDC-33864P Appendix A, the microprocessor-based NUMAC instruments consist of a chassis and a complement of modules, which may include embedded software. Software integration is accomplished by compiling individual software components into executable applications that are specific to each programmable entity in the modules, integrating those modules into the instruments in which they run, and finally integrating the instruments within the system to perform the system functions. For GEH, software integration is performed by the design team and their activities are described in the SyEDP. At completion of design team activities, software and hardware are provided to the Independent Verification and Validation Team who perform independent integration and system testing in a phased approach as detailed in the SyIVVP. Management Characteristics of the SIntP: • Purpose – Objectives and scope of a software Integration plan are included within the SyEDP lifecycle process. As part of the Design Phase of the SyEDP, planning is performed and software design specifications are developed which

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					describe major modules, their functions and how the software tasks fit together. In the Implementation Phase, code is assembled into modules and tested as described in Section 3.4.5.2.2, Software Module Testing. After module testing, software is integrated with the hardware and tested as described in Section 3.4.5.2.4, Integration Testing. • Organization – design team organization is discussed in SyEDP Section 2.2. Scheduling and resource allocation is described in SyEDP Section 3.1.1, Project Planning. • Responsibilities - design team responsibilities are discussed in SyEDP Section 2.1 Implementation Characteristics of the SIntP: • Measurement - The software development process includes a series of technical design reviews and baseline reviews. At the end of each of these reviews, a review report and a scorecard will be issued by the review chair. The review report summarizes the results of the review. The scorecard evaluates the content of the review material and the performance of the design team based on pre-established criteria

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					also known as metrics. Per SyEDP Section 3.4, integration testing is part of the Implementation Phase (Baseline 4) baseline and technical review. • Procedures – as indicated in SyEDP Sections 3.4.5.2.2 and 3.4.5.2.4, results, methods, and extent of testing are recorded during the testing and are included in a test item transmittal report. Resource Characteristics of the SIntP: • Methods/tools - SyEDP Section 3.4.5.2.2 and 3.4.5.2.4 discusses the general methods employed for testing and types of tools used. Section 5.0 of the SyEDP describes the use of tool evaluation reports and method for approval of development tools which includes tools used for module and integration testing. <u>2/16/2016</u> GEH does not have a separate software integration team, rather software integration is performed by the design team. Therefore, the characteristics described in the SyEDP for design team activities apply to integration activities as well. For explanation of how measurement is performed, see response to 6.c.

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		b) Section B.3.1.4.3 identifies software tools. As mentioned in open item 7.d, these GEH document do not identify the software tools to be used. Please provide this information.	Close	No See EICB RAI-2c. Already covered in Open Item No. 7.	3/15/2016 Supplemental Response See open item 7.d. 2/16/2016 See response to open item 7.d.
10.	EICB	Software Safety Plan (SSP) GEH did to submit a separate plan for this. However, GEH (Appendix K) identified the NUMAC documents that cover the requirements for this plan (BTP 7-14, Section B.3.1.9). Based on this information, the staff identified the following question: Appendix K refers to the IVVP and SyMP for the information required in BTP 7-14. However, the information identified in these sources seem to address the hazard analysis required by IEEE 102, and not what is required in BTP 7-14. The SSP should provide a general description of the software safety effort, and the intended interactions between the software safety organization and the general system safety organization.	Close	No	The PRNM upgrade is a retrofit system. As a retrofit system, the GEH approach to software safety planning for PRNM is to ensure that the safety significance of the PRNM retrofit is consistent with the design basis of the replaced system and of the plant. GEH provided details on software safety approach during previous (Grand Gulf and Columbia) projects. See RAI #1 and 2 in GNRO-2011/00039 (ML111460590) and Section 4.4.1.9 in NEDC-33685 (ML12040A074).
11.		Appendix D, NUMAC Systems Independent Verification and Validation	Close	EICB RAI-5	

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		a) Section 2.1 describes the GEH organization. This section states the GEH Chief Engineer's office supervises independent V&V activities. However, Appendix D, Figure 2-1 identifies the Chief Consulting Engineer as the person responsible for V&V activities.	Close	No	The Chief Consulting Engineer reports to the Chief Engineer's Office.
		b) Section 3.1.2 describes the safety analysis for the concept phase. It is not clear if this activity will include the preliminary hazard analysis, since it seems to only cover evaluation of the documentation.	Close	No	See response to open item 10.
		c) Is the safety analyses described in each lifecycle phase considered to be the hazard analysis identified in IEEE Std. 1012? If so, will this also include the risk analysis identified in IEEE Std. 1012?	Close	No	Hazard analysis is performed during various lifecycle phases as indicated in Appendix K, Table 5 for cross-reference of IEEE Std 1012 to NUMAC process. Project risk management is performed during all system life cycle development phases in accordance with the GEH Quality Assurance Program
		d) Appendix K refers to the IVVP Section 4.0 to confirm item B.3.1.10.1, risks. Section 4.0 describes the baseline process. So it is not clear how the baseline process will be used to identify and manage risks associated with the V&V process.	Close	EICB RAI-5	Project risk management is performed during all system life cycle development phases in accordance with the GEH Quality Assurance Program. SyIVVP Section 4.2 describes Technical Reviews. Although not stated in the SyIVVP, the GEH procedure for Technical Design Reviews requires risks management. SyIVVP Section 4.3 describes Baseline Reviews, which are a process check to

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					ensure the project plans are being followed.
		e) Appendix K refers to several sections in the IVVP to confirm item B.3.1.10.2, measurement. However, the information provided does not clearly define the indicators that will be used.	Close	No See EICB RAI-1c	3/15/2016 Supplemental Response See open item 6.c. 2/16/2016 See response to open item 6.c.
		f) Section B.3.1.10.2, procedures requires applicants to describe how anomalies are identified and reported. This information is not provide in the plan (See item 11.b above)	Close	No See EICB RAI-2b	3/15/2016 Supplemental Response See open item 7.b. 2/16/2016 Per section 2.2.2 and 2.2.3 of the SyIVV, the System Verification Engineer and System Safety Analysis Engineer are responsible for documenting results of reviews including anomalies in their respective tasks reports. The task reports are discussed in sections 4.4.1 and 4.4.2.
12.	EICB	Software Configuration Management Plan (SCMP) GEH did to submit a separate plan for this. However, GEH (Appendix K) identified the NUMAC documents that cover the requirements for this plan (BTP 7-14, Section B.3.1.11). Based on this information, the staff identified the following question: Appendix K refers to the SyEDP for the information required in section B.3.1.11.2, procedures. However, the information identified in these sources seem to	Close	EICB RAI-6	SyEDP - section 3.4 specifies configuration management of source code and section 5 specifies configuration management of firmware. Tools are controlled at the baseline in which they are introduced. Configuration Status Accounting includes all the configurable items.

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		address only configuration of documents, and not all configuration items (e.g., software tools, source code, etc.). How will GEH control these items?			
13.	EICB	EQ Testing The system equipment qualification (EQ) test plan was not submitted with the LAR. Instead the licensee submitted an EQ program in Appendix H. This program states the EQ plans will provide the details on the system to be qualified. Also, that the EQ program provides guidance to prepare EQ plans, if they are necessary. For this amendment, GEH described design changes for the HVPS, Relay Logic Card, and UFP Display. Therefore, a qualification plan for these components should be submitted. ISG-06, Section D.5.2 describes the information to be provided for the staff to evaluate EQ of I&C systems. Section D.5.2 requires submittal of the EQ plan.	Close	No	4/19/2016 The Qualification Summary Report has been uploaded to the PRNM Reading Room portal (Phase 2 folder): "002N9894-PRNM System Qualification Summary Report_Rev0.pdf" NRC update 03022016: The qualification summary report will provide the information requested. These items are encompassed by Appendix H. They are specifically identified in Section 3.3 and qualification approach is discussed in Section 5.
14.	EICB	EQ Testing Requirements Are the EQ requirements based on the plant conditions?	Close	No	The EQ requirements are based on plant conditions: From NEDC-33864P Appendix H Section 1.1: The replacement NUMAC PRNM system is designed to maintain functional operability under conditions specified in the PSEG Hope Creek Generating

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					Station Power Range Neutron Monitoring System (PRNM) Upgrade Project H-1-SE-KDS-0494 [Reference 7.1]. The qualification requirements, the subject of this system qualification program, are further delineated in the NUMAC PRNM System Requirements Specification [Reference 7.2]. Reference 7.2 is provided as NEDC-33864P Appendix F Part 1 (NUMAC PRNM System Requirements Specification). Section 2.5 references Hope Creek specification H-1-SE-KDS-0494; the qualification requirements in Appendix F Part 1 Section 9 are obtained directly from the Hope Creek specification.
15.	APHB	Section D.9.4, "Technical Evaluation," of DI&C-ISG-06, Subsection D.9.4.2.14, "IEEE Std. 603, Clause 5.14, Human Factors Considerations," states, in part, that the information provided should be sufficient to demonstrate that the guidance contained in Standard Review Plan, Appendix 18-A, has been met. NUREG-0800, Standard Review Plan, Appendix 18-A, "Crediting Manual Operator Actions in Diversity and Defense-in-Depth (D3) Analyses," Revision 0, states, in part, that a diversity and defense-in-depth analysis should include the justification of any operator	Open	No	6/21/2016 The PRNM HFE Assessment (Revision 0) and the PRNM 18-A Assessment (Revision 0) were placed in the PRNM Reading Room portal (Phase 2 folder) June 8, 2016, for NRC review and feedback prior to docketing with the Phase 2 supplement in September 2016: • PRNM Human Factors Assessment Rev 0.pdf • PRNM Appendix 18-A Assessment Rev 0.pdf 2/16/2016

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		actions that are credited for response to an Anticipated Operational Occurrence/Postulated Accident concurrent with software Common Cause Failure (CCF). It further states that credited manual operator actions and their associated interfaces (controls, displays, and alarms) should be specifically addressed in the vendor/licensee/applicant's Human Factors Engineering (HFE) Program. The vendor/licensee/applicant should commit, in the defense-in-depth submittal, to include the proposed defense-in-depth coping actions in an HFE Program consistent with that described in NUREG-0711 and to provide the results of the HFE Program to the staff prior to implementation of the proposed action(s). As stated in NUREG-0800, Appendix 18-A, to credit operator actions, an acceptable method would be to demonstrate that the manual actions in response to a BTP 7-19 software CCF are both feasible and reliable, given the time available, and that the ability of operators to perform credited actions reliably will be maintained for as long as the manual actions are necessary to satisfy the defense-in-depth analysis. Changes in plant design, including those that do not add, change,			An analysis, consistent with NUREG-0800, Appendix 18-A, will be provided demonstrating that the manual operator actions remain both feasible and reliable, and the ability to perform the actions reliably within the time available is maintained. The analysis will be provided in the HCGS PRNM Electronic Reading Room portal, in the second quarter of 2016. <u>PSEG would like to discuss some clarifications concerning Appendix 18-A</u>: a. Phase 3 vs Phase 1 required time: If the required time (and margin to time available) has been verified via Phase 3 ISV, is it still necessary to perform the Phase 1 time required estimate? b. For the two manual operator action items from the D3 report the HCGS Operators have multiple existing indications available. Consequently, PSEG does not need the simulator PRNM digital modification to support the18-A Phase 3 ISV; the existing plant/simulator configuration supports the ISV. The ISV is scheduled to be completed in March/April 2016. (Note: if simulator modifications were required before timing operator actions that could not be done

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		or delete the credited manual operator actions, may affect the ability of operators to correctly and reliably perform manual actions due to performance shaping factors (e.g., workload, time pressure) or other causes. Provide information regarding the analysis, consistent with NUREG-0800, Appendix A, that was used to demonstrate that the manual actions remain both feasible and reliable, and the ability to perform the actions reliably within the time available is maintained. The analysis should demonstrate that (1) the time available to perform the required manual actions is greater than the time required for the operator(s) to perform the actions, and (2) the operator(s) can perform the actions correctly and reliably in the time available. PSEG should provide sufficient information to demonstrate that the conclusions reached in the previously performed analysis regarding the feasibility and reliability of credited manual operator actions will remain valid in the post-modification environment (i.e., that the time available to perform the required manual actions and the time required to perform such actions will not be adversely affected by the proposed modification).			until couple of months before modification implementation, ie 2018)

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16.	EICB	System Requirements Appendix F defines the system requirements for the NUMAC PRNM system. It is not clear if these requirements reflect the system to be installed in HCGS. Specifically, does appendix F include the requirements for the modified components described in Appendix J?	Close	EICB RAI-7	3/15/2016 The Hope Creek System Requirements Specification (Appendix F) is plant specific. The following discussion elaborates on how the topics from Appendix J are addressed in the Hope Creek specifications. LTR Deviations 1. APRM Upscale / OPRM Upscale / APRM Inop. Appendix F1, Section 6.1 reflects this LTR deviation. NOTE: Appendix J Reference document 001N5636 can be provided in the reading room portal, if desired. This topic was discussed during previous PRNM projects. Please see, Enclosure 1 (Section 1.5 and Appendix A) of ML12040A073, submitted for Columbia. 2. Time to Calculate Flow-biased Trip Setpoint. This clarifies a statement in the LTR but does not affect the NUMAC PRNM design. NOTE: Appendix J Reference document 001N5637 can be provided in the reading room portal, if desired. This topic was discussed during a previous PRNM project. Please see, Enclosure 1 of ML12040A073, submitted for Columbia.

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					3. Abnormal Conditions Leading to Inoperative Status. Appendix F2, Section 4.3.4.9 reflects this LTR deviation. NOTE: Appendix J Reference document 001N5635 can be provided in the reading room portal, if desired. This topic was discussed during a previous PRNM project. Please see Enclosure 1 of ML12040A073, submitted for Columbia. 4. OPRM Pre-Trip Alarms. Appendix F1, Section 4.3.1.2 reflects this LTR deviation. NOTE: Appendix J Reference document 001N5641 can be provided in the reading room portal, if desired. This topic was discussed during a previous PRNM project. Please see Appendix A (page A-5) of ML101790437, submitted for Grand Gulf (DSS-CD Plant like HCGS). 5. Increased Instrument Security. Appendix F1 Section 4.1 (traceable item 436R) provides the higher level requirement that the system provides a means to adjust user-configurable parameters, and Appendix F2 Section 4.4.14 (traceable item 2345R) incorporates the same feature at the instrument level. That the Hope Creek design implements increased security relative to previous applications may be seen by comparing it to a previous application. Please see Section 4.4.8 of

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					25A5916, APRM Performance Specification for CGS (Reference 64 and included in Appendix A) - ML12040A074 submitted for Columbia. That design includes an "OPER-SET" function, a function that enables the user to adjust a small number of select parameters after entering a password but without placing the instrument in INOP. PSEG elected to not include this feature at Hope Creek. NOTE: Appendix J Reference document 001N5640 can be provided in the reading room portal, if desired. 6. PRNM System Input Power Source. The deviation does not affect the PRNM design. Appendix F1 Section 7.5 reflects the type of input power as described in the Hope Creek LAR Attachment 1 Section 4.1.1 page 28 of 46, which deviates from what is described in the LTR. NOTE: Appendix J Reference document 002N3909 can be provided in the reading room portal, if desired. <u>Differences from Columbia Generating Station PRNM</u> 1. OPRM Solution. Appendix F1 Section 4.1 (traceable item 225) and 4.3 reflect this difference.

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					2. Relay Logic Module. The new part is incorporated in schematics and bills of material, which may be placed in the reading room portal if desired. The design function is not changed and therefore does not affect Appendix F. 3. APRM High voltage Power Supply. Appendix F2 Section 4.4.2 (traceable item 2322) reflects this difference (note that Appendix F2 Table 4.3-1 erroneously points to Section 3.3.1 vs 4.4.2 for 'Manual LPRM I/V curve request'). 4. Display of Calibration Constants for LPRM Detector and Flow Signals. Appendix F2 Section 4.4.5 (traceable item 2287) reflects this difference. 5. Instrument Front Panel Display. The new part is incorporated in schematics and bills of material, which may be placed in the reading room portal if desired. The design function is not changed and therefore does not affect Appendix F.
17.	EICB	System Requirements Appendix F defines the system requirements for the NUMAC PRNM system. There are requirements identified (use of the word SHALL) that do not include identifiers in brackets (e.g., Section 5.6). Then there are statements	Close	No	3/15/2016 The requirements marked with brackets in Appendix F are identified for traceability purposes. Appendix F also includes several sections that are written in support of the requirements marked with brackets for traceability. Section 4 of Appendix F1 states "The primary system

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		that seems more description than requirements (e.g., Sections 5.4 and 5.5). Clarify if all sections are requirements for the system.			functions of the integrated NUMAC PRNM replacement system are summarized below, followed by a specific identification of the safety functions of the system. See Sections 5 and 6 for more details on the input and output requirements discussed in this section." Therefore, Sections 5 and 6 are also considered as requirements although these requirements would not be explicitly traced in downstream documents. For example, it would be cumbersome to establish traceability for the LPRM assignments in Section 5.1. However, each LPRM assignment will be verified and validated in the V&V activities. The bases for the V&V would be Section 5.1 of Appendix F.
18.	SRXB	HCGS is changing the existing ABB OPRM with the BWROG Option III stability solution to the GEH-OPRM with the Detect and Suppress Solution-Confirmation Density (DSS-CD) stability solution. Submit the HCGS power/flow map identifying Scram (Region I) and Controlled Entry (Region II). A plant-specific power/flow map is required for the review of DSS-CD setpoint evaluation given in Appendix T, "HCGS Thermal Hydraulic Stability, DSS-CD Evaluation" of NEDC-33864P.	Close 7/6/2016 SRXB reviewed the representative power/flow map in the reading portal. 6/9/2016 NRC staff will review the representative	No	6/21/2016 A representative power/flow map was placed in the PRNM Reading Room portal May 18, 2016: • 003N5661r0_HCGS_OI18_PF Map.pdf 4/19/2016 PSEG can supply a representative power/flow map with BSP regions identified. However, PSEG would like clarification on the purpose/value of providing such a map. The Amplitude Discriminator Setpoint (SAD) and

No.	Resp.	Issue Description	Status	RAI No.	PSEG Response
			power/flow map in the reading room portal.		minimum time period limit (Tmin) are not dependent on the BSP regions as described in Section 2.1 of NEDC-33864P, Appendix T. The ABSP setpoints are developed based on the BSP Region I; however, the methodology described in the DSS-CD LTR is applied to establish or validate the ABSP setpoints (NEDC-33075P, Section 7.4 details ABSP region generation, Section 7.5.4 details ABSP implementation). This methodology will be applied on a cycle specific basis as required by Section 7.5.3 of the DSS-CD LTR. Section 7.2 of the DSS-CD LTR describes the methodology for the generation of the manual BSP regions. With the implementation of DSS-CD there are no changes to the process to determine the cycle-specific manual BSP regions and the existing BSP methodology.
19.	SRXB	TS Change 8a, Table 3.3.6-2, Page 3/4 3-59, Control Rod Block Instrumentation set points: The proposed new notes a, b, c, and d identify a low power set point of 28% rated thermal power and a high power set point of 83% rated thermal power. In the proposed addition to the Applicability section for Rod Block Monitor in TS 3.1.4.3 (Page 3/4 1-18), 30% and 90% are proposed. Provide a justification for	Close	No	4/19/2016 The values provided in TS 3.1.4.3 are for determination of the operating region where the RBM is required to be operable. The 30% and 90% values are not associated with the power setpoints. The RBM is required to be operable above 30% RTP if the MCPR value is below the MCPR value provided in the COLR. There will be two MCPR values provided in the COLR; one that is applicable with power less than 90% RTP

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		the margins of 2% for the low set point and 7% for the high set point.			and one applicable at or above 90% RTP. Unlike the power setpoints described below, the operability requirements are administrative. The operability requirements were determined by the analysis detailed in Section 3.5 of NEDC-33864P, Appendix S. TS Table 3.3.6-2 has the added notes a, b, c, and d which identify the LPSP, IPSP, and HPSP. These setpoints are used to distinguish rated thermal power ranges that apply to the power trip setpoints. Section 3.3.1 of NEDC-33864P, Appendix S details the analysis completed for the determination of these values. Analytical Limits for the LPSP, IPSP, and HPSP are provided in Tables 5 and 6 of Appendix S while the Allowable Values and Nominal Trip Setpoints are provided in Section 3 of Appendix P2. Allowable Values are used in TS for the power setpoints; the analytical limit for the LPSP is 30%. The RBM is automatically bypassed below the LPSP in accordance with the 30% operability criteria described above. The HPSP does not represent an automatic bypass and is not associated with the 90% operability criteria.
20.	SRXB	(a) TS 6.9.1.9, Page 6-20, Core Operating Limits Report:	(a) Close (b) Close <u>6/9/2016</u>	No	<u>6/21/2016</u> (b) The proposed revisions to TS 6.9.1.9 are consistent and appropriate for the existing HCGS (non-improved standard) TS.

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		Add or provide justification for not including the following staff-approved LTRs as references: • NEDC-33075P-A, Revision 8, "GE Hitachi Boiling Water Reactor Detect and Suppress Solution-Confirmation Density," November 2013. • 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. • NEDC-32410P-A, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function," October 1995. (b) TS 6.9.1.9, Page 6-20, Core Operating Limits Report: The following is provided in the DSS-CD LTR NEDC-33075P-A, Revision 8, Appendix A, Example of Changes to BWR/4 Standard Technical Specifications, TS Section 5.6.3, which is not included in the proposed Administrative Controls section of the	The Columbia LAR is not exactly like the Hope Creek LAR – Columbia was not putting in DSS-CD. It is not clear how the proposed addition of 3/4.3.1 and 3/4.3.6 will satisfy Item 1 of Appendix A, 5.6.3(a). DSS-CD LTR NEDC-33075P-A, Appendix A states that "For DSS-CD, the following is required in addition to the normal list of limits." …		As noted in the previous response, Appendix A of NEDC-33075P-A provides DSS-CD changes to the GE improved standard TS and Bases. PSEG does not have improved standard TS/Bases; the language in TS 6.9.1.9 is different than the language in improved standard TS 5.6.3. Specifically, Hope Creek's language is: "Core operating limits shall be established and documented in the PSEG Nuclear LLC generated Core Operating Limits Report before each reload cycle, or any remaining part of a reload cycle **for the following Technical Specifications**:." The difference is Hope Creek's language points to the specific Technical Specifications; whereas, the improved TS 5.6.3 (and CGS and NMP) language uses the phrase "… **for the following**:"; i.e., it is not pointing to the specific Technical Specifications but leaving it open to what is described 'in the following.' Therefore, consistent with the HCGS language and the current listing of TS in TS 6.9.1.9, the specific TS affected by the PRNM/DSS-CD upgrade have been added to the list. 4/19/2016 (a) NEDC-33075P-A, Revision 8 (DSS-CD LTR) is incorporated by reference: Section 3.2 of Appendix T (NEDC-33864P) includes the disposition of

No.	Resp.	Issue Description	Status	RAI No.	PSEG Response
		technical specifications, Page 6-20, 6.9.1.9, Core Operating Limit Report: "[For DSS-CD, the following is required in addition to the normal list of limits.]" "1. The Manual Backup Stability Protection (BSP) Scram Region (Region I), the Manual BSP Controlled Entry Region (Region II), the modified APRM flow-biased set point used in the OPRM, Automatic BSP Scram Region, and the BSP Boundary) for Specification 3.3.1.1." Explain in detail why the above requirements given in the DSS-CD LTR are not in the proposed TSs. The NRC staff acknowledges that HCGS is not using "BSP Boundary," but justification is needed as to why the other regions are not applicable.			Limitation and Condition 5.2 which indicates that GESTAR (Global Nuclear Fuel, "General Electric Standard Application for Reactor Fuel," NEDE-24011-P-A-22 and NEDE-24011-P-A-22-US.), which includes reference to the DSS-CD LTR, is referenced in TS 6.9.1.9. NEDC-32410P-A (PRNM LTR) is not required, or appropriate, to include in the COLR list of references. The PRNM LTR does not provide any analytical methodology for determining operating limits contained in the COLR. The PRNM LTR references were also not included in the approved changes to TS 5.6.3 (COLR) for the Columbia Generating Station PRNM upgrade (ADAMS ML13317B623). (b) Appendix A of NEDC-33075P-A provides DSS-CD changes to the GE improved standard TS and Bases; PSEG has included appropriate language for the HCGS TS Bases. The limits in question are applicable to HCGS and are provided in the proposed changes to TS 6.9.1.9. This is indicated in mark-up of TS 6.9.1.9 by the addition of TS 2.2 (Reactor Protection System Instrumentation Setpoints) and TS 3/4.3.1 (Reactor Protection System Instrumentation) to the list of applicable TS. The proposed changes to TS 2.2 and 3/4 3.1 indicate COLR provided values for the indicated

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					limits. The proposed changes to HCGS TS 6.9.1.9 are similar to the approved changes to TS 5.6.3 (COLR) for the Columbia Generating Station PRNM upgrade.
21.	SRXB	TS Bases Insert 1, Page 3 of 5, 2.f. OPRM Upscale: (a) Add GDCs 10 and 12 and revise the first sentence as follows to be consistent with Appendix A of NEDC-33075P-A: The OPRM Upscale Function provides compliance with GDC 10 and 12, thereby providing protection from exceeding the fuel safety limit (SL) MCPR due to anticipated thermal-hydraulic oscillations. (b) Add the following to be consistent with Appendix A (page A-20) of NEDC-33075P-A: Note (m) in TS page 3/4 3-5 reflects the need for plant need for data collection in order to test the DSS-CD equipment. Testing the DSS-CD equipment ensures its proper operation and prevents spurious reactor trips. Entry into the DSS-CD Armed Region without automatic arming of DSS-CD during this initial testing phase allows for changes in plant operations to address maintenance or other operational needs.	(a) Close (b) Close	No No	4/19/2016 (a) The TS Bases will be revised in accordance with the Open Item. (b) Note (m) does not reflect a 'need', rather it describes an option (to prevent spurious scrams) that that plant may or may not choose to implement, consistent with NEDC-33075P-A, Section 3.2.6. Information on Note (m) is included in the TS Bases consistent with the level of detail in the existing HCGS TS Bases, and consistent for a 'one-time' note. Also refer to the response to OI#23.

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22.	SRXB	Enclosure 3, NEDC-33864P, Appendix I, Diversity and Defense in Depth (D3) Analysis: (a) Section 1.2, Background PRNM LTR NEDC-32410P, Section 6.4, provides a D3 assessment using EPRI Report No. NP-2230, Part 3, "ATWS Frequency of Anticipated Transients." Section 6.4.1 refers to Table F-1. NRC staff review of this table is required to verify that for each event for which the PRNM may be called upon to initiate scram, there is at least one other parameter processed by a different type of I&C equipment that provides a diverse means of detecting the event and initiating a scram. This table is required for the review of Table 4.1, "Assessment of HCGS AOOs." Please submit the EPRI report. (b) Section 4.1.2, Instability, page I-9, states: "The postulated CCF in the PRNM system results in the system providing valid indications of plant conditions until the stability transient occurs …" Assuming the failure of PRNM due to CCF, which system will provide the valid indications during instability events?	~~6/9/2016~~ (a) Close 6/9/2016 The NRC staff requests PSEG to place EPRI Report NP-2230 in the reading room for review. (b) Close (c) Close 6/9/2016 Staff will review the document in the reading room. (d) Close 6/9/2016 Table 4.1 does not provide sufficient information. The staff will review the EPRI Report in an effort to resolve the issue.	No No SRXB RAI-1 No	6/21/2016 (a), (d) As discussed during the April 19th call: PSEG stated that it could not place the EPRI report in the project reading room (PSEG does not own the report, it must be obtained directly from EPRI). However the NRC could view Table F-1 in the CGS PRNM submittal – it was understood that the NRC staff would look at the CGS document. This was further discussed and agreed to in the response to OI#26. To further facilitate the review, a copy of the table has been placed in the PRNM Reading Room portal (refer to updated OI#26 response). 4/19/2016 (a) The table NEDC-32410P-A Section 6.4 refers to is in NEDC-30851P-A, which references the EPRI report. NEDC-30851P-A was reviewed and approved previously, so it does not seem necessary to submit the EPRI report. The table from NEDC-30851P-A was also reproduced in the Columbia PRNM LAR. See NEDO-33694 (ML12040A076), containing the D3 analysis for the Columbia PRNM. The Hope Creek LAR supplemented this analysis with NEDC-33864 Appendix I, which includes an evaluation of each event in the Hope Creek UFSAR against the criteria in BTP 7-19.

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		(c) Section 4.1.2, Instability, pages I-9 and I-10: Provide the TRACG transient results plots for the limiting cases to demonstrate that the SLMCPR is not exceeded for these events. (d) On page I-14, the response to BTP 7-19 Criterion 7 states: "… instability is the only AOO requiring a diverse protection method." Please provide justification for this conclusion. Revise Table 4-2 to show that this conclusion is valid.			(b) The diverse systems that provide valid indications are described in Appendix I Section 4.1.2, starting with the last paragraph on page I-9 (2RPT scenario) and the last paragraph on page I-10 (LFWH scenario). (c) The requested plots for the limiting cases are provided in GEH Document 003N5152, Revision 0. This document has been placed in the PRNM Reading Room portal. (d) The quoted section refers to Section 4.1, which includes Table 4.1 (not Table 4.2). Generic and plant-specific discussions are provided in Table 4.1 for each event except instability justifying that there is no threat to the applicable limits (BTP 7-19 Criterion (1)) posed by a CCF in PRNM in conjunction with the event.
23.	SRXB	Enclosure 3, NEDC-33864P, Appendix R, Plant Responses Required by PRNM LTR: On page R-21, the licensee provided the following response: "Regarding the initial monitoring period, the GEH NUMAC OPRM system can be installed and activated immediately without an initial monitoring period	Close 6/9/2016 The NRC staff will review the document in the reading room.	No	4/19/2016 The response is provided in GEH Document 003N5152, Revision 0, which has been placed in the PRNM Reading Room portal.

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		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, 3) **[[…]].** The DSS-CD LTR does not require an additional monitoring period." Every plant PRNMS is unique and, therefore, a monitoring period is required. Because only a few BWRs have implemented DSS-CD, there is insufficient operating data to justify a deviation from the staff position discussed in the approved LTR (SER Section 3.2.6, First Cycle Implementation). Please provide justification for not requiring an additional monitoring period.			
24.	SRXB	Enclosure 3, NEDC-33864P, Appendix S, Supplemental Information for ARTS for HCGS. The Section 3.3.1 analyses refer to a generic statistical analysis for application to all BWRs, including HCGS. Identify the staff-approved LTR section that approved the generic statistical analyses.	Close 6/9/2016 The generic statistical analyses refer to GESTAR NEDE-24011-P-A. During the staff's review of this document, it was unable to identify the source for Table	No	6/21/2016 As stated below, there is no approved ARTS LTR; also note that Appendix S Section 3.3.1 does not refer to GESTAR for the generic statistical analysis. The information provided in Appendix S is consistent with the level of information that was provided for Columbia which implemented full ARTS (NRC SE: ADAMS ML13317B623). 4/19/2016 There is no NRC approved ARTS LTR; ARTS are individually analyzed and

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			2 of Appendix S and the applicability of Table 2 to Hope Creek. Typically, there will be a generic LTR approved by the staff for the approval of the statistical analyses. The staff needs to see this generic analyses for rod withdrawal error (RWE).		approved for each plant. ARTS (concurrent with MELLLA) for HCGS was approved by Amendment 163 (ADAMS ML060620500). A HCGS-specific ARTS/MELLLA safety analysis report (A/MSAR), NEDC-33066P, was submitted to support the change. As discussed in NEDC-33864P Appendix S, the implementation of the NUMAC PRNM allows for the hardware portion of ARTS to be installed thus allowing the transition to full ARTS.
25.	SRXB	Enclosure 3, NEDC-33864P, Appendix T, HCGS Thermal Hydraulic Stability, DSS-CD Evaluation: (a) Section 2.1 DSS-CD Set points: "As a part of DSS-CD implementation, the applicability checklist is incorporated into the reload evaluation process and is documented in the Supplemental Reload Licensing Report (SRLR)." Submit the SRLR for GNF2 fuel to verify the DSS-CD implementation process. (Confirmatory item) (b) HCGS plans to transition from GE-14 to GNF2 during the implementation of PRNMS. Resubmit Appendix T, HCGS	(a) Close (b) Close (c) Close (d) Close (e) Close <u>6/9/2016</u> Some plants have experienced larger feedwater	No No No No No	<u>6/21/2016</u> (e) Hope Creek has never experienced feedwater temperature reduction greater than 102 °F. <u>4/19/2016</u> (a) The DSS-CD implementation at HCGS is based on GE14 fuel and is done per the DSS-CD LTR (NEDC-33075P-A, Revision 8). The DSS-CD stability section of the SRLR is of a standard format, which includes the confirmation checklist. If required, GEH can provide the reference of a representative DSS-CD SRLR already issued for another plant.

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		Thermal Hydraulic Stability DSS-CD Evaluation and Appendix S, Supplemental Information for ARTS for HCGS, for the GNF2. RWE analysis was done for Cycle 13. RWE analyses are required with the GNF2 fuel. (Confirmatory item) (c) HCGS plant-specific LPRM/APRM data was gathered during Cycle 18 and Cycle 19 at lower power/flow conditions, rather than at full power/flow conditions. Please justify why it was not necessary to collect data at full power/flow conditions. (d) In Table 2-1, a Checklist Confirmation is provided. The NRC staff may perform an audit to verify the confirmations done for all the parameters. (e) The rated feedwater temperature reduction is provided in Table 2-1. Historically, what has been the maximum feedwater heater temperature reduction experienced at HCGS? (f) The TRACG confirmatory best-estimate MCPR margins to the SLMCPR were calculated and are summarized in Table 2-2. Submit the detailed plots that include the important parameters for the most limiting case.	temperature reduction than the reduction value assumed in the analyses. Have there been any instances at Hope Creek when the feedwater temperature decreased more than 102 degrees F? (f) Close <u>6/9/2016</u> The staff will review the information in the reading room portal. (g) Close	SRXB RAI-2 No	(b) The PRNM license amendment request is based on the GE14 fuel design that is currently in operation at Hope Creek. The DSS-CD implementation at HCGS is per the DSS-CD LTR (NEDC-33075P-A, Revision 8). Any future implementation of a new fuel design at HCGS, such as GNF2, will be addressed through the approved DSS-CD process described in Section 6.1of the LTR. Plant-specific review and approval is not required for fuel transition as stated in Items 7 and 9 in Section 6.0 of the Safety Evaluation of the DSS-CD LTR (NEDC-33075P-A, Revision 8). As stated in the first paragraph of Section 3.3.1 of Appendix S, “A generic statistical analysis for application to all BWRs including HCGS has been performed and is summarized in Table 2. The application of these results is validated for GE and GNF fuel and core design for each reload analysis in accordance with Reference 2.” (Reference 2 being GESTAR-II). Consequently, the application of the generic statistical analysis is not dependent on plant type, specific core design, or specific GE / GNF fuel design. The application of these results will be validated on a cycle specific bases including consideration of any future new fuel designs, such as

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		(g) Table 3-1, Disposition of Limitations and Conditions: In the table, only Condition 9.18 is addressed. Please address all (except for MELLLA+ items) conditions and limitations identified in the SER for NEDC-33173P, "Applicability of GE Methods to Expanded Operating Domains."			GNF2, as described in Section 1.2.6 B of GESTAR-II. (c) Thermal-Hydraulic instabilities are not of concern at rated conditions and the DSS-CD system is not armed at rated conditions. Therefore, data collected at rated conditions is not of interest for DSS-CD applications. (d) No response required. (e) Hope Creek is licensed to operate at rated thermal power with feedwater at a minimum temperature of 329.6 °F (HCGS FOL 2.C.11). This corresponds to a 102 °F reduction from the rated feedwater temperature of 431.6 °F. PSEG would like clarification on why the maximum historical feedwater temperature reduction value is required in support of the value indicated in Table 2-1. (f) The requested plot for the cases listed in Table 2-2 is provided in GEH Document 003N5152, Revision 0, which has been placed in the PSEG Reading Room portal. (g) The DSS-CD methodology is used for the detection and suppression of thermal-hydraulic instability. Only NEDC-33173P limitation and condition 9.18 is associated with stability and therefore is the only

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					limitation and condition discussed in Section 2.1(Page T-5) and addressed in Table 3-1 of Appendix T.
26.	EICB	Appendix R, Section 6.6 of Reference 1, System failure Analysis, item 1, states "a similar Table to F-1 provided in Reference 11 (NEDC-30851P-A) of the PRNM LTR is included in the HCGS defense-in-depth and diversity analysis. However, Appendix I of the LAR does not include this table. PRNM LTR Section 6.4.1 requires identification the diverse parameter monitored to detect symptoms of each event. This table should include each event in Chapter 15 of HCGS's SAR where an APRM-based scram trip is credited in the analysis.	Close 6/9/2016 The table from NEDC-30851P-A was also reproduced in the Columbia PRNM LAR. See NEDO-33694 (ML12040A076), containing the D3 analysis for the Columbia PRNM.	No	6/21/2016 A copy of the table has been placed in the PRNM Reading Room portal: • NEDC-30851P-A_Table F-1.pdf Also see OI#22a response. 4/19/2016 The reference to Appendix I Table F-1 is an editorial error. During the preparation and review of the content that became Appendix I, it was decided to not reproduce Table F-1 from NEDC-30851P-A, as was done during a previous LAR. (See response to Open Item #22a.) If a copy of the table is necessary to complete the Hope Creek PRNM review, the table was provided previously, as discussed in response to Open Item #22a. It can be provided again in the reading room portal. Note that each event from Hope Creek UFSAR Chapter 15 was evaluated, and those that could be affected by a CCF in PRNM are discussed in Appendix I Section 4.1 and 4.2.

No.	Resp.	Issue Description	Status	RAI No.	PSEG Response
27.	EICB	Appendix I provides the defense-in-depth and diversity analysis for HCGS. This appendix does not include analysis for the potential of the PRNMS to adversely affect other echelons of defense (e.g. the control echelon). Please describe how other echelons of defense could not be adversely influenced by interfaces with the PRNMS.	Close	No	4/19/2016 Each of the BTP 7-19 criteria are addressed in Appendix I. The criteria that directly address the potential of the PRNMS to adversely affect other echelons of defense may be found in Table 4.2. For example, The discussion about the potential for PRNMS to adversely affect the control echelon is addressed in Criterion (3). A similar discussion has been provided in previous submittals: Refer to RAI #9 in GNRO-2011/00039 (ML111460590) for GGNS, NEDC-33694P (ML12040A076) for Columbia.

28.	EICB	LAR Section 4.1.1 states, in part, that: "All interfaces with external systems are maintained electrically equivalent using interface subassemblies with exception of the interface to the plant computer and plant operator's panel." As written, this statement implies that plant computer and operator's panel interfaces do not maintain electrical compatibility between the PRNMS and these systems. The NRC staff needs to understand the nature of this exception in order to determine if these interfaces are compliant with independence criteria of IEEE 603. Please provide additional information describing this exception as well as a justification for why this exception is acceptable from a functional and system independence perspective.	Close	EICB RAI-8	6/21/2016 The statement was not meant to imply that any of the PRNM system interfaces do not maintain electrical compatibility. This statement indicates that all interfaces other than those mentioned are electrically equivalent to the existing system, as discussed in the PRNM LTR Section 2.1.2. The plant computer interface is modified by deleting the existing physical I/O and implementing a data link. The plant operator's panel interface is modified by the addition of Operator Display Assemblies. Hope Creek's proposed design conforms to descriptions of these interfaces in the PRNM LTR. The system compliance with electrical independence is addressed in Appendix L of NEDC-33864P.

29.	EICB	The NUMAC Systems Independent Verification and Validation Plan (Appendix D) identifies two members of the NUMAC IVV team as; the System Verification and Validation Engineer and the System Safety Analysis Engineer and defines roles and responsibilities for these positions in Sections 2.2.2 & 2.2.3 respectively. The Hope Creek NUMAC System Management Plan however, identifies a third position of System Test and Qualification Engineer as a member of the IVV team (See Figure 2-1 and Section 2.2.4 of Appendix E). The responsibilities for this third position are not defined in either Appendix D or E. The NRC staff requests information of the roles and responsibilities for the Test and Qualification Engineer be provided to support the staff's determination of NUMAC V&V effectiveness.	Close	No	7/19/2016 As stated in the SyIVVP (NEDC-33864P, Appendix D, Section 2.2.1), the responsibilities of the IVV team include: • Prepare equipment qualification test plans and procedures • Perform equipment qualification testing/analysis and document the results • Summarize equipment qualification results in a qualification summary report The SyIVVP also states that the IVV team reports to the Chief Engineer's Office (CEO) and that the CEO may "draw upon subject matter experts from anywhere within the GEH engineering population". GEH Engineering has a team of Test and Qualification Engineers who are responsible for the testing and qualification of all types of equipment, including mechanical and analog devices. Members of this team are logical candidates for performing the test and qualification of the PRNM equipment for Hope Creek. However, the candidate must be approved by the CEO. Therefore, the role and responsibilities of the Test and Qualification Engineer are as stated in the three bullets above from the SyIVVP.