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

August 17, 2016

Mr. Peter P. Sena, III
President
PSEG Nuclear LLC - N09
P.O. Box 236
Hancocks Bridge, NJ 08038

SUBJECT: HOPE CREEK GENERATING STATION – REQUEST FOR ADDITIONAL INFORMATION REGARDING DIGITAL POWER RANGE NEUTRON MONITORING SYSTEM UPGRADE (CAC NO. MF6768)

Dear Mr. Sena:

By letter dated September 21, 2015 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML15265A223), as supplemented by letter dated November 19, 2015 (ADAMS Accession No. ML15323A268), PSEG Nuclear LLC (PSEG or the licensee) submitted a license amendment request for the Hope Creek Generating Station. The proposed amendment would allow for the replacement and upgrade of the existing analog Average Power Range Monitor subsystem of the Neutron Monitoring System with General Electric-Hitachi digital Nuclear Measurement Analysis and Control Power Range Neutron Monitoring (PRNM) system. The PRNM upgrade also includes Oscillation Power Range Monitor capability and will allow full Average Power Range Monitor, Rod Block Monitor, Technical Specification Improvement Program implementation, and will include application of Technical Specifications Task Force (TSTF) Traveler TSTF-493, Revision 4, "Clarify Application of Setpoint Methodology for LSSS Functions," to affected PRNM functions.

The U.S. Nuclear Regulatory Commission staff has reviewed the licensee's application and, based upon this review, determined that additional information is needed, as set forth in the enclosed Request for Additional Information. On July 27, 2016, a draft of these questions was sent to Mr. Paul Duke of your staff to ensure that the questions were understandable, the regulatory basis for the questions was clear, and to determine if the information was previously docketed. On July 29, 2016, Mr. Duke indicated that PSEG will submit a response by September 30, 2016.

If you have any questions, please contact me at 301-415-1603 or Carleen.Parker@nrc.gov.

Sincerely,

Carleen J. Parker, Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-354

Enclosure:
Request for Additional Information

cc w/enclosure: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION

LICENSE AMENDMENT REQUEST FOR DIGITAL POWER RANGE NEUTRON

MONITORING SYSTEM UPGRADE

PSEG NUCLEAR LLC

HOPE CREEK GENERATING STATION

DOCKET NO. 50-354

By letter dated September 21, 2015 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML15265A223), as supplemented by letter dated November 19, 2015 (ADAMS Accession No. ML15323A268), PSEG Nuclear LLC (PSEG or the licensee) submitted a license amendment request (LAR) for the Hope Creek Generating Station (HCGS). The proposed amendment would allow for the replacement and upgrade of the existing analog Average Power Range Monitor subsystem of the Neutron Monitoring System with General Electric-Hitachi (GEH) digital Nuclear Measurement Analysis and Control Power Range Neutron Monitoring (PRNM) system. The PRNM upgrade also includes Oscillation Power Range Monitor capability and will allow full Average Power Range Monitor, Rod Block Monitor, Technical Specification Improvement Program implementation, and will include application of Technical Specifications Task Force (TSTF) Traveler (TSTF)-493, Revision 4, "Clarify Application of Setpoint Methodology for LSSS Functions," to affected PRNM functions.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the licensee's application and, based upon this review, determined that additional information is needed, as set forth below.

A series of Category 1 public teleconferences are being held periodically to discuss the issues associated with the NRC staff's LAR review (ADAMS Accession No. ML16036A154). Preliminary issues that the NRC staff identified during the initial review, and the licensee's responses to the preliminary issues as detailed in the updated Issues List, were discussed during the teleconferences. Issues that require a formal docketed response from the licensee are being sought in this request for additional information (RAI). These issues are designated accordingly in the "RAI No." column of the updated Issues List. The open item numbers in the RAIs below refer to the open item number in the updated Issues List. The Issues Lists, as updated, and meeting summaries can be found in ADAMS.[1]

[1] The February meeting summary can be found at ADAMS Accession No. ML16064A005; the March meeting summary can be found at ADAMS Accession No. ML16113A396; the April meeting summary can be found at ADAMS Accession No. ML16141A240; the June meeting summary can be found at ADAMS Accession No. ML16201A029; and the July meeting summary can be found at ADAMS Accession No ML16217A455. The Issues List discussed at each meeting is referenced, with the ADAMS Accession No., in the respective meeting summary.

Request for Additional Information

EICB-RAI-1

(Open Item 6) PRNM System Management Plan (LAR Appendix E)

a. Section 2.3, "Management Objectives and Priorities – Oversight," 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 not define these features. Since these features are part of project oversight, please describe these features, and identify in which document(s) they will be recorded in.

b. Section 2.4.1, "Secured Development Environment," describes the secure development environment. This section states the controls employed in the system development should be in accordance with GEH established procedures, consistent with guidance provided in Regulatory Guide (RG) 1.152, "Criteria for Use of Computers in Safety Systems of Nuclear Power Plants." In order to complete its assessment of the criteria of RG 1.152, the NRC staff needs to review these documents. Please provide additional information including a description of the GEH procedures to be followed for secure development environment or make these procedures available for NRC audit.

c. Section 3.1, "Project Quality Metrics – Measurement," describes the need to establish project quality metrics; however, this section does not identify the project quality metrics used to track progress and determine appropriateness of the software development process.

   Appendix K of the LAR, "Design Analysis Report: Methodology Modifications," refers to two sections in the Systems Independent Verification and Validation Plan (SyIVVP) (LAR Appendix D) to confirm Branch Technical Position (BTP) 7-14, Section B.3.1.10.2, which includes measurement criteria. Section 4.2 of the SyIVVP describes how metrics are used to assess design review objectives, but it does not identify the metrics. Section 4.4.4 of the SyIVVP discusses recording of quality metrics but fails to identify the metrics used for Nuclear Measurement Analysis and Control (NUMAC) system development.

   In order for the NRC staff to complete its assessment of BTP 7-14, Section B.3.1.10.2 criteria, information on application-specific metrics will need to be reviewed. Please provide additional information on HCGS project quality metrics used to determine the effectiveness of the HCGS PRNM development verification and validation (V&V) effort.

EICB-RAI-2

(Open Item 7) PRNM Systems Engineering Development Plan (LAR Appendix B)

a. Section 4.2, "Technical Design Review," of Appendix B describes an independent review team to perform the technical design review. Section 2.3 of Appendix K implies that

these reviews are performed by a team independent of the design team. However, Section 2.4.1 of Appendix K states the verification of the design documents is performed by the design team prior to Independent Verification and Validation Plan activities. Please provide clarification of what group (in the GEH organization) performs these independent reviews.

b. BTP 7-14, Section B.3.1.10.2 procedures state the Software Verification and Validation Plan should describe how anomalies are identified and reported. To complete the safety evaluation, the NRC staff needs to assess the adequacy of the processes used to identify, document, and address deficiencies found during system design and development.

   Section 4.5, "Configuration Control," of Appendix B describes three different forms of documenting deficiencies, or discrepancies, to be tracked. Section 7.0, "NUMAC Problem Reports," states, "most problems identified during product development are generally handled through the engineering change order," processes. The specific criteria for determining which of the three discrepancy resolution processes to be invoked, however, is unclear. It is also unclear if the three processes can be invoked concurrently or if only one would be invoked for a single issue. Please provide additional information on methods used to identify and track problems that are identified during technical design reviews. This information should include a description of the process for approving resolution of these problems.

c. BTP 7-14, Section B.3.1.2.3, provides guidance for reviewing software tools used during system development. Additional guidance for the use of software tools is provided in Section 5.3.2 of Institute of Electrical and Electronics Engineers (IEEE) Standard 7-4.3.2, "IEEE Standard Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations." Section 5.0 of the Systems Engineering Development Plan describes the use of development tools; however, it does not identify the tools used for HCGS application development. Section 4.3 states the baseline review team would also review and approve development tools. Please provide additional information regarding the specific software development tools used for the development of the HCGS PRNMS.

d. Section 6.0, "Secure Development and Operational Environment," of Appendix B, describes the secure development and operational environment. This section states access to the NUMAC lab is controlled and monitored. However, it does not provide details on how these activities are performed. Please provide additional information on these activities, including a description of all activities performed to establish and maintain the secure NUMAC application development environment. This information should also include a description of access control measures for the secure server in which the NUMAC application code is stored.

EICB-RAI-3

(Open Item 8) NUMAC Systems Quality Assurance Plan (SyQAP) (LAR Appendix C)

a. The SyQAP plan does not cover all the activities identified in Section B.3.1.3 of BTP 7-14. Specifically, the SyQAP does not describe the corrective action program (Anomaly Reporting and Resolution), provide a description of quality assurance procedures, or identify indicators to determine software quality (measurement). Please provide additional information for NUMAC software quality assurance activities to address the Criteria B.3.1.3 of BTP 7-14.

b. Section 3.0 of the SyQAP states, "[a]n unresolved configuration anomaly is grounds for failure of a baseline review." The NRC staff needs to understand how these anomalies are identified, recorded, and tracked to completion, including who is responsible for approving resolution of these issues. Please provide additional information on how unresolved configuration anomalies are addressed and documented.

EICB-RAI-4

(Open Item 9) Software Integration Plan (SIntP)

BTP 7-14, Section B.3.1.4.2, identifies the implementation characteristics required for an SIntP. This section requires description of the software integration activities. GEH did not submit a separate SIntP; however, Appendix K of the LAR identified the NUMAC documents to address the requirements for this plan. GEH references System Engineering Development Plan (SyEDP) for this, but SyEDP does not provide sufficient information about the software integration processes to support the NRC review. Please provide additional information on software integration activities performed to address the criteria of BTP 7-14, Section B.3.1.4.2.

EICB-RAI-5

(Open Item 11) NUMAC SyIVVP (LAR Appendix D)

Appendix K of the LAR refers to the SyIVVP, Section 4.0, "Baseline Process," to confirm BTP 7-14, Item B.3.1.10.1 criteria for assessment of risk. It is not clear to the NRC staff how the baseline process will be used to identify and manage risks associated with the V&V process. Please provide additional information on the processes and methods employed by the baseline review team for assessing project risk to safety associated with each software item and V&V task in relation to the criteria of BTP 7-14, Section B.3.1.10.1, "Risks."

EICB-RAI-6

(Open Item 12) Software Configuration Management Plan (SCMP)

LAR Appendix K refers to the SyEDP (Appendix B) for the information required in BTP 7-14, Section B.3.1.11.2 criteria for software configuration management. The information identified in the SyEDP addresses configuration of documents; however, other types of configuration items (e.g., data files, tables, software libraries, support software, software tools, etc.) are not addressed. Please provide additional information to demonstrate compliance with the criteria in BTP 7-14, Section B.3.1.11.2 for the other configuration items.

EICB-RAI-7

(Open Item 16) System Requirements

LAR Appendix F defines generic system requirements for a NUMAC PRNM system for a boiling water reactor nuclear power plant. It is not clear if these requirements reflect the specific system to be installed in HCGS. It is also unclear to the NRC staff if the requirements identified in Appendix F include the plant-specific requirements for the modified components described in Appendix J. Please provide additional information to ensure that all HCGS plant-specific PRNM system specifications meet the criteria in BTP 7-14, Section B.3.3.1.

EICB-RAI-8

(Open Item 28)

LAR Section 4.1.1 states that, "[a]ll 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 PRNM system 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 Standard 603-1991, "IEEE Standard Criteria for Safety Systems for Nuclear Generating Stations," as incorporated by Title 10 of the *Code of Federal Regulation* Section 55a, "Code and standards," paragraph (h). Please provide additional information describing this exception, as well as a justification for why this exception is acceptable from a system functional and independence perspective.

SRXB-RAI-1

(Open Item 22) Diversity and Defense in Depth Analysis (LAR Appendix I)

Appendix-I, "Diversity and Defense in Depth Analysis," provides information to reach the conclusion that the instrumentation and controls are sufficiently robust against software common cause failure. For Section 4.1.2, "Instability," provide the TRACG transient results plots

(please include all relevant sensitivity parameters) for the limiting cases to demonstrate that the Safety Limit Minimum Critical Power Ratio (SLMCPR) is not exceeded for these events.

SRXB-RAI-2

(Open Item 25) Thermal Hydraulic Stability (LAR Appendix T)

Appendix-T, "HCGS Thermal Hydraulic Stability, DSS-CD Evaluation," describes the long-term thermal hydraulic stability solution. The TRACG confirmatory best-estimate Minimum Critical Power Ratio margins to the SLMCPR were calculated and are summarized in Appendix-T, Table 2-2. Submit the detailed plots (please include all relevant sensitivity parameters) that include the important parameters for the most limiting case to demonstrate that the SLMCPR is not exceeded.

If you have any questions, please contact me at 301-415-1603 or Carleen.Parker@nrc.gov.

Sincerely,

/RA/

Carleen J. Parker, Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-354

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