

DRAFT Audit Plan 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

DRAFT Regulatory Audit Plan for General Electric – Hitachi

NUMAC PRNM System

U.S. NUCLEAR REGULATORY COMMISSION
INSTRUMENTATION AND CONTROLS BRANCH
HOPE CREEK GENERATING STATION
DRAFT REGULATORY AUDIT PLAN FOR GENERAL ELECTRIC – HITACHI
NUMAC POWER RANGE NEUTRON MONITORING SYSTEM (PRNM) SYSTEM

Background

The U.S. Nuclear Regulatory Commission (NRC) staff is currently engaged in a review of a digital PRNM system replacement for the Hope Creek Generating Station (HCGS). By letter dated September 21, 2015, PSEG Nuclear LLC (PSEG), the licensee, submitted a license amendment request (LAR) (Agencywide Document Access and Management System (ADAMS) Accession No. ML15265A224) to support the installation of a digital General Electric - Hitachi (GEH) Nuclear Measurement Analysis and Control (NUMAC) Power Range Neutron Monitor (PRNM) system for Hope Creek Generating Station (HCGS). The LAR requested NRC review and approval of the proposed design.

Regulatory Audit Basis

To support its safety evaluation, the NRC Instrumentation and Controls Branch (EICB) will conduct an audit at the GEH facility in Castle Hayne, North Carolina. This audit will be conducted in accordance with NRR Office Instruction LIC-111, "Regulatory Audits." The purpose of this audit is to gain a better understanding of the NUMAC development life cycle processes to support the safety evaluation of the PRNM system for use at HCGS, to confirm the staff's understanding of this application and to inform future regulatory actions involving NUMAC product based safety related instrumentation and control systems.

Regulatory Audit Scope

The objective of this audit is to verify, via an independent evaluation, the NUMAC based PRNM system to be used at HCGS conforms to applicable regulations, standards, guidelines, plans, and procedures by assessing the implementation of the systems developmental life cycle process. A review of activities associated with the establishment of a secure development environment will also be conducted.

Audit Requirements

- **Software V&V** - Verify the NUMAC application software V&V program meets the requirements of IEEE 1012, and the V&V program is implemented in a manner which reliably verifies and validates the design outputs at each stage of the NUMAC software development process.
- **Configuration Management** - Verify the configuration management system has the appropriate hardware and software under configuration management, and the configuration

management system is effectively controlling the items under configuration management.

- **Software Quality Assurance** - Verify the Software Quality Assurance (SQA) program is effective in controlling the software development process to assure quality of NUMAC application software.
- **Software Safety** - Verify that software safety plans and procedures used for safety analysis activities are adequate to determine that PRNM software is safe to be used for safety related nuclear power plant operations.
- **Secure Development Environment** - The audit team will evaluate the NUMAC systems development environment. The results of this audit activity will be used to determine conformance to the secure development environment requirements of RG 1.152, Revision 3.

Information Needed for the Regulatory Audit

The following documentation and supporting materials will be required for performance of this audit. The NRC requests that these documents be available to the audit team upon arrival at the GEH facility.

- Configuration Diagrams for the HCGS PRNM system.
- NEDC-32410P-A, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function, Volumes 1 & 2 ," October 1995 (9605290009-Proprietary)
- NEDO-11209 Revision 11, "GE Hitachi Nuclear Energy Quality Assurance Program Description," February 12, 2015 (ADAMS Accession No. ML15043A414)
- NEDO-33075P-A, Rev. 8, "Licensing Topical Report GE Hitachi Boiling Water Reactor Detect and Suppress, November 19, 2013 (ADAMS Accession No. ML13324A098 (Proprietary) and ML13324A099 (Non-Proprietary)
- NEDO-32465-A, "Licensing Topical Report, Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications," Class I, August 1996 (ADAMS Accession No. ML072260045)

The audit staff also requires access to the current HCGS Project Traceability Matrix in order to observe that applicable functional requirements are correctly implemented in the PRNM system.

Note: Non-docketed licensee information will not be removed from the audit site.

Team Assignments / Resource Estimates

The resource estimate for this audit visit is approximately 75 hours of direct audit effort. Three members of the NRC staff will perform this audit.

Logistics

This Audit will be conducted at the GEH NUMAC facilities in Castle Hayne, North Carolina. The audit will begin at 8:00 am on Tuesday Oct 18, 2016 and conclude on Thursday Oct 20, 2016 at 5:00 pm. Our tentative schedule for the audit is as follows:

Tuesday, (8:00 am – 5:30 pm)

- Entrance meeting - NRC staff: Provide brief overview of HCGS PRNMS upgrade. Discuss background information pertaining to NUMAC development process evolution. Review purpose of audit.
- Establish Documentation Flow processes and review requirements traceability matrix.
- Audit team to jointly work on selected requirements threads to evaluate effectiveness of NUMAC software development processes.
- Make appointments for interviews to be conducted on Wednesday.

Wednesday, (8:00 am – 5:30 pm)

- Morning meeting between NRC staff and GEH to discuss activities and logistics for the day
- Review of NUMAC documentation / Continue Thread reviews.
- Review DSS-CD Plant Applicability Checklist determinations and basis documentation. (Reference NEDC-33075P-A Table 6-1, & 6-2)
- Conduct scheduled interviews with key GEH personnel
- NRC staff internal meeting – Discuss audit observations, need for additional information or additional audit activities. Forward follow-up questions to GEH.

Thursday, (8:00 am – 5:00 pm)

- Review meeting to discuss current open item list and RAI responses.
- NRC staff internal meeting - identification / resolution of any open items

4:00 pm - Exit meeting: NRC staff – general overview of observations & identification of any open items

Deliverables

At the conclusion of the audit, the NRC staff will conduct an exit briefing and will provide a summary of audit results in each subject area defined in the audit scope. The NRC Regulatory Audit Report will be issued by November 30, 2016.

References:

Licensee Documentation:

LR-N15-0178, "License Amendment Request – Digital Power Range Neutron Monitoring (PRNM) System Upgrade", dated 21 September 2015. (ADAMS Accession No. ML15265A224), and appendices (ADAMS Accession No. ML15265A226)

Supplemental information – License Amendment Request – Digital Power Range Neutron Monitoring (PRNM) System Upgrade (ADAMS Accession No. ML16172A012)

NRC Guidance:

Standard Review Plan (NUREG-0800), Chapter 7, "Instrumentation and Controls."

Regulatory Guide 1.152, Revision 3, "Criteria for Use of Computers in Safety Systems of Nuclear Power Plants."

Regulatory Guide 1.153, Revision 1, "Criteria for Safety Systems."

Regulatory Guide 1.168, Revision 1, "Verification, Validation, Reviews, and Audits for Digital Computer Software Used in Safety Systems of Nuclear Power Plants."

Regulatory Guide 1.169, "Configuration Management Plans for Digital Computer Software Used in Safety Systems of Nuclear Power Plants."

Regulatory Guide 1.173, dated September 1997, "Developing Software Life Cycle Processes for Digital Computer Software Used in Safety Systems of Nuclear Power Plants."

Industry Standards:

NEI 08-09, dated April 2010, "Cyber Security Plan for Nuclear Power Reactors," Revision 2.

IEEE Std. 7-4.3.2-2003, "IEEE Standard Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations."

IEEE Std. 603-1991, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations."

IEEE Std. 828-1990, "IEEE Standard for Software Configuration Management Plans."

ANSI/IEEE Std. 1042-1987, "IEEE Guide to Software Configuration Management."

IEEE Std. 1012-1998, "IEEE Standard for Software Verification and Validation."

IEEE Std. 1028-1997, "IEEE Standard for Software Reviews and Audits."

IEEE Std. 1074-1995, "IEEE Standard for Developing Software Life Cycle Processes."