

GNRO-2010/00075

December 13, 2010

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555

**SUBJECT:** Response to NRC Request for Additional Information Pertaining to License Amendment Request for Power Range Neutron Monitoring System (TAC No. ME2531)

Grand Gulf Nuclear Station, Unit 1  
Docket No. 50-416  
License No. NPF-29

- REFERENCES:**
1. Entergy Operations, Inc. letter to the NRC (GNRO-2009/00054), *License Amendment Request – Power Range Neutron Monitoring System Upgrade*, November 3, 2009 (ADAMS Accession No. ML093140463)
  2. NRC letter to Entergy Operations, Inc. (GNRI-2010/00067), *Request for Additional Information Re: Power Range Neutron Monitoring System*, May 4, 2010 (ADAMS Accession No. ML101190125)
  3. Entergy Operations, Inc. letter to the NRC (GNRO-2010/00040), *Responses to NRC Requests for Additional Information Pertaining to License Amendment Request for Power Range Neutron Monitoring System (TAC No. ME2531)*, June 3, 2010 (ADAMS Accession No. ML101790436)
  4. Entergy Operations, Inc. letter to the NRC (GNRO-2010/00051), *Responses to NRC Requests for Additional Information Pertaining to License Amendment Request for Power Range Neutron Monitoring System (TAC No. ME2531)*, July 29, 2010 (ADAMS Accession No. ML102150029)

Dear Sir or Madam:

In Reference 1, Entergy Operations, Inc. (Entergy) submitted to the NRC a license amendment request (LAR), which proposes to revise the Grand Gulf Nuclear Station (GGNS) Technical Specifications (TS) to reflect installation of the digital General Electric-Hitachi (GEH) Nuclear Measurement Analysis and Control (NUMAC) Power Range Neutron Monitoring System (PRNMS).

In Reference 2, the NRC staff transmitted to Entergy requests for additional information (RAIs) needed to support their review and approval of the LAR. Entergy submitted responses to several of the RAIs via Reference 3; however, Entergy provided only a partial response to RAI No. 7 at that time. In Reference 4, Entergy committed to provide the remaining information on or before January 17, 2011. Attached is the response to RAI No. 7, which includes the requested human factors evaluation information.

The No Significant Hazards Determination and the Environmental Consideration provided in Reference 1 are not impacted by the information contained in this letter.

This letter contains no new commitments.

If you have any questions or require additional information, please contact Mr. Guy Davant at (601) 368-5756.

I declare under penalty of perjury that the foregoing is true and correct; executed on December 13, 2010.

Sincerely,

A handwritten signature in black ink, appearing to read "M. A. Krupp". The signature is written in a cursive style and is contained within a light gray rectangular box.

MAK/ghd

Attachment: Response to RAI No. 7

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**ATTACHMENT**

**GNRO-2010/00075  
GRAND GULF NUCLEAR STATION, UNIT 1**

**RESPONSE TO RAI No. 7**

## **RESPONSE TO RAI No. 7**

### **NRC RAI No. 7**

As required by Item 6) of paragraph 5.0 in the original Safety Evaluation Report for the LTR, please provide the information necessary to demonstrate that any changes to Grand Gulf's operator's panel have received human factors reviews per plant-specific procedures. Contrary to the Safety Evaluation Report, Section 2.3.4 in Attachment 2 does not contain the results of the human factors review. Please provide the HFE information that is representative of the statements made in 2.3.3.6.2.1 that the Grand Gulf operator panel will "maintain the current interface feel."

### **Response**

The human factors review is performed as part of the engineering design and modification process in accordance with Entergy Nuclear Management Manual Procedure EN-DC-115, *Engineering Change Process*. To accomplish the review, the Power Range Neutron Monitoring System (PRNMS) design is analyzed in accordance with Grand Gulf Nuclear Station (GGNS) Engineering Standard No. 17, *Human Factors Design Criteria*, which applies the guidance of NUREG-0700, *Human-System Interface Design Review Guidelines*, to the GGNS control room design.

Human Factors Engineering (HFE) addresses the efficient and safe operation of the control room from the operator's perspective. The criteria presented in Engineering Standard No. 17 consider how changes to control room equipment affect the operator in terms of:

- Availability of necessary information;
- Adequacy of controls for tasks performed;
- Efficiency of overall panel layout; and
- Suitability of the environment.

The PRNMS equipment is designed to replace existing Average Power Range Monitor (APRM) components in their current locations within control room panels 1H13-P669, 1H13-P670, 1H13-P671, 1H13-P672, and 1H13-P680. In addition, the new Nuclear Measurement Analysis and Control (NUMAC) Interface Computer (NIC) modules will be installed in control room panels 1C91-P865 and 1C91-P866.

The NIC modules communicate with the Plant Process Computer and the PRNM Communication Interface (PCI) modules. There is no human-machine interface involved with the NIC; hence, the ability of the operators to perceive and comprehend displayed data is not impacted. Therefore, no HFE considerations were applied to panels P865 and P866.

HFE considerations and requirements of Engineering Standard No. 17 applied to panels P669 through P672 and P680 are discussed below.

### HFE Application to Panels 1H13-P669, P670, P671, P672, and P680

The only modification to the P680 panel resulting from the PRNMS design involves replacing the two existing APRM bypass switches, located on either side of the central reactor core display, with one new fiber optic bypass switch. The new bypass switch, which maintains the same look, feel, and function of the existing switches, will be installed in the location vacated by the existing left-hand switch. (The location of the right-hand switch will be blanked off.) Other than this modification, the base design for panel P680 uses the existing operator interface devices. Because the new bypass switch has the same look, feel, and function of the existing left-hand switch it replaces, there is no effect on the plant HFE, as stated in Section 4.4.1.9 of GEH License Topical Report NEDC-32410P-A, *Nuclear Measurement Analysis and Control – Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function*.

The PRNMS installation adds new displays, alarms, and control and diagnostic features. Each is discussed below.

- Displays

PRNMS introduces new graphic displays to panels P669 through P672. Four (4) displays will be installed, one in each panel, to replace the existing LPRM analog meters. The displays are self-contained with four menu soft-keys below the screen. Each display is divided into three sections (upper, middle, and lower), which are accessed via the soft-keys. The upper section is reserved for critical information and channel status, including “INOP,” “Bypass,” “Trouble,” and “Alarm” indications. This presentation ensures the operator is continuously provided with the status of each channel. The other two sections display other system information such as APRM and LPRM data and OPRM status information. The displays simplify data presentation to the operators compared with existing data presentation features and are consistent with guidance in NUREG-0700 Sections 1.2, “Display Formats,” 1.3, “Display Elements,” and 1.4, “Data Quality and Update Rate.”

The displays are designed such that optical reflections, ambient noise, and control room environmental factors will not interfere with the ability of the operators to perceive and comprehend the data. This design complies with the guidance of NUREG-0700 Sections 1.5, “Display Pages,” and 1.6, “Display Devices.”

Adequate levels of illumination are part of the new displays and ensure that visual effectiveness is sufficient for task performance. Monitor light levels are verified as adequate to ensure visual effectiveness. Glare is almost non-existent and displays are not shadowed. Surface colors are recognizable under both normal and emergency lighting conditions. These characteristics are consistent with NUREG-0700 Section 7.2, “Information Display.”

- Alarms

Similar to current design, an audible trouble alarm in the area of the P680 panel alerts operators to PRNMS fault conditions. The PRNMS annunciator changes are consistent with the design and terminology of the current APRM system. The existence of a fault is displayed as a trouble indication on the top of the PRNMS panel displays in panels P669

through P672. The design of the alarm display is consistent with NUREG-0700 Sections 1.2, "Display Formats," 1.3, "Display Elements," 1.4, "Data Quality and Update Rate," and 4, "Alarm System."

- Control Features

Operators may perform system manipulations of the PRNM electronics in panels P669 through P672; these include calibrating, testing, and bypassing channels. These manipulations require placing the associated channel switch key in "INOP" and entering the appropriate password. These controls minimize the risk of operator error.

The bypass controls are readily available and provide operators with logical arrangement of indications to allow them to rapidly assess plant conditions and take appropriate actions, if required. These attributes comply with NUREG-0700 Sections 2.9, "System Security," and 12.1.1.11-5, "User-Configured Displays." They also conform to the requirements of IEEE Standard 279-1971, *Criteria for Protection System for Nuclear Power Generating Stations*, Paragraphs 4.10, "Capability for Test and Calibration," and 4.18, "Access to Set Point Adjustment, Calibration, and Test Points."

- Diagnostic Features

The PRNMS design reduces the human-machine interface at panels P669 through P672 by employing self-test features within the electronics. These features facilitate recognition, location, replacement, repair, and/or adjustment of malfunctioning components or modules. The self-test features provide fault information at the panel displays that allows operators and maintenance personnel to determine the exact fault location and type. The self-test features provide alarms on panel P680 that alert operators to fault conditions. Other than the alarms provided on the P680 panel, there is no human-machine interface pertaining to the self-test features; therefore, no human factors requirements need be applied to them.

### Conclusion

The changes to the human-machine interface at control room panels 1H13-P669, 1H13-P670, 1H13-P671, 1H13-P672, and 1H13-P680 maintain the "current interface feel" in that they are equivalent to or better than the existing interface. These changes meet HFE requirements specified in GGNS Engineering Standard No. 17 and are consistent with guidance provided in NUREG-0700.