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Constellation Energy
Nine Mile Point Nuclear Station

November 2, 2007

U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

ATTENTION: Document Control Desk

SUBJECT: Nine Mile Point Nuclear Station
Unit No. 2; Docket No. 50-410

Response to Request for Additional Information:
Implementation of ARTS/MELLLA (TAC No. MD5233)

REFERENCES:

(a) Letter from K. J. Nietmann (NMPNS) to Document Control Desk (NRC), dated March 30, 2007, License Amendment request Pursuant to 10 CFR 50.90: Implementation of ARTS/MELLLA

(b) Letter from M. J. David, (NRC) to K. J. Polson (NMPNS), dated September 20, 2007, Request for Additional Information Regarding Nine Mile Point Nuclear Station, Unit No. 2, Implementation of ARTS/MELLLA (TAC No. MD5233)

Pursuant to 10 CFR 50.90, Nine Mile Point Nuclear Station, LLC (NMPNS) requested, in Reference (a), approval of an amendment to the Nine Mile Point Unit 2 Renewed Operating License NPF-69 to reflect an expanded operating domain resulting from the implementation of Average Power Range Monitor/Rod Block Monitor/Technical Specifications/Maximum Extended Load Line Limit Analysis (ARTS/MELLLA). The purpose of this letter is to provide responses to the request for additional information (RAI) transmitted to NMPNS in Reference (b).

Responses to the RAI are provided in Attachment (1). Revisions to the proposed Technical Specifications (TS) and TS Bases are shown in Attachments (2) and (3), respectively. This response does not affect the No Significant Hazards Determination analysis provided by NMPNS in Reference (a). Pursuant to 10 CFR 50.91(b)(1), NMPNS has provided a copy of this response, with attachments, to the appropriate state representative.

Should you have any questions regarding this submittal, please contact T. F. Syrell, Licensing Director, at (315) 349-5219.

Very truly yours,

STATE OF NEW YORK :
: **TO WIT:**
COUNTY OF OSWEGO :

I, Keith J. Polson, being duly sworn, state that I am Vice President-Nine Mile Point, and that I am duly authorized to execute and file this response on behalf of Nine Mile Point Nuclear Station, LLC. To the best of my knowledge and belief, the statements contained in this document are true and correct. To the extent that these statements are not based on my personal knowledge, they are based upon information provided by other Nine Mile Point employees and/or consultants. Such information has been reviewed in accordance with company practice and I believe it to be reliable.

Subscribed and sworn before me, a Notary Public, in and for the State of New York and County of Oswego, this 2nd day of November, 2007.

WITNESS my Hand and Notarial Seal:

Notary Public

My Commission Expires:

10/25/09
Date

SANDRA A. OSWALD
Notary Public, State of New York
No. 01OS6032276
Qualified in Oswego County
Commission Expires 10/25/09

KJP/JJD

Attachments: (1) Response to Request for Additional Information Regarding Implementation of ARTS/MELLLA
(2) Proposed Technical Specification (TS) Changes (Mark-up)
(3) Changes to Technical Specification Bases (Mark-up)

cc: M. J. David, NRC
S. J. Collins, NRC
Resident Inspector, NRC
J. P. Spath, NYSERDA

ATTACHMENT (1)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

REGARDING IMPLEMENTATION OF ARTS/MELLLA

Nine Mile Point Nuclear Station, LLC
November 2, 2007

By letter dated March 30, 2007, Nine Mile Point Nuclear Station, LLC (NMPNS) submitted a license amendment request (LAR) for Nine Mile Point Unit 2 (NMP2) Renewed Operating License NPF-69. The proposed amendment would reflect an expanded operating domain resulting from the implementation of Average Power Range Monitor/Rod Block Monitor/Technical Specifications/Maximum Extended Load Line Limit Analysis (ARTS/MELLLA). The Average Power Range Monitor (APRM) flow-biased simulated thermal power scram Allowable Value would be revised to permit operation in the MELLLA region. The current flow-biased Rod Block Monitor (RBM) would also be replaced by a power dependent RBM which also would require new Allowable Values. In addition, the flow-biased APRM simulated thermal power setdown requirement would be replaced by more direct power and flow dependent thermal limits to reduce the need for manual APRM gain adjustments and to provide more direct thermal limits administration during operation at other than rated conditions.

The NRC issued a request for additional information (RAI) concerning the NMP2 license amendment request for implementation of ARTS/MELLLA on September 20, 2007. The NMPNS responses to the RAI questions follow.

NRC Question 17

Section 12 of Attachment (7) of your request states that NMP2 evaluated the effects of the higher mass and energy release profiles and concluded that the resulting subcompartment pressures, temperatures and humidity levels are acceptable with respect to the existing design criteria. Please provide a detailed explanation and assumptions for performing the environmental qualification analyses. Also, provide a comparison between existing and new data/profiles (i.e., temperature, humidity, pressure, and radiation) and technical justifications to support the above conclusion.

NMPNS Response 17

The MELLLA operating domain does not change the initial assumed environmental conditions associated with humidity assumed for environmental qualification (EQ) analysis associated with the high energy line break (HELB) condition events. The EQ temperatures are defined based on the conservative assumption of 100% relative humidity and therefore, are bounding calculations for the HELB events. In addition, the MELLLA operating domain does not change the operating or accident source term as the maximum steam flow and power level are unchanged and therefore, the radiation qualification is not impacted.

The impact of the MELLLA operating domain on the subcompartment pressures and temperatures is an increase in the subcooling and, consequently, increases in the mass and energy release rates. The evaluation of the MELLLA domain mass and energy release was conservatively defined by assuming rated pressure conditions for the off-rated power points with the maximum subcooling initial condition for the off-rated power points. Application of these conservative assumptions defined the bounding change in mass and energy release resulting from the MELLLA boundary compared to the extended load line limit (ELLLA) boundary. In the case of the feedwater line break (FWLB) and the reactor water cleanup (RWCU) line break, the current design basis HELB subcompartment analysis mass and energy release was not bounding for the MELLLA domain using this conservative screen. The following evaluations were performed to conclude that the resulting subcompartment pressure and temperature were acceptable relative to the design criteria.

Table 17-1 summarizes the MELLLA and ELLLA boundary initial conditions used to screen the impact of the MELLLA boundary on the subcompartment pressure and temperature profiles.

Table 17-1
Summary of Heat Balances

State Point	Case	Condition	Core Inlet Enthalpy (Btu/lbm)	FW Enthalpy (Btu/lbm)
Rated Power/Flow Point	1	102P/100F, Nominal Feedwater Temperature (NFWT)	531.7	405.7
Rated Power/Flow Point	2	102P/100F, Lower Bound Feedwater Heating (FWH) (-20°F)	529.2	383.9
MELLLA Point at Rated Power	3	102P/80F, Lower Bound FWH (-20°F)	523.3	383.8
Flow Control Valve Minimum Position Point at MELLLA Rod Line	4	56.202P/29.5F Lower Bound FWH (-20°F)	497.0	323.2
Flow Control Valve Minimum Position Point at MELLLA Rod Line	4A	56.202P/29.5F NFWT	499.9	339.7
Flow Control Valve Minimum Position Point at 100% Rod Line, ELLLA	5A	47.94P/29.5F NFWT	505.2	324.2

FWLB

The HELB for the feedwater line break into the main steam tunnel was impacted as a result of increased subcooling as summarized in Table 17-2. The main steam line break is limiting by a significant margin. The FWLB mass release is not increased, while the total energy release increase is small (2.8%) and does not represent an increase that could result in changing the limiting break.

Table 17-2
Summary of Mass Energy Release for FWLB

Case	Mass Flux (lbm/ft^2-sec)	Energy Flux (Btu/ft^2-sec)	Pressure (psia)	Enthalpy (Btu/lbm)
4A (MELLLA) (56.202P/29.5F)	21646.5	7353315	1081	339.7
5A (ELLLA) (47.94P/29.5F)	22073.0	7156077	1081	324.2

RWCU Line Breaks

Four different RWCU line break events define the existing design basis HELB subcompartment analysis.

1) RWCU line break at the filter/demineralizer (F/D) and holdup pump room, upstream,
2) RWCU line break at the F/D and holdup pump room, downstream,
3) RWCU line break at RWCU pump room, pipe tunnels and pipe chase, discharge side,
4) RWCU line break at RWCU pump room, pipe tunnels and pipe chase, suction side

The impact on the subcompartment mass and energy release is summarized below for each break location (Tables 17-3 through 17-6). The impact on the change in the mass and energy release for the most limiting subcompartment pressure and temperature location is compared to the qualification envelope to conclude that the increase remains within the existing qualification envelope. The evaluation applied the change in the mass and energy release for the MELLLA domain derived by this method and not the absolute mass and energy release terms.

Table 17-3
Summary of Initial Mass and Energy Flux for RWCU Line Break (events 1, 2, 3)

Case	Mass Flux (lbm/ft^2-sec)	Energy Flux (Btu/ft^2-sec)	Pressure (psia)	Enthalpy (Btu/lbm)
4A (MELLLA) (56.202P/29.5F)	15151.1	7574053	1250	499.9
5A (ELLLA) (47.94P/29.5F)	14638.0	7395136	1250	505.2

Notes: The assessment for events 1, 2 and 3 are the same based on the initial mass and energy release method.

The initial mass release is increased 3.5% for the MELLLA point versus the ELLLA point and the energy release is increased 2.4% based on the conservative methods used for this evaluation.

Table 17-4
Limiting Subcompartment Impact

Location	Mass Increase	Energy Increase	Max Dp (psid)	Limiting Design Dp Margin (psid)	Max Temp. (°F)	Design envelope (°F)
RWCU F/D cubicle	Base Case	Base Case	10.9	4.1	224	250
	3.5%	2.4%	11.4	3.6	225.5	250

The subcompartment with the minimum design pressure margin is chosen to evaluate the impact of the increased mass and energy release change. The design subcompartment analysis for this break location was used to calculate the impact of the change in mass and energy release. The relative increase in pressure and temperature is not significant relative to the design envelope margin for the pressure and temperature environmental qualification.

Table 17-5
Summary of Initial Mass and Energy Flux for RWCU Line Break (event 4)

Case	Mass Flux (lbm/ft^2-sec)	Energy Flux (Btu/ft^2-sec)	Pressure (psia)	Enthalpy (Btu/lbm)
4A (MELLLA) (56.202P/29.5F)	11789.0	5893337	1055	499.9
5A (ELLLA) (47.94P/29.5F)	11174.2	5645215	1055	505.2

Note: The initial mass release is increased 5.5% for the MELLLA point versus the ELLLA point and the energy release is increased 4.4% based on the conservative methods used for this evaluation.

Table 17-6
Subcompartment Impact

Location	Mass Increase	Energy Increase	Max Dp (psid)	Limiting Design Dp Margin (psid)	Max Temp (°F)	Design envelope (°F)
RWCU suction break into Node 215-5	Base Case	Base Case	3.75	1.25	218	220
	5.5%	4.4%	3.95	1.05	218	220

Several subcompartments have similar pressure and temperature transients. A representative case with limiting temperature and pressure conditions is summarized. The relative increase in pressure is not significant and no significant change in temperature was calculated. The conclusion is that the MELLLA domain remains within the design envelope with margin for the pressure and temperature. Environmental qualification is maintained.

Supplemental reviews have been performed using detailed piping configurations. These reviews have demonstrated that the actual design basis mass and energy release assumption used for the environmental qualification remains bounding and no change to the subcompartment analysis is necessary.

NRC Question 18

Setpoint Calculation Methodology: Please provide documentation (including sample calculations) of the methodology used for establishing the limiting setpoint or nominal setpoint (NSP) and the limiting acceptable values for the As-Found and As-Left setpoints as measured in periodic surveillance testing as discussed in items 20 and 21, below. Indicate the related Analytical Limits and other limiting design values (and the sources of these values) for each setpoint.

NMPNS Response 18

As discussed in the response to RAI Question 19, the three power-dependent RBM instrument functions are Safety Limit (SL)-Related. As such, they are further discussed in the response to RAI Question 20. The methodology used to establish the RBM setpoints was described on page 10 of Attachment (1) of the LAR. A sample calculation for these setpoints was included as part of Attachment (7) of the LAR, including Analytical Limits. As stated on page 10 of Attachment (1) of the LAR, the RBM setpoints have no As-Found or As-Left tolerances.

Similarly, as discussed in the response to RAI Question 19, the flow-biased simulated thermal power (STP)-upscale function for two loop operation is not SL-Related. As such, this function is further discussed in the response to RAI Question 21. The methodology used to establish the setpoints for this function is the same methodology as used for the RBM setpoints (i.e., the methodology described in NEDC-31336P-A, "General Electric Setpoint Methodology") with minor adjustments for MELLLA operation made per the methodology described in Section 5.3 of NEDC-33004P-A, "Constant Pressure Power Uprate." As such, the calculation previously provided for the RBM setpoints is representative of the use of this methodology. The Allowable Value for this function was provided on page 2 of Attachment (1) of the LAR. The nominal trip setpoint (NTSP) is 0.64W + 60.8% rated thermal power (RTP), where W = rated core flow. The analytical limit for this function is 0.64W + 66.8% RTP. The As-Found and As-Left tolerance is +/- 1% RTP.

NRC Question 19

Safety Limit (SL)-Related Determination: Please provide a statement as to whether or not the setpoint is a limiting safety system setting (LSSS) for a variable on which an SL has been placed as discussed in Title 10 of the *Code of Federal Regulations* (10 CFR) 50.36(c)(1)(ii)(A). Such setpoints are described as "SL-Related" in the discussions that follow. In accordance with 10 CFR 50.36(c)(1)(ii)(A), the following guidance is provided for identifying a list of functions to be included in the subset of LSSSs specified for variables on which SLs have been placed as defined in Standard TS (STS) Sections 2.1.1, Reactor Core SLs and 2.1.2, Reactor Coolant System Pressure SLs. This subset includes automatic protective devices in TSs for specified variables on which SLs have been placed that: (1) initiate a reactor trip; or (2) actuate safety systems. As such these variables provide protection against violating reactor core safety limits, or reactor coolant system pressure boundary safety limits.

Examples of instrument functions that might have LSSSs included in this subset in accordance with the plant-specific licensing basis are, rod block monitor (RBM) withdrawal blocks, feedwater and main turbine high water level trip, and end of cycle recirculation pump trip. For each setpoint, or related group of setpoints, that you determined not to be SL-Related, explain the basis for this determination.

NMPNS Response 19

LSSS determinations for the setpoints modified by the change and the bases for these determinations are discussed on pages 9 and 10 of Attachment (1) of the LAR. As previously discussed, the three power–dependent rod block monitor Allowable Values are SL-Related LSSSs and the APRM Flow-Biased Simulated Thermal Power-Upscale Allowable Value is not a SL-Related LSSS.

NRC Question 20

For Setpoints Determined to be SL-Related: The NRC letter to the Nuclear Energy Institute Setpoint Methods Task Force dated September 7, 2005 (ADAMS Accession Number ML052500004), describes Setpoint-Related TS (SRTS) that are acceptable to the NRC for instrument settings associated with SL-Related setpoints. Specifically: Part "A" of the Enclosure to the letter provides Limiting Condition for Operation (LCO) notes to be added to the TS, and Part "B" includes a check list of the information to be provided in the TS Bases related to the proposed TS changes.

NRC Question 20a

Describe whether and how you plan to implement the SRTS suggested in the September 7, 2005, letter. If you do not plan to adopt the suggested SRTS, then explain how you will ensure compliance with 10 CFR 50.36 by addressing items b. and c., below. The NRC staff's position on complying with 10 CFR 50.36 is provided in RIS 2006-17.

NMPNS Response 20a

NMPNS does not plan to implement the SRTS suggested in the September 7, 2005, letter. However, as described in the response to RAI Question 23, a note that meets the intent of Regulatory Issue Summary (RIS) 2006-17 for digital equipment is proposed to be added to the RBM TSs.

NRC Question 20b

As-Found Setpoint Evaluation: Describe how surveillance test results and associated TS limits are used to establish operability of the safety system. Show that this evaluation is consistent with the assumptions and results of the setpoint calculation methodology. Discuss the plant corrective action processes (including plant procedures) for restoring channels to operable status when channels are determined to be "inoperable" or "operable but degraded." If the criteria for determining operability of the instrument being tested are located in a document other than the TS (e.g., plant test procedure), explain how the requirements of 10 CFR 50.36 are met.

NMPNS Response 20b

As stated on page 10 of Attachment (1) of the LAR, the RBM setpoints do not include an As-Found tolerance due to the digital nature of the device. If an As-Found setpoint is not the NTSP, no As-Found setpoint evaluation is needed since the channel is declared inoperable. This requirement is included in the TS note discussed in the response to RAI Question 23 and meets the requirements of 10 CFR 50.36 as discussed in RIS 2006-17. Use of the corrective action process to address instruments found out of calibration is addressed on page 11 of Attachment (1) of the LAR.

NRC Question 20c

As-Left Setpoint Control: Describe the controls employed to ensure that the instrument setpoint is, upon completion of surveillance testing, consistent with the assumptions of the associated analyses. If the controls are located in a document other than the TS (e.g., plant test procedure), explain how the requirements of 10 CFR 50.36 are met.

NMPNS Response 20c

As stated on page 10 of Attachment (1) of the LAR, the RBM setpoints do not include an As-Left tolerance due to the digital nature of the device. For a RBM channel to be declared operable after calibration, the As-Left setpoint must be the same as the NTSP. The requirements of 10 CFR 50.36 are met by including in the new TS note (see the response to RAI Question 23) the location of the NTSP and the setpoint methodology used.

NRC Question 21

For Setpoints not Determined to be SL-Related: Describe the measures to be taken to ensure that the associated instrument channel is capable of performing its specified safety functions in accordance with applicable design requirements and associated analyses. Include in your discussion, information on the controls you employ to ensure that the As-Left trip setting after completion of periodic surveillance is consistent with your setpoint methodology. Also, discuss the plant corrective action processes (including plant procedures) for restoring channels to operable status when channels are determined to be "inoperable" or "operable but degraded." If the controls are located in a document other than the TS (e.g., plant test procedure), describe how it is ensured that the controls will be implemented.

NMPNS Response 21

Controls are in place to ensure the flow-biased STP-upscale scram function (the only non-SL related function being revised by this LAR) will perform in accordance with applicable design requirements.

The Surveillance Test Program establishes the administrative controls for surveillance testing. As-Left trip settings are controlled under procedures based on the Surveillance Test Program. As-Found settings found outside acceptable tolerances are addressed through the NMPNS 10CFR50, Appendix B, Criterion XVI, corrective action program. Operability determinations are integral to the corrective action program. When the condition described in a condition report represents an operability concern, an operability determination is completed. The return of a degraded or nonconforming component to a fully-qualified status is addressed under the corrective action program.

Instrument reference accuracy is used for the As-Found and As-Left tolerances. An As-Left setting is procedurally required to be within the required As-Left tolerance. If the As-Found setting is outside the required As-Found tolerance, the device is reset to within the As-Left tolerance.

NRC Question 22

The next to the last paragraph on page 9 of Attachment (1) of your request states, "With the implementation of the ARTS/MELLLA license amendment, the rod block function (with three power dependent Allowable Values) will be credited in the transient analysis with protecting the MCPR SL specified in TS 2.1.1.2 and will have associated LSSSs." The NRC staff requests the following information with regards to protecting an SL:

NRC Question 22a

Describe the difference between the Minimum Critical Power Ratio (MCPR) SL and the MCPR operating limit.

NMPNS Response 22a

The fuel cladding integrity MCPR SL is established to assure that at least 99.9% of the fuel rods in the core would not experience boiling transition if the limit is not violated. The MCPR operating limit (OLMCPR) is the minimum CPR allowed by the TSs for normal steady-state operation. The minimum value of CPR is selected such that during the most limiting anticipated operational occurrence (AOO), the CPR will not be less than the MCPR SL.

NRC Question 22b

Will the RBM protect the MCPR SL or the MCPR operating limit?

NMPNS Response 22b

The RBM, in conjunction with the OLMCPR, will protect the MCPR SL. Steady state operation within the MCPR operating limit ensures that sufficient MCPR margin remains such that a rod withdrawal error will be terminated by the RBM before the MCPR SL is exceeded. See the response to RAI Question 26 for related information.

NRC Question 22c

Identify all RBM LSSSs that ensure a TS SL is not exceeded. This information will be used by the NRC staff to assess the adequacy of the surveillance requirements (SRs) in maintaining the necessary quality of the RBM system and its components for the applicable modes of [*sic*] other specified conditions. This information will also be used by the staff to ensure the requirements of 10 CFR 50.36(c)(1)(ii)(A) are met.

NMPNS Response 22c

As discussed on pages 9 and 10 of Attachment (1) of the LAR and the response to RAI Question 19, the three power-dependent rod block monitor Allowable Values are SL-related LSSSs.

NRC Question 22d

The second and third sentences of Comment and Recommendation 9, on page 11 of the RBM Instrument Limits Calculation, "0000-0053-1006 NMP2 A-M-T506-RBM-Calc-2006, Revision 0, dated January 2007," appears to disagree with the RBM power dependent setpoints being LSSSs.

Discuss this apparent discrepancy.

NMPNS Response 22d

Comment 9 in the referenced setpoint calculation is based on the licensing basis that the RBM is not a safety related system. This licensing basis has been documented in the GE Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Licensing Topical Report (NEDC-32410P-A) which has been accepted by the NRC. The basis of this position is the NRC regulations (10 CFR 21.3, 10 CFR 50.49(b)(1), 10 CFR 100 Appendix A, VI (a)(1)) which define that a safety related Structure, System or Component as one that assures:

a. The integrity of the reactor coolant pressure boundary; or
b. The capability to shut down the reactor and maintain it in a safe shutdown condition; or
c. The capability to prevent or mitigate the consequences of accidents that could result in potential off site exposures comparable to 10 CFR 50.34(a)(1) or 10 CFR 100.11 guideline exposures, as applicable.

The RBM does not perform these functions and therefore, is not safety related. Further discussion of the basis for the safety classification of the RBM was provided in the response to RAI Question 1 (letter from K. J. Polson (NMPNS) to Document Control Desk (NRC), dated October 16, 2007, Response to Request for Additional Information: Implementation of ARTS/MELLLA (TAC No. MD5233)).

However, the RBM protects the MCPR SL (which is one of the Safety Limits defined in the Technical Specifications) and therefore, meets the requirement of being an LSSS. According to 10 CFR 50.36, which deals with TS requirements, the LSSS is defined as follows:

"Limiting safety system settings for nuclear reactors are settings for automatic protective devices related to those variables having significant safety functions."

Thus, the RBM meets the NRC definition of an LSSS instrument, but does not meet the NRC definition of a safety related instrument. This is not in conflict because the RBM provides protection against local fuel damage (which is a Technical Specification requirement), but does not mitigate accidents that could result in large off-site exposures (which is the relevant safety related requirement).

NRC Question 22e

With the implementation of your request, address how General Design Criteria 20, 22, and 25 are met for the RBM. Also, describe the quality standards to which the RBM has been designed, procured, tested and will be maintained. In addition, describe the power supply design and quality, and what would occur if the RBM lost power.

NMPNS Response 22e

General Design Criteria Evaluation

General Design Criteria (GDC) 20, 22, and 25 are reiterated below:

> GDC 20
>
> Protection System Functions - The protection system shall be designed (1) to initiate automatically the operation of appropriate systems including the reactivity control systems, to assure that specified acceptable fuel design limits are not exceeded as a result of anticipated operational occurrences and (2) to sense accident conditions and to initiate the operation of systems and components important to safety.
>
> GDC 22
>
> Protection System Independence - The protection system shall be designed to assure that the effects of natural phenomena, and of normal operating, maintenance, testing, and postulated accident conditions on redundant channels do not result in loss of the protection function, or shall be demonstrated to be acceptable on some other defined basis. Design techniques, such as functional diversity or diversity in component design and principles of operation, shall be used to the extent practical to prevent loss of the protection function.
>
> GDC 25
>
> The protection system shall be designed to assure that specified acceptable fuel design limits are not exceeded for any single malfunction of the reactivity control systems, such as accidental withdrawal (not ejection or dropout) of control rods.

These three GDCs define the design requirements for the "protection system." The NMP2 conformance with these GDCs is described in the NMP2 Updated Safety Analysis Report (USAR) Sections 3.1.2.20, 3.1.2.22, and 3.1.2.25. These USAR sections describe that the "protection system" associated with these GDCs for NMP2 is the "reactor protection system."

The Reactor Protection System (RPS) is described in NMP2 USAR Section 1.2.9.1, which states:

> 1.2.9.1 Reactor Protection System
>
> The RPS initiates a rapid, automatic shutdown (scram) of the reactor. It acts in time to prevent fuel cladding damage and any nuclear system process barrier damage following abnormal operational transients. The RPS overrides all Operator actions and process controls and is based on a fail-safe design philosophy that allows appropriate protective action even if a single failure occurs.

The function of the Rod Block Monitor is described in NMP2 USAR Section 7.7.1.7.3.1.

7.7.1.7.3.1 Rod Block Monitor Function

The purpose of the RBM is to limit control rod withdrawal if localized neutron flux exceeds a predetermined setpoint during Operator control rod manipulations.

The RBM is not part of the reactor protection system. The RBM does not initiate "a rapid, automatic shutdown (scram) of the reactor." It simply applies a rod block. As a result, the requirements of GDCs 20, 22, and 25 do not apply to the RBM since it is not the reactor protection system.

Relevant portions of the NMP2 USAR Sections are reproduced below:

3.1.2.20 Protection System Functions (Criterion 20)

Design Conformance

The RPS is designed to provide timely protection against the onset and consequences of conditions that threaten the integrity of the fuel barrier and the RCPB. Fuel damage is prevented by initiation of an automatic reactor shutdown if monitored nuclear system variables exceed preestablished limits of anticipated operational occurrences. Scram trip settings are selected and verified to be far enough above or below operating levels to provide proper protection, but not be subject to spurious scrams. The RPS includes the high-inertia, uninterruptible power system, sensors, transmitters, trip units, bypass circuitry, and switches that signal the control rod system to scram and shut down the reactor. The scrams initiated by NMS variables, nuclear system high pressure, turbine stop valve closure, turbine control valve (TCV) fast closure, main steam isolation valve (MSIV) closure, and reactor vessel low water level, prevent fuel damage following abnormal operational transients. Specifically, these process parameters initiate a scram in time to prevent the core from exceeding thermal-hydraulic safety limits during abnormal operational transients. Additional scram trips are initiated by drywell high pressure generator load rejection and scram discharge volume (SDV) high water level. Response by the RPS is prompt and the total scram time is short. Control rod scram motion starts in less than 250 msec after the sensor contacts actuate.

In addition to the RPS, which provides for automatic shutdown of the reactor to prevent fuel damage, other protection systems are provided to sense accident conditions and automatically initiate operation of other systems and components important to safety. Systems such as the emergency core cooling system (ECCS) are automatically initiated to limit the extent of fuel damage following a LOCA.

Other systems automatically isolate the reactor vessel or containment to prevent the release of significant amounts of radioactive materials from the fuel and the RCPB. Controls and instrumentation for the ECCS and isolation systems are automatically initiated when monitored variables exceed preselected operational limits. The design of the protection system satisfies the functional requirements specified in Criterion 20.

3.1.2.22 Protection System Independence (Criterion 22)

Design Conformance

The components of the protection system are designed so that environments resulting from any emergency situation in which the components are required to function do not interfere with the operation of that function. Wiring for the RPS outside the main control room is run in rigid or flexible conduit. No other wiring is run in these conduits. The wires from duplicate sensors on a common process tap are run in separate conduits. The system sensors are electrically and physically separated. Only one trip channel actuator logic circuit from each trip system is run in the same conduit.

The RPS is designed to permit maintenance and diagnostic work while the reactor is operating without restricting plant operation or hindering the output of that safety function. Flexibility in design afforded the protection system allows operational system testing by the use of an independent trip channel for each trip logic input. When an essential monitored variable exceeds its scram trip point, it is sensed by at least two independent sensors in each trip system. Maintenance operation, calibration operation, or test, unless manually bypassed, can result in a single channel trip and one trip system trip (half scram). This leaves at least two trip channels per monitored variable of the other trip system capable of initiating a scram. Thus, the arrangement of two trip channels per trip system ensures that a scram occurs as a monitored variable exceeds its scram setting. Only one trip channel in each trip system must trip to initiate a scram.

The protection system meets the design requirements for functional and physical independence, as specified in Criterion 22.

3.1.2.25 Protection System Requirements for Reactivity Control Malfunctions (Criterion 25)

Design Conformance

The RPS provides protection against the onset and consequences of conditions that threaten the integrity of the fuel barrier and the RCPB. Any monitored variable that exceeds the scram setpoint initiates an automatic scram and does not impair the remaining variables from being monitored; if one channel fails, the remaining portions of the RPS function.

The reactor manual control system (RMCS) is designed so that no single failure negates the effectiveness of a reactor scram. Circuitry for the RMCS is completely independent of the circuitry controlling the scram valves. This separation of the scram and normal rod control functions prevents failures in the RMCS circuitry from affecting the scram circuitry. Because each control rod is controlled as an individual unit, a failure that results in energizing any of the insert or withdraw solenoid valves can affect only one control rod. Effectiveness of a reactor scram is not impaired by the malfunctioning of any one control rod.

Design of the protection system assures that acceptable fuel limits are not exceeded for any single malfunction of the reactivity control systems as specified in Criterion 25.

RBM Design Quality

Although the RBM is not safety related, it is part of the PRNM which does contain safety related components (APRM, Oscillation Power Range Monitor [OPRM]) that can initiate an RPS scram. As such, the RBM is designed to maintain physical integrity and separation under all conditions so that no failure in the RBM can prevent the APRM or OPRM components from performing their safety functions. Further, as described in Section 5.3.2.6 of the PRNM Licensing Topical Report (NEDC-32410P-A), the RBM is designed such that it is highly unlikely that a failure or fault would disable power to the components required to perform safety related functions, or cause loss of the RPS AC power busses coming into the PRNM System (PRNMS) panels. The RBM and APRM/OPRM are mounted in separate bays in the panel with metal barriers so that faults are contained within an enclosure and do not propagate from the RBM to any of the APRM/OPRM channels. The RBM receives signals from the APRM over a fiber-optic data link meeting IEEE-279-1971 signal isolation requirements. The RBM also serves as the interface for all PRNM (including APRM, OPRM and RBM) data communication with the non-safety related plant computer. This communication is also via an IEEE-279 conforming fiber-optic data link. Additionally, all safety function wiring is separated from non-safety system wiring via the use of conduits, thermal sleeves, or physical separation.

The RBM does not provide a safety related function, but as part of the PRNMS it is designed, manufactured, qualified, tested and documented the same as for Class 1E safety related equipment. Safety classifications of the components of the PRNMS (related to the RBM) are listed in the following table:

Table 22e-1
NMP2 PRNMS Safety Classification of Main Components Related to the RBM

Name	Safety Classification
Average Power Range Monitor	Q
Rod Block Monitor	S
Quad Low Voltage Power Supply Chassis	Q
2/4 Logic Module	Q
RBM Interface Module	S
Fiber Optic Cables	N
Power Range Monitor Cabinet	Q
Cables	Q, N
Local Power Range Monitor (LPRM) Connector Panel	Q
Multi Vendor Data Acquisition System	N

N = Non-Safety Related
Q = Safety Related
S = Special Requirements

The Special Requirements classification "S" that is applicable to the RBM is applied to those components that do not perform a safety function but are designed, produced, and documented with considerations similar to safety related components. This classification is used in applications where the component itself performs no safety function; however, it is located near safety related components and thus, it is desirable to ensure a failure of the non-safety component will not adversely affect any safety function. Note:

NMPNS uses different safety classification designators than General Electric-Hitachi, but the requirements are equivalent.

Maintenance of the RBM system is performed during required surveillance testing and on an as needed basis. Should corrective maintenance be required, a work order would be initiated, planned, and executed per the requirements of station procedures. If parts replacement is required, the parts are purchased in accordance with the original material identification and requisition drawing and requirements. Upon return to service of the RBM system, the appropriate surveillance testing would be performed to ensure operability in accordance with the TSs.

The PRNM (including RBM) equipment is qualified for environmental, radiation and electromagnetic interference conditions that cover the intended application in a control room environment, as described in Section 4.4.2 of NEDC-32410P-A. Results of the qualification of the PRNM (including RBM) are documented in the NMP2 Qualification Summary Report.

The standards and guidelines used in the qualification are stated in Section 2.3 of the NMP2 Qualification Summary Report, and include:

- IEEE Std. 323-1974, Standard for Qualifying Class IE Equipment for Nuclear Power Generating Stations
- IEEE Std. 344-1975, Recommended Practices for Seismic Qualification of Class IE Equipment for Nuclear Power Generating Stations
- EPRI TR-102323 RI Draft, Guidelines for Electromagnetic Interference Testing in Power Plants, October 1995
- Mil-Std-461D, Requirements for the Control of Electromagnetic Interference Emissions and Susceptibility
- Mil-Std-462D. Measurement of Electromagnetic Interference Characteristics
- IEC Standard 801-2, Electromagnetic Compatibility for Industrial-Process Measurement and Control Equipment - Part 2: Electrostatic Discharge Requirements
- IEC Standard 801-4, Electromagnetic Compatibility For Industrial-Process Measurement and Control Equipment - Part 4: Electrical Fast Transient/Burst Requirements
- IEC Standard 801-5, Electromagnetic Compatibility For Industrial-Process Measurement and Control Equipment - Part 5: Surge Immunity Requirements

The overall NUMAC PRNM (including RBM) design was developed using the General Electric Quality Assurance (QA) Program with its implementing procedures (NEDC-31336 Section 9.2). The QA program has been accepted by the NRC and satisfies all applicable requirements of the following:

- 10 CFR 50 Appendix B
- ANSI/ASME NQA-1
- ISO 9001

The PRNM (including RBM) hardware design and procurement is performed in accordance with this program, and specific hardware documentation, user instructions, and maintenance requirements are documented in Operation and Maintenance Manuals provided with the PRNM equipment. PRNM (including RBM) software was developed and tested using a verification and validation (V&V) program based on requirements in NRC Regulatory Guide 1.152, "Criteria for Use for Computers in Safety Systems

of Nuclear Power Plants." Several such PRNM (including RBM) systems developed and tested by this program have been reviewed and accepted by the NRC, and are currently operating.

In summary, the RBM system is a highly reliable and high quality system that is designed to criteria and standards identical in many ways to the safety related portions of the PRNMS. The system does include redundancy features, fail-safe features and self monitoring features. This high quality design is consistent with the current NMP2 RBM design.

RBM Power Supply

Input power to the RBM chassis for the main RBM functions is supplied by the low voltage power sources in the Quad Low Voltage Power Supply (QLVPS) Chassis associated with the RBM. The QLVPS chassis receives two AC power inputs, one from each RPS channel bus, and supplies low voltage power inputs to the RBM. Each RBM chassis receives low voltage power, +5 VDC, +15 VDC, and -15 VDC from two redundant LVPSs contained in the QLVPS chassis, each of which get their input power from a different RPS AC power bus. The LVPSs are safety related components.

The outputs of the redundant power supplies are auctioned and monitored by the respective RBM chassis, both locally and at the LVPS chassis. The loss of a single supply's output, either due to hardware failure or input AC power failure, causes a self-test alarm at the control panel. The loss of redundant outputs causes an INOP condition and a trip for the affected RBM channel. The LVPS modules in the Quad LVPS chassis provide a high degree of isolation between AC inputs and DC outputs, making it highly unlikely that a fault on the DC side will propagate back to the AC side.

Per NEDC 32410P-A, Section 5.3.8, upon loss of all input power, the affected RBM chassis trip and alarm outputs default to the safe condition and remain in that condition until power is reapplied and one self-test cycle has completed without detection of a critical failure, at which point the INOP trip will clear. For the RBM, this safe condition initiates a rod block. Loss of all input power to an RBM causes the fail-safe RBM Inop outlet relay to de-energize and the associated normally open contact will open, resulting in a rod block.

NRC Question 23

Attachment (1) of your request indicates that the application of the notes suggested in the September 7, 2005, NRC letter are unnecessary for the RBM. The basis of this position is that the RBM has no drift characteristic with no As-Left and As-Found tolerances since the RBM only performs digital calculations on digitized input signals. Since the trip setpoint is a numerical value stored in the digital hardware and not subject to drift, the As-Left and As-Found values for the setpoint are the same as the setpoint. Therefore, there are no As-Left or As-Found tolerance bands associated with the RBM.

The NRC staff disagrees with the position that the notes are not applicable. For SL-Related digital instruments, notes may be appropriate. The notes could be worded differently than the wording suggested in the September 7, 2005, NRC letter and may be in the form of a single note. Since there is no drift characteristic and no As-Left or As-Found tolerances, the notes should address: (1) steps to be taken for the condition where the As-Found channel setpoint is not the NSP, (2) the document where the NSP is specified, and (3) the document where the methodology used to determine the NSP is specified. Please provide notes, as appropriate.

Also, discuss where drift associated with analog-to-digital and digital-to-analog conversions of signals, which provide inputs to the RBM, are accounted for in the SRs.

NMPNS Response 23

The following note is proposed to be added to Table 3.3.2.1-1 of the TSs, applicable to the channel calibration surveillances for the RBM power range setpoints:

> "If the as-found channel setpoint is not the nominal trip setpoint (NTSP), the channel is inoperable. The NTSP is specified in the COLR. The methodology used to determine the NTSP is specified in the Bases."

This note addresses the three items identified in the RAI. Attachment (2) provides a revised markup of the affected TS page showing the addition of the note. Attachment (2) also provides a revised markup of the affected TS page showing the addition of the RBM power range NTSPs to the items to be included in the Core Operating Limits Report (COLR). Attachment (3) provides revised markups of affected TS Bases pages to reflect the addition of the note. Revision bars are provided in Attachments (2) and (3) to identify the changes made from the markup pages initially submitted with the March 30, 2007, LAR. TS and Bases pages initially submitted with the March 30, 2007 LAR that are not affected by the response to RAI Question 23 are not included in Attachments (2) and (3).

The LPRM detector analog signals are converted to digital signals in modules of the APRMs: the digital signals are transferred from the APRMs to the RBM. Calibration of each LPRM channel, including the LPRM detector and the analog-to-digital (A/D) converter in the APRM, is performed on a periodic basis in accordance with NMP2 SR 3.3.1.1.7.

There are no digital-to-analog conversions associated with the RBM (the digital signal is used to perform the rod block function).

NRC Question 24

Item (d) of Attachment (4) of your request discusses modifications to the Multi-Vendor Data Acquisition System (MVD). The NRC staff requests the following information with regards to the MVD equipment and the anticipated changes to it:

NRC Question 24a

By functional description, identify the functions by which the licensee anticipates using the MVD.

NMPNS Response 24a

The MVD functional description was originally provided to the NRC as part of the NMP2 license amendment request to support the NUMAC PRNM system installation (letter from B. R. Sylvia (Niagara Mohawk Power Corporation) to Document Control Desk (NRC), dated October 31, 1997, License Amendment Request to Use NUMAC Power Range Neutron Monitor System (PRNM)). The following functional description was provided:

"NUMAC-PRNM Interface with Plant Computer System Via Multi-Vendor Data Acquisition System (MVD)

The NUMAC-PRNM interface to the plant computer is a multiplexed fiber-optic data link, except for the sequence of events monitoring for which existing interfaces are being retained. To allow connection to existing interfaces in the plant computer system, an intermediate "Multi-Vendor DAS" (MVD) will be added to transform the digital information on the multiplexed fiber-optic data link to a form that can be accepted by the existing plant computer system.

The existing PRM system uses analog amplifiers with resister divider networks to produce the required voltage signals for LPRM, APRM and recirculation flow signals. Each LPRM, APRM and recirculation flow output comes from a separate analog module. The PRM outputs are connected to analog output cards in the plant computer system.

The replacement NUMAC-PRNM system will provide the LPRM, APRM and recirculation flow values in digital form on multiplexed fiber-optic data links. The PRNM system also provides APRM upscale, downscale, bypass, and inop; RBM upscale, downscale, bypass and inop; flow reference; and flow compare signals in digital form on the multiplexed fiber-optic data links. The data is transferred from each APRM chassis to the two RBM chassis to the MVD unit. The MVD receives the digital information on multiplexed fiber-optic data links and produces analog outputs via "A/D Output cards" and bi-stable digital outputs via digital output cards to connect to the existing plant computer system.

The MVD also has a connection to the Ethernet to provide bi-directional communication between the PRNM system and the 3D Monicore computer. Data available on the 3D Monicore computer includes stability data, LPRM/APRM gains, LPRM I/V test data, etc. In addition, the 3D Monicore can send percent core thermal power for APRM gain calculations and LPRM gain adjustment factors to the PRNM system. The gain-adjustment factors are applied only after manual acceptance of the factors at the PRNM equipment.

The MVD is a microprocessor controlled VME bus based assembly that uses commercial components. Software to control the unit and databases to identify points, assign analog outputs, and assign position in data streams are downloaded into the MVD as part of the setup process. The MVD unit logic includes several "health" checks to assure correct operation. All multiplexed messages include error checking codes to detect message "damaged" during transmission. Critical messages from the PRNM to the MVD include diagnostic assessments which can detect loss of incoming signals. Internal checks in the MVD include hardware checks to assure that the MVD is continuing to function and is assessing all of the hardware. These checks include clock monitors, memory monitors and remote device "response" monitors.

MVD health checks, error checking, man-machine interfaces and software/hardware diagnostics are design features that monitor system integrity and minimize the effects of the new failure modes introduced by the MVD. These modes and effects are evaluated in a Failure Modes and Effects Analysis developed specifically for the MVD. Integration of the microprocessor based MVD into the operating practices of Neuron Monitoring will include configuration of the MVD system integrity functions to minimize the failure effects. In addition, operator actions to operate and maintain the MVD will be implemented into applicable procedures."

This previously provided functional description is not altered by the ARTS/MELLLA license amendment request.

NRC Question 24b

Explain what functions will change, and then the procedural steps to incorporate the modifications to the MVD for the ARTS logic implementation.

NMPNS Response 24b

Item (d) to Attachment (4) of the LAR stated, "Modify the Multi-Vendor Data Acquisition System (MVD) as necessary to reflect the power-based instead of flow-biased RBM setpoints, the status of which is transmitted from the PRNM."

During final design impact analysis it was determined that changes to the MVD parameters and/or functions were not necessary. Therefore, no changes to the MVD will be implemented for ARTS/MELLLA.

NRC Question 25

On page 1-4 of Attachment (7) of your request, it was stated that the APRM Flow-Biased Simulated Thermal Power (STP) scram line is conservatively not credited in any NMP2 safety analyses. It was further stated that the APRM Flow-Biased STP rod block line is conservatively not credited in any NMP2 safety analyses, although it is part of the NMP2 design configuration. Also, it was stated that the setpoint changes for these systems were made for operational flexibility purposes and provides the inputs to the NMP2 TS changes. The NRC staff believes that as long as the setpoints remain part of the TS (even though they are not credited in any safety analysis), the setpoints and their uncertainty analysis should still be determined using the same criteria and rigor as if they were credited in the safety analysis. Please explain.

NMPNS Response 25

The setpoint methodology used for the APRM Flow-Biased STP-Upscale function is discussed in the response to RAI Question 18. This is the same basic methodology used for the RBM LSSSs. As such, the setpoints and their uncertainty analysis for the APRM Flow-Biased STP-Upscale function are determined using the same criteria and rigor as setpoints used to protect SLs.

NRC Question 26

On page 9 of Attachment (1) of your request, it was stated that the Rod Withdrawal Error (RWE) event will continue to be evaluated each reload as a potentially limiting event. On page 4-12 of Attachment (7) of your request, it was stated that implementing your request will upgrade the performance of the system such that the RWE event will never be the limiting transient. Please explain this apparent discrepancy.

NMPNS Response 26

The OLMCPR required for the RWE to not violate the MCPR SL is dependent on the rod block setpoints.

The generic RWE analysis discussed in NEDC-33286P determined the rod block setpoints based on an assumed OLMCPR of 1.20 and a MCPR SL of 1.07 (i.e., a RWE starting at an initial MCPR of 1.20 would reach but not go below the 1.07 MCPR SL with the given rod block setpoints). The 1.20 value was arbitrarily chosen to be less limiting than the typical limiting event OLMCPR (RWE is typically not the limiting event). With this approach, the limiting AOO causes the OLMCPR to be typically greater than 1.20, and therefore, the rod block setpoints result in the RWE not being limiting i.e., the RWE initiated from an OLMCPR greater than 1.20 results in a transient MCPR greater than 1.07).

Calculations are performed each reload to verify the continued applicability of the generic analysis.

ATTACHMENT (2)

PROPOSED TECHNICAL SPECIFICATION (TS) CHANGES (MARK-UP)

TS Pages

3.3.2.1-6
5.6-3

Table 3.3.2.1-1 (page 1 of 1)
Control Rod Block Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Rod Block Monitor				
Insert 2 → a. Upscale	(a)	2	SR 3.3.2.1.3 SR 3.3.2.1.4 SR 3.3.2.1.7	As specified in the COLR (Delete)
d ~~b~~. Inop	~~(a)~~ (d)(e)	2	SR 3.3.2.1.3 ~~SR 3.3.2.1.4~~	NA
c. Downscale	(a)	2	SR 3.3.2.1.3 SR 3.3.2.1.4 SR 3.3.2.1.7	≥ 3% RTP (Delete)
2. Rod Worth Minimizer	1 ~~(b)~~ (f), 2 ~~(b)~~ (f)	1	SR 3.3.2.1.1 SR 3.3.2.1.2 SR 3.3.2.1.5 SR 3.3.2.1.8	NA
3. Reactor Mode Switch — Shutdown Position	~~(c)~~ (g)	2	SR 3.3.2.1.6	NA

Insert 3 → ~~(a)~~ THERMAL POWER ≥ 30% RTP and no peripheral control rod selected. (Delete)

(f) ~~(b)~~ With THERMAL POWER ≤ 10% RTP, except during the reactor shutdown process if the coupling of each withdrawn control rod has been confirmed.

(g) ~~(c)~~ Reactor mode switch in the shutdown position.

Insert 4 →

INSERT 2

a.	Low Power Range - Upscale	(a)	2	SR 3.3.2.1.3 SR 3.3.2.1.4 SR 3.3.2.1.7[(i)]	(h)
b.	Intermediate Power Range - Upscale	(b)	2	SR 3.3.2.1.3 SR 3.3.2.1.4 SR 3.3.2.1.7[(i)]	(h)
c.	High Power Range - Upscale	(c)(d)	2	SR 3.3.2.1.3 SR 3.3.2.1.4 SR 3.3.2.1.7[(i)]	(h)

INSERT 3

(a) APRM Simulated Thermal Power is ≥ 28% and < 63% RTP and MCPR < limit specified in the COLR and no peripheral control rod selected.

(b) APRM Simulated Thermal Power is ≥ 63% and < 83% RTP and MCPR < limit specified in the COLR and no peripheral control rod selected.

(c) APRM Simulated Thermal Power is ≥ 83% and < 90% RTP and MCPR < limit specified in the COLR and no peripheral control rod selected.

(d) APRM Simulated Thermal Power is ≥ 90% RTP and MCPR < limit specified in the COLR and no peripheral control rod selected.

(e) APRM Simulated Thermal Power is ≥ 28% RTP and < 90% RTP and MCPR < limit specified in the COLR and no peripheral control rod is selected.

INSERT 4

(h) Allowable Value specified in the COLR.

(i) If the as-found channel setpoint is not the nominal trip setpoint (NTSP), the channel is inoperable. The NTSP is specified in the COLR. The methodology used to determine the NTSP is specified in the Bases.

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

1. The APLHGR for Specification 3.2.1.

2. The MCPR for Specification 3.2.2.

3. The LHGR for Specification 3.2.3.

4. Reactor Protection System Instrumentation Setpoint for the OPRM – Upscale Function Allowable Value for Specification 3.3.1.1.

Delete

Insert 5 →

5. Control Rod Block Instrumentation Setpoint for the Rod Block Monitor – Upscale Function Allowable Value for Specification 3.3.2.1.

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

1. NEDE-24011-P-A-US, "General Electric Standard Application for Reactor Fuel," U.S. Supplement, (NRC approved version specified in the COLR).

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.

d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

(continued)

INSERT 5

5. The Allowable Values, NTSPs, and MCPR conditions for the Rod Block Monitor - Upscale Functions for Specification 3.3.2.1.

ATTACHMENT (3)

CHANGES TO TECHNICAL SPECIFICATION BASES (MARK-UP)

The current versions of the following Technical Specifications Bases pages have been marked-up by hand to reflect the proposed changes. These Bases pages are provided for information only and do not require NRC approval.

B 3.3.2.1-3
B 3.3.2.1-11
B 3.3.2.1-12

BASES (continued)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

1. Rod Block Monitor

The RBM is designed to prevent violation of the MCPR SL and the cladding 1% plastic strain fuel design limit that may result from a single control rod withdrawal error (RWE) event. The analytical methods and assumptions used in evaluating the RWE event are summarized in Reference ~~3~~ 10. Delete 1 ~~The cycle-specific analysis considers the continuous withdrawal of the maximum worth control rod at its maximum drive speed from the reactor, which is operating at rated power with a control rod pattern that results in the core being placed on thermal design limits. The condition is analyzed to ensure that the results obtained are conservative; the approach also serves to demonstrate the function of the RBM.~~

Insert B9 →

The RBM Function satisfies Criterion 3 of Reference 3.

Insert B10

Two channels of the RBM are required to be OPERABLE, with their setpoints within the appropriate Allowable Value~~s~~ to ensure that no single instrument failure can preclude a rod block from this Function. The actual setpoints are calibrated consistent with applicable setpoint methodology.

Insert B15 → Delete ~~Nominal trip setpoints are specified in the setpoint calculations.~~ The nominal setpoints are selected to ensure that the setpoints do not exceed the Allowable Values between successive CHANNEL CALIBRATIONS. Delete ~~Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable.~~

Insert B16 →

Delete Trip setpoints are those predetermined values of output at which an action should take place. ~~The setpoints are compared to the actual process parameter (e.g., reactor power), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. The analytic limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytic limits by accounting for calibration uncertainty, process measurement uncertainty, primary element uncertainty, instrument uncertainty, and applicable environmental effects. The trip setpoints are derived from the analytical limits by accounting for calibration uncertainty, process measurement uncertainty, primary element uncertainty, instrument uncertainty, applicable environmental effects, and drift. The trip setpoints are also derived from the Allowable Values in the conservative direction by considering calibration uncertainty, instrument uncertainty, environmental effects, and drift. The most~~

Insert B11 →

(continued)

INSERT B15

Nominal trip setpoints (NTSP) are determined using the methodology of Reference 11 and are specified in the COLR.

INSERT B16

Operation with a trip setpoint different than the NTSP is not permitted due to the setpoint's digital nature.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.2.1.7

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies the channel responds to the measured parameter within the necessary range and accuracy. ~~CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology.~~ Delete

As noted, neutron detectors are excluded from the CHANNEL CALIBRATION because they are passive devices, with minimal drift, and because of the difficulty of simulating a meaningful signal. Neutron detectors are adequately tested in SR 3.3.1.1.3 and SR 3.3.1.1.7.

The Frequency is based on the analysis in Reference 8.

Insert B17 →

SR 3.3.2.1.8

The RWM will only enforce the proper control rod sequence if the rod sequence is properly input into the RWM computer. This SR ensures that the proper sequence is loaded into the RWM so that it can perform its intended function. The Surveillance is performed once prior to declaring RWM OPERABLE following loading of sequence into RWM, since this is when rod sequence input errors are possible.

REFERENCES

1. USAR, Section 7.7.1.7.

2. USAR, Section 7.7.1.3.

3. 10 CFR 50.36(c)(2)(ii).

4. USAR, Section 15.4.2.3.

5. USAR, Section 15.4.9.

6. NRC SER, "Acceptance of Referencing of Licensing Topical Report NEDE-24011-P-A," "General Electric Standard Application for Reactor Fuel, Revision 8, Amendment 17," December 27, 1987.

(continued)

INSERT B17

SR 3.3.2.1.7 for SL-LSSS functions is modified by a Note as identified in Table 3.3.2.1-1. The Note requires declaring the channel inoperable if the as-found setpoint does not match the NTSP. Due to the digital nature of the RBM, there are no as-found or as-left tolerances. Identification of a channel setpoint different than the NTSP is indicative of a channel that is not functioning correctly.

The Note also requires that the NTSP be specified in the COLR and the methodology used to determine the NTSP be included in the Bases (see Ref. 11).

BASES

REFERENCES (continued)

7. GENE-770-06-1-A, "Addendum To Bases For Changes To Surveillance Test Intervals And Allowed Out-of-Service Times For Selected Instrumentation Technical Specifications," December 1992.

8. NEDC-32410-P-A, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC-PRNM) Retrofit Plus Option III Stability Trip Function," October 1995.

9. NEDO-33091-A, Revision 2, "Improved BPWS Control Rod Insertion Process," July 2004.

Insert B14 ⟶

INSERT B14

10. NEDC-33286P, "Nine Mile Point Nuclear Station Unit 2 – APRM/RBM/Technical Specifications/Maximum Extended Load Line Limit Analysis (ARTS/MELLLA)," March 2007.

11. NEDC-31336P-A, "General Electric Setpoint Methodology," September 1996.