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SUBJECT: Forwards response to RAI re response time testing.

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U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
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Gentlemen:

Subject: **WNP-2, OPERATING LICENSE NPF-21**
**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**
**REGARDING RESPONSE TIME TESTING**

References:
1) GE Nuclear Energy, BWR Owners' Group Licensing Topical Report, NEDO-32291-A, "System Analysis for the Elimination of Selected Response Time Testing Requirements," October 1995

2) Letter, GO2-97-057, PR Bemis (SS) to NRC, "Request for Amendment, Under Exigent Circumstances, to Operating License Regarding Technical Specification Response Time Testing," dated March 22, 1997

The staff has requested additional information regarding the implementation of the testing methods discussed in Reference 1. This information was requested to support the staff review of Reference 2. Specifically, the staff has requested that the Supply System describe the methods used by the Supply System to determine the response time assumed for the sensor or instrument loop, in those loops in which the sensor or instrumentation time is no longer measured. The determination of the assumed sensor response time was based on engineering judgement, supported by:

1) published vendor information;
2) WNP-2 design information;
3) WNP-2 operational data; or
4) available industry data.

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The system response time can be represented by an equation:

$T_{RTT} = T_S + T_X$ where:

$T_{RTT}$ = Total System Response Time;
$T_S$ = Sensor Response Time; and
$T_X$ = Channel, Logic, and other Component Response Time.[Note 1]

Note 1: For the main steam line isolation system response time, the acceptance criteria are for the sensor and logic only. It does not include the main steam isolation valve (MSIV) stroke time because of the separate requirement for a minimum as well as a maximum time. This time criterion is specified in SR 3.6.1.3.6 as $\geq$ 3.0 seconds and $\leq$ 5.0 seconds.

The assumed sensor or instrumentation response time was then used to derive acceptance criteria for the response time of the remainder of the system. The assumed sensor or instrumentation response time added to the measured response time for the remainder of the system must be within the limits specified in the WNP-2 Licensee Controlled Specifications (LCS).

The following discussion provides a summary of the methods used at WNP-2 for the Reactor Protection System (RPS) Functions for Reactor Steam Dome Pressure - High (Function 3) and Reactor Water Level - Low, Level 3 (Function 4). The same method was used for the Primary Containment Isolation (PCI) Main Steam Line Isolation on Reactor Water Level -Low, Level 2, Main Steam Line Pressure - Low, and Main Steam Line Flow - High (Functions 1.a, 1.b, and 1.c, respectively). The four sensor models used in the RPS and PCI system are Barton 288A level switches, Barksdale B1T pressure switches, and Static O-Ring (SOR) pressure switches, models 29-N6-B45 and 103AS-BB203. Specific design information is available in the WNP-2 FSAR and other design basis documents, such as the Design Specification Data (DSD) Sheets provided by General Electric and plant transient and accident analyses. Operational data were obtained by reviewing the results of surveillance procedures performed at WNP-2. Similar industry data were also obtained to supplement the WNP-2 data.

The new acceptance criteria (i.e., $T_X$) selected have been further validated by statistical analyses of available data. The statistical analyses of the available data have confirmed with a 95% confidence and 95% probability level (with a one-sided upper tolerance bound) that the values used as acceptance criteria are conservative (e.g., acceptance criteria for the logic portion of $T_X$ $\geq$ statistical results and the assumed $T_S$ $\geq$ statistical results). This provides assurance that the observed performance of the system is bounded by the plant specific accident and transient analyses.

Sufficient operational data and vendor information were not available to support statistical analyses of the assumed design sensor response times for the 2 SOR models (RPS Function 3 and PCI Function 1.a). The assumed sensor response times for these models were based on engineering judgement supported by additional information available in the FSAR and the DSD sheets. For the RPS function, the FSAR and the DSD sheet provided a sensor time of 0.5 seconds and a logic time of 0.05 seconds.

This breakdown was not available for the total response time of 1.0 second specified for the PCI function. An acceptance criteria of 0.05 seconds for $T_X$ was selected, consistent with the acceptance criteria for the other logic subject to response time measurements. Using the same logic response time of 0.05 seconds for the PCI logic allows the remaining 0.95 seconds for the sensor. The engineering judgement was supported by DSD sheets for similar components in other systems and a review of the analyses for which the function (MSIV isolation) was required. The limited operational data available supported the assumed sensor response time for each SOR model. In addition, bench testing was performed on both SOR models.

The statistical analysis of the bench testing data for the measured sensor response time and the operational data for the measured logic response time data also indicated that the assumed sensor response times of 0.5 seconds and 0.95 seconds and the acceptance criteria for the remainder of the logic were conservative when compared to the measured times and the required system response time.

The acceptance criteria for the Emergency Core Cooling Systems (ECCS), where the instrumentation loop response time is no longer measured, was also determined by reducing the ECCS response time by the amount of time assumed as the instrumentation response time. However, in this case, statistical analysis of operational data was not performed. A review of operational data at WNP-2 has verified that the response time of the ECCS initiation instrumentation is small when compared to the actual safety system actuation response times. As stated in the NRC safety evaluation of Reference 1:

> "The intent of these tests is to ensure that changes in response time of instrumentation beyond the limits assumed in safety analyses are detected, and combined with instrument calibrations, to ensure that the instrument is operating correctly. The response time tests do not demonstrate that the instrument response time design value is met, but rather that the specified performance requirements of the TSs are satisfied."

The WNP-2 analyses for ECCS response times assumed a 3 second response time for the initiation instrumentation and further evaluation of these analyses were performed during the implementation of Reference 1. This evaluation has indicated that a delay of up to 5 seconds would not have a significant impact on plant safety. As discussed in Reference 1, instrumentation components in ECCS that may experience response time degradation will continue to respond in the milli-second range prior to complete failure. Therefore, the response time degradation would not have a significant adverse effect on system actuation and the

instrumentation would continue to meet overall system requirements. As an additional conservative measure, the acceptance criteria in the applicable surveillance procedures for the ECCS response times were reduced by 5 seconds rather than the 3 seconds assumed in the analyses.

As stated in the NRC safety evaluation for Reference 1, the staff agreed with the BWROG that "significant degradation of instrumentation response times can be detected during the performance of calibrations and other currently required surveillance tests." The Supply System believes that the revisions made to the acceptance criteria of those procedures, which continue to quantitatively measure response times, provide further confidence that the safety function of the plant instrumentation will be satisfied.

Should you have any questions or desire additional information regarding this matter, please call me or DA Swank at (509) 377-4563.

Respectfully,

for PRB

P.R. Bemis
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