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Subject: Perry Nuclear Power Plant
License Amendment Request to Revise Technical Specification 3.3.1.1 Intermediate Range Monitoring Instrumentation Mode 5 CHANNEL FUNCTIONAL TESTING Surveillance Frequency from 7 Days to 31 Days

Ladies and Gentlemen:

Nuclear Regulatory Commission (NRC) review and approval of a license amendment for the Perry Nuclear Power Plant (PNPP) is requested. The proposed amendment would revise the frequency of the Mode 5 Intermediate Range Monitoring (IRM) Instrumentation CHANNEL FUNCTIONAL TEST contained in Technical Specification 3.3.1.1 from 7 days to 31 days. The amendment is based on a deterministic assessment of the IRM functions and components.

Approval of the license amendment is requested prior to February 28, 2007, with the amendment to be implemented within 90 days following its effective date. This will support implementation prior to the PNPP 11th Refueling Outage, which is scheduled for early 2007. This request is considered a cost beneficial licensing change due to anticipated cost savings in refueling outage duration.

The proposed changes have been reviewed by the PNPP Plant Operations Review Committee and the Company Nuclear Review Board. Enclosure 1 includes an evaluation of the proposed amendment.

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There are no regulatory commitments included in this letter or its attachments. If there are any questions or if additional information is required, please contact Mr. Gregory A. Dunn, Manager – FENOC Fleet Licensing, at 330-315-7243.

I declare under penalty of perjury that the foregoing is true and correct. Executed on February 14, 2006.

L.W. Pearce

Enclosure:

1. Perry Nuclear Power Plant Evaluation for Proposed License Amendment to Technical Specification 3.3.1.1

cc: NRC Project Manager
NRC Resident Inspector
NRC Region III
State of Ohio

PERRY NUCLEAR POWER PLANT EVALUATION FOR PROPOSED LICENSE AMENDMENT TO TECHNICAL SPECIFICATION 3.3.1.1

Subject: License Amendment Request to Revise Technical Specification 3.3.1.1 Intermediate Range Monitoring Instrumentation Mode 5 CHANNEL FUNCTIONAL TESTING Surveillance Frequency from 7 Days to 31 Days

1.0 DESCRIPTION

This License Amendment Request, which is being submitted to the Nuclear Regulatory Commission (NRC) for review and approval, proposes the revision of the frequency of the Mode 5 Intermediate Range Monitoring (IRM) Instrumentation CHANNEL FUNCTIONAL TEST from 7 days to 31 days.

A similar change to revise the IRM surveillance frequencies was approved by the NRC for the Vermont Yankee Nuclear Power Station (TAC NO. MB9091) on July 7, 2005.

2.0 PROPOSED TECHNICAL SPECIFICATION CHANGE

Technical Specification (TS) 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," will be revised by creating a new IRM Surveillance Requirement (SR), SR 3.3.1.1.19, for the performance of a CHANNEL FUNCTIONAL TEST during Mode 5, and revising Table 3.3.1.1-1, Items 1.a and 1.b to delete the current IRM Mode 5 surveillance, SR 3.3.1.1.5, and replace it with the new surveillance, SR 3.3.1.1.19. Refer to Attachment 2 for a copy of TS 3.3.1.1 with the proposed changes incorporated. The proposed TS change also impacts the TS Bases. The TS Bases are controlled under the Perry Nuclear Power Plant (PNPP) TS Bases Control Program in accordance with TS 5.5.11. The proposed TS Bases changes are described in Attachment 3 and are being forwarded to the NRC for informational purposes.

3.0 BACKGROUND

3.1 SYSTEM DESCRIPTION

The IRM instrumentation monitors neutron flux from the upper portion of the source range to the lower portion of the power range (the intermediate range).

The IRM instrumentation consists of eight channels. Each channel includes one fission chamber detector that can be positioned in the core by remote control. The detectors are inserted into the core for a reactor startup and are withdrawn after the reactor mode selector switch is placed in the RUN position (Mode 1).

Each IRM fission chamber is connected to a preamplifier. The preamplifier converts current pulses to voltage pulses and conditions the signal. Preamplification is selected by a remote range switch that provides 10 ranges of increasing attenuation (the first six are called low range, the last four are called high range). As the neutron flux of the reactor core increases, the signal from the fission chamber is attenuated to keep the output signal within the scale of an indicator located in the control room. The preamplifier output signal is further conditioned, and is provided to the Reactor Protection System (RPS) and the Rod Control and Information System (RC&IS).

The IRM remote range switches must be upranged or downranged to follow increases and decreases in power within the intermediate range to prevent either a scram or a rod block. The IRM detectors will be inserted into the core whenever the IRM

instrument channels are needed to monitor neutron flux, and withdrawn from the core when they are not needed to prevent unnecessary burnup of the fission chambers.

RPS Interface

The eight IRM channels are arranged such that two IRM channels are associated with each of the four RPS trip channels. This arrangement allows one IRM channel in each RPS trip channel to be bypassed, while still maintaining the RPS channel trip function. Each IRM channel includes circuits that trip when a preset upscale level is reached or if an inoperative channel condition exists.

The reactor mode switch arms the IRM trips that initiate a reactor scram. With the reactor mode switch in REFUEL (Mode 5) or STARTUP (Mode 2), an IRM Neutron Flux High or Inoperative trip signal actuates a Neutron Monitoring System (NMS) trip of the RPS. Only one of the IRM channels must trip to initiate an NMS trip of the associated RPS trip subsystem. Therefore, for a reactor scram to occur, one IRM channel in each of the two RPS trip subsystems needs to trip.

This trip function is designed to prevent fuel damage resulting from abnormal operating transients within this neutron power range. The most significant source of reactivity change is control rod withdrawal. The IRM provides a diverse protection to the Rod Pattern Controller (RPC), which monitors and controls the movement of control rods at low power. The RPC prevents the withdrawal of an out of sequence control rod, which could lead to an unacceptable power excursion. The IRM trip mitigates this transient. The IRM scram function is also capable of mitigating other reactivity excursions during a reactor startup, such as cold water injection, but no credit for this is assumed.

The controls and testing associated with maintaining the RPS functions are contained within the Technical Specifications. This license amendment proposes changes to a Technical Specification testing frequency.

RC&IS Interface

The IRMs send signals to the RC&IS which can inhibit the movement or selection of control rods.

The eight IRM channels are arranged such that four IRM channels are associated with each of the two RC&IS rod block logic circuits. Mechanical switches in the IRM detector drive systems provide position signals to the RC&IS rod block logic circuits which are used to indicate that a detector is not fully inserted. Each mechanical switch provides input to each of the rod block logic circuits.

Examples of IRM channel conditions that can initiate a rod block are: 1) an IRM upscale alarm, 2) an IRM inoperative alarm, 3) an IRM detector not fully inserted into the core, and 4) IRM downscale (bypassed in Range 1).

These rod blocks provide assurance that no control rod is withdrawn during low neutron flux level operations unless proper neutron monitoring capability is available and neutron flux is being correctly monitored. Additionally, the IRM upscale rod block provides a means to stop rod withdrawal in time to avoid conditions requiring RPS action (scram) in the event that a rod withdrawal error is made during low neutron flux level operations.

To permit continued reactor operation during repair or calibration of IRM equipment that provide rod block interlocks, manual bypasses are permitted. Each RC&IS rod block logic circuit is permitted to have only one IRM channel bypassed at a time. This results in a maximum of two IRM channels that can be bypassed in the RC&IS. This configuration ensures that the neutron flux in the core is adequately monitored.

The controls and testing associated with maintaining the RC&IS rod block functions are contained within the Operational Requirements Manual (ORM). Changes to the ORM are controlled in accordance with 10 CFR 50.59. Changes to the ORM are required to reflect the changes proposed by this license amendment. The proposed ORM changes are described in Attachment 4 and are being forwarded to the NRC for informational purposes. Since the changes proposed to the Technical Specifications and the ORM both extend the channel functional testing frequency, yet affect different functions, the PNPP staff intends to implement the changes to both the Technical Specifications and the ORM at the same time.

3.2 LICENSING ANALYSES

Technical Specification Improvement Analysis

In 1988, General Electric (GE) issued NEDC 30851P-A, entitled "BWR Owner's Group Technical Specification Improvement Analyses for BWR Reactor Protection System," which contained a detailed analysis confirming the acceptability of the then current Allowed Outage Times (AOTs) - Surveillance Test Intervals (STIs) for the RPS. This analysis supported changing the frequency for several RPS surveillance tests from monthly to quarterly and extending the AOTs for many components and functions. Though the RPS IRM functions were not explicitly modeled, the analysis is relevant for RPS events. The analysis showed that RPS unavailability was determined to be relatively insensitive to changes in component failure rates. A factor of 10 increase in the failure rates produced a negligible (0.1%) impact on RPS unavailability for each of the initiating events analyzed. The resultant impact on RPS failure frequency was also found to be negligible.

Additionally, NEDC 30851P-A included several sensitivity studies that were performed to evaluate the impact of methods for performing surveillances and the effects of operator errors. It was also found that reduced redundancy, that is, unavailability of any one sensor channel, during testing has negligible impact on RPS unavailability.

Therefore, though the IRMs were not explicitly modeled, it can be concluded from NEDC 30851P-A that the failure rates of the IRMs would not adversely impact the failure frequency of RPS.

Updated Safety Analysis Report (USAR)

PNPP USAR Chapter 15, "Accident Analysis," was reviewed to identify events in which the IRMs could provide some measure of event mitigation. Though this License Amendment Request only applies while the plant is in Mode 5, the USAR review also included evaluation of events associated with low power operations (startups and shutdowns). The accident/transient event relevant to the amendment is described in USAR Chapter 15.4.1.2, "Continuous Rod Withdrawal During Reactor Startup." The event occurs during plant startup (Mode 2). The RPC function of the RC&IS prevents the selection of an out of sequence control rod, minimizing the potential for the event from occurring. If the RPC function does not prevent the event, then the IRMs would initiate a scram to mitigate the event. Since the plant is in Mode 2, the Mode 2 IRM Technical Specification surveillances provide assurance that the IRMs are OPERABLE, hence their mitigation function would also be assured. This amendment request does not impact the Mode 2 IRM surveillance requirements.

3.3 FUNCTIONS AFFECTED BY PROPOSED TECHNICAL SPECIFICATION CHANGES

The proposed TS change affects the IRM Neutron Flux – High and Inop trip functions for Mode 5.

The Neutron Flux – High trip function provides a diverse protection to the RPC which monitors and controls the movement of control rods at low power. The RPC prevents the withdrawal of an out of sequence control rod, which could lead to an unacceptable power excursion. The IRM trip mitigates this transient. The IRM scram function is also capable of mitigating other reactivity excursions during a reactor startup, such as cold water injection, but no credit for this is assumed. The function's Allowable Value is contained in TS Table 3.3.1.1-1, Function 1.

The Inop function provides assurance that a minimum number of IRMs are operable. The function is performed by a bistable circuit. A reference voltage and a voltage proportional to the output of the High Voltage Power Supply (HVPS) is applied to the bistable circuit (the HVPS provides voltage to the IRM detector). The reference voltage is slightly less than the voltage from the HVPS. Anytime an IRM mode switch is placed into a position other than OPERATE, the preamplifier is disconnected, or a circuit module is not plugged in, the reference voltage will change and exceed the HVPS voltage, thereby tripping the bistable circuit. If the HVPS voltage drops below a set level, the voltage from the HVPS becomes less than the reference voltage, thereby tripping the bistable circuit. The Inop function is not credited in the accident analysis. Hence, there is no TS Allowable Value for this function.

4.0 TECHNICAL ANALYSIS

The proposed license amendment revises the Technical Specification Mode 5 CHANNEL FUNCTIONAL TEST interval from every 7 days to every 31 days. The purpose of the test is to ensure the channel will perform its intended function.

The Mode 5 functional test is only one of several SRs that are performed to ensure operability of the IRMs. The IRM CHANNEL CALIBRATION (SR 3.3.1.1.13) is a complete check of the instrument loop. This test verifies the instrument channel responds to the measured parameter within the necessary range and accuracy. The CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift between successive calibrations. This SR is performed every 24 months. The LOGIC SYSTEM FUNCTIONAL TEST (SR 3.3.1.1.15) demonstrates the operability of the trip logic upon receipt of either an actual or simulated automatic trip signal. This SR is performed every 24 months. The frequency is based upon operating experience. These SRs test the same components and logic as the CHANNEL FUNCTIONAL TESTS, verifying that the IRMs will perform the required functions. Further assurance of the operability of the IRMs during low power operation is provided by the requirement to either perform the CHANNEL CALIBRATION (SR 3.3.1.1.13) within 12 hours after achieving Mode 2 (from Mode 1) or to check the surveillance to be current. Additionally, overlap between the Average Power Range Monitoring (APRM) channels and IRMs (SR 3.3.1.1.7) is verified during the transition to Mode 2 from Mode 1. The proposed Technical Specification change does not impact either of these SRs.

Additionally, a CHANNEL CHECK is performed once every 12 hours when the instrumentation is required to be operable (SR 3.3.1.1.1) to confirm proper operation of the IRM channel instrumentation. This check verifies agreement among the different channels of indication and confirms operation of channel components. The CHANNEL CHECK indicates that the instrument channel continues to operate properly between each CHANNEL CALIBRATION. Additionally, when the IRMs are operable, control room personnel monitor the indications from these instrument channels. Hence, these two methods provide assurance that through significant changes in indication or deviations among channels, failures in channel components would be detected.

During plant startup (Mode 2), should a continuous rod withdrawal event occur and the RPC fails, the IRM High Neutron Flux trip would mitigate the event. As stated earlier, the IRM Mode 2 SRs (SRs 3.3.1.1, 3.3.1.4, 3.3.1.6, 3.3.1.7, 3.3.1.13, and 3.3.1.15) ensure the operability of the IRMs during this operational condition. If, however, sufficient IRMs failed during this period, which could jeopardize the trip function, the actions of TS 3.3.1.1, Required Action H.1 would be taken. Specifically, the plant would be returned to a shutdown condition. Furthermore, the APRM Neutron Flux – High, Setdown trip, which is also required to be operable during this operational period, provides redundancy to the IRM trip function. That is, the event would be mitigated.

As stated in the Background Section, the IRMs provide input to the control rod block circuits. Technical Specification 3.3.2.1, "Control Rod Block Instrumentation", requires certain control rod block features to be OPERABLE in Mode 2 (Startup) and when the Reactor Mode Switch is in the shutdown position. SRs exist which ensure the operability of these features. These SRs are required to be performed within one hour of entering the plant conditions that require the features to be OPERABLE. The proposed Technical Specification change does not impact these SRs.

A review of the maintenance history of the IRM channels, between 1988 and 2005 has been performed. There was only one documented occurrence of a trip unit failure. The trip unit was replaced. The only component that had repeat failures (which occurred on multiple IRM channels) was the IRM INOP INHIBIT Switch (S4). The S4 switch is only used during channel testing. The switch is a pushbutton switch that when actuated (pushed) prevents an inoperative trip condition caused by taking the channel Selector Switch out of OPERATE. In 2000, the S4 switch was replaced with a more reliable switch. Since this time, there has only been one additional failure with the component. Overall, the small number of failures indicates the IRMs are reliable.

A review of the surveillance test history was performed for the past 15 years. Of the 1169 IRM channel functional tests evaluated, only one test failure was identified. An IRM channel as found setpoint value was found outside of the Leave-As-Is-Zone (LAIZ) and required adjustment. The test review did not note problems associated with the Inop function. Therefore, the IRMs are considered reliable.

The PNPP Condition Report database (the database contains the Condition Reports of the past five years) was searched to determine any IRM operability issues associated with the performance of the SR 3.3.1.1.5 testing. Only one SR failure was noted. The failure was due to an electronic relay, which "locked in" a control rod withdrawal block which could not be reset. Since the control rod block would prohibit control rod movement, the failure was considered conservative. The relay was replaced and the IRM was returned to an operable status. A review of the maintenance history appears to indicate that this is the only failure of this relay. The lack of a large number of Condition Reports associated with the performance of SR 3.3.1.1.5, provides additional support for the overall reliability of the IRMs.

To further determine the reliability of the IRMs a drift analysis was performed. The drift analysis was performed using the guidance contained in Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Accommodate a 24-month Fuel Cycle," and EPRI Report TI-103335, "Guidelines for Instrument Calibration Extension/Reduction Programs." The drift analysis is summarized in Attachment 1. The results indicate that the IRMs are reliable components and should perform their design functions when required.

Additionally, a risk assessment was performed to determine the impact upon the overall plant risk from the surveillance extension. Since the IRMs are not used in Mode 1 and do not support any system, structure, or component included in the PNPP

Probabilistic Risk Assessment, there is no quantifiable risk associated with the IRM Mode 5 SR 3.3.1.1.5. In Modes 3 and 4, with the control rods fully inserted into the core, the SR is not applicable hence there is no impact upon risk. In Mode 2, both the APRMs and the IRMs are required to be operable. The APRM Neutron Flux – High, Setdown scram is redundant to the IRM high neutron flux scram. Inoperable IRMs would be detected upon initial entry into Mode 2 either through the performance of SR 3.3.1.1.6 due to lack of overlap with the Source Range Monitors or SR 3.3.1.1.7 due to lack of overlap with the APRMs. Furthermore, an IRM channel functional test is required by SR 3.3.1.1.4 within 12 hours after entering Mode 2 (from either Mode 1 to Mode 2 or for Mode 3 to Mode 2). Due to the redundancy of the APRM scram function and the SR 3.3.1.1.4 and SR 3.3.1.1.7 surveillance testing, the risk in Mode 2 is minimal. In Mode 5, the IRMs provide core neutron monitoring and protection against an unexpected reactivity excursion. A control rod removal or withdrawal would likely be the cause of this event. PNPP USAR Section 15.4.1.1, "Control Rod Removal Error During Refueling", describes this event. The control rod removal/withdrawal event description indicates that through plant design features (control rod blocks and refueling interlocks) and procedural controls the event is prevented. The USAR section indicates that multiple failures are needed in order for the reactivity excursion to occur. The probability of this combined with an IRM failure is considered unlikely. Therefore, the extension of SR 3.3.1.1.5 from 7 days to 31 days is not considered to have a significant impact upon plant risk.

CONCLUSION

Based upon the reliability of the IRMs, the failure-detection capability confirmed by required instrument testing, the continuous monitoring of the instruments, and the drift analysis for the extended surveillance interval, the effect upon the IRM functions by the proposed Technical Specification change on system availability is minimal.

5.0 <u>REGULATORY ANALYSIS</u>

5.1 NO SIGNIFICANT HAZARDS CONSIDERATION

The proposed amendment changes the PNPP Technical Specifications to revise the interval of the Mode 5 IRM CHANNEL FUNCTIONAL TEST from 7 days to 31 days.

The standards used to arrive at a determination that a request for amendment involves no significant hazards considerations are included in the NRC's regulation, 10 CFR 50.92, which states that the operation of the facility in accordance with the proposed amendment would not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any previously evaluated; or (3) involve a significant reduction in a margin of safety.

The proposed amendment has been reviewed with respect to these three factors, and it has been determined that the proposed change does not involve a significant hazard because:

1. The proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

   The proposed Technical Specifications (TS) change involves an increase in the Mode 5 CHANNEL FUNCTIONAL TEST interval for RPS IRM channels from 7 days to 31 days. The IRM system is used for event mitigation. The failure of an IRM does not initiate an accident or transient event. The proposed TS change does not alter the design or function of the IRM system for no physical changes are being made to the plant. Evaluation of the proposed testing interval change demonstrated that the availability of IRMs to mitigate the consequences of a control rod withdrawal event at low power levels are not significantly affected based on the effectiveness of other, required TS surveillance testing that is performed, the availability of redundant systems and equipment, and the high reliability of the IRM equipment.

   Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. The proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

   The proposed TS change involves an increase in the Mode 5 IRM CHANNEL FUNCTIONAL TEST interval from 7 days to 31 days. Existing TS testing requirements ensure the operability of the IRMs. The proposed TS change does not introduce any failure mechanisms of a different type than those previously evaluated, since no physical changes to the plant are being made. No new or different equipment is being installed, and no installed equipment is being operated in a different manner. As a result, no new failure modes are introduced. In addition, the manner in which surveillance tests are performed remains unchanged.

   Therefore, the proposed TS change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. The proposed change does not involve a significant reduction in a margin of safety.

   The proposed TS change involves an increase in the Mode 5 CHANNEL FUNCTIONAL TEST interval for RPS IRM channels from 7 days to 31 days. There is expected to be no impact on system operability, based upon the performance of the more frequent Channel Checks, Control Room monitoring when the IRMs are in use, and the overall IRM reliability.

   Furthermore, a historical review of surveillance test results and associated maintenance records did not indicate evidence of any failure that would invalidate the above conclusions.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based upon the reasoning presented above, the requested change does not involve a significant hazards consideration.

5.2 APPLICABLE REGULATORY REQUIREMENTS

Two regulatory requirements are relevant to this proposed License Amendment Request. First is General Design Criteria (GDC) 21, "Protection system reliability and testability." Second is 10 CFR 50.36, "Technical specifications."

GDC 21 identifies reliability and testability attributes of instrumentation and control systems. Component redundancy and independence are key features of the GDC. With respect to this License Amendment Request, no physical changes or modifications to the IRM channels are being proposed. No changes are being proposed to the operation of the IRM channels. Hence, IRM redundancy and independence are maintained. Therefore, GDC 21 continues to be satisfied.

10 CFR 50.36 establishes the regulatory requirements related to the contents of the Technical Specifications. Pursuant to 10 CFR 50.36, the Technical Specifications are required to include items in the following five specific categories: (1) safety limits, limiting safety system settings, and limiting control settings; (2) limiting conditions of operation; (3) surveillance requirements; (4) design features; and (5) administrative controls. With respect to this License Amendment Request, the relevant category is the "surveillance requirements." 10 CFR 50.36(c)(3), "Surveillance Requirements," states that these requirements are related to the testing, calibration, and inspection of components to ensure that facility operation will be within safety limits and that the limiting conditions of operation will be met. The proposed amendment does not eliminate any component testing, calibration, or inspection requirement; it just extends the performance frequency of one of the tests (SR 3.3.1.1.19). This amendment request does not propose: (1) any physical change or modification to an IRM channel, (2) any setpoint change, and (3) any change to the operation of an IRM channel. The IRM reliability, as described in the Technical Analysis section above, is such that the extension of the surveillance frequency would continue to meet the requirements of 10 CFR 50.36(c)(3).

The proposed License Amendment Request satisfies the relevant regulatory requirements.

6.0 ENVIRONMENTAL CONSIDERATION

The proposed Technical Specification change request was evaluated against the criteria of 10 CFR 51.22 for environmental considerations. The proposed change does not involve a significant hazards consideration, does not significantly change the types or significantly increase the amounts of effluents that may be released offsite, and does not significantly increase individual or cumulative occupational radiation

exposures. Based on the preceding, it has been concluded that the proposed Technical Specification change meets the criteria given in 10 CFR 51.22(c)(9) for a categorical exclusion from the requirement for an Environmental Impact Statement.

7.0 PRECEDENT

A similar change to revise the IRM surveillance frequencies was approved by the NRC for the Vermont Yankee Nuclear Power Station (TAC NO. MB9091) on July 7, 2005.

8.0 REFERENCES

1. PNPP Technical Specification 3.3.1.1, "Reactor Protection System (RPS) Instrumentation"

2. General Electric, NEDC 30851P-A, "BWR Owner's Group Technical Specification Improvement Analyses for BWR Reactor Protection System"

3. PNPP Updated Final Safety Analysis Report, Section 15.4.1.1, "Control Rod Removal Error During Refueling"

4. PNPP Updated Final Safety Analysis Report, Section 15.4.1.2, "Continuous Rod Withdrawal During Reactor Startup"

5. NRC Generic Letter (GL) 91-04, "Changes in Technical Specification Surveillance Intervals to Accommodate a 24-month Fuel Cycle"

6. EPRI Report, TI-103335, "Guidelines for Instrument Calibration Extension/Reduction Programs"

9.0 ATTACHMENTS

1. Intermediate Range Monitoring Drift Analysis

2. Technical Specification Pages Annotated with Proposed Change – Hand Mark-up

3. Technical Specification Bases Pages Annotated with Proposed Change

4. Proposed Operational Requirements Manual Change

INTERMEDIATE RANGE MONITORING DRIFT ANALYSIS

Methodology

In support of the change in testing frequency of the Mode 5 Intermediate Range Monitors (IRM) CHANNEL FUNCTIONAL TEST, a drift analysis based upon guidance contained in Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Accommodate a 24-month Fuel Cycle," and EPRI Report TI-103335, "Guidelines for Instrument Calibration Extension/Reduction Programs," was performed. The drift analysis that was performed is similar to the drift analyses that were used to support a license amendment which requested the extension of various PNPP technical specification surveillances for a 24-month operating cycle (letter PY-CEI/NRR-2398L, dated June 17, 1999 – TAC No. MA5930). The use of the guidance in Generic Letter 91-04 to support an increase in surveillance testing intervals on instrument drift and safety analysis assumptions for surveillance testing not associated with fuel cycle extensions has been accepted by the NRC as documented in a Safety Evaluation written for the Vermont Yankee Nuclear Power Station dated July 7, 2005 (TAC NO. MB9091).

At the Perry Nuclear Power Plant, the IRM setpoints are checked during the performance of the Mode 5 IRM CHANNEL FUNCTIONAL TEST (SR 3.3.1.1.5). This enabled Perry to obtain instrument drift data.

Generic Letter 91-04 identifies seven steps to follow in order to evaluate instrumentation changes. The seven steps, with the PNPP evaluation for the IRM surveillance change, are described below.

Step 1

> "Confirm that instrument drift as determined by as-found and as-left calibration data from surveillance and maintenance records has not, except on rare occasions, exceeded acceptable limits for a calibration interval."

PNPP Evaluation

The effect of longer channel functional intervals on the IRM channels was evaluated by performing a review of the surveillance test history for the affected instrument channels, including, where necessary, an instrument drift study. In this case, a drift study was performed for the IRM Neutron Flux - High setpoint. The IRM surveillance test history review evaluated 1169 channel functional tests. The tests were performed over the past 15 years, and were selected due to their ready availability and large size. The evaluation demonstrated that the instrument drift is such that the setpoint has not exceeded its allowable value and in only one case, did the setpoint exceed its Leave As Is (LAIZ) calibration acceptance tolerance. Since there is no TS Allowable Value associated with the IRM Inop function, a drift study was not performed.

Step 2

"Confirm that the values of drift for each instrument type (make, model, and range) and application have been determined with a high probability and a high degree of confidence. Provide a summary of the methodology and assumptions used to determine the rate of instrument drift with time based upon historical plant calibration data."

PNPP Evaluation

The values of drift have been determined with a high degree of confidence and a high degree of probability. The PNPP staff has performed this drift evaluation using a PNPP-specific drift analysis program, which is based upon EPRI Report TI-103335. The IRM drift analysis is similar to the drift analyses that were used to support a license amendment which requested the extension of various PNPP technical specification surveillances for a 24-month operating cycle (letter PY-CEI/NRR-2398L, dated June 17, 1999). The IRM drift analysis includes use of the EPRI IPASS Software, Revision 2, July 1999.

The IPASS software utilizes the As Found/As Left (AFAL) analysis methodology to statistically determine drift for the current surveillance intervals. The AFAL methodology utilizes historical data obtained from surveillance tests. Of the 1169 surveillances reviewed, data associated with surveillances that were either performed once (not repeated within 7 days) or the time between surveillance performance was greater than approximately 9 days were not included in the IPASS evaluation. This was done in order to ensure the drift value calculated by IPASS was based upon the drift associated with a 7 day testing frequency. IPASS, not only calculates the drift, but determines if any input data is statistically an outlier. IPASS automatically eliminates the Statistical Outliers from the final drift results. After eliminating the non-7 day data described above (265 points) and the Statistical Outliers (9 points), there were 895 data points included in the final IPASS evaluation. The 31 day drift results are well within the calibration tolerances of the existing instrument setpoint.

Step 3

"Confirm that the magnitude of instrument drift has been determined with a high probability and a high degree of confidence for a bounding calibration interval of 30 months for each instrument type (make, model number, and range) and application that performs a safety function. Provide a list of the channels by TS section that identifies these instrument applications."

PNPP Evaluation

In accordance with the methodology described in the previous section, the magnitude of instrument drift has been determined with a high degree of confidence and a high degree of probability for a bounding surveillance interval of 31 days + 25%. The instruments on which the drift analyses were performed are General Electric

instruments, Model Number 368X102BBG004. The applicable Technical Specification (TS) is TS 3.3.1.1, Table 3.3.1.1-1, "Reactor Protection System Instrumentation", Function 1.a, "Intermediate Range Monitors, Neutron Flux - High."

Step 4

> "Confirm that a comparison of the projected instrument drift errors has been made with the values of drift used in the setpoint analysis. If this results in revised setpoints to accommodate larger drift errors, provide proposed TS changes to update trip setpoints. If the drift errors result in revised safety analysis to support existing setpoints, provide a summary of the updated analysis conclusions to confirm that safety limits and safety analysis assumptions are not exceeded."

PNPP Evaluation

The 31 day + 25% drift value was compared with the drift uncertainty associated with the specific instrument setpoint analysis. In no case was it necessary to change the existing setpoint analysis to accommodate a larger instrument drift error.

Step 5

> "Confirm that the projected instrument errors caused by drift are acceptable for control of plant parameters to effect a safe shutdown with the associated instrumentation."

PNPP Evaluation

As discussed in the previous sections, the calculated drift values were compared to drift allowances in the setpoint calculations and the General Electric design bases applicable to PNPP. The instruments can still be effectively utilized to perform a safe plant shutdown.

Step 6

> "Confirm that all conditions and assumptions of the setpoint and safety analyses have been checked and are appropriately reflected in the acceptance criteria of plant surveillance procedures for channel checks, channel functional tests, and channel calibrations."

PNPP Evaluation

The conditions and assumptions of the setpoint and safety analyses have been checked and require no changes to the setpoint or the acceptance criteria contained within the applicable plant surveillance procedures. The extrapolated drift was less than the drift value assumed in the PNPP IRM Neutron Flux – High setpoint calculations. The Inop trip function has no TS Allowable Value. The function is a bistable circuit that compares

two voltage inputs. If one voltage signal becomes greater than the other, the bistable circuit actuates the trip function. The maintenance history review indicated the IRM channels are reliable, since there has been only one failure of a trip unit. Hence, no changes to the plant surveillance procedures were necessary.

Step 7

"Provide a summary description of the program for monitoring and assessing the effects of increased calibration surveillance intervals on instrument drift and its effect on safety."

PNPP Evaluation

The IRM channels will be monitored and trends evaluated in accordance with the PNPP drift analysis program. The PNPP program includes recording the as-found and as-left calibration data for each channel functional test (the exception is that as-found as-left data for the Inop function will not be recorded since there is no TS allowable value). This will identify occurrences of instruments found outside of their allowable value, or instruments whose performance is not as assumed in the drift or setpoint analysis.

When as-found conditions are outside the allowable value, an evaluation will be performed to determine if the drift or setpoint analysis is still valid, to evaluate the effect on plant safety, and to evaluate instrument operability.

Technical Specification Pages Annotated With Proposed Change – Hand Mark-up

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.3.1.1.5	Perform CHANNEL FUNCTIONAL TEST.	7 days
SR 3.3.1.1.6	Verify the source range monitor (SRM) and intermediate range monitor (IRM) channels overlap.	Prior to withdrawing SRMs from the fully inserted position
SR 3.3.1.1.7	-------------------NOTE------------------- Only required to be met during entry into MODE 2 from MODE 1. -- Verify the IRM and APRM channels overlap.	7 days
SR 3.3.1.1.8	Calibrate the local power range monitors.	1000 MWD/T average core exposure
SR 3.3.1.1.9	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.1.1.10	Calibrate the trip unit.	92 days

(continued)

INFORMATION ONLY

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.3.1.1.16	Verify Turbine Stop Valve Closure and Turbine Control Valve Fast Closure Trip Oil Pressure—Low Functions are not bypassed when THERMAL POWER is ≥ 38% RTP.	24 months
SR 3.3.1.1.17	Calibrate flow reference transmitters.	24 months
SR 3.3.1.1.18	-----NOTES----- 1. Neutron detectors are excluded. 2. For Functions 3, 4 and 5 in Table 3.3.1.1-1, the channel sensors are excluded. 3. For Function 6, "n" equals 4 channels for the purpose of determining the STAGGERED TEST BASIS Frequency. ----- Verify the RPS RESPONSE TIME is within limits.	24 months on a STAGGERED TEST BASIS

INSERT

SR 3.3.1.1.19	Perform CHANNEL FUNCTIONAL TEST	31 days

Table 3.3.1.1-1 (page 1 of 3)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Intermediate Range Monitors					
a. Neutron Flux—High	2	3	H	SR 3.3.1.1.1 SR 3.3.1.1.4 SR 3.3.1.1.6 SR ~~3.3.1.1.7~~ SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 122/125 divisions of full scale
	5(a)	3	I	SR 3.3.1.1.1 SR 3.3.1.1.~~5~~ 19 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 122/125 divisions of full scale
b. Inop	2	3	H	~~SR 3.3.1.1.4~~ ~~SR 3.3.1.1.15~~	NA
	5(a)	3	I	SR 3.3.1.1.~~5~~ 19 SR 3.3.1.1.15	NA
2. Average Power Range Monitors					
a. Neutron Flux—High, Setdown	2	3	H	SR 3.3.1.1.1 SR 3.3.1.1.4 SR 3.3.1.1.7 SR 3.3.1.1.8 SR 3.3.1.1.11 SR 3.3.1.1.15	≤ 20% RTP
b. Flow Biased Simulated Thermal Power—High	1	3	G	SR 3.3.1.1.1 SR 3.3.1.1.2 SR 3.3.1.1.3 SR 3.3.1.1.8 SR 3.3.1.1.9 SR 3.3.1.1.11 SR 3.3.1.1.14 SR 3.3.1.1.15 SR 3.3.1.1.17 SR 3.3.1.1.18	≤ 0.628 W + 63.8% RTP and ≤ 113% RTP[b]

(continued)

(a) With any control rod withdrawn from a core cell containing one or more fuel assemblies.

(b) Allowable Value is ≤ 0.628 W + 43.5% RTP when reset for single loop operation per LCO 3.4.1, "Recirculation Loops Operating."

Technical Specification Bases Pages Annotated With Proposed Change (For Information Only)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.1.5

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended Function. A Frequency of 7 days provides an acceptable level of system average availability over the Frequency and is based on the reliability analysis of Reference 9. (The Manual Scram Function's CHANNEL FUNCTIONAL TEST Frequency was credited in the analysis to extend many automatic scram Functions' Frequencies.)

SR 3.3.1.1.6 and SR 3.3.1.1.7

These Surveillances are established to ensure that no gaps in neutron flux indication exist from subcritical to power operation for monitoring core reactivity status.

The overlap between SRMs and IRMs is required to be demonstrated to ensure that reactor power will not be increased into a region without adequate neutron flux indication. This is required prior to withdrawing SRMs from the fully inserted position since indication is being transitioned from the SRMs to the IRMs.

The overlap between IRMs and APRMs is of concern when reducing power into the IRM range. On power increases, the system design will prevent further increases (initiate a rod block) if adequate overlap is not maintained.

Overlap (nominally 1/2 decade) between IRMs and APRMs exists when sufficient IRMs and APRMs concurrently have onscale readings such that the transition between MODE 1 and MODE 2 can be made without either APRM downscale rod block, or IRM upscale rod block. Overlap (nominally 1/2 decade) between SRMs and IRMs similarly exists when, prior to withdrawing the SRMs from the fully inserted position, IRMs are above 10/125 on range 1 before SRMs have reached the upscale rod block.

As noted, SR 3.3.1.1.7 is only required to be met during entry into MODE 2 from MODE 1. That is, after the overlap requirement has been met and indication has transitioned to the IRMs, maintaining overlap is not required (APRMs may be reading downscale once in MODE 2).

(continued)

INFORMATION ONLY

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.16 (continued)

If any bypass channel setpoint is nonconservative (i.e., the Functions are bypassed at ≥ 38% RTP, either due to open main turbine bypass valve(s) or other reasons), then the affected Turbine Stop Valve Closure and Turbine Control Valve Fast Closure, Trip Oil Pressure-Low Functions are considered inoperable. Alternatively, the bypass channel can be placed in the conservative condition (nonbypass). If placed in the nonbypass condition, this SR is met and the channel is considered OPERABLE.

The Frequency of 24 months is based on engineering judgment and reliability of the components.

SR 3.3.1.1.18

This SR ensures that the individual channel response times are less than or equal to the maximum values assumed in the accident analysis. The RPS RESPONSE TIME acceptance criteria are included in Reference 10.

As noted, neutron detectors are excluded from RPS RESPONSE TIME testing because the principles of detector operation virtually ensure an instantaneous response time. In addition, for Functions 3, 4 and 5, the associated sensors are not required to be response time tested. For these Functions, response time testing for the remaining channel components is required. This allowance is supported by Reference 11.

RPS RESPONSE TIME tests are conducted on a 24 month STAGGERED TEST BASIS. Note 2 requires STAGGERED TEST BASIS Frequency to be determined based on 4 channels per trip system, in lieu of the 8 channels specified in Table 3.3.1.1-1 for the MSIV-Closure Function. This Frequency is based on the logic interrelationships of the various channels required to produce an RPS scram signal. Therefore, staggered testing results in response time verification of these devices every 24 months. This Frequency is consistent with the typical industry refueling cycle and is based upon plant operating experience, which shows that random failures of instrumentation components causing serious time degradation, but not channel failure, are infrequent.

INSERT 1

(continued)

INSERT 1

SR 3.3.1.1.19

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended Function. A Frequency of 31 days provides an acceptable level of system average availability over the Frequency and is based upon operating experience and the reliability of this instrumentation.

Operational Requirements Manual Annotated With Proposed Change
(For Information Only)

6.2.3 Intermediate Range Monitors Control Rod Block Instrumentation

OPERATIONAL REQUIREMENT: The Intermediate Range Monitors (IRM) control rod block instrumentation channels shown in Table 6.2.3-1 shall be OPERABLE with their setpoints set consistent with the Allowable Values shown in the Table 6.2.3-2.

APPLICABILITY:

TABLE 6.2.3-1
IRM APPLICABILITY

TRIP FUNCTION	MINIMUM OPERABLE CHANNELS PER TRIP FUNCTION[a]	APPLICABLE MODES
1. Detector not full in	6	2,5
2. Upscale	6	2,5
3. Inoperative	6	2,5
4. Downscale[b]	6	2,5

(a) When a channel is placed in an inoperable status solely for performance of required testing, entry into the associated Actions may be delayed for up to 6 hours provided that the associated Function maintains trip, isolation, or initiation capability.

(b) This function is automatically bypassed when the IRM channels are on range 1.

6.2.3 Intermediate Range Monitors Control Rod Block Instrumentation (Cont.)

ACTION:

a. With a control rod block instrumentation channel trip setpoint less conservative than the value shown in the Allowable Value column of Table 6.2.3-2, declare the channel inoperable.

b. With the number of OPERABLE channels:

1. One less than required by the Minimum OPERABLE Channels Per Trip Function requirement, restore the inoperable channel to OPERABLE status within 7 days or place the inoperable channel in the tripped condition within the next hour.

2. Two or more less than required by the Minimum OPERABLE Channels Per Trip Function requirement, place at least one inoperable channel in the tripped condition or initiate a rod block within one hour.

TABLE 6.2.3-2
IRM INSTRUMENTATION SETPOINTS

TRIP FUNCTION	TRIP SETPOINT	ALLOWABLE VALUE
1. Detector not full in	N/A	N/A
2. Upscale	≤ 108/125 full scale	≤ 110/125 full scale
3. Inoperative	N/A	N/A
4. Downscale	≥ 5/125 full scale	≥ 3/125 full scale

INFORMATION ONLY

6.2.3 Intermediate Range Monitors Control Rod Block Instrumentation (Cont.)

TESTING REQUIREMENTS:

6.2.3.1 Perform a CHANNEL FUNCTIONAL TEST within 7 days prior to startup for the following trip functions:

a. Detector not full in
b. Upscale
c. Inoperative
d. Downscale

Deleted.

6.2.3.2 -------------------------------NOTE-------------------------------
Not required to be performed until 12 hours after entry into MODE 2 from MODE 1.

Perform a CHANNEL FUNCTIONAL TEST every ~~7~~ 31 days for the following trip functions:

a. Detector not full in
b. Upscale(1)
c. Inoperative
d. Downscale(1)

(1) - Trip setpoints are verified during ~~weekly~~ MONTHLY CHANNEL FUNCTIONAL TESTS.

PROPOSED CHANGES

6.2.3.3 -------------------------------NOTE-------------------------------
Not required to be performed until 12 hours after entry into MODE 2 from MODE 1.

Perform a CHANNEL CALIBRATION(2) every 24 months for the following trip functions:

a. N/A
b. Upscale
c. N/A
d. Downscale

(2) - Neutron detectors may be excluded from CHANNEL CALIBRATION.

6.2.3 Intermediate Range Monitors Control Rod Block Instrumentation (Cont.)

BASES: The control rod block functions are provided consistent with the requirements of Technical Specifications 3.3.2.1, Control Rod Block Instrumentation and 3.2, Power Distribution Limits. The trip logic is arranged so that a trip in any one of the inputs will result in a control rod block.

Operation with a trip set less conservative than its Trip Setpoint but within its specified Allowable Value is acceptable on the basis that the difference between each Trip Setpoint and the Allowable Value is an allowance for instrument drift specifically allocated for each trip in the safety analyses.

The Trip Functions identified in Table 6.2.3-1 are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required testing, entry into associated ACTIONs may be delayed for up to 6 hours, provided the associated Trip Function maintains control rod block capability. Upon completion of the testing, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable ACTIONs taken. This Note is based on the reliability analysis assumption that 6 hours is the average time required to perform channel testing. That analysis demonstrated that the 6 hour allowance does not significantly reduce the probability that the control rod block will occur when necessary.