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United States Nuclear Regulatory Commission
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Perry Nuclear Power Plant
Docket No. 50-440
Request for Extension of Enforcement
Discretion with Respect to Control
Rod Insertion Times

Gentlemen:

This letter requests that the Nuclear Regulatory Commission extend the enforcement discretion that was granted on December 11, 1994 with respect to Technical Specification 3.1.3.2, "Control Rod Maximum Scram Insertion Times", Actions c.1, c.3 and c.4. The extension of enforcement discretion is requested for an additional seven days ending at 10:30 p.m. on December 23, 1994, or until compliance with the Technical Specifications has been achieved, whichever occurs first.

For the duration of the extended enforcement discretion, continued plant operation is deemed acceptable from a safety standpoint. This conclusion is based on safety analyses which have been performed for Cycle 5.

Scram time testing of the control rods has been completed for all of the 177 control rods with a total of four rods identified as inoperable and 26 rods identified as "slow". The four inoperable control rods have had their scram solenoid pilot valves replaced, and the rods have been restored to an OPERABLE status. Efforts are now concentrated on completing corrective actions for rods identified as "slow". Corrective actions have been completed for eight of these "slow" rods. Additionally, replacement of all the scram solenoid pilot valves containing Viton batch 314 seating material will be completed no later than January 31, 1995.

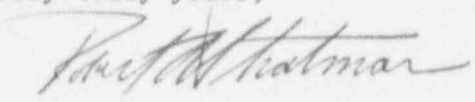
A001

The information necessary to support the request, as outlined in 10CFR2 Appendix C, Section VII.C, is provided by Attachment 1.

This request has been reviewed by the Plant Operations Review Committee.

If you have questions or require additional information, please contact Mr. James D. Kloosterman, Manager - Regulatory Affairs at (216) 280-5833.

Very truly yours,



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Attachment

cc: NRC Project Manager
NRC Resident Inspector
NRC Region III

INTRODUCTION

Control rod scram insertion time testing in accordance with Technical Specification Surveillance Requirements commenced at 9:50 a.m. on December 10, 1994. As discussed in more detail in the "Description of Circumstances" section below, data from tests performed during startup from the fourth refueling outage and after 49 days of operation had not provided conclusive indication of degradation in control rod scram times and did not indicate that widespread increases in scram times should be expected to occur during the Technical Specification (TS) surveillance tests.

However, at 8:45 p.m. on December 11, 1994, TS 3.1.3.2 ACTION c.1 was entered due to the number of "slow" control rods exceeding 20% of a 10% sample of the control rods, which required the unit to be in at least HOT SHUTDOWN within 12 hours. The unit would have been required to be placed in HOT SHUTDOWN by 8:45 a.m. on December 12, 1994.

Enforcement discretion with respect to TS 3.1.3.2 ACTIONS c.1, c.3 and c.4 was requested, and granted at 10:30 p.m. on December 11, 1994, to allow continued scram time testing to identify control rods that may be subject to degraded scram insertion times to notch position 43, and to provide for timely corrective action for identified rods. The duration of the enforcement discretion extends until 10:30 p.m. on December 16, 1994.

On December 12, 1994, testing of the initial sample had been completed. Expanded testing of 73 additional rods was completed on December 14, 1994, which identified an additional 10 "slow" control rods (OPERABLE but with scram times to notch position 43 in excess of the TS 3.1.3.2 LCO), and 1 inoperable rod for which the Scram Solenoid Pilot Valve (SSPV) was replaced.

Scram time testing for all of the 177 control rods was completed on December 15, 1994 with a total of four rods identified as inoperable and 26 rods identified as "slow". Immediate corrective action to replace the scram solenoid pilot valve has been completed for each control rod identified as inoperable, and efforts are now concentrated on completing corrective actions for rods identified as "slow". Additionally, replacement of all the scram solenoid pilot valves containing Viton batch 314 seating material will be completed no later than January 31, 1995.

As noted above, the current duration of the enforcement discretion is only through December 16, 1994, and corrective actions to restore compliance with the Technical Specifications can not be completed within the duration of the enforcement discretion. Therefore, without continued relief the Perry Nuclear Power Plant would be required to be placed in HOT SHUTDOWN.

As described in the "Safety Basis For The Request" section below, continued plant operation with the extended enforcement discretion will be acceptable from a safety standpoint. This conclusion is based on safety analyses which have been performed for Cycle 5.

IDENTIFICATION OF THE ASSOCIATED TECHNICAL SPECIFICATION

PNPP TS LCO 3.1.3.2 provides limits for control rod maximum scram insertion times from the fully withdrawn position.

TS 3.1.3.2 ACTION c. is applicable when the scram insertion time of one or more control rods exceeds the limits of the Specification as determined by demonstration of scram insertion times for at least 10% of the control rods.

DESCRIPTION OF CIRCUMSTANCES

Perry Nuclear Power Plant (PNPP) personnel were aware of Grand Gulf Nuclear Station (GGNS) difficulties with Scram Solenoid Pilot Valves (SSPV) using post-1991 Viton batch 314. While GGNS identified the root cause as a material problem with the SSPVs, the vendors suspected that contamination of SSPVs during GGNS refurbishment activities may have contributed to the problem. Consideration of the GGNS experience indicated that additional data was required to determine if the problems encountered at GGNS were applicable to PNPP.

Grand Gulf Nuclear Power Station Experience

Control rod scram time tests performed at the Grand Gulf Nuclear Station (GGNS) in May of 1994 identified that 25 of 191 control rod insertion times to notch position 43 were "slow" (e.g. 0.320 to 0.390 seconds) and that an additional 8 insertion times failed to meet the Technical Specification limits for operable rods (e.g. greater than 0.390 seconds).

GGNS root cause analysis identified a material problem with scram solenoid pilot valve (SSPV) seating material located in the disk holder sub-assembly supplied in pre-assembled top head assemblies. The root cause analysis indicated that a problem may exist with seating materials (Viton). The failure mechanism is believed to be associated with degradation of the seating material which causes it to "stick" to the seating surface. This results in a delay in venting the air actuator on the SSPV and concurrent "slow" control rod scram time to notch position 43. Testing performed by General Electric (GE) indicates a relationship between degradation in SSPV response time and the cumulative solenoid energization time.

Perry Nuclear Power Plant Experience

The Perry Nuclear Power Plant (PNPP) SSPVs were replaced during RF04. Of the 177 SSPVs installed during the outage, 132 were confirmed to contain Viton batch 314 material which is known to have been manufactured post-1991.

PNPP scram time data obtained during startup from RF04 included data from sequence B scram tests conducted for 89 control rods on July 27, 1994 (SSPVs had been energized 23 days), single rod scram tests performed during the period August 2-3, 1994 for 36 rods (SSPVs had been energized <195 hours), and sequence A scram tests for 88 rods on August 4, 1994 (SSPVs had been energized 195 hours).

The post-RF04 scram time data indicated that the PNPP control rods met the Technical Specification (TS) 3/4.1.3.2 Limiting Condition for Operation (LCO) for maximum insertion times. However, statistical analysis of the post-RF04 scram time data supported a claim that a failure mechanism might exist which could result in "slow" actuation of SSPVs. An offset (approximately 0.010 seconds) was observed in scram time distribution from historical PNPP scram time data for control rods with certain SSPV lots using batch 314 Viton material. Control rods with non-batch 314 SSPVs exhibited a normal distribution. In

addition, a relationship was observed between the cumulative energization time of the SSPVs and the scram time in that a statistically significant upward shift in the data mean values was noted at 195 hours energization time.

The post-RF04 scram time data was insufficient to project SSPV response time for solenoid energization exceeding 23 days. TS Surveillance Requirement 4.1.3.2.c requires control rod scram time testing at least once per 120 days of power operation. This is significantly longer than the maximum energization time (23 days) for which PNPP test data was available. Since the scram time offset appears to change with SSPV energization time, additional testing prior to the 120 day surveillance interval to monitor this phenomenon was determined to be prudent.

Scram time test performance during plant operation requires a reduction in reactor power to minimize cladding stress. On September 24 and 25, 1994, a reduction in reactor power was implemented for performance of a control rod deep-shallow exchange. The SSPVs had been energized for 49 days on September 24, 1994. Although not required by TS, scram time testing was performed during the reduction in reactor power to determine if degradation was occurring in the response time of the PNPP SSPVs.

An initial test sample of 20 control rods was selected to provide a statistical confidence level of 95% in SSPV performance. The basis for selection of specific control rods in the test sample was biased to include: 1) SSPVs from lot 526724001 containing Viton batch 314, which comprise the highest percentage of SSPVs installed at PNPP, 2) SSPVs from lot 511058001 containing Viton batch 314, for which 5 of 12 rods tested during RF04 had startup scram times (to notch position 43) ranging from 0.280 - 0.290 seconds, 3) rods tested during RF04 with scram times (to notch position 43) of 0.240 - 0.260 seconds, and 4) rods tested during RF04 with scram times (to notch position 43) of 0.270 - 0.290 seconds.

Rod selection for the test sample also accounted for the post control rod exchange pattern and attempted to minimize control rod manipulations and fuel duty resulting from the single rod scrams. This was accomplished by preferential selection of rods on the periphery of the core and rods not adjacent to partially inserted control rods.

Data from the September 24/25, 1994 interim testing as a whole did not indicate degradation in performance of the suspect (Viton batch 314) SSPVs at 49 days of continuous energization. In addition, based on cycle 4 scram time variances (to position 43) the data from lot 511058001 indicated no degradation of valve performance within this lot; data subgrouped for lot 526724001 indicated no clear trend; and data subgrouped for the tested population by previous times also did not indicate a clear trend. Irrespective of these results, it was deemed prudent to continue efforts to investigate the issue and prepare for the possibility of problems in future testing.

Control rod scram insertion time testing in accordance with TS Surveillance Requirement 4.1.3.2.c, which requires control rod scram time testing at least once per 120 days of power operation, commenced at 9:50 a.m. on December 10, 1994, for a designated initial test sample of 18 control rods.

All rods tested met TS 3.1.3.2 LCO maximum insertion times to notch positions 29 and 13; however, at 8:45 p.m. on December 11, 1994, the scram time for test

sample rod 12 of 19 (initial sample expanded due to invalid test results on sample rod #4) was identified as exceeding the LCO for maximum insertion time to notch position 43.

ACTION c.1 was entered due to the number of "slow" control rods exceeding 20% of the sample of control rods tested, which required the unit to be in at least HOT SHUTDOWN within 12 hours. The unit would have been required to be placed in HOT SHUTDOWN by 8:45 a.m. on December 12, 1994.

Enforcement discretion with respect to TS 3.1.3.2 ACTIONS c.1, c.3 and c.4 was requested, and granted at 10:30 p.m. on December 11, 1994, to allow continued scram time testing to identify control rods that may be subject to degraded scram insertion times to notch position 43, and to provide for timely corrective action for identified rods.

On December 12, 1994, testing of the TS surveillance sample and four additional adjacent rods had been completed, SSPVs had been replaced for 8 control rods with scram times identified in excess of the TS 3.1.3.2 LCO, and an expanded test plan had been developed to test an additional 73 control rods. The expanded sample testing identified 1 control rod considered to be inoperable because it did not meet the times in TS 3.1.3.2.a.1 (this SSPV was replaced and retested satisfactorily), and an additional 10 "slow" control rods (OPERABLE but with scram times to notch position 43 in excess of the TS 3.1.3.2 LCO).

Scram time testing of the control rods was expanded to include all of the 177 control rods in order to identify control rods that may be subject to degraded scram insertion times. Testing of all control rods was completed on December 15, 1994, and indicated that for the 177 control rods a total of four rods had been identified as inoperable (exceeding TS 3.1.3.2 ACTION a.1), and 26 rods had been identified as "slow" (OPERABLE but with scram times in excess of the TS 3.1.3.2 LCO). Immediate corrective action to replace the scram solenoid pilot valve was implemented for each control rod identified as inoperable. For control rods identified as "slow", corrective action has been completed for 8 control rods. The scram solenoid pilot valves for inoperable and slow control rods have been replaced with new valves using post-1991 non-batch-314 Viton seating material. Additionally, replacement of all the scram solenoid pilot valves containing Viton batch 314 seating material will be completed no later than January 31, 1995. Replacement valves will contain seating material other than batch 314 Viton. The replacements will be either new valves with post-1991 non-batch-314 Viton seating material or refurbished valves with pre-1991 Viton. Specific plans for valve replacement will be shared with the NRC resident inspector as they evolve. It is expected that the corrective actions to be completed by January 31, 1995 will resolve the SSPV issue to the extent practicable.

It is possible that during scram testing performed following SSPV replacement, isolated occurrences of slow scram times could be experienced. Since the corrective action plan is to restore all control rods to meeting the LCO scram times, any such results will lead to additional maintenance work to fix the identified problem, and the official Surveillance Requirement 4.1.3.2.b post-maintenance test would be performed once maintenance is considered fully complete on that SSPV. Therefore, ACTION a will not be entered for such "slow" results.

Prior to the point in time that the extended enforcement discretion will expire, compliance with the Technical Specification Surveillance Requirements will be established. Subsequent to replacement of SSPVs containing Viton batch 314 seating material, additional scram time testing of control rods will be performed to provide further confidence in the effectiveness of the corrective actions taken. Specific plans for this testing will be communicated to the NRC resident inspector.

As described in the Safety Assessment below, continued plant operation is acceptable. A limiting Cycle 5 analysis indicates that a 0.070 second delay in scram initiation is acceptable from a safety standpoint. This delay corresponds to the TS 3.1.3.2 ACTION a.1 "slow OPERABLE" scram time for notch position 43. Also, as described above, immediate corrective actions to replace the SSPV have been completed for each rod with a scram time in excess of TS 3.1.3.2 ACTION a.1 "slow" times (these rods were classified as inoperable). None of these inoperable rods were withdrawn after they had been scrammed to the fully inserted position, until their SSPV had been replaced.

SAFETY BASIS FOR THE REQUEST

As a result of the difficulties experienced at GGNS, the safety significance of delays in scram initiation times due to solenoid valve sticking was examined. The control rod scram is designed to bring the reactor subcritical at a rate fast enough to prevent fuel damage. The limiting "scram time sensitive" accidents/transients are those where the scram time can impact on the Minimum Critical Power Ratio (MCPR) or the vessel overpressurization limit.

The limiting event for MCPR (for the limiting fuel type in Cycle 5) is the Load Reject with No By-Pass valve actuation (LRNBP), and for pressurization it is the MSIV fast closure with a neutron flux scram (with no credit for the scram signal from MSIV position). Loss-of-Coolant Accidents do not set MCPR limits nor lead to overpressurization concerns, and other events such as Rod Withdrawal Errors or Rotated Fuel Bundles are not impacted by scram times. Therefore the examination of the impact of a delayed scram initiation concentrated on two areas: a re-analysis of the limiting scram time sensitive events for MCPR and pressurization issues, and reviews of the assumptions of the original analyses which serve as the basis for the Control Rod Maximum Scram Insertion Time Specification.

Re-analyses of the Load Reject with No By-Pass and MSIV Closure events was performed, which assumed the single failure of the highest worth rod to insert, and the remainder of the rods received the Reactor Protection System scram signal with an additional delay of 0.070 seconds from that assumed in the standard analysis. This 0.070 second time delay corresponds to the time difference (for notch position 43) between the standard analysis assumption and the point at which the rod would be declared "inoperable" by the TS. As an example, the standard analysis assumption for the time to notch position 43 at 1050 psig is 0.320 seconds, and the rod would be declared inoperable if its scram time exceeded 0.390 seconds. If any rod scram times to notch position 43 are measured during scram time testing at up to 0.070 seconds slower than the times assumed in the standard analysis, they are treated by the Technical Specifications as "slow" rods, but not inoperable. The re-analysis assumption

of a 0.070 second delay simulates that every trippable rod in the core is held up by its scram solenoid to the point that they would all be as "slow" as allowed without being declared "inoperable".

The results of the analyses of these two limiting events identified that even for the most limiting period in Cycle 5 operation (which will occur near the end of the cycle), the effects of the scram initiation delay were minimal. For MCPR, the change in Critical Power Ratio during the LRNBP event (the "delta CPR") was examined. In the original reload analysis for Cycle 5 (the current fuel cycle), the delta CPR was 0.15. In the re-analysis, the delta CPR was 0.16, a change of 0.01 from the base case. The MCPR limit for each fuel bundle type in the PNPP core is determined based on performance of various limiting transients, and for all but one of the seven fuel bundle types, the current MCPR limits are set by the Rotated Bundle Analysis, which is not scram time sensitive. For one of the fuel types, adding the additional 0.01 delta CPR makes the LRNBP the most limiting transient. This has been accounted for by implementing an administrative penalty on the parameter used during power operation to ensure the MCPR limits are met, i.e., the Maximum Fraction of Limiting Critical Power Ratio (MFLCPR). The MFLCPR acceptance criteria has been administratively reduced to 0.990 from 1.00 until repairs are completed on the rods which have been identified as "slow". Implementing the penalty in this manner applies the 0.01 delta CPR across all the fuel types, although only the one fuel type was limited by the re-analysis. In practice this has limited impact, since the core is not currently being operated near the limits; from December 1, 1994 to date the MFLCPR has remained at or below 0.957.

The change in peak vessel pressure during the MSIV Closure event was also examined. In the original reload analysis for Cycle 5, the peak pressure was calculated to be 1294 psig, well below the TS 2.1.3 Safety Limit of 1325 psig. In the re-analysis, the peak pressure was calculated to be 1296 psig, also maintaining adequate margin to the 1325 psig limit.

Therefore, during the current scram time testing, from a safety analysis standpoint there is no significance to rods found to be "slow", since all of the rods in the entire core could be "slow" and the safety parameters of concern would continue to be met. Following completion of their scram time test, plant safety is maintained even if these "slow" rods are withdrawn until the time that they are again inserted for replacement of their SSPV. The administrative reduction of the MFLCPR acceptance criteria described above has been implemented until repairs are completed on the rods which have been identified as "slow".

PROPOSED COMPENSATORY MEASURES DURING DISCRETION PERIOD

Compensatory measures that will be utilized during the duration of the enforcement discretion include: 1) corrective actions to restore Technical Specification compliance will be implemented for control rods which are slow to notch position 43, 2) reactor power will not exceed 85% rated thermal power, and 3) an administrative reduction of the MFLCPR acceptance criteria to 0.990 from 1.00 will be implemented.

DURATION OF THE ENFORCEMENT DISCRETION

The extension of enforcement discretion is requested for an additional seven days ending at 10:30 p.m. on December 23, 1994, or until compliance with the

Technical Specifications has been achieved, whichever occurs first. This provides sufficient time to perform the required testing, and perform any SSPV replacement and post-maintenance testing needed to restore compliance with the Technical Specifications, in a systematic and controlled manner.

The basis for determining when compliance with the Technical Specifications has been achieved is as follows. As noted above, during the December 11 performance of Surveillance Requirement 4.1.3.2.c, on a sample of at least 10% of the control rods, Action c was entered due to the number of "slow" rods exceeding 20% per subitem c.1. Now that additional scram time testing has been completed, an examination of Specification 3.1.3.2 identified that in order to restore compliance, subitem c.4 will be the limiting factor. Subitem c.4 requires that the total number of "slow" rods not exceed 7. This subitem is considered limiting since:

1. for subitem c.1, compliance is already achieved because the current population of known "slow" rods (i.e., 18) is less than 20% of the control rods tested [(177)x(.2) = 35.4].
2. for subitem c.2, PNPP was never out of compliance because for control rods that were determined to be slower than the times in ACTION a.1, the requirements of ACTION b were satisfied by declaring them inoperable, and the inoperable rods have now been restored to OPERABLE status.
3. for subitem c.3, compliance will be able to be achieved since SSPV replacement efforts will ensure that no adjacent "slow" rods exist at the point in time that only seven "slow" rods remain in the core.

Therefore, the enforcement discretion can expire once the PNPP administrative requirements have been completed to declare all but seven (7) of the control rods OPERABLE, and the administrative requirements are completed to document that Surveillance Requirement 4.1.3.2.c has been satisfied.

SAFETY HAZARD REVIEW

The proposed extension of enforcement discretion has been reviewed per the NRC guidance on implementation of 10 CFR 2, Appendix C, Section VII.C "Exercise of Discretion for an Operating Facility", and it has been determined that the proposed change will not have an adverse impact on the public health and safety and does not involve a significant safety hazard because:

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

   Withdrawn control rods with scram times of up to 0.070 second delay (called "slow" rods) are acceptable since such times are consistent with analysis done for the most limiting scram sensitive transient for MCPR impact at PNPP (the Load Reject with No Bypass Valve Actuation). The analysis showed that even with every rod in the core slow by 0.070 seconds (a very conservative assumption compared to the actual scram times that exist at any time), the Minimum Critical Power Ratio (MCPR) would be maintained above the safety limit for the transient conditions with administrative controls placed on the Maximum Fraction of Limiting Critical Power Ratio (MFLCPR). The peak pressure reached in the reactor vessel upon Main Steam Isolation Valve fast closure with a neutron flux scram would increase by

only 2 psig (from 1294 psig to 1296 psig), a minimal effect on margin to the reactor vessel peak pressure safety limit of 1325 psig. The analysis will allow the 0.070 second delay to be in effect during the duration of Cycle 5. Also, immediate corrective action to replace the scram solenoid pilot valve has been completed for each control rod identified as inoperable. The Cycle 5 analysis conservatively envelopes the identified individual control rods with scram times exceeding the limits of LCO 3.1.3.2 (the "slow" but OPERABLE rods). The requested extension does not affect any initiator of the limiting transient, and it has been shown that the safety limits are maintained.

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

   Control rods with scram times of up to 0.070 second delay do not provide a mechanism for a new or different kind of accident. The delay has been analyzed, and with administrative controls placed on MFLCPR, the results show that the MCPR of the most limiting scram sensitive transient is maintained above the safety limit, and that there is minimal effect on the safety limit for peak reactor vessel pressure during MSIV closure events. No other transients are as sensitive to this delay. Also, immediate corrective action to replace the scram solenoid pilot valve has been completed for each control rod identified as inoperable. The delay in scram times does not provide an initiator for a new or different kind of accident previously evaluated.

3. The proposed extension of enforcement discretion does not involve a significant reduction in a margin of safety.

   The analysis performed for the most limiting scram sensitive transients has shown that previously established safety limits, with appropriate administrative controls in place, are met and the margins of safety are not significantly reduced.

Therefore, the issue for which a extension to enforcement discretion has been proposed has been reviewed with respect to the above factors and it has been determined that the requested extension to enforcement discretion will not have an adverse impact on the public health and safety and does not involve a significant safety hazard.

ENVIRONMENTAL CONSIDERATION

The issue for which the extended enforcement discretion is requested has been reviewed against the criteria of 10CFR51.22 for environmental considerations. As identified above, the proposed extension of enforcement discretion does not involve a significant safety hazard, nor increase the types and amounts of effluents that may be released offsite, nor significantly increase individual or cumulative occupational radiation exposure. Accordingly, the proposed extension of enforcement discretion meets the eligibility criteria given in 10CFR51.22(c)(9) for a categorical exclusion from the requirement for an environmental impact statement. Pursuant to 10CFR51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with this request.