



WASHINGTON PUBLIC POWER SUPPLY SYSTEM

P.O. Box 968 • Richland, Washington 99352-0968

October 2, 1997
GO2-97-184

Docket No. 50-397

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

Gentlemen:

Subject: WNP-2, OPERATING LICENSE NPF-21
INSPECTION REPORT 97-10
RESPONSE TO NOTICE OF VIOLATION

- References:
- 1) Letter GO2-97-131, dated June 25, 1997, PR Bemis (SS) to NRC, "Reactor Feedwater Pump Trip Test Response to Questions"
 - 2) Letter, dated September 2, 1997, AT Howell III (NRC) to JV Parrish (SS), "NRC Special Inspection Report 50-397/97-10 and Notice of Violation"

The Supply System's response to the referenced Notice of Violation, pursuant to the provisions of Section 2.201, Title 10, Code of Federal Regulations, is enclosed as Attachment A.

Should you have any questions or desire additional information pertaining to this letter, please call me or P.J. Inserra at (509) 377-4147.

Respectfully,

P.R. Bemis
Vice President, Nuclear Operations
Mail Drop PE23

Attachment

cc: EW Merschoff - NRC RIV
KE Perkins, Jr. - NRC RIV, WCFO
TG Colburn - NRR

NRC Senior Resident Inspector - 927N
DL Williams - BPA/399
PD Robinson - Winston & Strawn

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INSPECTION REPORT 97-10 RESPONSE TO NOTICE OF VIOLATION

Attachment A
Page 1

VIOLATION A

Restatement of Violation

10 CFR Part 50, Appendix B, Criterion III (Design Control) states, in part, that "[m]easures shall be established to assure that applicable regulatory requirements and the design basis . . . are correctly translated into specifications, drawings, procedures, and instructions."

Contrary to the above, as of May 2, 1995, measures did not assure that the applicable regulatory requirements and the design basis, for the power-up rate modification, were correctly translated into specifications, drawings, procedures, and instructions. Specifically, the power-up rate modification (Technical Specification Amendment 137) became effective on May 2, 1995, with the recirculation system cavitation interlock setpoint established at 9.9°F even though the recirculation system design basis, as indicated in General Electric Letter 94-PU-0013, dated March 18, 1994, specified, in part, that the 10.7°F recirculation system differential temperature cavitation setpoint was consistent with the analysis in support of the power-up rate project. No additional analysis was performed to support the change in the power-up rate recirculation system design basis.

This is a Severity Level IV violation (Supplement I)

Response to Violation

The Supply System accepts the violation.

Reason for Violation

The reason for the violation was inadequate attention to detail and lack of a questioning attitude. This led to acceptance of previously known design information without in-depth challenge during the design phase of the power uprate project and implementation of extended core flow.

The reactor recirculation system differential temperature cavitation interlock setpoint of 10.7°F was established by General Electric in the original plant design. This setpoint was changed to 9.9°F by the Supply System based on data obtained during the initial plant startup power ascension test program. The jet pump cavitation interlock on the power-to-flow map was obtained by reducing power at 96.5 percent core flow until the differential temperature between the recirculation pump suction and steam dome was less than 9.9°F with no cavitation. The differential temperature cavitation setpoint was then set at 9.9°F and the jet pump cavitation interlock line was drawn through this data point on the power-to-flow map, parallel to the General Electric design input of 10.7°F.

As part of the power uprate project, General Electric reviewed the WNP-2 design basis and noted the inconsistency between the plant test data and design analysis values for this non-safety related setpoint. Based on a request from the Supply System, General Electric reexamined the setpoint



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value of 10.7°F. General Electric responded that the recommended setpoint of 10.7°F was a conservative value based on bounding recirculation system performance. General Electric also noted that the 10.7°F setpoint was consistent with the analysis performed in support of the power uprate project. It was concluded that further evaluation would be necessary to concur with a change to this setpoint.

However, because the Instrument Master Data Sheet indicated an in-field setting of 9.9°F ($\pm 1^\circ\text{F}$), personnel involved in the power uprate instrument setpoint change process determined that the existing setting encompassed the proposed change. Therefore, it was incorrectly assumed that a setpoint change to 10.7°F was not required.

The inconsistency between the plant test data value of 9.9°F and calculated value of 10.7°F should have also been re-analyzed in support of implementation of General Electric document NEDC-31107, "Safety Review of WPPSS Nuclear Project No 2 at Core Flow Conditions Above Rated Flow Throughout Cycle 1 and Final Feedwater Temperature Reduction," dated March 1986. In part, this analysis allowed for plant operation up to 106 percent rated core flow. Increased core flow influences the differential temperature at which cavitation occurs. The effect of the increased core flow on the reactor recirculation system differential temperature cavitation interlock setpoint was not re-analyzed by the Supply System at that time.

Corrective Steps Taken and Results Achieved

1. An Event Evaluation Team (EET), composed primarily of Supply System personnel, was established to investigate the reactor feedwater pump trip test and reactor scram which occurred on March 27, 1997. Specific areas evaluated by the team included analytical results of testing performed, performance of the digital feedwater level control and adjustable speed drive systems, and the adequacy of the design related to the digital feedwater level control and adjustable speed drive systems. As a result of this assessment, several recommendations were developed and are being implemented as part of our Problem Evaluation Request process.
2. A second Independent Evaluation Team (IET), composed primarily of non-Supply System personnel, evaluated the event and performed a critical review of the investigation conducted by the Supply System EET. The IET validated the findings of the EET.
3. A further evaluation of the reactor recirculation differential cavitation setpoint was performed. Based on this evaluation, General Electric concluded that the 10.7°F value remained valid. The setpoint includes margin and accounts for the higher cavitation conditions which would be experienced with increased core flow.
4. The reactor recirculation differential cavitation setpoint was changed from 9.9°F to 10.7°F to reflect the calculated value. Analysis was also performed to determine the maximum time that cavitation could exist without component damage. As a result of the analysis, the differential



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time delay to runback was increased from 15 seconds to ten minutes to avoid unnecessary runbacks resulting from transient operation.

Corrective Steps That Will Be Taken to Avoid Further Violations

In Reference 1, we responded to a series of questions pertaining to the reactor feedwater pump trip test and reactor scram which occurred on March 27, 1997. Included in our response was a listing of recommendations from the EET and IET assessments, and the planned response to those recommendations.

In all cases, the recommendations of the EET and IET were accepted and entered into the Plant Tracking Log. Several of these actions are directly related to preventing recurrence of this violation.

In the Notice of Violation, it was stated that our response may reference or include previous docketed correspondence, if the correspondence adequately addresses the required response. Accordingly, please refer to Reference 1, Attachment B, for a complete listing of our corrective actions.

Date of Full Compliance

Full compliance was achieved on June 25, 1997 when the reactor recirculation differential cavitation setpoint was changed to 10.7°F.

VIOLATION B

Restatement of Violation

10 CFR Part 50.59, in part, permits the licensee to make a change to the facility, as described in the safety analysis report, without prior Commission approval provided the change does not involve an unreviewed safety question. If such a change is made, the licensee is required to maintain records of the change and the records must include a written safety evaluation which provides the bases for the determination that the change does not involve an unreviewed safety question.

Final Safety Analysis Report, Appendix H.2.3.3.2.2, "Feedwater Pump Trip Runback," Amendment 35, states that, when the recirculation pump is running on the 100 percent power supply, the flow control valves close in response to a trip of one feedwater pump and indication of a reactor water level decrease (level drops to Level 4). This runback prevents a scram from a low level condition caused by the feedwater pump trip.

Contrary to the above, as of March 27, 1997, the written safety evaluations performed to support the installation of the adjustable speed drives (Safety Evaluation Control 93-200, dated July 11, 1995) and deferral of power ascension testing (Safety Evaluation Control 96-106, dated December 12, 1996) were not adequate to provide the basis that an unreviewed safety question did not exist.



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Specifically, the licensing basis impact determination for Plant Modification Request 87-0244 did not provide a sufficient basis to determine that the change did not involve an unreviewed safety question for the design and testing of the reactor recirculation system adjustable speed drive. The licensing basis impact determination did not identify that the reactor recirculation system cavitation interlock would actuate during a loss of a reactor feedwater pump. This resulted in a second recirculation pump runback and reactor operation near the power-to-flow instability Region A, an area of operation prohibited by Technical Specifications. This plant response was not recognized and reviewed.

This is a Severity Level IV violation (Supplement I)

Response to Violation

The Supply System accepts the violation.

Reason for Violation

The reason for the violation was inadequate attention to detail and lack of a questioning attitude. This led to acceptance of previously known design information without in-depth challenge during the design phase of the adjustable speed drive and digital feedwater level control system modifications. The integrated effect of these modifications, in conjunction with power uprate one year earlier, was not considered in relation to the cavitation interlock protection setpoint. This resulted in the failure to identify, and incorporate into the safety evaluations, the potential for activation of the reactor recirculation differential temperature cavitation interlock.

Corrective Steps Taken and Results Achieved

1. As stated on our response to Violation A, an EET was established to investigate the reactor feedwater pump trip test and reactor scram which occurred on March 27, 1997. Several recommendations were developed and the follow-up IET validated the findings of the EET.
2. A new safety evaluation (SE 97-078) was performed and provided a basis for determining that plant response to the March 27, 1997 reactor feedwater pump trip test did not reveal an unreviewed safety question. For the purposes of the safety evaluation, the implementing activity was defined as the plant response to the reactor feedwater pump trip test event. This included the differential temperature cavitation interlock trip and associated reactor recirculation pump runback, apparent entry into Region A of the power-to flow map (it was determined by followup engineering analyses that Region A had not been entered), and water level response. For ease of reference, the safety evaluation is summarized as follows.

Initiation of the differential temperature cavitation interlock and subsequent runback of the reactor recirculation system pumps to 15 Hz is bounded by the more severe and previously-analyzed trip of two recirculation pumps transient.

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Reactor recirculation system flow run-back and recirculation pump trip events that lead to entry into Region A of the WNP-2 power-to-flow map were considered in establishing the stability region boundaries. Personnel recognized during the development of the stability region that certain unplanned operational occurrences, most notably recirculation pump trips and runbacks, would lead to entry into the stability region. The region definitions fully account for entry into the region as a result of a core flow reduction, independent of the probability of occurrence of such a reduction in core flow.

Entry into Region A of the power-to-flow map is controlled by Technical Specification 3.4.1, "Recirculation Loops Operating." Compliance with the limiting condition for operation action statements in this specification, in the event of entry into Region A, assures that an unreviewed safety question does not exist. Although the Technical Specifications allow 15 minutes before action is necessary, management expectations, Operating Procedure PPM 4.12.4.7, "Unintentional Entry into Region of Potential Core Power Instabilities," and conservative control room decision making resulted in a manual scram upon the apparent entry into Region A. (The reactor was scrammed within approximately two minutes following the unplanned runback to 15 Hz.) This precluded operation in the exclusion region.

The adjustable speed drive and digital feedwater level control system pre-scram response to the feedwater pump trip and subsequent recirculation flow runback was as expected, with regard to reactor vessel water level, and did not result in a Level-3 scram. As feedwater flow stabilized and prior to the manual scram, reactor vessel level swelled and peaked at slightly over 51 inches, avoiding a Level-8 isolation. The trip of a single feedwater pump, that does not result in a reactor trip, indicates that the control system response does not increase the probability of a more severe transient resulting from an operational event. Other, less limiting, operational events are analyzed in the General Electric Adjustable Speed Drive Control System Report and are shown not to degrade due to adjustable speed drive and digital feedwater level control system response. Accordingly, less limiting transients do not become additional transients for FSAR analyses purposes.

The post-scram response was not dissimilar to what would have been seen with the previous analog system. Since the Level-8 trip was reached post-scram, there was no adverse impact on fuel thermal limits. For long-term cooling and inventory makeup, the high pressure core spray and reactor core isolation systems would be available if water level decreased to their initiation setpoints. Accordingly, the transients in the FSAR are still bounding and the consequences of an accident, as analyzed in the FSAR, were not increased.

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Corrective Steps That Will Be Taken to Avoid Further Violations

In Reference 1, we responded to a series of questions pertaining to the reactor feedwater pump trip test and reactor scram which occurred on March 27, 1997. Included in our response was a listing of recommendations from the EET and IET assessments, and the planned response to those recommendations.

In all cases, the recommendations of the EET and IET were accepted and entered into the Plant Tracking Log. Several of these actions are directly related to preventing recurrence of this violation.

In the Notice of Violation, it was stated that our response may reference or include previous docketed correspondence, if the correspondence adequately addresses the required response. Accordingly, please refer to Reference 1, Attachment B, for a complete listing of our corrective actions.

Date of Full Compliance

Full compliance was achieved on June 26, 1997 when Safety Evaluation 97-078 was approved by the Plant Operations Committee.



CATEGORY 1

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SUBJECT: Responds to NRC 970902 ltr re violations noted in insp rept
 50-397/97-10. Corrective actions: established Event Evaluation
 Team & Independent Evaluation Team to investigate reactor
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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

P.O. Box 968 • Richland, Washington 99352-0968

October 2, 1997
GO2-97-184

Docket No. 50-397

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

Gentlemen:

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INSPECTION REPORT 97-10
RESPONSE TO NOTICE OF VIOLATION

- References: 1) Letter GO2-97-131, dated June 25, 1997, PR Bemis (SS) to NRC,
"Reactor Feedwater Pump Trip Test Response to Questions"
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(SS), "NRC Special Inspection Report 50-397/97-10 and Notice of
Violation"

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Should you have any questions or desire additional information pertaining to this letter, please call me or P.J. Inserra at (509) 377-4147.

Respectfully,



P.R. Bemis
Vice President, Nuclear Operations
Mail Drop PE23

Attachment 140045

cc: EW Merschoff - NRC RIV
KE Perkins, Jr. - NRC RIV, WCFO
TG Colburn - NRR

NRC Senior Resident Inspector - 927N
DL Williams - BPA/399
PD Robinson - Winston & Strawn

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VIOLATION A

Restatement of Violation

10 CFR Part 50, Appendix B, Criterion III (Design Control) states, in part, that "[m]easures shall be established to assure that applicable regulatory requirements and the design basis . . . are correctly translated into specifications, drawings, procedures, and instructions."

Contrary to the above, as of May 2, 1995, measures did not assure that the applicable regulatory requirements and the design basis, for the power-up rate modification, were correctly translated into specifications, drawings, procedures, and instructions. Specifically, the power-up rate modification (Technical Specification Amendment 137) became effective on May 2, 1995, with the recirculation system cavitation interlock setpoint established at 9.9°F even though the recirculation system design basis, as indicated in General Electric Letter 94-PU-0013, dated March 18, 1994, specified, in part, that the 10.7°F recirculation system differential temperature cavitation setpoint was consistent with the analysis in support of the power-up rate project. No additional analysis was performed to support the change in the power-up rate recirculation system design basis.

This is a Severity Level IV violation (Supplement I)

Response to Violation

The Supply System accepts the violation.

Reason for Violation

The reason for the violation was inadequate attention to detail and lack of a questioning attitude. This led to acceptance of previously known design information without in-depth challenge during the design phase of the power uprate project and implementation of extended core flow.

The reactor recirculation system differential temperature cavitation interlock setpoint of 10.7°F was established by General Electric in the original plant design. This setpoint was changed to 9.9°F by the Supply System based on data obtained during the initial plant startup power ascension test program. The jet pump cavitation interlock on the power-to-flow map was obtained by reducing power at 96.5 percent core flow until the differential temperature between the recirculation pump suction and steam dome was less than 9.9°F with no cavitation. The differential temperature cavitation setpoint was then set at 9.9°F and the jet pump cavitation interlock line was drawn through this data point on the power-to-flow map, parallel to the General Electric design input of 10.7°F.

As part of the power uprate project, General Electric reviewed the WNP-2 design basis and noted the inconsistency between the plant test data and design analysis values for this non-safety related setpoint. Based on a request from the Supply System, General Electric reexamined the setpoint

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value of 10.7°F. General Electric responded that the recommended setpoint of 10.7°F was a conservative value based on bounding recirculation system performance. General Electric also noted that the 10.7°F setpoint was consistent with the analysis performed in support of the power uprate project. It was concluded that further evaluation would be necessary to concur with a change to this setpoint.

However, because the Instrument Master Data Sheet indicated an in-field setting of 9.9°F ($\pm 1^\circ\text{F}$), personnel involved in the power uprate instrument setpoint change process determined that the existing setting encompassed the proposed change. Therefore, it was incorrectly assumed that a setpoint change to 10.7°F was not required.

The inconsistency between the plant test data value of 9.9°F and calculated value of 10.7°F should have also been re-analyzed in support of implementation of General Electric document NEDC-31107, "Safety Review of WPPSS Nuclear Project No 2 at Core Flow Conditions Above Rated Flow Throughout Cycle 1 and Final Feedwater Temperature Reduction," dated March 1986. In part, this analysis allowed for plant operation up to 106 percent rated core flow. Increased core flow influences the differential temperature at which cavitation occurs. The effect of the increased core flow on the reactor recirculation system differential temperature cavitation interlock setpoint was not re-analyzed by the Supply System at that time.

Corrective Steps Taken and Results Achieved

1. An Event Evaluation Team (EET), composed primarily of Supply System personnel, was established to investigate the reactor feedwater pump trip test and reactor scram which occurred on March 27, 1997. Specific areas evaluated by the team included analytical results of testing performed, performance of the digital feedwater level control and adjustable speed drive systems, and the adequacy of the design related to the digital feedwater level control and adjustable speed drive systems. As a result of this assessment, several recommendations were developed and are being implemented as part of our Problem Evaluation Request process.
2. A second Independent Evaluation Team (IET), composed primarily of non-Supply System personnel, evaluated the event and performed a critical review of the investigation conducted by the Supply System EET. The IET validated the findings of the EET.
3. A further evaluation of the reactor recirculation differential cavitation setpoint was performed. Based on this evaluation, General Electric concluded that the 10.7°F value remained valid. The setpoint includes margin and accounts for the higher cavitation conditions which would be experienced with increased core flow.
4. The reactor recirculation differential cavitation setpoint was changed from 9.9°F to 10.7°F to reflect the calculated value. Analysis was also performed to determine the maximum time that cavitation could exist without component damage. As a result of the analysis, the differential

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time delay to runback was increased from 15 seconds to ten minutes to avoid unnecessary runbacks resulting from transient operation.

Corrective Steps That Will Be Taken to Avoid Further Violations

In Reference 1, we responded to a series of questions pertaining to the reactor feedwater pump trip test and reactor scram which occurred on March 27, 1997. Included in our response was a listing of recommendations from the EET and IET assessments, and the planned response to those recommendations.

In all cases, the recommendations of the EET and IET were accepted and entered into the Plant Tracking Log. Several of these actions are directly related to preventing recurrence of this violation.

In the Notice of Violation, it was stated that our response may reference or include previous docketed correspondence, if the correspondence adequately addresses the required response. Accordingly, please refer to Reference 1, Attachment B, for a complete listing of our corrective actions.

Date of Full Compliance

Full compliance was achieved on June 25, 1997 when the reactor recirculation differential cavitation setpoint was changed to 10.7°F.

VIOLATION B

Restatement of Violation

10 CFR Part 50.59, in part, permits the licensee to make a change to the facility, as described in the safety analysis report, without prior Commission approval provided the change does not involve an unreviewed safety question. If such a change is made, the licensee is required to maintain records of the change and the records must include a written safety evaluation which provides the bases for the determination that the change does not involve an unreviewed safety question.

Final Safety Analysis Report, Appendix H.2.3.3.2.2, "Feedwater Pump Trip Runback," Amendment 35, states that, when the recirculation pump is running on the 100 percent power supply, the flow control valves close in response to a trip of one feedwater pump and indication of a reactor water level decrease (level drops to Level 4). This runback prevents a scram from a low level condition caused by the feedwater pump trip.

Contrary to the above, as of March 27, 1997, the written safety evaluations performed to support the installation of the adjustable speed drives (Safety Evaluation Control 93-200, dated July 11, 1995) and deferral of power ascension testing (Safety Evaluation Control 96-106, dated December 12, 1996) were not adequate to provide the basis that an unreviewed safety question did not exist.



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Specifically, the licensing basis impact determination for Plant Modification Request 87-0244 did not provide a sufficient basis to determine that the change did not involve an unreviewed safety question for the design and testing of the reactor recirculation system adjustable speed drive. The licensing basis impact determination did not identify that the reactor recirculation system cavitation interlock would actuate during a loss of a reactor feedwater pump. This resulted in a second recirculation pump runback and reactor operation near the power-to-flow instability Region A, an area of operation prohibited by Technical Specifications. This plant response was not recognized and reviewed.

This is a Severity Level IV violation (Supplement I)

Response to Violation

The Supply System accepts the violation.

Reason for Violation

The reason for the violation was inadequate attention to detail and lack of a questioning attitude. This led to acceptance of previously known design information without in-depth challenge during the design phase of the adjustable speed drive and digital feedwater level control system modifications. The integrated effect of these modifications, in conjunction with power uprate one year earlier, was not considered in relation to the cavitation interlock protection setpoint. This resulted in the failure to identify, and incorporate into the safety evaluations, the potential for activation of the reactor recirculation differential temperature cavitation interlock.

Corrective Steps Taken and Results Achieved

1. As stated on our response to Violation A, an EET was established to investigate the reactor feedwater pump trip test and reactor scram which occurred on March 27, 1997. Several recommendations were developed and the follow-up IET validated the findings of the EET.
2. A new safety evaluation (SE 97-078) was performed and provided a basis for determining that plant response to the March 27, 1997 reactor feedwater pump trip test did not reveal an unreviewed safety question. For the purposes of the safety evaluation, the implementing activity was defined as the plant response to the reactor feedwater pump trip test event. This included the differential temperature cavitation interlock trip and associated reactor recirculation pump runback, apparent entry into Region A of the power-to flow map (it was determined by followup engineering analyses that Region A had not been entered), and water level response. For ease of reference, the safety evaluation is summarized as follows.

Initiation of the differential temperature cavitation interlock and subsequent runback of the reactor recirculation system pumps to 15 Hz is bounded by the more severe and previously-analyzed trip of two recirculation pumps transient.

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Reactor recirculation system flow run-back and recirculation pump trip events that lead to entry into Region A of the WNP-2 power-to-flow map were considered in establishing the stability region boundaries. Personnel recognized during the development of the stability region that certain unplanned operational occurrences, most notably recirculation pump trips and runbacks, would lead to entry into the stability region. The region definitions fully account for entry into the region as a result of a core flow reduction, independent of the probability of occurrence of such a reduction in core flow.

Entry into Region A of the power-to-flow map is controlled by Technical Specification 3.4.1, "Recirculation Loops Operating." Compliance with the limiting condition for operation action statements in this specification, in the event of entry into Region A, assures that an unreviewed safety question does not exist. Although the Technical Specifications allow 15 minutes before action is necessary, management expectations, Operating Procedure PPM 4.12.4.7, "Unintentional Entry into Region of Potential Core Power Instabilities," and conservative control room decision making resulted in a manual scram upon the apparent entry into Region A. (The reactor was scrammed within approximately two minutes following the unplanned runback to 15 Hz.) This precluded operation in the exclusion region.

The adjustable speed drive and digital feedwater level control system pre-scram response to the feedwater pump trip and subsequent recirculation flow runback was as expected, with regard to reactor vessel water level, and did not result in a Level-3 scram. As feedwater flow stabilized and prior to the manual scram, reactor vessel level swelled and peaked at slightly over 51 inches, avoiding a Level-8 isolation. The trip of a single feedwater pump, that does not result in a reactor trip, indicates that the control system response does not increase the probability of a more severe transient resulting from an operational event. Other, less limiting, operational events are analyzed in the General Electric Adjustable Speed Drive Control System Report and are shown not to degrade due to adjustable speed drive and digital feedwater level control system response. Accordingly, less limiting transients do not become additional transients for FSAR analyses purposes.

The post-scram response was not dissimilar to what would have been seen with the previous analog system. Since the Level-8 trip was reached post-scram, there was no adverse impact on fuel thermal limits. For long-term cooling and inventory makeup, the high pressure core spray and reactor core isolation systems would be available if water level decreased to their initiation setpoints. Accordingly, the transients in the FSAR are still bounding and the consequences of an accident, as analyzed in the FSAR, were not increased.

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Corrective Steps That Will Be Taken to Avoid Further Violations

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Date of Full Compliance

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