November 16, 2001

Mr. Oliver D. Kingsley, President
Exelon Nuclear
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: DRESDEN NUCLEAR POWER STATION UNITS 2 AND 3
NRC INSPECTION REPORT 50-237/01-21(DRS); 50-249/01-21(DRS)

Dear Mr. Kingsley:

On October 16, 2001, the NRC completed an inspection at the Dresden Nuclear Power Station, Units 2 and 3. The enclosed report documents the inspection findings which were discussed on October 16, 2001, with Mr. P. Swafford and other members of your Dresden staff.
This inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed equipment, and interviewed personnel. Specifically, the inspection focused on your staff's response to the discovery of damage to piping system supports for the high pressure coolant injection system indicative of a substantial system hydraulic transient.

Based on the results of this inspection, the inspectors identified six findings characterized as unresolved items pending determination of the safety significance of the findings. The findings, some with multiple examples, involved violations of regulatory requirements related to procedures, procedure adherence, corrective actions, test acceptance criteria, and Technical Specification surveillance testing. The findings were associated with multiple deficiencies in engineering work products and support necessary to assure that the high pressure coolant injection system would perform its safety function. These findings were determined to be at least of very low safety significance (Green) based on the high pressure coolant injection system being in a degraded condition, with continuing susceptibility to additional water hammer damage, for a period of approximately three months before your staff initiated corrective actions. A seventh unresolved item involves your continuing evaluation of the impact of system damage from the hydraulic transient and potential for further hydraulic transients on the function and operability of the high pressure coolant injection system. NRC review of the results of that evaluation will contribute to the resolution of these unresolved items and determination of the risk significance of these findings.

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Sincerely,

/RA/

John A. Grobe, Director
Division of Reactor Safety

Docket Nos. 50-237; 50-249
License Nos. DPR-19; DPR-25

Enclosure: Inspection Report 50-237/01-21(DRS);
50-249/01-21(DRS)

cc w/encl: W. Bohlke, Senior Vice President, Nuclear Services
C. Crane, Senior Vice President - Mid-West Regional
J. Cotton, Senior Vice President - Operations Support
J. Benjamin, Vice President - Licensing and Regulatory Affairs
R. Hovey, Operations Vice President
J. Skolds, Chief Operating Officer
K. Ainger, Director - Licensing
R. Helfrich, Senior Counsel, Nuclear
DCD - Licensing
P. Swafford, Site Vice President
R. Fisher, Station Manager
D. Ambler, Regulatory Assurance Manager
M. Aguilar, Assistant Attorney General
Illinois Department of Nuclear Safety
State Liaison Officer
Chairman, Illinois Commerce Commission

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos:	50-237; 50-249
License Nos:	DPR-19; DPR-25
Report No:	50-237/01-21(DRS); 50-249/01-21(DRS)
Licensee:	Exelon Generation Company, LLC
Facility:	Dresden Nuclear Power Station, Units 2 and 3
Location:	6500 N. Dresden Road Morris, IL 60450
Dates:	September 24 through October 16, 2001
Inspector:	J. Gavula, Senior Reactor Inspector J. Neurauter, Reactor Inspector in Training
Approved by:	J. Jacobson, Chief Mechanical Engineering Branch Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000237-01-21(DRS), 050000249-01-21(DRS), on 09/24-10/16/2001, Exelon Generation Company, LLC, Dresden Nuclear Power Station, Units 2 and 3. Operability Evaluations. Six findings with the color To-Be-Determined and one Unresolved Item.

The inspection was conducted by regional engineering specialists. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter 0609 "Significance Determination Process" (SDP). Findings for which the SDP does not apply are indicated by either No Color or the severity level of the applicable violation. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described at its Reactor Oversight Process website at http://www.nrc.gov/NRR/OVERSIGHT/index.html.

Inspector Identified Findings

Cornerstone: Mitigating Systems

- TBD. The operability of the HPCI system with a degraded pipe support was indeterminate because the licensee did not repair the support, took no action to prevent recurrence of the hydraulic transient that had damaged the support, and did not evaluate the system for recurrence of the transient. The system remained in this degraded condition for at least 70 days, without assurance that it could perform its safety function until, through intervention by the NRC, additional support discrepancies were identified, the degraded support was repaired, and a significant amount of air was vented from the discharge piping.

  The support damage had been caused by a water hammer due to voids in the discharge piping. The HPCI system would have experienced another water hammer because no actions were taken to eliminate the voids, and the damage to the system from another water hammer may have rendered the system inoperable. The significance of the finding has not yet been determined by the licensee, and this item is considered an Unresolved Item (Section 1R15.b.1).

- TBD. A violation of 10 CFR Part 50, Appendix B, Criterion V, Instructions, Procedures, and Drawings, for failing to provide adequate documentation in an operability determination as required by licensee procedures. The documentation provided in Operability Determination No. 01-031, as required by Dresden Procedure RS-AA-105, Operability Determination Process, was inadequate because it did not consider any water hammer loads in evaluating the HPCI system operability with a degraded support. Because the support had not been repaired, the system's response to the hydraulic transient was not bounded by the previous event. Also, since no action had been taken to prevent recurrence of the transient, the system was vulnerable to another water hammer.

  This finding was greater than minor because it had a credible impact on safety, in that, it was a contributing cause of the HPCI system operability not being ensured for more than 70 days. The significance of the finding can not be determined until the licensee completes the evaluation of the HPCI system's past operability for this condition. This

item is considered an Unresolved Item pending completion of the licensee's evaluation (Section 1R15.b.2).

- TBD. A violation of 10 CFR Part 50, Appendix B, Criterion XVI, Corrective Action, with four examples for inadequate corrective action associated with a damaged pipe support on the HPCI discharge piping. The initial corrective actions did not promptly repair the degraded support, determine the cause of the load that damaged the support, or prevent recurrence of the load. The subsequent root cause evaluation did not determine the cause of the water hammer or initiate corrective actions to prevent recurrence of a water hammer. Additional corrective actions did not promptly identify another pipe support with discrepancies, and activities to determine the cause of the water hammer failed to promptly identify pertinent pressure transient data.

  This finding was greater than minor because it had a credible impact on safety, in that, it was a contributing cause of the HPCI system operability not being ensured for more than 70 days. The significance of the finding can not be determined until the licensee completes the evaluation of the HPCI system's past operability for this condition. This item is considered an Unresolved Item pending completion of the licensee's evaluation (Section 1R15.b.3).

- TBD. A violation of Technical Specification Surveillance Requirement 3.5.1.1 for inadequate surveillance procedure which resulted in a significant amount of air in the HPCI discharge piping. The procedure failed to specify venting the system while the pump suction was aligned to the condensate storage tank.

  This finding was greater than minor because it had a credible impact on safety, in that, the inadequate surveillance failed to detect a large volume of air in HPCI discharge piping, making it susceptible to a significant water hammer. The significance of the finding can not be determined until the licensee completes the evaluation of the HPCI system's past operability for this condition. This item is considered an Unresolved Item pending completion of the licensee's evaluation (Section 1R15.b.4).

- TBD. A violation of 10 CFR Part 50, Appendix B, Criterion V, Instructions, Procedures, and Drawings with two examples was identified for the inadequate fill and vent procedures for the HPCI system. Two procedures failed to include the intermediate high point vent valves, which would allow air to reside in more than 40 feet of HPCI discharge piping.

  This finding was greater than minor because it had a credible impact on safety, in that, the inadequate procedures allowed a significant volume of air to remain in the HPCI discharge piping, making it susceptible to a significant water hammer. The significance of the finding can not be determined until the licensee completes the evaluation of the HPCI system's past operability for this condition. This item is considered an Unresolved Item pending completion of the licensee's evaluation (Section 1R15.b.5).

- TBD. A violation of 10 CFR Part 50, Appendix B, Criterion XI, Test Control for having acceptance criteria in a surveillance procedure that had no bases and were not contained in design documents. The allowable temperature on the HPCI discharge pipe following

an injection valve stroke test did not ensure that a steam void had not formed upstream of the injection valve.

This finding was greater than minor because it had a credible impact on safety, in that, the failure to ensure that voids had not formed in the HPCI discharge piping made it susceptible to a significant water hammer. The significance of the finding can not be determined until the licensee completes the evaluation of the HPCI system's past operability for this condition. This item is considered an Unresolved Item pending completion of the licensee's evaluation (Section 1R15.b.6).

- TBD. A violation of 10 CFR Part 50, Appendix B, Criterion XVI, Corrective Action, for inadequate corrective action associated with a 1989 event in which HPCI discharge piping had significant steam voids. The location points for the temperature monitoring could not detect steam void formation in the HPCI discharge piping.

  This finding was greater than minor because it had a credible impact on safety, in that, the failure to ensure that voids had not formed in the HPCI piping due to valve leakage made it susceptible to a significant water hammer. The significance of the finding can not be determined until the licensee completes the evaluation of the HPCI system's past operability for this condition. This item is considered an Unresolved Item pending completion of the licensee's evaluation (Section 1R15.b.7).

Report Details

1. REACTOR SAFETY

Cornerstones: Mitigating Systems

1R15 Operability Evaluations

a. Inspection Scope

On September 24, 2001, the inspectors reviewed the operability evaluation associated with a damaged pipe support on the Unit 3 high pressure coolant injection (HPCI) discharge piping. The operability evaluation was reviewed for technical adequacy and to determine if operability of the system was justified with a degraded support. In addition, the inspectors walked down pipe supports adjacent to the degraded support to independently verify the licensee's verbal conclusion regarding the occurrence of a water hammer.

b. Findings

Background

On July 19, 2001, licensee engineers identified a degraded lateral pipe support on the 14-inch HPCI injection piping. Two of the four 1-inch diameter anchor bolts on pipe support M-1187D-80 were pulled out from the concrete approximately 1.5 inches. Because of this condition, the support could not function as analyzed in the design basis piping analysis. The engineers documented the problem in Condition Report D2001-03793, writing that it was "believed that this support was damaged due to a significant load during system operation." Licensee engineers inspected adjacent pipe supports and did not identify any other obvious signs of damage. The proposed solution was to repair or replace the base plate anchorage.

The licensee completed an operability evaluation on July 24, 2001, in accordance with procedure RS-AA-105, "Operability Determination Process," and assumed that support M-1187D-80 could not perform its function. The evaluation reviewed the existing pipe stress analysis, which considered design basis loads (dead weight, thermal, and seismic) and concluded that the system was operable, based on engineering judgment because of sufficient stress margins. The operability evaluation specified one corrective action, to restore the support to the as-designed condition, with a due date of November 15, 2001. No compensatory actions were required by the operability evaluation.

After reviewing the condition report and operability evaluation, the licensee's Condition Review Group determined that an apparent cause evaluation should be performed for this issue. The licensee engineers completed the apparent cause evaluation on August 24, 2001, concluding that the "apparent cause of the event is a transient (i.e., water hammer) associated with the scram on July 5, 2001." The apparent cause evaluation specified one new corrective action, "to perform a water hammer evaluation to determine if further actions are required," and specified a due date of December 7, 2001.

After reviewing the licensee's operability evaluation, NRC Resident Inspectors questioned its validity and sent it to Region III for review by specialist inspectors. On September 24, 2001, regional specialists questioned the technical adequacy of the operability evaluation's conclusions because: (1) no actions had been taken to prevent the recurrence of the transient load that had damaged the support; (2) the pipe support had not yet been fixed, and the system's response, given a comparable transient load, would not be bounded by the previous event; and (3) the magnitude of the transient load had not been determined and system had not been evaluated to ensure that it would remain operable if the transient load recurred.

During a teleconference with the NRC on September 27, 2001, plant personnel stated that the HPCI system had not experienced a water hammer because their recent inspections of adjacent supports did not identify any corroborating evidence. Specifically, the licensee stated that pipe support M-1187D-83 would have shown signs of damage if a water hammer had occurred. The licensee explicitly stated that they had walked down the supports on September 26, 2001, and they had not observed any indications of water hammer damage. In addition, the licensee stated that during the scram on July 5, 2001, operators had taken immediate action to control HPCI injection and the maximum pump discharge pressure noted in the control room data was 193 pounds per square inch. Also during this teleconference, plant personnel stated that there were no voids in the system, because the HPCI pump suction had been aligned to the condensate storage tank for many months. They went on to state that this method met the Technical Specification surveillance requirement for verifying that the discharge piping was filled with water, and had been approved by NRC headquarters. When questioned whether the system had been vented since the discovery of the damage support, the licensee stated that it had not.

On September 28, 2001, NRC inspectors visually examined pipe support M-1187D-83 and noted that it was not supporting any weight and that there were several small chips of spalled concrete in the immediate area below the support. Since the support's design drawing indicated that it should be carrying a dead weight load of over 4000 pounds, both observations were potentially consistent with the support being overloaded during a water hammer.

Based on concerns raised by the NRC, the licensee vented the HPCI system on September 30, 2001, and found air in an estimated 5 feet of the 14-inch discharge pipe at the injection valve. Upon further questioning by the NRC, the licensee realized that the system also had an intermediate high point that had not been vented. Based on the NRC's review of HPCI system isometric drawings, over 40 feet of piping could not be vented using only the one high point vent. On October 3, 2001, the licensee vented this intermediate section of the system and found air in an estimated 24 feet of the discharge pipe. Based on the identification of these additional discrepancies, the licensee initiated an evaluation to determine if the system would have been operable in that configuration.

b.1 Operability of HPCI System with Degraded Support Was Indeterminate

An Unresolved Item (TBD) was identified for potential non-compliance with Technical Specification 3.5.1 associated with indeterminate HPCI system operabliity.

The inspectors identified that the operability of the HPCI system with a degraded support was indeterminate. Based on the background information discussed above, the HPCI system had significant voids in the discharge piping. Therefore, the damage found on pipe support M-1187D-80 was most probably caused by a hydraulic transient, and another transient would have occurred the next time HPCI initiated. Because the support had not been repaired, the system's response to the hydraulic transient was not bounded by the previous event. Further, no action had been taken to prevent recurrence of the hydraulic transient, nor had the system operation been evaluated with recurring hydraulic transient loads. Therefore, the operability of the HPCI system with the degraded support was not justified. This condition existed from at least July 19, 2001, the date that the support damage was identified, until October 3, 2001, when the system was properly vented.

Dresden Technical Specification, 3.5.1, "ECCS Operating," limiting condition for operation states, in part, that each ECCS injection/spray subsystem shall be operable while in Mode 1. However, between at least July 19, 2001, and October 3, 2001, with the unit operating in Mode 1, the operability of the Unit 3 HPCI system, an ECCS injection subsystem, was indeterminate because the system had substantial voids and was therefore vulnerable to a potentially significant water hammer. The licensee is currently evaluating the past operability of the HPCI system in the degraded condition. Pending completion of the licensee's evaluation, the compliance with Technical Specification 3.5.1 is considered an Unresolved Item (URI 50-249/01-21-01).

b.2 Operability Determination of the HPCI System with Degraded Support Was Inadequate

The inspectors identified a violation (TBD) of 10 CFR Part 50, Criterion V for having inadequate documentation to justify operability of the HPCI system in a degraded condition as required by licensee procedures.

Dresden Procedure RS-AA-105, Operability Determination Process, Revision 0, Step 4.1.3, requires, in part, that when a more rigorous evaluation is warranted, supporting operability documentation be prepared by Engineering. For condition report D2001-03793, supporting operability documentation, provided in Operability Determination No. 01-031, dated July 24, 2001, was inadequate, in that, it did not consider any hydraulic transient loads in evaluating the HPCI system with a degraded support. Because the support had not been repaired, the system's capability to function during another hydraulic transient was not bounded by the previous event. Also, since no action had been taken to prevent recurrence of the transient, the system was vulnerable to another hydraulic transient.

This finding was greater than minor because it had a credible impact on safety, in that, the operability of the HPCI system was not ensured for more than 70 days. The significance of this finding can not be determined until the licensee completes their evaluation of the HPCI system with the degraded support including the effects of the

hydraulic transient due to the existing air and its accompanying consequences. However, this issue is considered a violation of 10 CFR Part 50, Appendix B, Criterion V, Instructions, Procedures, and Drawings, in that, the adequate documentation was not provided in Operability Determination No. 01-031 as required by Dresden Procedure RS-AA-105, Operability Determination Process. Pending completion of the licensee's evaluation of the past operability of the HPCI system, this is considered an Unresolved Item (URI 50-249/01-21-02).

b.3 Inadequate Corrective Actions

Inspectors identified a violation (TBD) of 10 CFR Part 50, Appendix B, Criterion XVI, with four examples, for untimely and inadequate corrective actions associated with the degraded HPCI pipe support.

This finding, with four examples discussed below, was greater than minor because it had a credible impact on safety, in that, it was a contributing cause of the HPCI system operability not being ensured for more than 70 days. The significance of this finding can not be determined until the licensee completes their evaluation of the HPCI system with the degraded support including the effects of the hydraulic transient due to the existing air and its accompanying consequences.

b.3.1 Inspectors identified an example of a violation of 10 CFR Part 50, Appendix B, Criterion XVI, for untimely and inadequate corrective actions associated with the degraded HPCI pipe support. On July 19, 2001, the licensee identified a condition adverse to quality for the degraded anchor bolts on HPCI pipe support M-1187D-80. The inspectors considered this a significant condition adverse to quality, in that, an unanticipated and/or unanalyzed operational load caused this safety related component to be unable to perform its safety function. On September 27, 2001, inspectors identified that the damaged support had not been repaired, actions had not been taken to determine the cause of the load, an evaluation had not been performed to ensure the system would perform its safety function if a comparable operational load occurred, and no actions were taken to prevent recurrence of the load.

This issue is considered an example of a violation of 10 CFR Part 50, Appendix B, Criterion XVI, Corrective Actions, in that, the support deficiency was not promptly corrected and the cause of the condition was not determined and corrective actions were not taken to preclude repetition. Pending completion of the licensee's evaluation of the past operability of the HPCI system, this is considered an Unresolved Item. (URI 50-249/01-21-03a)

b.3.2 Inspectors identified another example of a violation (TBD) of 10 CFR Part 50, Appendix B, Criterion XVI, for inadequate corrective actions associated with the degraded HPCI pipe support. On August 24, 2001, the licensee's apparent cause evaluation concluded that the damage to support M-1187D-80 was due to "a transient (i.e., water hammer) associated with the scram on July 5, 2001." As a result of this conclusion, a new corrective action was initiated "to perform a water hammer evaluation to determine if any further actions are required," with an assigned due date of December 7, 2001. On September 27, 2001, inspectors identified that this corrective action was inadequate, in that, although the cause of the support damage was determined, the cause of the water

hammer was not clearly addressed, and no actions were taken to prevent recurrence of the water hammer. While these aspects may have been eventually been addressed during the water hammer evaluation, the damaged support had not yet been repaired and the system's response to a water hammer of a comparable magnitude would not be bounded by the previous event, and system had not been evaluated to ensure that it would remain operable if the water hammer recurred.

This issue was considered another example of a violation of 10 CFR Part 50, Appendix B, Criterion XVI, Corrective Actions, for inadequate corrective actions, in that, no actions were taken to address the cause of the water hammer. Pending completion of the licensee's evaluation of the past operability of the HPCI system, this is considered an Unresolved Item (URI 50-249/01-21-03b).

b.3.3 Inspectors identified another example of a violation (TBD) of 10 CFR Part 50, Appendix B, Criterion XVI, for inadequate corrective actions associated with the degraded HPCI pipe support. During a presentation to the NRC on October 15, 2001, licensee representatives stated that the discrepancy, identified by the NRC on pipe support M-1187D-83 for not supporting any weight, had been previously noted during the licensee's walk downs on September 26, 2001. The licensee's engineers had discounted this observation because the discrepancy did not adversely affect functionality of the piping. On October 16, 2001, inspectors identified that this condition adverse to quality, (the support load did not conform to the design analysis) had not been promptly identified by the licensee and entered into the corrective action system. In addition, the inspectors noted that this observation was not mentioned by the licensee during discussions with the NRC on September 27, 2001.

This issue was considered another example of a violation of 10 CFR Part 50, Appendix B, Criterion XVI, Corrective Actions, in that, a condition adverse to quality was not promptly identified. Pending completion of the licensee's evaluation of the past operability of the HPCI system, this is considered an Unresolved Item (URI 50-249/01-21-03c).

b.3.4 Inspectors identified another example of a violation (TBD) of 10 CFR Part 50, Appendix B, Criterion XVI, for inadequate corrective actions associated with the degraded HPCI pipe support. Following the exit meeting on October 16, 2001, licensee representatives called the NRC inspectors and informed them that they had recently found additional data from the July 5, 2001 scram event associated with the HPCI pump discharge pressures. The data was from a high speed transient recorder and potentially provided additional insight into what damaged pipe support M-1187D-80. On October 25, 2001, inspectors identified that the corrective action activities to determine the cause of the HPCI transient load were inadequate because the critical data had not been identified until more than 90 days after the event.

This was considered another example of a violation of 10 CFR Part 50, Appendix B, Criterion XVI, Corrective Actions, in that, activities to determine that cause of a significant condition adverse to quality were inadequate. Pending completion of the licensee's evaluation of the past operability of the HPCI system, this is considered an Unresolved Item (URI 50-249/01-21-03d).

b.4 Inadequate Verification of HPCI Discharge Piping Being Filled With Water

Inspectors identified a violation (TBD) of Technical Specification 3.5.1.1 for inadequate verification of HPCI discharge piping being filled with water.

Based on the background information above, on September 30, and October 3, 2001, the licensee vented a significant amount of air from two separate sections of the HPCI discharge piping, between the pump discharge valve and injection valve. According to the licensee's preliminary calculations, this represented approximately 29 feet of voided piping. Dresden's Technical Specification surveillance requirement 3.5.1.1 states, in part, to verify that the piping for each ECCS injection/spray subsystem is filled with water from the pump discharge valve to the injection valve every 31 days. The HPCI system is an ECCS injection subsystem. Prior to the above dates, since approximately 1997, the licensee had verified that the HPCI discharge piping was filled with water only by ensuring that the condensate storage tank level was greater than 10.5 feet when the HPCI pump suction was aligned to the condensate storage tank. The licensee had concluded that venting the system from the high points was not required.

This finding was greater than minor because it had a credible impact on safety, in that, the inadequate verification of the piping being filled with water allowed the existence of a significant volume of air. This resulted in susceptibility of the HPCI system to significant water hammer events and contributed to the HPCI system operability not being ensured for more than 70 days. The significance of this finding can not be determined until the licensee completes their evaluation of the HPCI system with the degraded support including the effects of the hydraulic transient due to the existing air and its accompanying consequences. However, this issue was considered a violation of Technical Specification 3.5.1.1, in that, the licensee's verification that the HPCI piping was filled with water was demonstrated to be inadequate. Pending completion of the licensee's evaluation of the past operability of the HPCI system, this is considered an Unresolved Item (URI 50-249/01-21-04).

b.5 Inadequate Fill and Vent Procedures

Inspectors identified two examples of a violation (TBD) of 10 CFR Part 50, Appendix B, Criterion V, for inadequate fill and vent procedures on the HPCI system.

Based on the background information above, the procedures to vent and fill the HPCI system were inadequate, in that, the intermediate high point vent valves were not included. Specifically, Procedure DOP 2300-01, "HPCI System Standby Operation," Section G.4 for filling and venting the system did not include venting the intermediate high point section of the piping through valves 3-2304-A-500 and 3-2304-A-501. In addition Procedure DOS1400-07, "ECCS Venting," Section I.7 for venting the HPCI system was inappropriate for the circumstances, in that, it also did not prescribe venting the intermediate high point section of the piping through valves 3-2304-A-500 and 3-2304-A-501.

This finding was greater than minor because it had a credible impact on safety, in that, the HPCI system was susceptible to a significant water hammer due to air in the piping. This was a contributing cause of the HPCI system operability not being ensured for more

than 70 days. The significance of this finding can not be determined until the licensee completes their evaluation of the HPCI system with the degraded support including the effects of the hydraulic transient due to the existing air and its accompanying consequences. However, this issue was considered of a violation of 10 CFR Part 50, Appendix B, Criterion V, Instructions, Procedures, and Drawings, in that, the procedures were not appropriate to the circumstances because they did not include the intermediate high point vent valves. Pending completion of the licensee's evaluation of the past operability of the HPCI system, this is considered an Unresolved Item (URI 50-249/01-21-05).

b.6 Inadequate Basis for Acceptance Limits in HPCI Temperature Monitoring Procedure

Inspectors identified a violation (TBD) of 10 CFR Part 50, Appendix B, Criterion XI, for having acceptance criteria that were not contained in any design documents or based on any calculation or analysis.

During discussions with NRC inspectors on October 3, 2001, licensee representatives stated that a postulated water hammer scenario associated with steam voids in the system had been ruled out based on periodic temperature monitoring of the HPCI discharge piping. During quarterly valve timing surveillance, the temperature of the discharge piping is monitored through procedure DOS 2300-8, "HPCI Pump Discharge Line Temperature Monitoring." This procedure was a corrective action from Licensee Event Report (LER) 237-89-29, which described elevated HPCI discharge piping temperatures due to feed water system back leakage. As a result of the elevated temperatures during that event, the HPCI system was declared inoperable due to the possible existence of a steam void in the discharge piping.

In reviewing data from recent performance of the above procedure, the NRC inspectors noted that temperature increases of approximately 15^{o}F were recorded after the HPCI injection valve was cycled. This was potentially significant because the temperature monitoring point was in the torus area, at an elevation more than 15 feet lower than the injection valve located in the "X area." When questioned by the NRC inspectors, the licensee said that the temperature variations were potentially due to ambient temperature changes. This explanation did not appear reasonable to the NRC inspectors.

The NRC inspector's explanation for the above temperature difference was that a vapor void formed when the injection valve was opened, forcing warm water from the piping within the "X area" back toward the measurement point. Licensee engineers agreed with this explanation. In reviewing the acceptance criteria for the temperature monitoring procedure, the NRC inspectors questioned the basis for allowing 50^{o}F temperature differences between the initial and final temperatures at various points on the HPCI discharge piping. The procedure's discussion section stated that exceeding this differential temperature was an indication of possible leakage. However, based on the previous data, smaller temperature differences could be indicative of possible leakage or void formation. After extensive research, the licensee was unable to find any calculation or analysis to justify the acceptance criterion. According to a licensee representative, it appears to have been based only on engineering judgment.

This finding was greater than minor because it had a credible impact on safety, in that, the procedure's acceptance criteria failed to ensure that voids due to high temperatures had not formed in the piping. This was a contributing cause of the HPCI system operability not being ensured for more than 70 days. The significance of this finding can not be determined until the licensee completes their evaluation of the HPCI system with the degraded support including the effects of the hydraulic transient due to the existing air and its accompanying consequences. However, this issue was considered a violation of 10 CFR Part 50, Appendix B, Criterion XI, Test Control, in that, the acceptance limit in the procedure was not contained in applicable design documents and was not based on any documented calculation or analysis. Pending completion of the licensee's evaluation of the past operability of the HPCI system, this is considered an Unresolved Item (URI 50-249/01-21-06).

b.7 Inadequate Corrective Action for Previous HPCI Discharge Piping Temperature Event

Inspectors identified a violation (TBD) of 10 CFR Part 50, Appendix B, Criterion XVI, for inadequate corrective actions to address the previous elevated temperatures in the HPCI discharge piping.

As discussed in paragraph b.6 above, the HPCI discharge piping had previously experienced high temperatures due to back leakage from the feed water system. The event was apparently caused by degradation of injection valve 3-2301-8 and check valve 3-2301-7. In reviewing the LER (237-89-29) associated with this event, the NRC inspectors noted that a temperature of 163°F was measured at a piping elevation of 510 feet, and a temperature of 255°F was measured several feet away at elevation 513 feet. This temperature variance indicated that a steam void existed from the injection valve at elevation 525.5 feet down to elevation 513 feet. For that reason, the HPCI system was declared inoperable at that time.

The corrective action from the 1989 event was to institute periodic temperature monitoring of the HPCI discharge piping. Procedure DOS 2300-8, "HPCI Pump Discharge Line Temperature Monitoring," specified five different locations at which to measure temperatures. The closest measurement location to the injection valve was point No. 1, which was at a piping elevation of 510 feet. This was the same location as the 163°F measurement discussed in the LER, and was more than 15.5 feet below the elevation of the injection valve. Since the specified temperature monitoring location could never detect a steam void in the piping unless it had expanded beyond that point, this corrective action taken for the previous high temperature event was considered inadequate. Although temperature monitoring at this location could detect significant back leakage from the down stream valves, it could not detect leakage that could still cause a significant hydraulic transient upon a system initiation.

This finding was greater than minor because it had a credible impact on safety, in that, the corrective actions failed to ensure that voids did not form in the HPCI piping due to high temperatures from valve leakage. This was a contributing cause of the HPCI system operability not being ensured for more than 70 days. The significance of this finding can not be determined until the licensee completes their evaluation of the HPCI system with the degraded support including the effects of the hydraulic transient due to the existing air and its accompanying consequences. However, this issue was considered a violation of

10 CFR Part 50, Appendix B, Criterion XVI, Corrective Actions, in that, actions to correct previous elevated HPCI discharge temperatures by monitoring piping in the torus area were inadequate. Pending completion of the licensee's evaluation of the past operability of the HPCI system, this is considered an Unresolved Item (URI 50-249/01-21-07).

4. OTHER ACTIVITIES

4OA5 Meetings

Exit Meeting

The inspectors presented the inspection results to Mr. P. Swafford, Site Vice President, and other members of licensee management at the exit meeting held on October 16, 2001. No proprietary information was identified. On October 17, 2001, the licensee contacted the NRC inspector regarding additional information on the pressure transient experienced by the HPCI system. This information was subsequently provided to the NRC inspector on October 25, 2001.

KEY POINT OF CONTACT

Licensee
P. Swafford, Site Vice President
R. Fisher, Plant Manager
K. Bowman, Operations Director
T. Luke, Engineering Director
D. Ambler, Regulatory Assurance Manager
J. Sipek, Nuclear Oversight Manager
D. Galanis, Design Engineering Manager
R. Ruffin, Regulatory Assurance
P. Simpson, Licensing Director

NRC
J. Grobe, Director, Division of Reactor Safety
J. Jacobson, Chief, Mechanical Engineering Branch
D. Smith, Senior Resident Inspector
B. Dickson, Resident Inspector
J. Neurauter, Reactor Inspector in Training

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-249/01-21-01	URI	Past operability of the HPCI system with a degraded support was indeterminate because there was no consideration for transient load that had damaged the support
50-249/01-21-02	URI	Operability determination for the HPCI system with a degraded support was inadequate
50-249/01-21-03	URI	Four examples of inadequate corrective action associated with the identification of degraded HPCI pipe support
50-249/01-21-04	URI	Violation of Technical Specification surveillance requirement 3.5.1.1 for inadequate verification that HPCI discharge piping was filled with water
50-249/01-21-05	URI	Two examples of inadequate procedures associated with filling and venting the HPCI discharge piping
50-249/01-21-06	URI	Test control violation associated with the lack a design basis in establishing acceptance criteria for the HPCI temperature monitoring
50-249/01-21-07	URI	Inadequate corrective action associated with the 1989 event for voids in HPCI discharge piping due to high temperatures

LIST OF DOCUMENTS REVIEWED

Calculations
Operability Determination 01-031, HPCI Pipe Support M-1187D-80, July 24, 2001

Drawings
M-374, Diagram of High Pressure Coolant Injection Piping, Revision CD
M-1187C-4, Computer Math Model High Pressure Coolant Injection, Sheet 1, 2 & 3, Revision 0
M-1187D-80, Pipe Support Drawing, Revision 2
M-1187D-83, Pipe Support Drawing, Revision B

Condition Reports
03793, HPCI support baseplate anchor pulled out of underside of 517 slab, July 19, 2001
77082, Air found in HPCI piping during venting, October 1, 2001
77181, Walkdown of HPCI Support M-1187D-80 with NRC inspectors, October 1, 2001
77674, HPCI water discharge piping vented, October 3, 2001
78361, DOS 1400-07 does not identify all required HPCI high points, October 10, 2001
78406, Ineffective Management of HPCI Operability Issues, October 10, 2001
78628, Unit 3 HPCI P7ID (M-374) Requires Enhancement

Procedures/Surveillances
RS-AA-105, Operability Determination Process, Revision 0
DOP 2300-01, High Pressure Coolant Injection System Standby Operation, Revision 18
NES-MS-01.3, Water Hammer Transient Evaluation, Revision 1
DOS 1400-07, ECCS Venting, Revision 10
DOS 2300-08, HPCI Discharge Line Temperature Monitoring, Revision 9

Reports / Miscellaneous Information

LER 237/89-029-04, Elevated HPCI Discharge Piping Temperature Due to Reactor Feedwater System Back Leakage, October 28, 1993
Dresden Unit 3 HPCI Operability Presentation, October 15, 2001
Control Room Log Unit 3, September 30, and October 3, 2001
Unit 3 HPCI Pump Discharge Pressure - Data from July Scram
Transient Accident Data System Data from July 5, 2001