Exelon Generation
Dresden Generating Station
6500 North Dresden Road
Morris, IL 60450-9765
Tel 815-942-2920

www.exeloncorp.com

Exelon Nuclear

10 CFR 50.73

February 14, 2003

RHLTR: #03-0013

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Dresden Nuclear Power Station, Unit 3
Facility Operating License No. DPR-25
NRC Docket No. 50-249

Subject: Licensee Event Report 2002-005-01, "Unit 3 High Pressure Coolant Injection System Inoperable Due to Water Hammer Event"

Enclosed is a supplemental Licensee Event Report 2002-005-01, "Unit 3 High Pressure Coolant Injection System Inoperable Due to Water Hammer Event," for the Dresden Nuclear Power Station. This event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B), "Any operation or condition which was prohibited by the plant's Technical Specifications."

If you have any questions, please contact Mr. Jeff Hansen, Regulatory Assurance Manager at (815) 416-2800.

Respectfully,

R. J. Hovey
Site Vice President
Dresden Nuclear Power Station

Enclosure

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Dresden Nuclear Power Station

IE22

NRC FORM 366 (7-2001) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004

Estimated burden per response to comply with this mandatory information collection request 50 hours Reported lessons learned are incorporated into the licensing process and fed back to industry Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U S Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503 If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Dresden Nuclear Power Station Unit 3	05000249	1 of 5

4. TITLE High Pressure Coolant Injection System Inoperable Due to Water Hammer Event

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									N/A	N/A
07	05	2001	2002	– 005	– 01	02	14	2003	FACILITY NAME N/A	DOCKET NUMBER N/A

9. OPERATING MODE	1
10. POWER LEVEL	100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

	20 2201(b)		20.2203(a)(3)(ii)	50 73(a)(2)(ii)(B)	50 73(a)(2)(ix)(A)
	20 2201(d)		20.2203(a)(4)	50 73(a)(2)(iii)	50 73(a)(2)(x)
	20 2203(a)(1)		50 36(c)(1)(i)(A)	50 73(a)(2)(iv)(A)	73 71(a)(4)
	20 2203(a)(2)(i)		50 36(c)(1)(ii)(A)	50 73(a)(2)(v)(A)	73 71(a)(5)
	20 2203(a)(2)(ii)		50 36(c)(2)	50 73(a)(2)(v)(B)	OTHER
	20 2203(a)(2)(iii)		50 46(a)(3)(ii)	50 73(a)(2)(v)(C)	Specify in Abstract below or in NRC Form 366A
	20 2203(a)(2)(iv)		50 73(a)(2)(i)(A)	50 73(a)(2)(v)(D)	
	20 2203(a)(2)(v)	X	50 73(a)(2)(i)(B)	50 73(a)(2)(vii)	
	20 2203(a)(2)(vi)		50 73(a)(2)(i)(C)	50 73(a)(2)(viii)(A)	
	20 2203(a)(3)(i)		50 73(a)(2)(ii)(A)	50 73(a)(2)(viii)(B)	

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Timothy P. Heisterman	(815) 416-2815

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED			15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

16 ABSTRACT (Limit to 1400 spaces, i e , approximately 15 single-spaced typewritten lines)

On July 19, 2001, Dresden Nuclear Power Station (DNPS) personnel identified a Unit 3 High Pressure Coolant Injection (HPCI) discharge piping support in a degraded condition. An operability determination was performed, which supported continued HPCI operability. Due to perceived low safety significance, the damaged support was not immediately repaired. Corrective actions were to restore the supports during the next scheduled maintenance window. A review of Transient Analysis Display System (TADS) data made it apparent that a hydrodynamic transient / water hammer had occurred on July 5, 2001, during an automatic initiation of the Unit 3 HPCI system. The hydrodynamic transient / water hammer event was the result of a combination of air pockets and steam voids in the discharge piping, which resulted from inadequate venting of the system. The support was repaired and the discharge piping vented on September 30, 2001. On November 16, 2001, the Nuclear Regulatory Commission (NRC) issued an Inspection Report which identified an Unresolved Item associated with the operability of the HPCI system with the degraded support. In January 2002, DNPS provided engineering analysis to the NRC and in June of 2002, the NRC transmitted a Request for Additional Information associated with the analysis. These questions were discussed in a meeting on July 25, 2002, and in subsequent teleconferences between members of Exelon and NRC. In response to these questions, DNPS performed additional evaluations. Subsequently, DNPS has been unable to demonstrate through analysis that the Unit 3 HPCI piping and supports would have met operability evaluation acceptance criteria following an additional automatic initiation. On October 4, 2002, DNPS concluded that the Unit 3 HPCI system was inoperable for the period following the hydrodynamic transient / water hammer on July 5, 2001, until September 30, 2001.

A. Plant Conditions Prior to Event:

Unit: 03 Event Date: 07-05-2001 Event Time: 1006 CDT
Reactor Mode: 1 Mode Name: Run Power Level: 100 percent
Reactor Coolant System Pressure: 1000 psig

B. Description of Event:

On July 19, 2001, it was identified that two out of four base plate anchors for support M-1187D-80 were partially pulled out of the concrete on the underside of the 517'-6" slab, above the torus. Engineering performed an immediate extent of condition walk-down of the HPCI [BJ] pump discharge piping that could be accessed from the torus catwalk area. The engineers inspected the adjacent supports for similar damage. No other visible damage to accessible supports was identified. A corrective action program condition report (CR) was written and a prompt operability determination was completed.

On July 24, 2001, the final Operability Determination 01-031 was completed in accordance with the station's operability determination process and NES-MS-03.2, "Evaluation of Discrepant Piping and Support Systems." It concluded that the system was operable for design basis loads with the existing support damage. The conclusion of the operability determination was based on the past experience and practice that systems could be considered operable even with the failure of one support due to conservatism in design.

A work request (WR) was written to repair the support and was identified as part of the operability determination. The WR completion was scheduled for November 1, 2001 based on the normal work control scheduling process. Subsequently, the WR Screening Committee assigned the work request a lower priority, and the repair was rescheduled for a later date.

On July 26, 2001, a management review committee screened the CR and an apparent cause evaluation (ACE) was assigned to engineering to investigate the cause of the failed support. On August 24, 2001, the ACE was completed and approved. The ACE stated, "It is likely that the anchor deficiencies are a result of a transient (water hammer) possibly associated with the Unit 3 scram, or could be the result of another event." The ACE also stated the following corrective action: "The Dresden water hammer subject matter expert (SME) should perform a water hammer evaluation to determine if any further actions are required." This action was tracked by an action tracking item (ATI) with a due date of December 7, 2001. The completed ACE, which lacked a quality supervisory review, did not present a basis for the stated apparent cause and did not assess the impact of its conclusion on the open operability determination.

On September 26, 2001, the NRC Regional Inspector expressed concerns regarding the adequacy of the operability determination. The concerns were: (a) the failed support was not repaired, (b) there were no corrective actions in place to prevent the piping loads necessary to fail the support from recurring, (c) the system had not been vented, and (d) the Operability Determination did not consider any transient that might have failed the support.

Following additional walkdowns, on September 29, 2001, Operability Determination 01-031 was revised to remove credit for the two intact anchors on the damaged support The supports were repaired on September 30, 2001, and Unit 3 HPCI pump discharge piping was vented at the high point vent per the venting procedure. Air was

found, but no steam or hot water was noted. As a result of finding air, a review for past reportability and was initiated. The Unit 2 HPCI pump discharge piping was vented on October 1, 2001, and air was found. It was determined that the amount of air found in the Unit 2 HPCI system would not cause a damaging transient.

During this time period the Transient Analysis Display System (TADS) was reviewed for the July 5, 2001, scram. Engineering personnel concluded the HPCI system had experienced a hydrodynamic transient / water hammer on July 5, 2001.

October 17, 2001, a CR was issued to document the July 5, 2001, HPCI pressure and flowrate transient data and its impact on Operability Determination 01-031. From the period between October 2001 and October 2002, numerous communications between Exelon and the NRC were conducted. Although the support had been repaired and the discharge piping vented, engineering performed detailed analyses assuming the pipe support was in a degraded condition and the system not properly vented in order to determine past reportability of the condition. Subsequently, DNPS has been unable to demonstrate through analysis that the Unit 3 HPCI piping and supports would have met operability evaluation acceptance criteria following an additional automatic initiation. Thus, it has been concluded that the Unit 3 HPCI system was inoperable for the period following the hydrodynamic transient / water hammer on July 5, 2001, until September 30, 2001.

C. Cause of Event:

Two root causes were identified as a result of this event. One root cause addressed the cause of the damage to the support and the other addressed the station's management of the issue. The root cause of the HPCI support failure was a hydrodynamic transient / water hammer during the system actuation on July 5, 2001, due to air pockets and steam voids in the HPCI pump discharge piping. The cause of the air pockets was due to inadequate venting of the system. The root cause of the management issues was the failure of Design Engineering to evaluate the HPCI operability issue from the proper safety perspective because the focus was on demonstrating operability and not on recognizing the extent of the degraded condition, which resulted in untimely corrective actions. Corrective actions to prevent recurrence are: (1) to implement modifications and revise appropriate procedures as required, to ensure that air/steam voids do not recur and (2), to develop and implement a Design Engineering Excellence Plan to address the management issues and knowledge deficiencies.

D. Safety Analysis:

This event has been determined to be of low to moderate safety significance. This result is based on an assumption that the HPCI discharge piping stresses would exceed operability limits if HPCI injected during the period of approximately 80 days during which the support was degraded and the potential for an additional hydraulic transient existed. The Automatic Depressurization, Isolation Condenser [BL], Low Pressure Coolant Injection [BO], and Core Spray [BM] systems were operable and available, except for short periods during maintenance (within Technical Specification compliance), to provide reactor pressure / inventory control under postulated design basis accident conditions.

E. Corrective Actions:

The Unit 3 HPCI supports M-1187D-80 and M-1187D-83 were repaired

The Unit 2 and 3 HPCI pump discharge piping in the X-Area, torus Area and HPCI pump room was vented.

Appropriate station procedures were revised to include all high point vents when venting and require venting of the HPCI pump discharge piping when lined up to the CCST.

A modification was performed on Unit 3 to eliminate potential steam voids on HPCI initiation by adding a pressure permissive on the injection valves. A similar modification will be performed on Unit 2.

Developed and implemented a Design Engineering Plan to address the knowledge and management deficiencies in the areas of problem solving, performance of operability evaluations, walk-downs, recognizing safety significance of issues without being prompted by outside agencies, identification and resolution of issues, communication, and issue management.

NES-MS-03.2 "Evaluation of Discrepant Piping and Support Systems," was revised to recommend expediting repair when the cause of the degradation is unknown and to include guidance on when to consider cause as an integral element of operability determinations.

Open operability determinations were reviewed for extent of condition.

Performance managed individuals involved on challenging the quality of ACE's, Operability Determinations and being aware of compensatory actions. Reinforced expectations regarding ACE quality and operability determinations.

Developed guidance on how to properly evaluate and respond to NRC concerns and presented as a discussion topic at the Engineering Support Personnel Training session.

A post-transient system walk-down process was developed with a standard walk-down checklist and appropriate review by engineering management.

F. Previous Occurrences:

HPCI Water Hammer Events

Licensee Event Report 1989-029-05, "Elevated High Pressure Coolant Injection (HPCI) Discharge Piping Temperature Due to Reactor Feedwater System Back Leakage." On October 23, 1989, during normal Unit 2 operation at 100 percent power, an evaluation of the High Pressure Coolant Injection (HPCI) system discharge piping revealed discharge piping temperatures as high as 275 degrees Fahrenheit. The Unit 2 HPCI system was declared inoperable due to the possibility of a steam void existing within the discharge piping. A seven day Limiting Condition for Operation (LCO) was entered in accordance with Technical Specification 3.5.C. Subsequently, on October 31, 1989, during normal Unit 3 operation at 100 percent power, the Unit 3 HPCI system was also declared inoperable due to the discharge piping temperatures being as high as 256 degrees Fahrenheit

the HPCI temperature increase was system back leakage into the HPCI discharge piping on both Units 2 and 3 from the HPCI pump discharge valve MOV 2(3)-2301-8 and HPCI pump discharge check valve 2(3)-2301-7. The corrective actions associated with this event would not have prevented the event described in this LER.

LER 92-011, "High Pressure Coolant Injection Operability Surveillance Interval Exceeded Due to Turbine Oil Leakage." On Unit 3, piping supports were discovered damaged on the Gland Seal Condenser (GSC) subsystem following an April 8, 1992 event. The investigation concluded that the degradation may have occurred during HPCI overspeed testing, when the only source of cooling water supply to the GSC was secured in order to maintain the proper oil temperatures. Without cooling water flow, steam voids would form in the GSC tubes, and a water hammer would occur once the cooling water pump was restarted.

LER 92-013-01, "Unit 2 High Pressure Coolant Injection Supports Found Outside of FSAR Allowables due to Water Hammer." On April 11, 1992, at 1540 hours, several Unit 2 supports on its HPCI GSC subsystem were determined to be outside of Final Safety Analysis Report (FSAR) allowable stress limits. These damaged supports were found subsequent to the Unit 3 April 8, 1992 event described above.

The corrective actions associated with both GSC incidents would not have prevented the event described in this LER

Isolation Condenser Water Hammer Event

On January 8, 2002, while performing DOS 0010-16, "Unit 2(3) Isolation Condenser Safe Shutdown Valve Operability," Operations noted a loud noise while manually opening the Isolation Condenser condensate return inboard isolation valve, 3-1301-3. During the next eight days, extensive investigation and analyses were performed to determine the cause and effects of the loud noise (water hammer). The cause was determined to be flashing of the hot water trapped between the Isolation Condenser condensate return isolation valves, 3-1301-3 and 3-1301-4, serving as a pressure source to drive fluid into the two 12 inch Isolation Condenser steam headers The water hammer occurred when the two fluid fronts collided in the 12 inch horizontal steam headers. The effects of the water hammer were damage to one support, degradation and shearing of pass plate bolts internal to the isolation condenser, and bowing of the pass plates. The corrective actions to this event included repairs to the degraded components (support and pass plates) and revisions to procedures. Repairs to all degraded components were completed, a thermal performance test for the Isolation Condenser was satisfactorily completed, and the Isolation Condenser was declared Operable on January 17, 2002. Two causes were identified as a result of this event. One cause was inadequate design, in that the current design does not provide instrument indication (pressure or temperature) for the volume between condensate return isolation valves 3-1301-3 and 3-1301-4. The second cause was inadequate procedures. The procedures did not provide adequate instructions to assure proper pressure equalization across the Isolation Condenser condensate return isolation valve 3-1301-3, prior to valve opening. The corrective actions associated with this event would not have prevented the event described in this LER.

G. Component Failure Data:

N/A