

Exelon Generation
Quad Cities Generating Station
22710 206th Avenue North
Cordova, IL 61242-9740
Tel 309-654-2241

www.exeloncorp.com

January 26, 2001

SVP-01-010

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Quad Cities Nuclear Power Station, Unit 1
Facility Operating License No. DPR-29
NRC Docket No. 50-254

Subject: Licensee Event Report Concerning Inadequate Fill and Vent
Surveillance Performed on High Pressure Coolant Injection Resulting in
Air in Discharge Piping

Enclosed is Licensee Event Report (LER) 254/01-007, "Inadequate Fill and Vent Surveillance Performed on High Pressure Coolant Injection Resulting in Air in Discharge Piping," Revision 00, for Quad Cities Nuclear Power Station.

This report is submitted in accordance with the requirements of 10 CFR 50.73(a)(2)(i)(B), which requires reporting of any operation or condition prohibited by the Plant's Technical Specifications.

We are committing to the following actions:

The filling and venting procedure will be revised to make it a requirement to perform both the pump fill and vent and the discharge piping fill and vent whenever the pump piping is drained.

Revised filling and venting criteria will be provided to account for the migration of air from the worst case intermediate point in the system, and the filling and venting procedure will be revised based upon the revised criteria.

The lesson learned from this event will be reviewed with the Operations Procedures Group.

Any other actions described in the submittal represent intended or planned actions by Exelon Generation Company. They are described for the NRC's information and are not regulatory commitments.

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Should you have any questions concerning this letter, please contact Mr. W. J. Beck at (309) 654-2241, extension 3609.

Respectfully,

A handwritten signature in black ink, appearing to read 'T. Tulon', written in a cursive style.

Tim J. Tulon
Site Vice President
Quad Cities Nuclear Power Station

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

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Information and Records Management Branch (t-6 f33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office Of Management And Budget, Washington, DC 20503. If an 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)

FACILITY NAME (1)

Quad Cities Nuclear Power Station, Unit 1

DOCKET NUMBER (2)

05000254

PAGE (3)

1 of 4

TITLE (4)

Inadequate Fill and Vent Surveillance Performed on High Pressure Coolant Injection Resulting in Air in Discharge Piping

| EVENT DATE (5) | | | LER NUMBER (6) | | | REPORT DATE (7) | | | OTHER FACILITIES INVOLVED (8) | |
|-----------------------|-----|------|--|----------------------|--------------------|-----------------|-----|------|-------------------------------|---|
| MON TH | DAY | YEAR | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | MONTH | DAY | YEAR | FACILITY NAME | DOCKET NUMBER |
| 12 | 27 | 2000 | 2000 | 007 | 00 | 01 | 26 | 2001 | N/A | 05000 |
| OPERATING MODE (9) | | | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more) (11) | | | | | | | |
| 1 | | | 20.2201(b) | | 20.2203(a)(2)(v) | | X | | 50.73(a)(2)(i) | 50.73(a)(2)(viii) |
| POWER LEVEL (10) | | | 20.2203(a)(i) | | 20.2203(a)(3)(i) | | | | 50.73(a)(2)(ii) | 50.73(a)(2)(x) |
| 100 | | | 20.2203(a)(2)(i) | | 20.2203(a)(3)(ii) | | | | 50.73(a)(2)(iii) | 73.71 |
| | | | 20.2203(a)(2)(ii) | | 20.2203(a)(4) | | | | 50.73(a)(2)(iv) | OTHER |
| | | | 20.2203(a)(2)(iii) | | 50.36(c)(1) | | | | 50.73(a)(2)(v) | Specify in Abstract below or in NRC Form 366A |
| | | | 20.2203(a)(2)(iv) | | 50.36(c)(2) | | | | 50.73(a)(2)(vii) | |

LICENSEE CONTACT FOR THIS LER (12)

NAME

Wally Beck, Regulatory Assurance Manager

TELEPHONE NUMBER (Include Area Code)

(309) 654-2241 ext 3609

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

| CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO EPIX | CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO EPIX |
|-------|--------|-----------|--------------|-----------------------|-------|--------|-----------|--------------|-----------------------|
| | | | | | | | | | |
| | | | | | | | | | |

SUPPLEMENTAL REPORT EXPECTED (14)

| | | | | | | |
|--|---|----|-------------------------------------|-------|-----|------|
| YES (If yes, complete EXPECTED SUBMISSION DATE) | X | NO | EXPECTED SUBMISSION DATE (15) | MONTH | DAY | YEAR |
| | | | | | | |

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

On December 27, 2000, during the monthly verification of fill for the High Pressure Coolant Injection (HPCI) system, it was determined that the HPCI discharge piping was not completely filled. The discharge line was vented for an additional 5 minutes until full continuous flow was observed. As a result of the air pocket found in the discharge piping, Unit 1 HPCI was declared inoperable. On December 27, 2000, at 2014 hours Unit 1 HPCI was declared operable.

It was subsequently determined that the system had been inadequately vented on November 30, 2000, following maintenance. The root cause of the event was an inadequate review of the fill and vent procedure during the revision process, resulting in an ineffective procedure. Corrective actions include revising the appropriate procedures and reviewing the event with the Operations Procedure Group.

The safety significance of this event was minimal. Engineering analysis determined that the additional stresses generated by the collapsing air void created piping stresses that remained below the design allowable limits. Supporting structures were judged to be acceptable as well. The piping remained qualified for all loading conditions with no mode restrictions. Also, engineering analysis determined that the air void would not delay injection following an accident. Based on the engineering analyses, the HPCI and system would have been able to perform its safety function.

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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2511 MWt rated core thermal power
Energy Industry Identification System (EIIIS) Codes are identified in the text as [XX] and are obtained from IEEE Standard 805-1984, IEEE Recommended Practice for System Identification in Nuclear Power Plants and Related Facilities.

EVENT IDENTIFICATION:

Inadequate Fill and Vent Surveillance Performed on High Pressure Coolant Injection Resulting in Air in Discharge Piping

A. PLANT CONDITIONS PRIOR TO EVENT:

Unit: 1 Event Date: December 27, 2000 Event Time: 1330 hours
Reactor Mode: 1 Mode Name: Power Operation Power Level: 100

Power Operation (1) - Mode switch in the RUN position with average reactor coolant temperature at any temperature.

B. DESCRIPTION OF EVENT:

On November 28, 2000, with the Unit 1 High Pressure Coolant Injection (HPCI) [BJ] Pump [P] Discharge Motor Operated Valve (MOV), 1-2301-9, closed and out of service, the Unit 1 HPCI pump suction piping and the discharge piping from the pump to the 1-2301-9 valve was drained to support online inspection of the HPCI Contaminated Condensate Storage Tank (CCST) [KA] Suction Check Valve [V], 1-2301-20.

On November 29, 2000, following completion of the 1-2301-20 inspection, Operations performed a fill and vent of the suction piping up through the pump casing in accordance with station procedure. Due to piping configuration, approximately 40 feet of discharge piping, estimated from the first elbow on the HPCI pump discharge to the still closed 1-2301-9 valve, remained unfilled. This was not known at the time.

On November 30, 2000, at 1000 hours, Operations performed the HPCI piping vent verification with the 1-2301-9 valve open. An operator stationed at the vent line sight glass observed continuous water flow for approximately 2 minutes and concluded the system was vented, in accordance with station procedure.

On November 30, 2000, at 1840 hours, the HPCI system was tested for operability. The surveillance met all the acceptance criteria and Unit 1 HPCI was declared operable at 2145 hours.

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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

On December 27, 2000, at 0848 hours, Operations started performance of the monthly CCST / Torus suction auto-swap surveillance. As a requirement of the surveillance, the HPCI Vent Verification surveillance was performed, with unsatisfactory results. An operator stationed at the high point vent sight glass observed partial flow for approximately 15 seconds, and then saw no indication of water for approximately 90 seconds. After the valve line-up was confirmed, the vent line-up was reestablished and full continuous flow was observed in the sight glass after an additional 5 minutes of venting. As a result of the air pocket found in the discharge piping, Unit 1 HPCI was declared inoperable.

On December 27, 2000, at 2014 hours Unit 1 HPCI was declared operable.

C. CAUSE OF EVENT:

The root cause of this event is an inadequate technical review of the fill and vent procedure during a revision to the procedure in 1996. The procedure revision incorporated instructions to vent the pump seals when venting the pump and in doing so restructured the procedure to make the pump fill and vent section independent of the discharge piping fill and vent. The technical review failed to identify the impact of performing the pump fill and vent independent of the discharge piping fill and vent. The inadequate procedure review led to the procedure being ineffective in accomplishing the intent of the fill and vent evolution.

Though not a direct cause to this event, the venting criteria in the fill and vent procedure is flawed. The requirement to vent for 35 seconds does not account for a situation in which the air bubble is at an intermediate point in the system.

In addition, a contributing cause for this event was inadequate acceptance criteria in the monthly fill verification procedure. The criteria incorrectly assumed air was already at or near the vent piping exit and did not account for worst case head pressure, check valve resistance or the extent that vent valves may be throttled.

D. SAFETY ANALYSIS

The safety significance of this event was minimal.

An engineering analysis of the force that would be developed during injection with a void in the HPCI discharge piping, and the effect the force would have on piping, piping supports, and associated structures was performed. In all cases the evaluation was able to show that the additional stresses generated by the collapsing air void (44.6 ft air void assumed) created piping stresses that remained below the design allowable limits. Supporting structures were judged to be acceptable as well. The piping remained qualified for all loading conditions with no mode restrictions.

An additional safety concern exists when voids in the system can effectively delay the time it takes for water to inject into the vessel. In this event, as a result of the pressure change (14.7 psig to ~1150 psig) that occurs as the HPCI pump accelerates, the assumed 40 feet long bubble is compressed to ~1/78 of its original size and spreads along the upper half of the discharge header pipe. Consequently, there is always water against the injection check valve waiting to be injected into the Feedwater [SJ] system. This evaluation determined that HPCI was capable of meeting the requirement to inject at the earliest opportunity, as this event would not have changed the injection time.

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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

Based on the discussion above, the HPCI and Feedwater systems would have been able to perform their safety functions.

E. CORRECTIVE ACTIONS:Corrective Action Completed

The HPCI fill verification procedure has been revised to include conservative criteria for verification of fill.

Corrective Action to be Completed

The filling and venting procedure will be revised to make it a requirement to perform both the pump fill and vent and the discharge piping fill and vent whenever the pump piping is drained.

Revised filling and venting criteria will be provided to account for the migration of air from the worst case intermediate point in the system, and the filling and venting procedure will be revised based upon the revised criteria.

The lesson learned from this event will be reviewed with the Operations Procedures Group.

F. PREVIOUS OCCURRENCES:

Licensee Event Report 265/00-005, Revision 2, dated September 18, 2000: on February 11, 2000, while performing the Unit 2 HPCI verification of fill, an operator noted approximately 5 seconds of water flow initially when the vent line isolation valves were opened, and then, after 85 seconds with no water flow, water was again observed to be flowing. Engineering determined that, based on the amount of time needed to again see flow in the sight glass, the air volume was not bounded by the calculation for waterhammer. The corrective action was to require venting from the high-point vent for at least 35 seconds when filling the HPCI system piping. In addition, the HPCI monthly fill verification surveillance criteria was revised to require the operator in attendance at the venting sight glass to observe water flow for at least 35 seconds or until the piping is noticeably "hot" due to water originally in the Main Steam Isolation Valve (MSIV) room reaching the sight glass. An analysis at that time determined that at least 20 seconds is required to get water to flow from the HPCI discharge header, through 130 feet of ¾" diameter piping to the sight glass.

The failure mode for the above event is similar to that of this LER in that air migrated to the high point vent. The criterion implemented in response to the February event was ineffective for this event because it failed to consider all system conditions that may exist.

G. COMPONENT FAILURE DATA:

There were no component failures associated with this event.