

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

www.exeloncorp.com

March 11, 2001

SVP-02-021

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 254/02-001, "Reactor Shutdown due to Failure of
Reactor Recirculation Jet Pump"

Enclosed is Licensee Event Report (LER) 254/02-001, "Reactor Shutdown Due to Failure of
Reactor Recirculation Jet Pump," for Quad Cities Nuclear Power Station.

This report is submitted in accordance with the requirements of the Code of Federal
Regulations, Title 10, Part 50.73(a)(2)(i)(A), which requires reporting of the completion
of any nuclear plant shutdown required by the plant's Technical Specifications, and
Part 50.73(a)(2)(v)(D), which requires the reporting of any event or condition that could
have prevented the fulfillment of the safety function of structures or systems that are
needed to mitigate the consequences of an accident.

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

Should you have any questions concerning this report, please contact Mr. W. J. Beck at
(309) 227-2800.

Respectfully,



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

Attachment

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

IE 22

LICENSEE EVENT REPORT (LER)

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

Corrective actions included replacing all of the original-style BWR/3 jet pump hold-down beams with BWR/4 beams on Units 1 and 2, replacing the "B" recirculation pump impeller and repairing jet pump #20.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Quad Cities Nuclear Power Station, Unit 1	05000254	02	- 001	- 00	2 of 4

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

PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor, 2511 Megawatts Thermal Rated Core Power
Energy Industry Identification System (EIIS) codes are identified in the text as [XX].

EVENT IDENTIFICATION

Reactor Shutdown due to Failure of Reactor Recirculation Jet Pump

A. CONDITION PRIOR TO EVENT

Unit: 1 Event Date: January 9, 2002 Event Time: 1416 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 January 9, 2002, at 1416 hours, Quad Cities Nuclear Power Station Unit 1 control room received indications of a jet pump [P] [AD] failure. These indications consisted of a reactor [RCT] level spike up by 6 inches and then back down, a drop in reactor power from 100% to 91%, a decrease in reactor pressure and core plate differential pressure and an increase in total core flow. A non-licensed operator was dispatched to take jet pump readings.

At 1439 hours, a main steam line (MSL) [SB] high radiation alarm was received. At 1442 hours, oscillations in the Unit 1 "B" recirculation pump flow were noted, followed by a trip of the Unit 1 "B" recirculation pump motor.

At 1445 hours, the Unit 1 Operator reduced "A" Recirculation pump speed and started to insert control rods to shut the unit down. At 1521 hours, Unit 1 jet pump 19/20 was declared inoperable due to greater than a 10% difference from established patterns. Technical Specification 3.4.2.A was entered, requiring Unit 1 to be in Mode 3 within 12 hours. At 1708 hours, an Emergency Notification System notification was made for the failure of the jet pump.

At 1748 hours the Unit 1 reactor entered Mode 2, and at 1830 hours the Unit 1 reactor was subcritical. At 2158 hours the mode switch was put in the shutdown position and the reactor entered Mode 3. At that time, the Technical Specification action statement was exited.

C. CAUSE OF EVENT

The preliminary root cause of the failure of jet pump #20 was failure of the hold-down beam due to intergranular stress corrosion cracking in the transition portion of the beam. If necessary, a revised report will be submitted upon completion of the root cause evaluation. The crack was located in an area of the jet pump hold-down beam that is not covered by the inspection requirements of BWRVIP-41, "BWR Jet Pump Assembly

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Quad Cities Nuclear Power Station, Unit 1	05000254	02	- 001	- 00	3 of 4

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

Inspection and Flow Evaluation Guidelines." Therefore, although Quad Cities Nuclear Power Station implemented the requirements of BWRVIP-41, including periodic inspections of the required areas of the jet pump hold-down beams, the transition area of the beam was not required to be inspected and the crack was not identified prior to failure.

The "B" recirculation pump motor trip and the MSL high radiation alarm were also a result of the failure of the jet pump hold-down beam. The "B" recirculation pump motor tripped due to the introduction into the recirculation pump impeller of a piece of the jet pump hold-down beam.

The MSL high radiation alarm was due to the changes in flow dynamics and mixing in the annulus region of the vessel due to the jet pump failure, and the resultant increase in ammonia levels. The redirected flow of the ammonia, which includes Nitrogen-16 as a component, and the resulting decrease in efficiency of the steam dryer, caused elevated levels of the ammonia to be carried over into the main steam lines, causing the increased radiation levels.

D. SAFETY ANALYSIS

The safety significance of this event was minimal. Although the reactor shutdown and cooldown were accomplished with normal means, all emergency core cooling systems were operable during this event. The failure of the jet pump was readily detected from diverse plant parameters displayed in the control room, and the reactor was shut down within eight hours of the initial indications.

The structural integrity of the jet pump supports the capability of reflooding the core to two-thirds core height during a design basis loss-of-coolant accident (LOCA) (i.e., a double-ended guillotine break of a 28" reactor recirculation pipe). Had the jet pump failed during a LOCA with no other single failure, the total ECCS inventory delivered to the core would be well in excess of the licensing basis case with the worst single ECCS failure.

Additionally, the containment response during a LOCA with a failed jet pump was determined to be within the UFSAR-assumed response, because the UFSAR assumes that the equalizer valves are in the abnormal open position.

This report is being submitted in accordance with 10 CFR 50.73(a)(2)(i)(A) as "the completion of any nuclear plant shutdown required by the plant's Technical Specifications," and in accordance with 10 CFR 50.73(a)(2)(v)(D) as an "event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident."

E. CORRECTIVE ACTIONS

Immediate Corrective Actions:

The unit was shut down, the failed jet pump was repaired, and all of the original-style BWR/3 jet pump hold-down beams were replaced with BWR/4 jet pump hold-down beams.

The Unit 1 "B" recirculation pump impeller was replaced.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Quad Cities Nuclear Power Station, Unit 1	05000254	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 of 4
		02	- 001	- 00	

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

An operability evaluation was performed to support operation of Unit 2 from the time of the jet pump failure until the start of the next Unit 2 refueling outage (about 34 days).

Completed Corrective Actions:

All of the original-style BWR/3 jet pump hold-down beams on Unit 2 were replaced with BWR/4 jet pump hold-down beams.

F. PREVIOUS OCCURRENCES

No previous occurrences of jet pump hold-down beam failures at Quad Cities Nuclear Power Station were identified.

G. COMPONENT FAILURE DATA

The jet pump hold-down beam was an original design (BWR/3) beam made of Inconel X-750, by Willamette Iron and Steel Co. and forged by Berkeley Forge and Tool, Inc.