

Exelon Generation Company, LLC  
Quad Cities Nuclear Power Station  
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November 12, 2001

SVP-01-110

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

Quad Cities Generating Station, Units 1 and 2  
Facility Operating License Nos. DPR-29 and DPR-30  
NRC Docket Nos. 50-254 and 50-265

Subject: Licensee Event Report 265/01-002, "Potential Common Cause Inoperability of  
Emergency Diesel Generator Fuel Oil Transfer System"

Enclosed is Licensee Event Report (LER) 265/01-002, "Potential Common Cause Inoperability  
of Emergency Diesel Generator Fuel Oil Transfer System," for Quad Cities Generating Station.

This LER is submitted as a voluntary report. Although the condition described in this report  
does not meet the criteria for required reporting, Exelon Generation Company (EGC), LLC,  
believes the condition might be of generic concern.

We are committing to the following actions:

Safety-related and risk-significant systems will be reviewed for solenoid valves in  
piping sections that are susceptible to thermal pressurization.

Case studies will be performed and reviewed with design engineers to illustrate the  
effects of human performance errors in design.

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

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

Respectfully,

A handwritten signature in cursive script that reads "George P. Barnes for".

Timothy J. Tulon  
Site Vice President  
Quad Cities Generating Station

cc: Regional Administrator – NRC Region III  
NRC Senior Resident Inspector – Quad Cities Generating 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. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and by internet e-mail to [bjsl@nrc.gov](mailto:bjsl@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NOEB-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)**

<b>FACILITY NAME (1):</b> Quad Cities Nuclear Power Station, Unit 2	<b>DOCKET NUMBER (2)</b> 05000265	<b>PAGE (3)</b> 1 of 4
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**TITLE (4)** Potential Common Cause Inoperability of Emergency Diesel Generator Fuel Oil Transfer Systems

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
05	01	01	01	002	00	11	12	01	Quad Cities Nuclear Power Station, Unit 1	05000254
									FACILITY NAME	DOCKET NUMBER
									N/A	N/A

**OPERATING MODE (9)** 1  
**POWER LEVEL (10)** 100

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

<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(x)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 73.71(a)(4)
<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(5)
<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input checked="" type="checkbox"/> OTHER
<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	Voluntary Report Specify in Abstract below or in NRC Form 366A
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	
<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	
<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	
<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	

**LICENSEE CONTACT FOR THIS LER (12)**

<b>NAME</b> Wally Beck, Regulatory Assurance Manager	<b>TELEPHONE NUMBER (Include Area Code)</b> (309) 227-2800
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**COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)**

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	EK	FSV	A246	Y					

**SUPPLEMENTAL REPORT EXPECTED (14)**

<b>YES</b> (If yes, complete EXPECTED SUBMISSION DATE)	<b>X</b>	<b>NO</b>	<b>EXPECTED SUBMISSION DATE (15)</b>	MONTH	DAY	YEAR
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**ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines)(16)**

On May 1, 2001, at 2036 hours and on May 3, 2001, at 2012 hours, a solenoid valve in the Unit 2 Emergency Diesel Generator (EDG) Fuel Oil Transfer (FOT) system failed to open approximately 12 hours after the start of the EDG endurance test due to thermal pressurization of an isolated section of the FOT pump discharge piping.

The root cause of this condition is the inadequate original design of the FOT system in that thermal effects in the piping volume between the discharge check valve and solenoid valve were not accounted for, allowing a pressure increase in the isolated volume beyond the operating capability of the FOT solenoid. The design of the FOT piping on the Unit 1 and Unit 1/2 EDGs is similar to the Unit 2 design. Although the solenoid valves on the Unit 1 and Unit 1/2 EDGs had a larger actuator (15.4 watts versus 6 watts), and have been shown in tests to be capable of opening against a larger differential pressure, these valves may still have been susceptible to failure to open due to thermal pressurization. The solenoid valves have subsequently been removed or replaced with manual valves.

The safety significance of this event was minimal. Equipment and procedural guidance was in place to allow the manual transfer of fuel oil from the main diesel oil tanks to the day tanks. This LER is being submitted as a voluntary report.

**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 2	05000265	01	002	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**

Potential Common Cause Inoperability of Emergency Diesel Generator Fuel Oil Transfer Systems

**A. CONDITION PRIOR TO EVENT**

Unit: 2    Event Date: May 1, 2001                      Event Time: 2036 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 May 1, 2001, at 2036 hours, approximately 12 hours after initiation of the 24-hour surveillance test of the Unit 2 Emergency Diesel Generator (EDG) [EK], an alarm was received in the control room for low level in the diesel generator fuel oil day tank [DC]. The test was stopped and the situation was investigated. The investigation considered several potential causes for the low level including that a solenoid valve [FSV] in the fuel oil transfer line from the fuel oil transfer pump [P] to the day tank [TK] had failed to open when required. The solenoid valve assembly was removed and the valve was overhauled. The solenoid valve assembly was reinstalled and on May 3, 2001, the test was run again.

At 2012 hours on May 3, 2001, approximately 12 hours into the second test, the alarm was received in the control room for low level in the diesel generator fuel oil day tank. The test was continued, and the situation was investigated. Again, it was believed that the solenoid valve in the fuel oil transfer line might have failed to open. The operator investigating the alarm opened a drain valve in the fuel oil transfer line and the solenoid valve then opened. The test was completed without further incident. The solenoid valve was subsequently replaced with a new solenoid valve rated for a larger wattage. The test was performed one final time without any problems, after which the system was returned to service and the EDG was declared operable.

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

**C. CAUSE OF EVENT**

The root cause of this condition is the inadequate original design of the fuel oil transfer system in that thermal effects in the piping volume between the discharge check valve and solenoid valve were not accounted for, allowing a pressure increase in the isolated volume beyond the operating capability of the fuel oil transfer solenoid. The design of the fuel oil transfer piping on the Unit 1 and Unit 1/2 EDGs is similar to the Unit 2 design. Although the solenoid valves on the Unit 1 and Unit 1/2 EDGs had a larger actuator (15.4 watts versus 6 watts), and have been shown in tests to be capable of opening against a larger differential pressure, these valves may still have been susceptible to failure to open due to thermal pressurization. Note that no failures of the solenoid valves in the Unit 1 and Unit 1/2 EDG fuel oil transfer systems have been experienced.

**D. SAFETY ANALYSIS**

The safety significance of this event was minimal. As noted in the Updated Final Safety Analysis Report, fuel oil can be manually transferred to the day tanks from the main diesel oil tanks. The actions to manually provide fuel oil to the EDG day tank are delineated in a normal station operating procedure. Operators are directed to this procedure by the annunciator response procedure for the Diesel Generator Day Tank low level alarm. No troubleshooting or diagnosis is required to perform the procedure. This issue does not impact the automatic start and loading of the EDG. Approximately 4 hours of fuel oil are available in the day tank. Performance of this procedure was previously time validated and shown to take less than 1 hour to perform. The low day tank level alarm annunciates with 2 hours of fuel oil remaining in the day tank. A discussion of the method for manually providing fuel oil to the EDG tanks is included in a lesson plan that is presented biennially in the classroom to operators. The equipment required to manually provide fuel oil to the EDG day tank is pre-staged in accordance with station procedure. Therefore, in the event the fuel oil transfer system was to fail fuel oil would be manually transferred to the EDG day tank without impacting operation of the EDG.

**E. CORRECTIVE ACTIONS**

Immediate Corrective Actions:

The Unit 2 solenoid valve was replaced with a solenoid valve with a higher rating.  
A formal root cause investigation and laboratory analysis was initiated.

Completed Corrective Actions:

The Unit 1 and 2 EDG fuel oil transfer solenoid valves have been replaced with normally open manual valves.

The Unit 1/2 EDG fuel oil transfer solenoid valve has been removed. There is no requirement to isolate this line for the Unit 1/2 EDG.

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Quad Cities Nuclear Power Station, Unit 2	05000265	01	- 002 -	00	4 of 4

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

Corrective Actions to be Completed:

Safety-related and risk-significant systems will be reviewed for solenoid valves in piping sections that are susceptible to thermal pressurization.

Case studies will be performed and reviewed with design engineers to illustrate the effects of human performance errors in design.

**F. PREVIOUS OCCURRENCES**

No LERs were identified in the past 5 years that involved the EDG fuel oil transfer system or thermal pressurization.

**G. COMPONENT FAILURE DATA**

The solenoid valve that failed to open was a 6 watt ASCO model HT8211C89.