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ESK-96-063

April 24, 1996

Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Document Control Desk

Subject: Quad Cities Nuclear Power Station Units 1 and 2
Plant Specific ECCS Evaluation Changes - 10CFR50.46 Report
DPR-29 and DPR-30
NRC Docket Nos. 50-254 and 50-265

Reference: C. P. Patel of the Nuclear Regulatory Commission letter to D. L. Farrar dated August 4 ,1994, Transmitting Safety Evaluation Report for Core Spray Header Flaw at Quad Cities Unit 1

This letter fulfills the thirty day reporting requirement of 10CFR50.46(a)(3)(i) for Unit 1 of Quad Cities Nuclear Power Station because the effects of the installation of modifications to the Core Spray "Tee Box" and Core Shroud repairs performed this outage cause a change in calculated Peak Clad Temperature (PCT) difference of more than 50 °F. This letter also fulfills the annual reporting requirement of 10CFR50.46(a)(3)(ii) for Unit 2 of Quad Cities Nuclear Power Station.

The Reference letter transmitted from the Nuclear Regulatory Commission is the most recent PCT change for Quad Cities Nuclear Power Station. Attachment 1 provides updated information regarding the PCT of the limiting Loss of Coolant Accident evaluations for Quad Cities Nuclear Power Station. This update includes changes not previously reported. As can be seen on Attachment 1, the net change in PCT is less than the 50 °F reporting criteria. This report is required because the changes implemented during the current outage do exceed 50 °F, though they are only partial components of the overall update. Attachment 1 includes all assessments as of April 3, 1996 and updates both Quad Cities Units' calculated values. The assessment notes provide a detailed description for each change or error reported.

General Electric has evaluated issues which have resulted in PCT assessments to Loss of Coolant Accident (LOCA) analyses for Quad Cities Nuclear Power Station. General Electric and ComEd have determined that these issues do not constitute substantial safety hazards, and that Quad Cities Nuclear Power Station continues to comply with the requirements of 10CFR50.46 and 10CFR50 Appendix K acceptance criteria. Near term re-analysis is planned with the future transition to Siemens Power Corporation fuel.

A Unicom Company

Unit 2 will load Siemens fuel with the startup of Cycle 15 and apply the Siemens LOCA re-analysis to bound both units. Unit 1 will load Siemens fuel for the startup of Cycle 16.

If there are any questions or comments concerning this letter, please refer them to Nick Chrissotimos at (309) 654-2241, extension 3100.

Sincerely,

E. S. Kraft, Jr.
Site Vice President
Quad Cities Nuclear Power Station

Attachment 1: Quad Cities 10CFR 50.46 Report

cc: H. J. Miller, Regional Administrator - RIII
R. M. Pulsifer, Project Manager - NRR
C. G. Miller, Senior Resident Inspector - Quad Cities
Office of Nuclear Facility Safety - IDNS
D. B. Tubbs, MidAmerican Energy Co.
R. J. Singer, MidAmerican Energy Co.

Attachment 1

Quad Cities 10CFR 50.46 Report

PLANT NAME: Quad Cities Unit 1
ECCS EVALUATION MODEL: Large Break LOCA
REPORT REVISION DATE: 5/3/96
CURRENT OPERATING CYCLE: 15

ANALYSIS OF RECORD

Evaluation Model: SAFER/GESTR - LOCA
Calculation: General Electric document NEDC-31345P, Revision 2, dated July, 1989
Fuel: P8x8R/BP8x8R which bounds GE8, GE9 and GE10

Reference PCT	PCT =	1382°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

LPCI injection delay to 75 seconds (Note 1)	ΔPCT =	+288°F
Extended Operating Domain & Equipment OOS (Note 2)	ΔPCT =	+10°F
Safety Evaluation Report for Core Spray Header Flaw (Note 3)	ΔPCT =	+110°F
Prior Assessments PCT	PCT =	1790°F

B. CURRENT LOCA MODEL ASSESSMENTS

Replacement Access hole cover modification (Note 4)	ΔPCT =	+10°F
CS injection valve stroke time increased to 50 seconds (Note 5)	ΔPCT =	+0°F
Bottom Head Drain Flowpath (Note 6)	ΔPCT =	+10°F
Remove NRC SER requirement for Core Spray Header Flaw (Note 7)	ΔPCT =	-110°F
CS Tee Box repair including CS piping leakage (Note 8)	ΔPCT =	+40°F
Jet Pump Riser repair penalty (Note 9)	ΔPCT =	+20°F
Shroud repair including access hole cover (Note 10)	ΔPCT =	+15°F
Remove penalty for Replacement Access hole cover (Note 11)	ΔPCT =	-10°F
Total PCT Change from Current Assessments	ΔPCT =	-25°F

NET PCT	**PCT =**	**1765°F**

Attachment 1

Quad Cities 10CFR 50.46 Report

PLANT NAME: Quad Cities Unit 2
ECCS EVALUATION MODEL: Large Break LOCA
REPORT REVISION DATE: 5/3/96
CURRENT OPERATING CYCLE: 14

ANALYSIS OF RECORD

Evaluation Model: SAFER/GESTR - LOCA
Calculation: General Electric document NEDC-31345P, Revision 2, dated July, 1989
Fuel: P8x8R/BP8x8R which bounds GE8, GE9 and GE10

Reference PCT	PCT =	1382°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

LPCI injection delay to 75 seconds (Note 1)	ΔPCT =	+288°F
Extended Operating Domain & Equipment OOS (Note 2)	ΔPCT =	+10°F
Prior Assessments PCT	PCT =	1680°F

B. CURRENT LOCA MODEL ASSESSMENTS

Replacement Access hole cover modification (Note 4)	ΔPCT =	+10°F
CS injection valve stroke time increased to 50 seconds (Note 5)	ΔPCT =	+0°F
Bottom Head Drain Flowpath (Note 6)	ΔPCT =	+10°F
Shroud repair including access hole cover (Note 10)	ΔPCT =	+15°F
Remove penalty for replacement access hole cover (Note 11)	ΔPCT =	-10°F
Total PCT Change from Current Assessments	ΔPCT =	+25°F

NET PCT	**PCT =**	**1705°F**

Attachment 1

Quad Cities 10CFR 50.46 Report

Assessment Notes

1. Delay in LPCI from 48 seconds to 75 seconds after LOCA initiation

On April 11, 1990, an Auto-Transfer Logic Operability Surveillance, was completed during an outage on Unit 2. Part of this surveillance includes timing the transfer of Motor Control Center loads from Bus 29 to Bus 28 during a simulated loss of off-site power (LOOP) and failure of the Unit 2 Diesel Generator (DG). The transfer was timed at 38.99 seconds. The acceptance criteria for the time delay was 20 ± 5 seconds. ComEd had General Electric evaluate the consequences on a LOCA for this as-found relay setpoint drift. This evaluation assessed the impact of a time delay in LPCI injection due to power transfer during a LOCA and Loss Of Offsite Power (LOOP) with a Battery Failure. General Electric practice has been to delay LPCI injection until the Recirculation Pump Discharge valve is completely closed. This valve is normally powered from bus 29. LPCI injection time is therefore the Auto-Transfer Logic time plus the Recirculation Pump Discharge valve stroke time. The as-found relay setpoint drift would have resulted in a LPCI injection time of 63 seconds (39 seconds for the as-found transfer time and 24 seconds for the slowest Unit 2 Recirculation Discharge Valve). ComEd immediately restored the Auto-Transfer Logic to its design value of 20 seconds but conservatively retains a delayed LPCI as part of its LOCA analysis. This was described in a thirty day 10CFR50.46 report dated March 26, 1993. Quad Cities Units 1 and 2 currently maintain LPCI injection times at 75 seconds or less.

2. Extended Operating Domain/Equipment Out Of Service (EOD/EOOS)

The report "Extended Operating Domain and Equipment Out Of Service for Quad Cities Nuclear Power Station Units 1 and 2", GE Document NEDC-31449, Revision 1, April 1992 analyzed Quad Cities for an Extended Operating Domain (EOD) allowing increased core flow above nominal values. Included as part of this analysis were the following Equipment Out-Of-Service (EOOS) and EOD operating modes: Feedwater Heaters Out-Of-Service, Single Recirculation Loop Operation (SLO), Relief Valve Out-Of-Service, Increased Core Flow (ICF), and Final Feedwater Temperature Reduction. The Extended Load Line Limit region and the ICF region of the power/flow map was supported for all fuel types used. Table 1 below summarizes the combined modes of operation analyzed in the EOD and EOOS document for Quad Cities. Note that with the exception of the SLO condition, the EOOS analyses are valid for the Increased Core Flow Region. The conclusions of the Extended Operating Domain and Equipment Out Of Service report for Quad Cities assessed the impact on LOCA PCT as less than +10 °F.

Attachment 1

Quad Cities 10CFR 50.46 Report

Assessment Notes

Table 1
Equipment Out of Service Analysis and Extended Operating Domain
for Quad Cities Units 1 and 2

EQUIPMENT OUT OF SERVICE	APPLICABLE OPERATING DOMAIN
Relief Valve-OOS	EOD Including ICF Region
Feed Water Heater-OOS	EOD Including ICF Region
Feed Water Heater -OOS and Relief Valve -OOS	EOD Including ICF Region
Single Recirculation Loop Operation	EOD Excluding ICF Region
Single Recirculation Loop Operation and Relief Valve -OOS	EOD Excluding ICF Region

3. Reactor Vessel leakage assessed for the startup of Unit 1 Cycle 14

Emergent leakage paths associated with core shroud flaws, core spray piping flaws (repaired with the startup of Unit 1 Cycle 15) and jet pump riser flaws (repaired with the startup of Unit 1 Cycle 14) were evaluated and assigned PCT increases. For the Quad Cities Unit 1 restart, emergent leakage paths described above resulted in an increase in PCT of 110 °F as accepted in NRC SER letter from Chandu P. Patel dated August 4, 1994. This increase resulted in a limiting PCT of 1790 °F for Unit 1 only. As a result of subsequent repairs to the Unit 1 Shroud and Core Spray line, the increase in PCT of 110 °F from the NRC SER was later removed and replaced with separate PCT assessments associated with each repair. Note that the NRC SER 110 °F PCT increase was imposed on Unit 1 for fuel cycle 14 only.

4. Replacement access hole cover

This PCT increase was applied to Quad Cities with the modification of the access covers in the core shroud support plate. These removable covers allow access from the downcomer region to the lower plenum region. This modification changed the design of the access cover from a welded design to a bolted design. The small amount of leakage associated with the bolted joint was analyzed and resulted in less than a 10 °F PCT increase. Note that leakage from these access covers was included in each of the subsequent LOCA evaluations.

Attachment 1

Quad Cities 10CFR 50.46 Report

Assessment Notes

5. CS Injection valve maximum stroke time increased from 15 to 50 seconds

Modification of the CS injection valve stroke time was necessary as a part of the NRC Generic Letter 89-10 compliance. The supporting LOCA evaluation addressed the impact of increasing the Core Spray (CS) Injection valve stroke time from a maximum of 15 seconds to a maximum of 50 seconds. This analysis credits the partial Core Spray flow while valves are stroking open which compensated for the longer injection valve stroke times. GE completed the analysis using their licensed SAFER/GESTR methods and determined there was no change to the LOCA PCT.

6. Bottom Head Drain flowpath

GE reported under 10CFR50.46 on December 15, 1995 that the impact of the Reactor Pressure Vessel (RPV) bottom head drain (BHD) providing an additional flow path for coolant loss under LOCA conditions was an increase less than 10 °F on the PCT. Continuous Reactor Water Cleanup system operation takes suction from the BHD and from the Recirculation suction piping which are connected at a common point. A design basis LOCA where the break is on the Recirculation suction piping would allow water in the lower plenum of the reactor vessel to be lost through the Reactor Water Cleanup piping where it connects to the Recirculation suction piping.

7. Remove increase in PCT of 110 °F (from NRC SER requirement, see note 3)

As a result of the repairs to Unit 1 shroud and Core Spray line, the increase in PCT of 110 °F required by the NRC SER in note 3 was removed and replaced with PCT assessments associated with each repair. Note that the NRC SER 110 °F PCT increase was imposed on Unit 1 for fuel cycle 14 only.

8. CS Tee Box repair including CS piping leakage

The purpose of the assessment was to analyze the impact of installing the Core Spray (CS) Tee Box repair clamp. This modification was necessary as a result of cracks found in the Tee Box and a subsequent commitment to the NRC to repair it. The LOCA evaluation was done for 4,100 GPM of CS delivered to the top of the core. The previous LOCA analysis was performed with 4500 GPM of CS delivered to the top of the core. Since the maximum CS leakage was calculated to be 277 GPM with the CS Tee box repair, this represents excess leakage accounted for in the 40 °F Peak Clad Temperature (PCT) penalty. This excess leakage can be used for assessment of consequences for any additional CS line flaws that may occur in the future. Note that as a result of the subsequent repairs to Unit 1 Core Spray, the increase in PCT of 110 °F from the NRC SER was later removed and replaced with separate PCT assessments associated with each repair. This increase in PCT of 40 °F is associated with the CS leakage including the Tee Box repair.

Attachment 1

Quad Cities 10CFR 50.46 Report

Assessment Notes

9. Jet Pump Riser repair

Potential leakage paths associated with jet pump riser cracks (repaired with the startup of Unit 1 Cycle 14) were evaluated and assigned PCT increases. GE evaluated the PCT increase for two leakage scenarios which were evaluated and submitted to the NRC on July 14, 1994. In that letter, the nominal leakage scenario (including the Core Spray flaw along with the repaired jet pump riser) resulted in an increase in PCT of 20 °F. Note that as a result of the subsequent repairs to Unit 1 shroud and Core Spray, the increase in PCT of 110 °F from the NRC SER was later removed and replaced with separate PCT assessments associated with each repair. This increase in PCT of 20 °F is associated with the nominal leakage from the jet pump riser repair.

10. Shroud repair including access hole cover

Repairs to the Quad Cities core shroud were completed with the startup of Unit 1 Cycle 15 and with the startup of Unit 2 Cycle 14. These repairs included installation of hardware which required machining of holes in the shroud and shroud support plate. Each of these holes have some clearance which will allow some leakage to occur at the hole's location. Also, the leakage of the cracks found in the shroud were included in the repair PCT assessment. This repair on each Unit resulted in an increase of 15 °F when compared to the LOCA analysis without any shroud leakage. Included in the assessment was the replacement access hole cover leakage. Note that as a result of the repairs to Unit 1 shroud, the increase in PCT of 110 °F from the NRC SER was removed and replaced with separate PCT assessments associated with each repair. This increase in PCT of 15 °F is associated with the leakage from the shroud repair.

11. Remove replacement access hole cover penalty

As a result of the shroud repair assessment which included access hole cover leakage, the increase in PCT of 10 °F from the modification specific assessment was removed and replaced with PCT assessment associated with shroud repair.