Exelon Generation Company, LLC
Quad Cities Nuclear Power Station
22710 206th Avenue North
Cordova, IL 61242-9740

www.exeloncorp.com

Exelon Nuclear

May 9, 2002

SVP-02-039

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

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

Subject: Transmittal of 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light water nuclear power reactors," Annual Report for Quad Cities Units 1 and 2

The purpose of this letter is to satisfy the annual reporting requirement for 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light water nuclear power reactors," for the Quad Cities Nuclear Power Station.

The attachments describe all changes in accumulated Peak Cladding Temperature (PCT) since the last annual submittal.

Quad Cities Unit 1 is expected to implement the same change, as in Unit 2, to the ECCS evaluation model and transition to GE14 fuel in November 2002. Exelon will submit the 50.46 letter within 30 days to report the change implemented with the start of Unit 1 Cycle 18 operation.

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

Respectfully,

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

A001

Attachments:

Attachment A: Quad Cities Unit 1, 10 CFR 50.46 Report (GE Fuel)
Attachment B: Quad Cities Unit 1, 10 CFR 50.46 Report (Framatone ANP Fuel)
Attachment C: Quad Cities Unit 2, 10 CFR 50.46 Report (GE Fuel and ANP Fuel)
Attachment D: Quad Cities Units 1 and 2, 10 CFR.46 Report Assessment Notes

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

10CFR50.46 Attachment A
Quad Cities Nuclear Power Station Unit 1
Report (GE Fuel)

PLANT NAME: Quad Cities Unit 1
ECCS EVALUATION MODEL: SAFER/GESTR-LOCA
REPORT REVISION DATE: 05/09/02
CURRENT OPERATING CYCLE: 17

ANALYSIS OF RECORD

ECCS Evaluation Model: SAFER/GESTR-LOCA, NEDE-24011-P-A-8-US, May 1986

Calculation: General Electric document NEDC-31345P, Revision 2, dated July 1989

Fuel: P8x8R/BP8x8R, which bounds GE8, GE9 and GE10
Limiting Fuel Type: P8x8R/BP8x8R, which bounds GE8, GE9 and GE10
Limiting Single Failure: Battery Failure
Limiting Break Size and Location: 1.0 Double Ended Guillotine Recirculation Suction Line Break

Reference PCT PCT = 1382°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

Reported to USNRC on November 8, 1999	ΔPCT = +468°F
10 CFR 50.46 Report dated May 12, 2000	ΔPCT = 0°F
10 CFR 50.46 report dated May 9, 2001	ΔPCT = -5°F
Net PCT	**1845 °F**

B. CURRENT LOCA MODEL ASSESSMENTS

SAFER Condensation Model Error (see Note 1)	ΔPCT = 0°F
SAFER Pressure Rate Model Error (see Note 2)	ΔPCT = 10°F
Improved Technical Specifications Changes (Note 10)	ΔPCT = 0°F
Total PCT change from current assessments	ΔPCT =10°F
Cumulative PCT change from current assessments	$\Sigma \lvert \Delta PCT \rvert$ = 10°F
Net PCT	**1855 °F**

Attachment B
Quad Cities Nuclear Power Station Unit 1
10CFR50.46 Report (Framatome ANP Fuel)

PLANT NAME: Quad Cities Unit 1
ECCS EVALUATION MODEL: EXEM BWR
REPORT REVISION DATE: 05/09/02
CURRENT OPERATING CYCLE: 17

ANALYSIS OF RECORD

Evaluation Model: Advanced Nuclear Fuels Corporation Methodology for Boiling Water Reactors EXEM BWR Evaluation Model, ANF-91-048(P)(A), dated January 1993.

Calculations:

1. "Quad Cities LOCA-ECCS Analysis MAPLHGR Limits for ATRIUM™-9B Fuel," EMF-2348(P), Revision 0, Siemens Power Corporation, dated February 2000.

2. "LOCA Break Spectrum Analysis for Quad Cities Units 1 and 2," EMF-96-184(P), Siemens Power Corporation, dated December 1996.

Fuel: ATRIUM™-9B
Limiting Fuel Type: ATRIUM™-9B
Limiting Single Failure: LPCI Injection Valve
Limiting Break Size and Location: 1.0 (DEG) Double-Ended Guillotine in a Recirculation Suction Pipe

Reference PCT PCT = 1952°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

10 CFR 50.46 Report dated May 12, 2000	ΔPCT = 0°F
10 CFR 50.46 report dated May 9, 2001	ΔPCT = 3°F
Net PCT	**1955 °F**

B. CURRENT LOCA MODEL ASSESSMENTS (see Note 8)

Incorrect pellet dish volume terms in RDX2LSE fuel swelling calculation (see Note 3)	ΔPCT = 0 °F
Reconciliation of RODEX2-2A numerical iteration scheme (see Note 4)	ΔPCT = 1 °F
Incorrect HUXY gadolinia conductivity model (see Note 5)	ΔPCT = -3 °F
Incorrect calculation start time for the BULGEX code (see Note 6)	ΔPCT = 0 °F
Incorrect constant used in the rupture temperature calculation (see Note 7)	ΔPCT = 1 °F
Incorrect Zircaloy heat of reaction (see Note 8)	ΔPCT = 3 °F
Improved Technical Specifications Changes (Note 10)	ΔPCT = 0°F
Total PCT change from current assessments	ΣΔPCT = 2 °F
Cumulative PCT change from current assessments	$\Sigma \lvert \Delta PCT \rvert$ = 8°F
Net PCT	**1957 °F**

Attachment C
Quad Cities Nuclear Power Station Unit 2
10CFR50.46 Report (GE Fuel and Framatome ANP Fuel)

PLANT NAME:	Quad Cities Unit 2
ECCS EVALUATION MODEL:	SAFER/GESTR-LOCA
REPORT REVISION DATE:	05/09/02
CURRENT OPERATING CYCLE:	17

ANALYSIS OF RECORD

Evaluation Model: The GESTR-LOCA and SAFER Models for the Evaluation of the Loss-of-Coolant Accident, Volume III, SAFER/GESTR Application Methodology, NEDE-23785-1-PA, General Electric Company, Revision 1, October 1984.

Calculations:

"SAFER/GESTR-LOCA Loss-of-Coolant Accident Analysis for Dresden Nuclear Station 2 and 3 and Quad Cities Nuclear Station Units 1 and 2," NEDC-32990P, Revision 1, GE Nuclear Energy, September 2001.

Fuel Analyzed in Calculation: GE9/10, ATRIUM-9B and GE14
Limiting Fuel Type: GE14
Limiting Single Failure: Diesel Generator
Limiting Break Size and Location: 1.0 Double-Ended Guillotine in a Recirculation Suction Pipe

Reference Peak Cladding Temperature (PCT) PCT = 2110°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

10 CFR 50.46 Report dated March 28, 2002	ΔPCT = 0°F
Net PCT	**2110°F**

B. CURRENT LOCA MODEL ASSESSMENTS

None (see Note 9)	ΔPCT = 0°F
Total PCT change from current assessments	ΣΔPCT = 0°F
Cumulative PCT change from current assessments	Σ |ΔPCT = 0°F
Net PCT	**2110°F**

Attachment D
Quad Cities Nuclear Power Station Units 1 and 2
10CFR50.46 Report Assessment Notes

1. SAFER Condensation Model Error

   GNF issued a 10 CFR 50.46 Notification for Quad Cities due to a SAFER code error in condensation model during ECCS injection. There is no impact in PCT for both Units 1 and 2.

   [Reference: GNF Letter, "10 CFR 50.46 Notification - SAFER Condensation Error -2001-01-Exelon," CPC:01PB-040, May 8, 2001.]

2. SAFER Pressure Rate Model Error

   GNF issued a 10 CFR 50.46 Notification for Quad Cities due to SAFER code error in pressure rate calculation. The result is an increase in PCT of 10º F for Unit 1 analysis, which contained this error. The analysis for Unit 2 did not include this error.

   [Reference: GNF Letter, "10 CFR 50.46 Notification - SAFER Pressure Error - 2001-02 - Exelon," CPC:01-044, May 10, 2001.]

3. Incorrect pellet dish volume terms in RDX2LSE fuel swelling calculation

   The equation used in RDX2LSE to calculate the dish volume for swelling accommodation has an error resulting in the underestimation of the dish volume. The underestimation could affect predicted temperatures and gap conductances at moderate to high burnups.

   [References: Letter from D. Garber (FRA-ANP) to F. W. Trikur (Exelon), "10 CFR 50.46 PCT Reporting for Quad Cities Units," DEG:01:109, July 19, 2001.

   Letter from D. Garber (SPC) to R. J. Chin (ComEd), "Transmittal of Condition Report 8266 and Associated Part 21 Evaluation Report," DEG:00:029, January 27, 2000.]

4. Reconciliation of RODEX2-2A numerical iteration scheme

   Framatome ANP created a new RODEX2-2A code by merging the RODEX2-2A code for rod mechanical design analyses and the RDX2LSE code for safety analyses. The previous codes used the same NRC approved models and they are equivalent but contained some differences in iteration schemes. The new code has reconciled the differences in iteration schemes.

   [Reference: Letter from D. Garber (FRA-ANP) to F. W. Trikur (Exelon), "10 CFR 50.46 PCT Reporting for Quad Cities Units," DEG:01:109, July 19, 2001.]

Attachment D
Quad Cities Nuclear Power Station Units 1 and 2
10CFR50.46 Report Assessment Notes

5. Incorrect HUXY gadolinia conductivity model

   In 1998, Framatome ANP discovered that the NRC approved gadolinia conductivity model was not incorporated into the RDX2LSE code. Additional investigation for the condition report revealed that the HUXY code contained the same error.

   [References: Letter from D. Garber (FRA-ANP) to F. W. Trikur (Exelon), "10 CFR 50.46 PCT Reporting for Quad Cities Units," DEG:01:109, July 19, 2001.

   Letter from D. Garber (SPC) to R. J. Chin (ComEd), "Transmittal of Condition Report 6419 with Part 21 Evaluation Report," DEG:98:024, January 26, 1998.]

6. Incorrect calculation start time for the BULGEX code

   During the evaluation of a new version of the HUXY code to correct a user message, it was discovered that the BULGEX subroutine needed to be initiated at a much earlier time.

   [References: Letter from D. Garber (FRA-ANP) to F. W. Trikur (Exelon), "10 CFR 50.46 PCT Reporting for Quad Cities Units," DEG:01:109, July 19, 2001.

   Letter from D. Garber (FRA-ANP) to F. W. Trikur (Exelon), "Transmittal of 10 CFR 50.46 Reporting for LaSalle Units, Condition Report 9008, and CMR 2156," DEG:01:108, January 17, 2001.]

7. Incorrect constant used in the rupture temperature calculation

   The rupture temperature calculation over 950°C in BULGEX incorrectly and non-conservatively rounds a constant parameter term.

   [References: Letter from D. Garber (FRA-ANP) to F. W. Trikur (Exelon), "10 CFR 50.46 PCT Reporting for Quad Cities Units," DEG:01:109, July 19, 2001.

   Letter from D. Garber (FRA-ANP) to F. W. Trikur (Exelon), "Transmittal of 10 CFR 50.46 Reporting for LaSalle Units, Condition Report 9008, and CMR 2156," DEG:01:108, January 17, 2001.]

8. Incorrect Zircaloy heat of reaction

   The heat of reaction for zircaloy in the HUXY code is incorrect. The heat of reaction as a function of temperature does not account for the variation of the zircaloy heat capacity in the alpha-beta transformation temperature range.

   [References: Letter from D. Garber (FRA-ANP) to F. W. Trikur (Exelon), "10 CFR 50.46 PCT Reporting for Quad Cities Units," DEG:01:109, July 19, 2001.

   Letter from D. Garber (SPC) to R. J. Chin (ComEd), "Transmittal of Condition Report 8168, R/1, with Part 21 Evaluation Report," DEG:99:349, December 22, 1999.]

Attachment D
Quad Cities Nuclear Power Station Units 1 and 2
10CFR50.46 Report Assessment Notes

9. Current LOCA Model Assessments

   A new LOCA analysis was performed to support EPU, ITS and transition to GE14 fuel for Quad Cities Unit 2. There is no current assessment penalty.

   [Reference: Letter from Timothy J. Tulon (SVP-02-025) (Exelon) to USNRC, "10 CFR 50.46, 30-Day Report for Quad Cities Unit 2," March 28, 2002.]

10. Improved Technical Specifications (ITS) Changes

    The ITS changes for LPCI loop select ΔP setpoint, LPCI and Core Spray pumps start time delay setpoints have been evaluated and determined that for each change the PCT impact is zero for the Quad Cities Unit 1. ITS was implemented at Quad Cities on May 19, 2001.

    [References: "LPCI Loop Select Logic Δp Switch Alarm Setpoints for Commonwealth Edison Dresden and Quad Cities Plants," GE-NE-E12-00170-00-01, May 2000.

    Letter from D. Garber (SPC) to R.J. Chin (ComEd), "Dresden and Quad Cities Loop Select Logic Limitation," DEG:00:131, May 26, 2000.

    Memo to Joseph Taft (Quad Cities) from R. W. Tsai (NFM), "Analytical Limits for Pump Start Time Delay for the LPCI and CS Pumps at Quad Cities," NFM-MW:01-0029, January 26, 2001.]