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SVP-01-059

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.

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

Respectfully,



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

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)
- Attachment D: Quad Cities Unit 2, 10 CFR 50.46 Report (Framatone ANP Fuel)
- Attachment E: Quad Cities Units 1 and 2, 10 CFR.46 PCT Assessment Notes

A001

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

Attachment A
Quad Cities Unit 1, 10 CFR 50.46 Report (GE Fuel)
Page 1 of 2

PLANT NAME: Quad Cities Unit 1
ECCS EVALUATION MODEL: SAFER/GESTR-LOCA
REPORT REVISION DATE: 5/11/01
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

MARGIN ALLOCATION
(on the following page)

Attachment A
Quad Cities Unit 1, 10 CFR 50.46 Report (GE Fuel)
Page 2 of 2

Reference PCT

PCT = 1382°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

Reported to USNRC on 11/8/99
2000 Annual 10 CFR 50.46 Report dated 5/12/00

Δ PCT = +468°F

Δ PCT = 0°F

Prior Assessments PCT

PCT = 1850°F

B. CURRENT LOCA MODEL ASSESSMENTS

SAFER ECCS Leakage Flow Model Error (see Note 1)
SAFER Time Step Change (See Note 2)

Δ PCT = 0°F

Δ PCT = -5°F

Total PCT Change from Current Assessments

$\sum \Delta$ PCT = -5°F

Cumulative PCT Change from Current Assessments

$\sum |\Delta$ PCT| = 5°F

NET PCT

PCT = 1845°F

Attachment B
Quad Cities Unit 1, 10 CFR 50.46 Report (Framatome ANP Fuel)
Page 1 of 2

PLANT NAME: Quad Cities Unit 1
ECCS EVALUATION MODEL: EXEM BWR
REPORT REVISION DATE: 5/11/01
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

MARGIN ALLOCATION
(on the following page)

Reference PCT

PCT = 1952°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

2000 Annual 10 CFR 50.46 Report dated 5/12/00

Δ PCT = 0°F

Prior Assessments PCT

PCT = 1952°F

B. CURRENT LOCA MODEL ASSESSMENTS

Q1C17 Reload Fuel Assessment*

Δ PCT = 0°F

Incorrect Wilson Bubble Rise Model in FLEX (see Note 3)

Δ PCT = 0°F

Incorrect Momentum Equation in FLEX (see Note 4)

Δ PCT = 0°F

Impact of FLEX Code Changes Due to Validation and
Verification Activities (see Note 5)

Δ PCT = +3°F

Total PCT Change from Current Assessments

$\sum \Delta$ PCT = +3°F

Cumulative PCT Change from Current Assessments

$\sum |\Delta$ PCT| = 3°F

NET PCT

PCT = 1955°F

* Quad Cities Unit 1 Cycle 17 Reload Analysis, EMF-2416, Rev. 0, dated August 2000.

Attachment C
Quad Cities Unit 2, 10 CFR 50.46 Report (GE Fuel)
Page 1 of 2

PLANT NAME: Quad Cities Unit 2
ECCS EVALUATION MODEL: SAFER/GESTR-LOCA
REPORT REVISION DATE: 5/11/01
CURRENT OPERATING CYCLE: 16

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

MARGIN ALLOCATION
(on the following page)

Attachment C
Quad Cities Unit 2, 10 CFR 50.46 Report (GE Fuel)
Page 2 of 2

Reference PCT

PCT = 1382°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

Reported to USNRC on 11/8/99
2000 Annual 10 CFR 50.46 Report dated 5/12/00

Δ PCT = +468°F

Δ PCT = 0°F

Prior Assessments PCT

PCT = 1850°F

B. CURRENT LOCA MODEL ASSESSMENTS

SAFER ECCS Leakage Flow Model Error (see Note 1)
SAFER Time Step Change (See Note 2)

Δ PCT = 0°F

Δ PCT = -5°F

Total PCT Change from Current Assessments

$\sum \Delta$ PCT = -5°F

Cumulative PCT Change from Current Assessments

$\sum |\Delta$ PCT| = 5°F

NET PCT

PCT = 1845°F

Attachment D
Quad Cities Unit 2, 10 CFR 50.46 Report (Framatome ANP Fuel)
Page 1 of 2

PLANT NAME: Quad Cities Unit 2
ECCS EVALUATION MODEL: EXEM BWR
REPORT REVISION DATE: 5/11/01
CURRENT OPERATING CYCLE: 16

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

MARGIN ALLOCATION
(on the following page)

Attachment D
Quad Cities Unit 2, 10 CFR 50.46 Report (Framatome ANP Fuel)
Page 2 of 2

Reference PCT

PCT = 1952°F

MARGIN ALLOCATION

C. PRIOR LOCA MODEL ASSESSMENTS

2000 Annual 10 CFR 50.46 Report dated 5/12/00

Δ PCT = 0°F

Prior Assessments PCT

PCT = 1952°F

D. CURRENT LOCA MODEL ASSESSMENTS

Q2C16 Reload Fuel Assessment*

Δ PCT = 0°F

Incorrect Wilson Bubble Rise Model in FLEX (see Note 3)

Δ PCT = 0°F

Incorrect Momentum Equation in FLEX (see Note 4)

Δ PCT = 0°F

Impact of FLEX Code Changes Due to Validation and
Verification Activities (see Note 5)

Δ PCT = +3°F

Total PCT Change from Current Assessments

$\sum \Delta$ PCT = +3°F

Cumulative PCT Change from Current Assessments

$\sum |\Delta$ PCT| = 3°F

NET PCT

PCT = 1955°F

* In February 2000, Siemens reanalyzed ATRIUM-9B fuel with corrections made for all known computer code errors and modeling assessments previously reported. This provided a new analysis of record for Q2C16 as reported in the 2000 annual 10 CFR 50.46 report.

Attachment E
Quad Cities Units 1 and 2, 10 CFR 50.46 PCT Assessment Notes
Page 1 of 1

1. SAFER ECCS Leakage Flow Model

In the GENE's SAFER LOCA analyses for some plants, the ECCS leakage flows had not been subtracted from the ECCS system flows. An evaluation was performed to determine the impact of the ECCS leakage on the PCT for the affected plant analyses. The Quad Cities units are not affected by this error.

Reference:

"10 CFR 50.46 Error Report – ECCS Leakage Flows in SAFER analysis", GE Letter, dated 9/15/00.

2. SAFER Time Step Change

Per a recommendation of the BWROG audit of GENE's SAFER LOCA analysis process and methodology, an evaluation was performed to determine the impact of the time step size on LOCA calculations performed with SAFER04V. Smaller hydraulic and conduction time step sizes were recommended in the SAFER analyses for all plant types. The result is a decrease in PCT of 5°F for the Quad Cities Units 1 and 2.

Reference:

GE Letter, "Impact of SAFER Time Step Size on the Peak Clad Temperature (PCT) for Jet Pump Plant Analyses", dated 11/8/00.

3. Incorrect Wilson Bubble Rise Model in FLEX

The Wilson Bubble Rise model was implemented with an incorrect region slope in FLEX code. The calculated bubble rise velocity was affected and FLEX would produce less level swell during a transient. Quad Cities units were reevaluated using a version of FLEX with a correct transition point. There is no PCT (0 °F) impact for the Quad Cities units.

References:

1. "10 CFR 50.46 PCT Reporting for Quad Cities Units", SPC Letter, D. Garber to R. J. Chin, DEG:00:208, dated 8/31/00.
2. "FLEX V&V Findings", FANP Condition Report CR7806, Rev. 2, dated 10/2/00.

4. Incorrect Momentum Equation in FLEX

The momentum equation for pipe geometry adjacent to the break is missing an area divider in the injection flow term in FLEX code. Quad Cities units were not affected by the error and there is no PCT (0 °F) impact.

1. "10 CFR 50.46 PCT Reporting for Quad Cities Units", SPC Letter, D. Garber to R. J. Chin, DEG:00:208, dated 8/31/00.
2. "FLEX V&V Findings", FANP Condition Report CR7806, Rev. 2, dated 10/2/00.

5. Validation and Verification Activities of FLEX Code Changes

All the errors/deviations and code cleanup items in the reporting period were corrected and implemented and the V&V have been completed. Quad Cities units were reevaluated using the corrected version of FLEX. The result is an increase in PCT of 3°F for Quad Cities Units 1 and 2.

1. "10 CFR 50.46 PCT Reporting for Quad Cities Units", SPC Letter, D. Garber to R. J. Chin, DEG:00:208, dated 8/31/00.
2. "FLEX V&V Findings", FANP Condition Report CR7806, Rev. 2, dated 10/2/00.