Commonwealth Edison Company
Dresden Generating Station
6500 North Dresden Road
Morris, IL 60450
Tel 815-942-2920

ComEd

July 10, 1999

JMHLTR: #99-0080

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Dresden Nuclear Power Station Units 2 and 3
Facility Operating License Nos. DPR-19 and DPR-25
NRC Docket Nos. 50-237 and 50-249

Subject: Plant Specific ECCS Evaluation Changes - 10CFR50.46 Annual Report

Reference:
1) Letter from J. S. Perry (JSPLTR #97-0131) (ComEd) to USNRC, "Dresden Nuclear Power Station Units 2 and 3, Plant Specific ECCS Evaluation Changes - 10CFR50.46 Report DPR-19 and DPR-25, NRC Docket Nos. 50-237 and 50-249," dated July 10, 1997.

2) Letter from J.M.Heffley (JMHLTR #98-0199) (ComEd) to USNRC "Dresden Nuclear Power Station Units 2 and 3, Plant Specific ECCS Evaluation Changes - 10CFR50.46 Annual Report DPR-19 and DPR-25, NRC Docket Nos. 50-237 and 50-249," dated July 10, 1998.

3) Letter from J. Stephen Perry (JSPLTR #97-0059) (ComEd) to USNRC "Dresden Nuclear Power Station Units 2 and 3 Evaluation of Methods To Address ECCS Flow and Pressure Measurement Uncertainties, NRC Docket Nos. 50-237 and 50-249," dated March 21, 1997.

This letter fulfills the annual reporting requirement of 10CFR50.46(a)(3) for Dresden Nuclear Power Station Units 2 and 3. References 1 and 2 provided the Nuclear Regulatory Commission the Peak Cladding Temperature (PCT) data for Dresden Station since the Loss of Coolant Accident (LOCA) was reanalyzed in 1997. The PCT data reported in References 1 and 2 are supported by calculations using an acceptable evaluation model. The PCT data reported in this letter are based on estimates by Siemens Power Corporation. Since the sum of the absolute values of the estimated PCT changes does not exceed 50 degrees, reanalysis by an acceptable evaluation model is not required at this time per NRC IN 97-15, Supplement 1, "Reporting of Errors and Changes in Large-Break/Small-Break Loss-of-Coolant Evaluation Models of Fuel Vendors and Compliance with 10CFR 50.46(a)(3)."

A001

Attachments 1 and 2 provide PCT information for the limiting LOCA evaluations for Dresden Station, including all assessments as of July 1, 1999. The assessment notes in Attachment 3 provide a detailed description for each change or error reported.

In March 1997, we committed to perform an evaluation of methods to address Emergency Core Cooling System (ECCS) flow and pressure measurement uncertainties (Reference 3). The PCTs reported for both Unit 2 and Unit 3 include the results of the instrument loop inaccuracies. The ECCS measurement uncertainties were treated as a degradation to the overall ECCS response modeled in the 10CFR50, Appendix K LOCA analyses. Inclusion of these ECCS measurement uncertainties in the LOCA analyses fulfills the requirements of the Reference 3 commitment.

If there are any questions or comments concerning this letter, please contact Mr. D.F. Ambler at (815) 942-2920, extension 3800.

Respectfully,

for J. M. Heffley
Site Vice President
Dresden Nuclear Power Station

Attachment 1: Dresden Unit 2 10 CFR 50.46 Report
Attachment 2: Dresden Unit 3 10 CFR 50.46 Report
Attachment 3: Dresden Unit 2 and Unit 3 PCT Assessment Notes

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

# Attachment 1

# Dresden Unit 2 10CFR 50.46 Report

PLANT NAME: Dresden Unit 2
ECCS EVALUATION MODEL: EXEM BWR
REPORT REVISION DATE: 7/10/99
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. "Dresden LOCA-ECCS Analysis MAPLHGR Limits for ATRIUM-9B and 9x9-2 Fuel – Reduced LPCS Runout Flow," EMF-98-007(P), Supplement 2, Siemens Power Corporation, dated January 1998 (see Note 1).

2. "LOCA Break Spectrum Analysis for Dresden Units 2 and 3," EMF-97-025(P), Revision 1, Siemens Power Corporation, dated May 1997.

Fuel: 9x9-2, ATRIUM-9B LFA and ATRIUM-9B
Limiting Fuel Type: 9x9-2
Limiting Single Failure: LPCI Injection Valve
Limiting Break Size and Location: 1.0 Double-Ended Guillotine (DEG) in a Recirculation Suction Pipe

Reference PCT (see Note 2) PCT = 2018°F

## MARGIN ALLOCATION

### A. PRIOR LOCA MODEL ASSESSMENTS

| | |
|---|---|
| 50.46 report dated July 10, 1997 (See Note 3) | ΔPCT = 0°F |
| 50.46 report dated July 10, 1998 (See Note 4) | ΔPCT = 3°F |

**NET PCT** **PCT = 2021°F**

# Attachment 1

# Dresden Unit 2 10CFR 50.46 Report (Continued)

## B. CURRENT LOCA MODEL ASSESSMENTS

| | |
|---|---|
| Error in EXEM BWR evaluation model: Estimated impact of incorrect RDX2LSE Gadolinia conductivity model (see Note 5) | ΔPCT = 0°F |
| Error in EXEM BWR evaluation model: Estimated impact of incorrect RDX2LSE Gadolinia density model (see Note 6) | ΔPCT = 0°F |
| Error in EXEM BWR evaluation model: Estimated impact of incorrect RDX2LSE Gadolinia corrosion model (see Note 7) | ΔPCT = 0°F |
| Error in EXEM BWR Evaluation Model: Estimated impact of incorrect RDX2LSE fission gas release model for Gadolinia fuel (see Note 8) | ΔPCT = 0°F |
| Error in EXEM BWR Evaluation Model: Estimated impact of incorrect RELAX decay heat model (see Note 9) | ΔPCT = 10°F |
| Error in EXEM BWR Evaluation Model: Estimated impact of incorrect RELAX fuel average temperature calculation (see Note 10) | ΔPCT = 10°F |
| | |
| | |
| Total PCT Change from Current Assessments | $\sum\Delta PCT = 20°F$ |
| Cumulative PCT Change from Current Assessments | $\sum \lvert \Delta PCT \rvert = 20°F$ |

**NET PCT** **PCT = 2041°F**

# Attachment 2

# Dresden Unit 3 10CFR50.46 Report

PLANT NAME: Dresden Unit 3
ECCS EVALUATION MODEL: EXEM BWR
REPORT REVISION DATE: 7/10/99
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. "Dresden LOCA-ECCS Analysis MAPLHGR Limits for ATRIUM-9B and 9x9-2 Fuel," EMF-98-007(P), Siemens Power Corporation, dated January 1998 (see Note 1).

2. "LOCA Break Spectrum Analysis for Dresden Units 2 and 3," EMF-97-025(P), Revision 1, Siemens Power Corporation, dated May 1997.

Fuel: 9x9-2 and ATRIUM-9B
Limiting Fuel Type: 9x9-2
Limiting Single Failure: LPCI Injection Valve
Limiting Break Size and Location: 1.0 Double-Ended Guillotine (DEG) in a Recirculation Suction Pipe

Reference PCT (see Note 2) PCT = 1920°F

## MARGIN ALLOCATION

### A. PRIOR LOCA MODEL ASSESSMENTS

| | |
|---|---|
| July 10, 1997 50.46 report (See Note 3) | ΔPCT = 0°F |
| July 10, 1998 50.46 report (See Note 4) | ΔPCT = 16°F |

**NET PCT** **PCT = 1936°F**

# Attachment 2

# Dresden Unit 3 10CFR50.46 Report (Continued)

## B. CURRENT LOCA MODEL ASSESSMENTS

| | |
|---|---|
| Cycle 16 reload fuel (see Note 11) | ΔPCT = 0°F |
| Error in EXEM BWR evaluation model: Estimated impact of incorrect RDX2LSE Gadolinia conductivity model (see Note 5) | ΔPCT = 0°F |
| Error in EXEM BWR evaluation model: Estimated impact of incorrect RDX2LSE Gadolinia density model (see Note 6) | ΔPCT = 0°F |
| Error in EXEM BWR evaluation model: Estimated impact of incorrect RDX2LSE Gadolinia corrosion model (see Note 7) | ΔPCT = 0°F |
| Error in EXEM BWR Evaluation Model: Estimated impact of incorrect RDX2LSE fission gas release model for Gadolinia fuel (see Note 8) | ΔPCT = 0°F |
| Error in EXEM BWR Evaluation Model: Estimated impact of incorrect RELAX decay heat model (see Note 9) | ΔPCT = 10°F |
| Error in EXEM BWR Evaluation Model: Estimated impact of incorrect RELAX fuel average temperature calculation (see Note 10) | ΔPCT = 10°F |
| | |
| | |
| Total PCT Change from Current Assessments | $\sum\Delta PCT = 20°F$ |
| Cumulative PCT Change from Current Assessments | $\sum \lvert \Delta PCT \rvert = 20°F$ |

**NET PCT** **PCT = 1956°F**

# Attachment 3

# Dresden Unit 2 and Unit 3 PCT Assessment Notes

1. Analysis of Record

The 50.46 report dated July 10, 1997 noted that the analyses of record were EMF-97-031(P), Revision 1 and EMF-97-031(P) respectively for Units 2 and 3. These reports were reissued in January 1998 as EMF-98-007(P), Supplement 2 and EMF-98-007(P) respectively.

2. Reporting of Different Peak Cladding Temperatures for Each Unit

Dresden Unit 2 and Unit 3 are being maintained under separate analyses of record (EMF-98-007(P), Supplement 2 and EMF-98-007(P) respectively) as a result of a degraded Core Spray runout flow condition that exists at Dresden Unit 2. This flow condition is lower with respect to the LOCA analysis assumption for Dresden Unit 3. The following table lists the Core Spray runout flows assumed for both Units 2 and 3 in the analysis of record for each unit.

**Dresden Units 2 & 3 Core Spray Runout Flow**

| Current Unit 2 CS Runout Flow (GPM) | Current Unit 3 CS Runout Flow (GPM) | Current Unit 2 Analyzed CS Runout Flow (GPM) | Current Unit 3 Analyzed CS Runout Flow (GPM) |
|---|---|---|---|
| 5400[1] | 5650[2] | 5300[1] | 5650[2] |

(1) Core Spray runout flow tests at Dresden Unit 2 show that at least 5400 gpm of runout flow per loop would be available from the Core Spray system. Based on this information the Core Spray flow was conservatively modeled as being 5300 gpm per loop in the analysis of record for Unit 2 (EMF-98-007(P), Supplement 2).

(2) Core Spray runout flow tests at Dresden Unit 3 show that at least 5650 gpm of runout flow per loop would be available from the Core Spray system. Based on this information the Core Spray flow was modeled as being 5650 gpm per loop in the analysis of record for Unit 3 (EMF-98-007(P)).

3. Prior LOCA Model Assessment

The prior LOCA model assessment submitted by Reference 1 was a new baseline analysis for Dresden Units 2 and 3. Therefore, there is no PCT change.

# Attachment 3

## Dresden Unit 2 and Unit 3 PCT Assessment Notes (Continued)

4. Prior LOCA Model Assessment

The 50.46 report dated July 10, 1998 (Reference 2) assessed the impact of plant parameter changes and errors in the LOCA evaluation model. Calculations were performed to determine the PCT changes for both units.

5. Error in EXEM BWR Evaluation model – Incorrect RDX2LSE Gadolinia conductivity model.

The RDX2LSE code is used to calculate the fuel rod characteristics that are input to LOCA analyses. The NRC approved Gadolinia conductivity model described in XN-NF-85-92(P) was not incorporated in the code. SPC estimated the PCT impact to be zero for both units.

6. Error in EXEM BWR Evaluation model – Incorrect RDX2LSE Gadolinia density model.

The RDX2LSE code is used to calculate the fuel rod characteristics that are input to LOCA analyses. The code does not contain a $UO_2$-$Gd_2O_3$ theoretical density correlation but instead uses the $UO_2$ correlation for gadolinia fuel weight calculation. Calculations using a developmental version of the code with the correct correlation show the PCT impact to be zero for both units. Since an approved version of the code was not used, the PCT impact is considered an estimate.

7. Error in EXEM BWR Evaluation model – Incorrect RDX2LSE corrosion model.

The RDX2LSE code is used to calculate the fuel rod characteristics that are input to LOCA analyses. The MATPRO corrosion model is incorrectly programmed in the August 1998 and all earlier versions of the RDX2LSE code. The MATPRO corrosion model has been corrected in the October 1998 version and analyses performed for representative fuel rods. The results showed small changes in stored energy and gap conductance. SPC assessed the PCT impact to be zero for both units.

8. Error in EXEM BWR Evaluation model – Incorrect RDX2LSE fission gas release model for Gadolinia fuel.

The RDX2LSE code is used to calculate the fuel rod characteristics that are input to LOCA analyses. The fission gas release model is incorrect for gadolinia (Gd) rods in the August 1998 and all earlier versions of the RDX2LSE code. The model overpredicts the Gd rod fission gas release resulting in higher Gd fuel rod temperature. Therefore, the Gd rod temperature calculated by the incorrect model is conservative and the PCT change is reported as zero. The gas release model has been corrected.

# Attachment 3

## Dresden Unit 2 and Unit 3 PCT Assessment Notes (Continued)

9. Error in EXEM BWR Evaluation model – Incorrect RELAX decay heat model.

The RELAX code is used to calculate the system thermal-hydraulic response during the blowdown phase of the LOCA. The code calculates a decay heat multiplier which is less than 1.2 as required by Appendix K. Based on other analyses using the corrected code, the PCT impact is estimated to be 10 degrees.

10. Error in EXEM BWR Evaluation model – Incorrect RELAX fuel average temperature calculation.

The RELAX code is used to calculate the system thermal-hydraulic response during the blowdown phase of the LOCA. The error in the code results in lower fuel average temperature. Based on other analyses using the corrected code, the PCT impact is estimated to be 10 degrees.

11. Unit 3 Cycle 16 reload fuel

The LOCA analysis of record for Unit 3 was performed for the fuel types in the Dresden Unit 3 Cycle 15 (D3C15) cores. The calculated PCT for the new ATRIUM-9B fuel loaded into the D3C16 core is bounded by the PCT of the limiting fuel types in D3C15.