

LICENSEE: Duke Energy Corporation

FACILITY: Catawba Nuclear Station, Units 1 and 2  
McGuire Nuclear Station, Units 1 and 2

SUBJECT: SUMMARY OF MEETING HELD ON NOVEMBER 16, 1999,  
REGARDING TECHNICAL ISSUES RELATED TO THE LICENSEE'S  
AMENDMENT REQUEST OF JUNE 24, 1999 (TAC NOS. MA5989,  
MA5990, MA5994, AND MA5995)

REFERENCE: Meeting Notice by P. S. Tam, November 2, 1999

The U.S. Nuclear Regulatory Commission (NRC) staff held a meeting with Duke Energy Corporation (the licensee for Catawba and McGuire) to discuss technical issues related to proposed amendments to the Catawba and McGuire Technical Specifications (TS). Enclosure 1 is a list of participants. Enclosure 2 is the material the licensee provided at the meeting.

By letter dated June 24, 1999, the licensee proposed to revise various portions of the TS regarding reactor coolant flow limits. Staff review of the licensee's request led to a number of questions which were attached to the meeting notice referenced above. The most significant issue was how the licensee uses the methodology of maximum allowable radial peak (MARP) limits to justify the proposed new TS limits.

Licensee personnel described the history of the staff's review and approval of methodologies used at the licensee's nuclear plants. These methodologies are documented in Duke topical reports DPC-NE-1004, -2004, -3000, -3001, and -3002 (see Enclosure 2 for titles of these reports). However, the staff pointed out that the MARP methodology was not adequately described in these topical reports; the MARP methodology was described only for the rod ejection accident in DPC-NE-3001.

Participants agreed on these points: (1) the licensee needs to revise/supplement its submitted information to improve the description of MARP methodology; (2) the licensee needs to revise the wording of the TS Bases and the Updated Final Safety Analysis Report regarding use of MARP methodology and correct errors (e.g. the reference to DPC-NE-2005 should be DPC-NE-2004); and (3) the licensee needs to expeditiously respond to the questions attached to the meeting notice referenced above, especially in light of the clarification provided by the staff in the meeting.

Peter S. Tam, Senior Project Manager, Section 1  
Project Directorate II  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket Nos. 50-413, 50-414, 50-369 and 50-370

Enclosures: 1 and 2 as stated  
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UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

November 19, 1999

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McGuire Nuclear Station, Units 1 and 2

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A handwritten signature in black ink that reads "Peter S. Tam".

Peter S. Tam, Senior Project Manager, Section 1  
Project Directorate II  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket Nos. 50-413, 50-414, 50-369 and 50-370

Enclosures: 1 and 2 as stated

cc w/encl. 1 only: See next page

**Distribution for Meeting Summary**

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ACRS (w/o encl.)  
OGC (w/o encl.)

**E-MAIL (with only Enclosure 1)**

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MEETING WITH DUKE ENERGY CORPORATION

November 16, 1999

LIST OF ATTENDEES  
(In order of signing up)

<u>Name</u>	<u>Affiliation</u>
Peter Tam	NRC/NRR [Office of Nuclear Reactor Regulation]/Project Manager for Catawba
Frank Rinaldi	NRC/NRR/Project Manager for McGuire
Mike Cash	Duke Energy Corporation/McGuire
Greg Swindlehurst	Duke Energy Corporation
Timothy Niggel	Duke Energy Corporation
Scott Thomas	Duke Energy Corporation
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Eric Weiss	NRC/NRR/Reactor Systems Branch
Y. S. (Gene) Hsui	NRC/NRR/Reactor Systems Branch
Anthony Attard	NRC/NRR/Reactor Systems Branch
Lambros Lois	NRC/NRR/Reactor Systems Branch

# **Duke Energy Corporation**

## **DNB License Amendment and Related Methodology Meeting**

**November 16, 1999**

**Office of Nuclear Reactor Regulation**

Enclosure 2



# **Agenda**

<b>Introduction and Agenda Review</b>	<b>MTC</b>
<b>Licensing Basis and Submittal</b>	<b>MTC</b>
<b>UCBW/MARP Licensing Process</b>	<b>GBS</b>
<b>Uncontrolled Bank Withdrawal Accident</b>	<b>TRN/SBT</b>
<b>Technical Specifications and Methodology</b>	<b>SBT</b>
<b>Question Review</b>	<b>MTC</b>
<b>Wrap-up</b>	<b>MTC</b>

# **Introduction and Agenda Review**

**Duke Participants**

**Review Agenda**

**Submittal Summary**

**Content of Package**

**Referenced Topical Reports**

**Previous Discussions with Staff**

**Purpose of Meeting**

**Review Licensing Framework**

**Technical Sufficiency of Methods**

**Answer Staff's Questions**

**Importance of Submittal to Duke Reloads**

# **Licensing Basis and Submittal**

**Duke Safety Analysis in Support of Reload**

**Since McGuire Unit 1 Cycle 8 1991**

**Since Catawba Unit 1 Cycle 7 1992**

**Duke License Amendments use these methods**

**Methods not materially altered since initial use**

**Licensing Basis for Methods**

**Topical Report Submittals**

**Letters and other Docketed Correspondence**

**Safety Evaluation Reports**

**Previous Staff Review and Approval of these Methods**

# Licensing Basis and Submittal (cont)

## Topical Reports of Relevance

DPC-NE-2004, Core Thermal-Hydraulic Methodology Using VIPRE-01,  
Revision 1 SER Issued 02/20/97

DPC-NE-3000, Thermal-Hydraulic Transient Analysis Methodology,  
Revision 2 SER Issued 10/14/98

DPC-NE-3001, Multidimensional Reactor Transients and Safety Analysis  
Physics Parameter Methodology, SER Issued 11/15/91

DPC-NE-3002, UFSAR Chapter 15 System Transient Analysis Methodology,  
Revision 3 SER Issued 02/05/99

DPC-NE-1004, Nuclear Design Methodology Using CASMO-3 /  
SIMULATE-3P, Revision 1 SER Issued 05/26/96

# **UCBW/MARP Licensing Process**

**DPC-NE-3000 (RETRAN and VIPRE models) submitted  
9/87 in response to G. L. 83-11**

**Duke topical submittal plans for B&W fuel transition  
communicated to NRC 7/89**

**DPC-NE-3001 (REA, SLB, DR) submitted 1/90 for B&W  
fuel transition**

**NRC requests submittal of analysis details for events not  
in -3001 in meeting on 7/9/91**

**Duke proposes new DPC-NE-3002 topical with example  
by fax dated 7/15/91**

**NRC (R. Jones) agrees to -3002 scope and content by  
phone call on 7/16/91**

# **UCBW/MARP Licensing Process**

**Duke submits -3002 dated 8/30/91**

**NRC meeting at Duke on 10/7&8/91 to walk through  
the modeling details related to -3002**

**Duke submits meeting handouts on docket 10/16/91  
as requested by NRC**

**NRC issues questions / Duke responds**

**NRC SER issued 11/15/91**

**NRC SER refers to 10/16/91 submittal as a  
“supplement” to -3002**

**NRC 11/27/91 SER for M1C8 reload refers to the  
meeting and the docketed handouts**

# **UCBW/MARP Licensing Process**

## **Duke Perspective on the 3002 Review Process**

**Duke prepared 3002 in response to NRC request**

**NRC requested a meeting format to expedite review**

**This meeting material is docketed and forms part of the basis of the NRC approval (Current Licensing Basis)**

**The review was extensive in scope and depth**

**Significant technical resources were required by Duke and the NRC staff in this previous review**

# **UCBW/MARP Licensing Process**

**Duke has reviewed the NRC's questions regarding the MARP process and the UCBW accident in detail**

**Duke is using NRC-approved methods in conformance with the Current Licensing Basis as described in the Topical reports and related docketed information (DPC-NE-3000 and DPC-NE-3002)**

**The methodology provides a conservative cycle-specific confirmation that the core power peaking will not result in exceeding the DNBR limit for the UCBW transient**



# Uncontrolled Bank Withdrawal Accident

- System thermal-hydraulic transient analysis (RETRAN)
  - Model - DPC-NE-3000-PA
  - Analysis methodology - DPC-NE-3002-A
- Sensitivity studies:
  - Initial power level (10, 50, 98, 100%)
  - Withdrawal rate (1 - 45 pcm/sec)
  - Burnup (BOC, EOC)
  - Pressurizer pressure control (sprays, PORVs on / off)

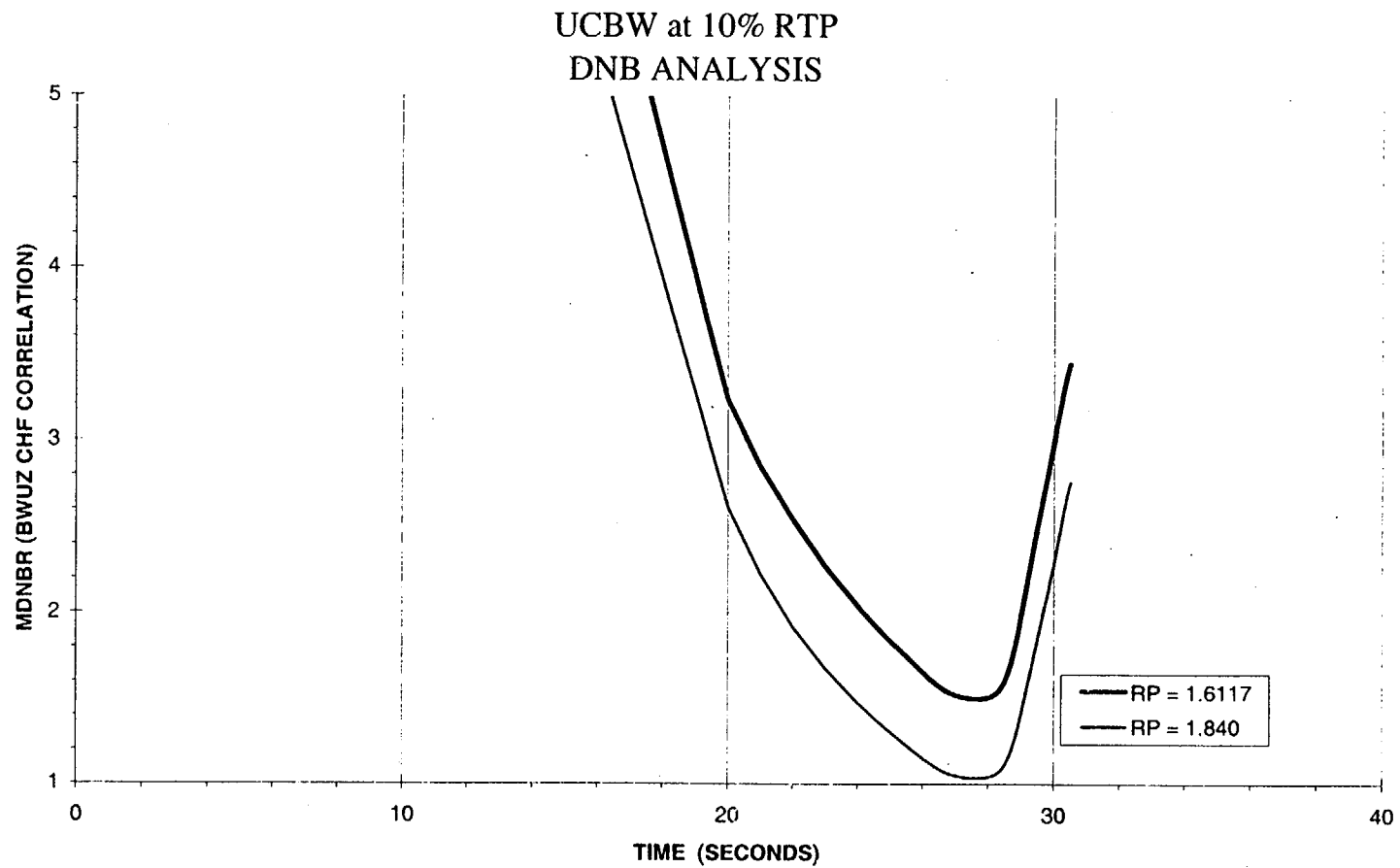
# Uncontrolled Bank Withdrawal Accident

- Detailed core thermal-hydraulic calculation (VIPRE)
  - Model - DPC-NE-3000-PA
- Transient results taken from RETRAN for use as boundary condition forcing functions:
  - Core exit pressure
  - Core inlet temperature
  - Core inlet flow rate
  - Core average heat flux

# Uncontrolled Bank Withdrawal Accident

- Transient DNBR analyses are performed using assumed core power distributions
- The most limiting case is determined based upon these transient DNBR analyses
- From the results of this limiting case, the minimum DNBR statepoint is established
- The time at which the minimum DNBR occurs is independent of the assumed power distribution

# Uncontrolled Bank Withdrawal Accident



# Uncontrolled Bank Withdrawal Accident

- A family of maximum allowable radial peak (MARP) limits are generated at the DNBR statepoint conditions (heat flux, flow rate, temperature, pressure)
- For each given axial power distribution (peak and location), the radial peak is adjusted until the DNBR limit is attained
- These MARP limits are then used to confirm that the cycle-specific core power peaking at the UCBW statepoint is less than the peaking at which the DNBR limit would be exceeded.

# **Uncontrolled Bank Withdrawal Accident**

**UCBW Power Distributions are Evaluated at Three Times During the Cycle, Typically Performed at BOC, MOC, and EOC**

**The Heat Flux Corresponding to the MDNBR Statepoint for Each Accident (10%, 50%, and 100% FP Events) is Used in the Peaking Evaluation**

**Rod Positions Over the Range of Allowable Positions as Determined By The Power Dependent Rod Insertion Limit Defined at the Initiating Power Level**

**Bank Misalignments of 12 Steps Are Considered**

# **Uncontrolled Bank Withdrawal Accident**

**Power Maneuvers are Performed to Generate Xenon Distributions That Are Conservative Relative Those Expected to Occur**

**Both Top and Bottom Peaked Xenon Distributions are Generated and Used To Evaluate Operation at the AFD Limits**

**Variations in the Previous Cycle Length are Considered in The Peaking Evaluation**

**Acceptable Result Is No Assembly Peaking Values Above the UCBW MARP Limits**

# **Technical Specifications and Methodology**

## **Important Core Limit Technical Specifications**

**$F_Q$ ,  $F_{\Delta H}$ , Rod Insertion Limits, Core Flow, AFD, QPTR**

**Power Distribution Measurements for LCO 3.2.1 ( $F_q$ ) and LCO 3.2.2 ( $F_{\Delta H}$ ) are Performed at Steady State Nominal Power Levels**

**LCO 3.2.2 Ensures the DNBR Design Basis is Met for Non-OT $\Delta$ T Condition II Transients That Initiate From Steady State Nominal Power Levels, and In Which the Event Itself Does Not Change the Power Distribution**



# **Technical Specifications and Methodology**

**LCO 3.2.2 Alone Does Not Provide Protection Against DNB for UCBW Accidents Initiated at Less Than Full Power**

**Instead of Relying on Surveillance Measurements to Confirm Acceptable DNB Results For the UCBW Accident, Cycle Specific Analyses are Performed at the Limiting Statepoint Conditions**

# **Question Review and Wrap Up**

**General Questions Left Open**

**Question by Question Review**

**Wrap Up**

**Dukes Methods for this submittal are within the CLB**  
**Dukes Methods are adequate and conservative**  
**Additional Actions to Ensure Timely Review**