NRC FORM 658
(9-1999)

U.S. NUCLEAR REGULATORY COMMISSION

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DATE OF MEETING
11/16/1999

The attached document(s), which was/were handed out in this meeting, is/are to be placed in the public domain as soon as possible. The minutes of the meeting will be issued in the near future. Following are administrative details regarding this meeting:

Docket Number(s)	**50-413, -414, -369, -370**
Plant/Facility Name	**Catawba and McGuire Nuclear Stations**
TAC Number(s) (if available)	**MA5989, MA5990, MA5994, MA5995**
Reference Meeting Notice	**P. Tam to R. Emch, 11/2/99**
Purpose of Meeting (copy from meeting notice)	**To discuss technical issues related to the proposed amendments (reference: letter, M. Tuckman to NRC, 6/24/99) to the Technical Specifications.**

NAME OF PERSON WHO ISSUED MEETING NOTICE	TITLE
Peter S. Tam	**Senior Project Manager**

OFFICE
Nuclear Reactor Regulation

DIVISION
Division of Licensing Project Management

BRANCH
Project Directorate II

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Duke Energy Corporation

DNB License Amendment and Related Methodology Meeting

November 16, 1999

Office of Nuclear Reactor Regulation

Agenda

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

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)

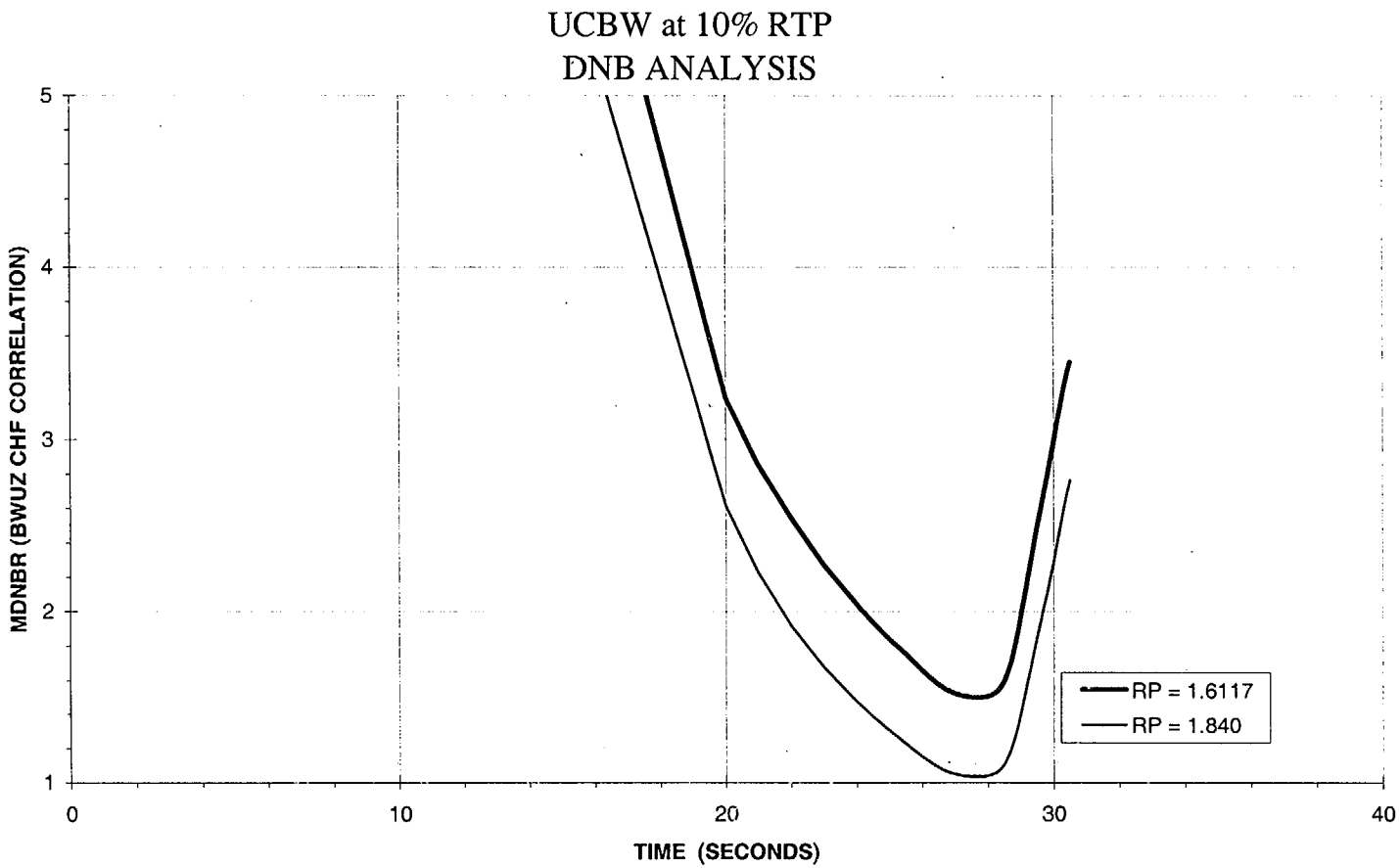
Uncontrolled Bank Withdrawal Accident

- 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 (Fq) and LCO 3.2.2 (FΔH) are Performed at Steady State Nominal Power Levels

LCO 3.2.2 Ensures the DNBR Design Basis is Met for Non-OTΔT 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**