FEB 26 1986

50-369/413

MEMORANDUM FOR: DISTRIBUTION

FROM: Carl H. Berlinger, Chief
Reactor Systems Branch, PWR-A

SUBJECT: SUMMARY OF JANUARY 22, 1986 MEETING REGARDING B&W'S PLAN FOR LICENSING FUEL IN DUKE PLANTS

On January 22, 1986, NRR staff met with representatives of Babcock & Wilcox Company and Duke Power Company to discuss the B&W plan for licensing fuel loading in Duke Power Company's plants having Westinghouse NSSS. The attendees are listed in Enclosure 1.

In the meeting, a Duke representative gave a brief perspective of Duke Power Company's plan to have B&W fuel loaded in the Westinghouse NSSS plants. B&W representatives gave an overview of their fuel program and licensing activity, details of B&W fuel design and experience, details of the B&W fuel analytical program, and licensing schedule. Enclosure 2 contains an outline of the B&W presentation with proprietary information deleted.

The staff gave no commitments on the review schedule in the absence of an official submittal, but identified the NRC contact as Carl Berlinger, Chief, Reactor Systems Branch, Division of PWR Licensing-A.

Original signed by:
J. Wilson for
Carl H. Berlinger, Chief
Reactor Systems Branch, PWR-A

Enclosure:
As stated

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2/24/86	2/25/86	2/26/86

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MEETING SUMMARY DISTRIBUTION LIST

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NRC Participants

T. Novak
B. Sheron
E. Rossi
C. Berlinger
W. Jensen
W. Brooks
S. Wu
J. Wilson
D. Hood
K. Jabbour
M. Dunenfeld

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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John H. Wilson for
Carl H. Berlinger, Chief
Reactor Systems Branch, PWR-A

Enclosure:
As stated

FEB 26 1986

ENCLOSURE 1

NAME	ORGANIZATION
Frank McPhatter	B&W
Jim Taylor	B&W
Walton Jensen	NRC/RSB
Jerry Wilson	NRC/RSB
Dave Hood	NRC/PWR-A/PAD-4
Gene Hsii	NRC/PWR-A/RSB
K. Jabbour	NRC/PWR-A/PAD-4
T. Novak	NRC/NRR/PWR-A
Neal Rutherford	Duke Power Company
Carl Berlinger	NRC/NRR/PWR-A (RSB)
Ernie Coppola	B&W/Fuel Project Manager
Ken Canady	Duke Power
Joe Cudlin	B&W
Jim Taylor	B&W
Mike Hannah	B&W
Ray King	B&W
George Meyer	B&W
Barclay Andrews	B&W
Gary Hanson	B&W
R. O. Sharpe	Duke Power Company
Walter Brooks	NRC/PWR-A/RSB
Marvin Dunenfeld	NRC/PWR-A/RSB
Shih-Liang Wu	NRC/PWR-A/RSB
B. Sheron	NRC/DSRO
Ernie Rossi	NRC/PWR-A

Enclosure 2

B&W/DUKE/NRC

MANAGEMENT MEETING

JANUARY 22, 1986

AGENDA

I.	INTRODUCTION AND MEETING OBJECTIVE	J. H. TAYLOR/B&W
II.	DUKE POWER COMPANY PERSPECTIVE	K. S. CANADY/DPC
III.	OVERVIEW OF FUEL PROGRAM AND LICENSING ACTIVITIES	M. A. HANNAH/B&W
IV.	DETAILS OF B&W FUEL DESIGN AND EXPERIENCE	R. A. KING/B&W
V.	DETAILS OF B&W FUEL ANALYTICAL PROGRAM AND LICENSING SCHEDULE	J. J. CUDLIN/B&W
VI.	CONCLUDING DISCUSSION	ALL

Agenda

I.	Introduction and Meeting Objective	J.H. Taylor/B&W
II.	Duke Power Company Perspective	K.S. Canady/DPC
III.	Overview of Fuel Program and Licensing Activities	M.A. Hannah/B&W
IV.	Details of B&W Fuel Design and Experience	R.A. King/B&W
V.	Details of B&W Fuel Analytical Program and Licensing Schedule	J.J. Cudlin/B&W
VI.	Concluding Discussion	All

Meeting Objectives

- Inform NRC Management of B&W's Plan for Licensing Fuel in Duke Power's McGuire and Catawba Units

- Obtain NRC Concurrence With This Plan So That the Licensing Review Process Can Commence

Overview of Fuel Program and Licensing Activites

- Background
- Fuel Design & Experience
- B&W Analytical Programs
- Licensing Strategy
- Schedule
- Summary

Background

- B&W Met With NRC Staff February 15, 1985 to Discuss Plans for Fuel in W NSSS
- Staff Concurred With Plan, But Said B&W Needed Customer Before Resources Could Be Committed To Review Process
- B&W Received a Contract From Duke Power for Catawba and McGuire Reload Fuel Beginning in 1990

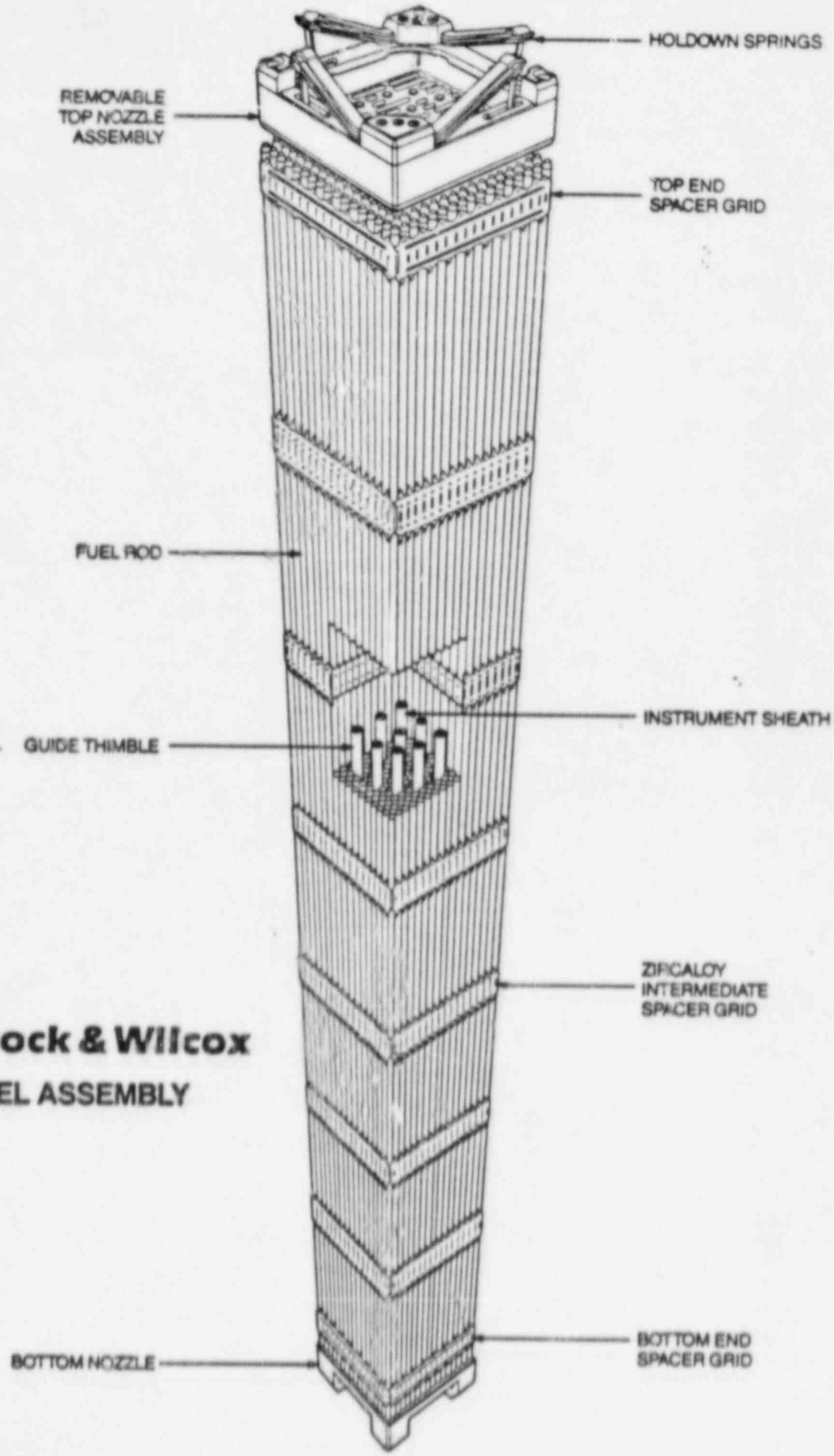
B&W Fuel Experience

- B&W Has Been Designing and Manufacturing Commerical Nuclear Fuel for Over 25 Years
- 4267 15 x 15 Fuel Assemblies Have Been Irradiated in B&W Designed NSSS (Oconee Class)
- 416 15 x 15 Fuel Assemblies Have Been Irradiated in W Designed NSSS (Conn Yankee)
- B&W Fuel Integrity Matches the Industry Average (99.996% in 1985)

B&W/NFI

- Nuclear Fuel Industries of Japan Entered into A License Agreement With B&W in 1976 For Design and Manufacturing Technology
- NFI Supplies 40% of Japanese PWR Market Including W 14 x 14, 15 x 15, and 17 x 17 Designs
- Of the 1014 Reload Fuel Assemblies Irradiated to Date, No Leakers Have Been Detected

B&W Domestic Experience	+	B&W Assistance To NFI	=	B&W Fuel for W NSSS



Babcock & Wilcox

FUEL ASSEMBLY

B&W Fuel Assembly Design Experience

• Incorporates B&W Standard Design Features	Operating Experience
Grid Restraint	US/Japan
Top & Bottom Spring Fuel Support	US/Japan
Rods Seated on Lower End Fitting	US/Japan
Keyable Grid/Fuel Rod Support	US/Japan
Dished/Chamfered Fuel Pellets	US/Japan
Zircaloy Intermediate Grids	US
• Other Design Features	
Reconstitutable	US/Japan
Mixing Vanes	US/Japan
Leaf Springs	US/Japan

Design Qualification

Full Size Prototype Testing

- Flow Testing
- Fuel Assembly Structural
- Component Structural
- Reactor Thermal-Hydraulic

Demonstration Program

- Four Fuel Assemblies
- McGuire Unit 2, Cycle 4 - Mid 1987
- Target Burnup: 45,000 MWd/mtU (4 Cycles)
- Post Irradiation Exam (PIE) After Each Cycle

B&W Topicals Applicable to Westinghouse NSSSs

Discipline	Topical	Code	Use
Core Thermal-Hydraulics	10141A	TACO2	Fuel Rod Performance
	10129A	LYNX1	Core DNB Analysis
	10130A	LYNX2	Core DNB Analysis
	10156	LYNXT	Core DNB Analysis
Nuclear Analysis	10115A	NULIF	Cross Section Calculation
	10116A	PDQ	Depletion Studies
	10118A	PDQ	Reactivity & Power Distribution
	10119A	PDQ	Nuclear Uncertainty
	10125A	FLAME	Maneuvering
	10152A	NOODLE	Multidimensional Studies
Mechanical Design	10084A	CROV	Creep Collapse Analysis
ECCS & Safety Analysis	10148	REFLOD3	Reflood Hydraulics
	10155	FOAM2	Core Mixture Level

PROPRIETARY

Topical Reports

Licensing Strategy

- Submit Codes and Methods Topicals on a Schedule That Will Permit Their Approval Prior to the Start of Application Analyses (McGuire 2 Cycle 6 in 1989)
- Have Online Review for Safety and ECCS Areas to Facilitate Schedule and Make Most Efficient Use of Resources

Schedule of Fuel Program and Licensing Activities

	1986	1987	1988	1989	1990
Prototype Testing					
Demo Assembly Irradiation					
Codes & Methods Topicals					
McGuire 2 Cycle 6 Analyses					
1st Batch Irradiation					
NRC Review					

Summary

- The B&W Fuel Assembly Design Is A Combination of Design Features Proven Through Operation in the US and Japan
- B&W's Analytical Capability Is Well Established and Modifications to Make Them Applicalbe to W NSSS Are in Progress
- B&W and Duke Power Have Established a Licensing Plan for Inserting B&W Fuel In Catawba and McGuire That Should Allow Effective Utilization of Resourcesat B&W, Duke, and the NRC

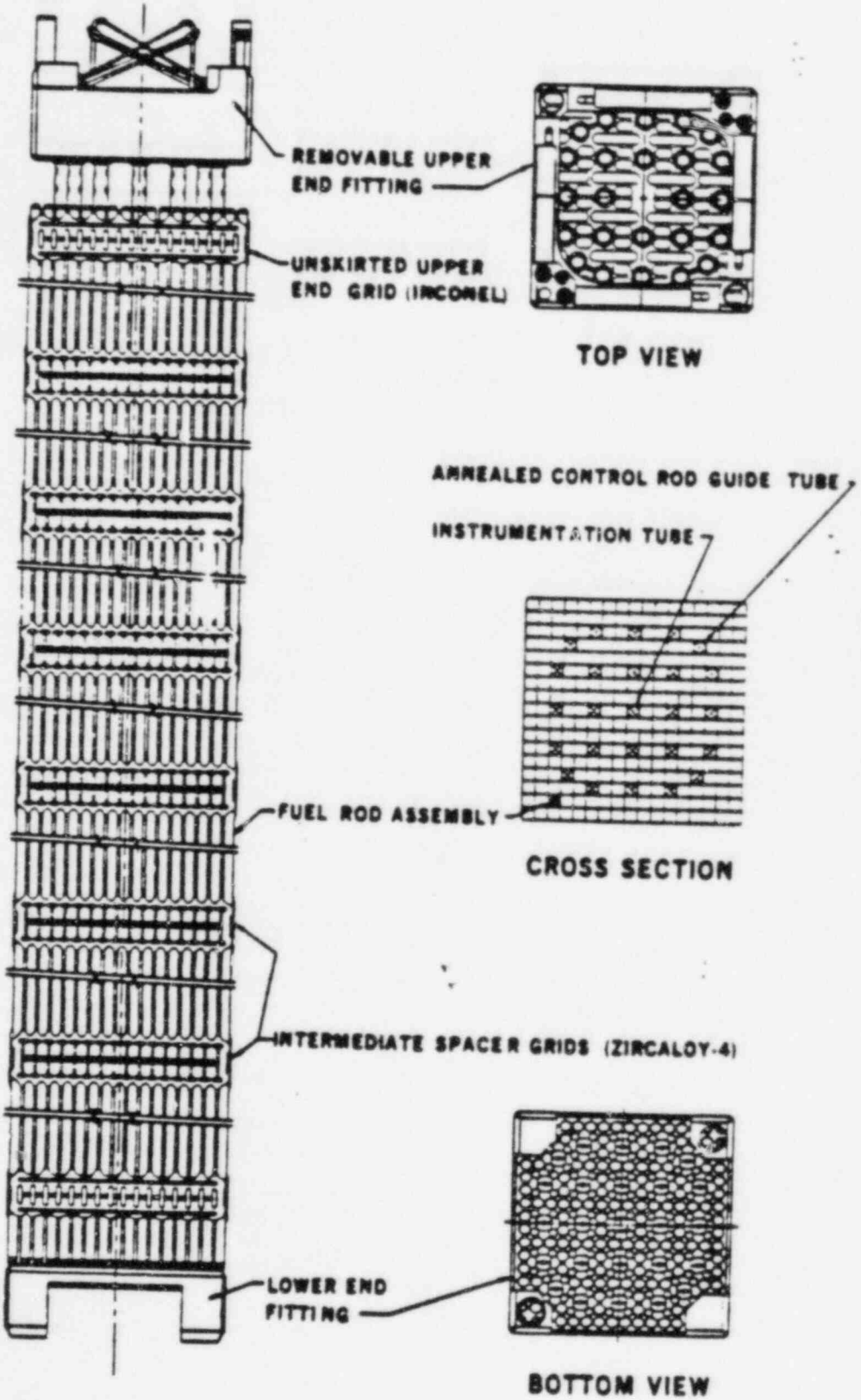
Design Description

Development Overview

Test Program Description

Demonstration Program

Reload Fuel Assembly



Fuel Assembly Design

- Compatible With Resident Fuel Assemblies, Reactor Intenals, Control Comonents and Storage/Handling Equipment.

	Operating Experience
• Incorporates B&W Standard Design Features	
Grid Restraint	US/Japan
Top & Bottom Spring Fuel Support	US/Japan
Rods Seated on Lower End Fitting	US/Japan
Keyable Grid/Fuel Rod Support	US/Japan
Dished/Chamfered Fuel Pellets	US/Japan
Zircaloy Intermediate Grids	US
• Other Design Features	
Reconstitutable	US/Japan
Mixing Vanes	US/Japan

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Fuel Assembly
Design Comparison

Parameter	Reload Assembly Design	B&W Design Mk-B	B&W Design Licensee NFI
Rod Array			
No. Rods			
No. Guide Thimbles			
No. Instrument Tubes			
No. Spacer Grids			
Fuel Length (In.)			
Rod Pitch (In.)			
Materials			
Fuel Clad			
Guide Thimble			
Instrument Tube			
Intermediate Grids			
End Grids			
Fuel Rods			
Outside Diameter (In.)			
Clad Thickness (In.)			
Dia. Gap (In.)			
Fuel Density %			

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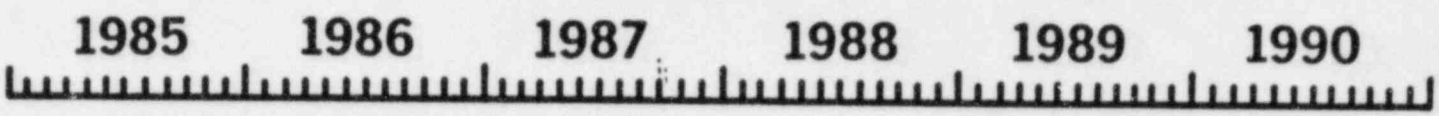
Comparison of Fuel Assembly Designs

W.B. McGuire: Units 1 & 2

Parameter	Original Design LOPAR	Current Design OFA	B&W Assembly Design
Rod Array	1		
No. Fuel Rods			
No. Guide Thimbles			
No. Instrument Tubes			
No. Spacer Grids			
Fuel Rod Pitch (In.)			
Assembly Envelope (In.)			
Fuel Stack Length			
Materials:			
Fuel Clad			
Guide Thimble			
Instrument Tube			
Intermediate Grids			
2 End Grids			
*Fuel Rods:			
Outside Dia.			
Clad Thickness			
Dia. Gap			
*Fuel Pellets:			
Diameter			
Length			
Density (% Theoretical)			
*Guide Thimbles:			
Upper Section OD/t(In.)			
Lower Section OD/t(In.)			
*Instrument Tube:			
OD/t			

*Design Change Relative To OFA Design.

Fuel Assembly Design/Testing/Manufacturing Major Milestones



MAJOR MILESTONE:

TEST PROGRAM

DEMONSTRATION PROGRAM

FIRST FUEL FABRICATION

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Test Program

Objective: Perform Mechanical/Hydraulic Tests to Support Licensing and Qualify Design for Full Batch Implementation (1990)

Test Hardware: Full Size Prototype Fuel Assembly and Control Components

Flow Testing

- ΔP and Lift
- Life and Wear
- Control Rod/Thimble Plug

Fuel Assembly Structural

- Lateral, Axial, Torsional Stiffness
- Frequency and Damping

Component Structural

- Spacer Grid Seismic
- Joint Strengths
- Misc. Hardware

Reactor Thermal-Hydraulic

- Critical Heat Flux (CHF)
- Laser Doppler Velocimeter (LDV)

Demonstration Program

- Four Fuel Assemblies
- McGuire Unit 2, Cycle 4 – Mid 1987
- Target Burnup: 45,000 MWd/mtU (4 Cycles)
- Post Irradiation Exam (PIE) After Each Cycle
  - Precharacterized
  - Detailed Visual (Video & Photo)
  - Fuel Assembly Growth
  - Fuel Rod Growth/Shoulder Gap Closure
  - Spacer Grid Elevations
  - Holddown Spring Set

Summary

- Fuel Assembly Design Based on Proven Technology and Design Experience
- Comprehensive Test Program and Demonstration Irradiation Provide Verification of Design for Full Batch Implementation

McGuire Unit 2/Cycle 6
Reload Licensing Plan

- Major Activities
- Schedule
- Questions

JJ Cudlin
B&W Fuel Engineering

NRC
1/22/86

McGuire Unit 2/Cycle 6
Reload Licensing Plan

Major Activities

- Methods and Code Development
- Preparation and Submittal of Topical Reports
- NRC Review
- Plant Specific Analyses
- Reload Report

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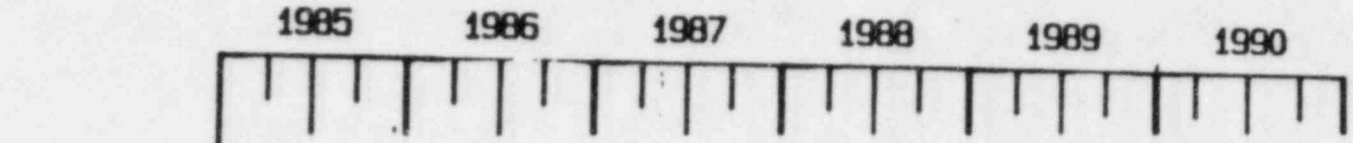
McGuire Unit 2/Cycle 6
Reload Licensing Plan

Topical Reports



Licensing

CHF TR

Operating Limits Methods TR

Mechanical, SCD, and Transient Analysis TR's

ECCS Code TR's

ECCS Evaluation Model TR

Design Limits Analysis

Reload Report

NRC Review

(On-Line and Post-Submittal)

B&W Activity

NRC Activity

McGuire Unit 2/Cycle 6 Licensing Plan

McGuire Unit 2/Cycle 6
Reload Licensing Plan

Questions

- Will the NRC Support the Licensing Plan?
- Will the NRC Provide On-Line Review in the Core T/H and ECCS/Safety Areas?
- Will the NRC Identify Contacts for Kick-Off Meetings in All/Some Areas?