Preliminary Agenda and Representative Draft Slides for Westinghouse Fuel Performance Update Meeting on February 19-21, 2008 (Non-Proprietary)

Westinghouse Electric Company
P.O. Box 355
Pittsburgh, Pennsylvania 15230-0355

Westinghouse Fuel Performance Update
Preliminary Agenda
Feb. 19-21, 2008

Tuesday, February 19

Facility Tour

2:00 pm - 4:00 pm	Columbia Facility Tour (contact lenses prohibited)

Wednesday, February 20

8:00 am - 8:15 am	Introductions and Welcome
	BWR Fuel Update
8:15 am - 9:15 am	Fuel Performance Update *
9:15 am - 10:15 am	Optima 3 *
10:15 am - 10:30 am	Break
	New Reactor Fuel Update
10:30 am - 11:45 am	New Reactor Fuel *
	PWR Fuel Update
11:45 am - 12:15 pm	Spent Fuel Pool Criticality *
12:15 pm - 1:00 pm	Lunch/Informal Discussion between NRC, Customers and Westinghouse
1:00 pm - 2:15 pm	Fuel Performance Update *
2:15 pm - 3:30 pm	High Burnup and New Alloy Strategies * LTA Programs High Burnup
3:30 pm - 3:45 pm	Break
3:45 pm - 4:30 pm	Foxfire *
4:30 pm - 4:45 pm	Beacon Sentinel *
4:45 pm - 5:00 pm	Wrap-Up

* The majority of these presentations is expected to be proprietary in nature.

Dress is business casual.

Thursday, February 21	**Licensing Review (Westinghouse & NRC)**
9:00 am - 9:30 am	PWR/BWR Topicals and Schedule *
9:30 am - 11:30 am	General Licensing Topics *
11:30 am - 12:30 pm	Lunch/Informal Discussion between NRC & Westinghouse & Wrap-Up

* The majority of these presentations is expected to be proprietary in nature.

Dress is business casual.

AP1000 Fuel Update

Westinghouse/NRC Fuel Update Meeting
Columbia, SC
Feb 20, 2008

DRAFT

Westinghouse

Agenda

- Westinghouse Fuels approach to initial core load for AP1000
- The Core Reference Report
- Gray Rod Enhancement (GRCA)
- Overview of other Fuel and Core Components

Westinghouse Approach to Initial Core Load

The AP1000 fuel, core components and core design are being developed in three distinct stages:

1. Reference Design ⇨ defined by the DCD (rev 15)
2. Licensed Design ⇨ defined by the DCD (rev 16) ⇨ COL
3. Final Design ⇨ defined by the COL + Core Reference Report ⇨ Initial Plant Start-up

A 3 step process allows the use of the best fuel product, core components and core design at the time of initial plant start-up consistent with the ongoing advancements we are seeing today.

Approach to Initial Core Load (continued)

- Reference Design ⇨ defined by the DCD Rev 15
  - Purpose to provide a reference design on which to base plant certification completed (circa 1990s)
  - Establishes the AP1000 plant requirements
- Licensed Design ⇨ DCD Rev 16 [defined by the DCD + Technical Report] ⇨ COL
  - Provides the licensed design in support of the COL application
  - Establishes a process for making changes and enhancements to the Fuel, Core Components and Core Design prior to initial start-up and for subsequent reloads
  - COL's submitted fall 2007 ⇨ Initial plant operations ~2014

DRAFT

Approach to Initial Core Load (continued)

- Final Design ⇨ COL + Core Reference Report
  - Submitted after the initial COL is issued but prior to initial fuel load with sufficient time for NRC review and approval .
  - A core reference report submitted to the NRC for review and approval (consistent with the requirements to address Tier 2* items)
    - Addresses enhancements to fuel assembly and core components design
    - Addresses initial fuel loading pattern, control rod designations and associated core physics parameters
  - Standardized Core Reference Report for the AP1000 fleet would be incorporated into the New Plant License following the standard license amendment process (10 CFR50.92)
  - Provides for NRC review & approval of initial core

A COL License can be amended using 10 CFR 50.92 to implement changes to the initial fuel, core component and core design.

The AP1000 Core Reference Report

AP1000 Core Reference Report

- The AP1000 Core Reference Report once reviewed and approved by the NRC would address any final changes to the fuel assembly design, methods and requirements prior to initial core load.

- The report presents the COL holder's actual initial core (cycle 1) fuel loading pattern, control rod designation (both RCCAs and GRCA) and associated core physics parameters at the time of initial start-up .

DRAFT

Core Reference Report

Examples of Fuel and Core Design evolutions that will be addressed in the Core Reference Report:

[ ] a, c

Core Reference Report will be submitted to the NRC for review and approval and there will be no change to the Chapter 15 conclusions.

DRAFT

Approach to Initial Core Load

- Basic Ground Rules for the Initial Core
  - Tier 2 * changes must be NRC Reviewed and Approved
  - "DCD Design Criteria" is defined as the Principal Design Requirements
    - Section 4.1.1 defines the Principal Design Requirements
    - Conclusions of the Chapter 15 Safety Analyses remain valid
  - Actual fuel and core component designs (including RCCAs and GRCAs), loading pattern, control rod designations and core physics changes from the design in the DCD **will be submitted to the NRC for review and approval (Core Reference Report) prior to initial fuel load**.
    - Subsequent cycles / reloads will follow the guidelines established by Westinghouse's standard licensed reload methodology and WCAP-12488-P-A "Fuel Acceptance Criteria"

DRAFT

Status of Fuel Licensing Activities

- Technical Report (TR-18) submitted Oct 31,2006
  - COL Information Item Addressed
  - Limited design changes to reflect enhancements or address inconsistencies
  - Provided the basis for the changes in DCD Rev 16 currently under review
- Responded to all RAIs by Sept 30, 2007
- NRC position ?

No Tier 1 Changes to Fuel
Tier 2 Changes Addressed in Fuel Technical Report

Summary – Next step

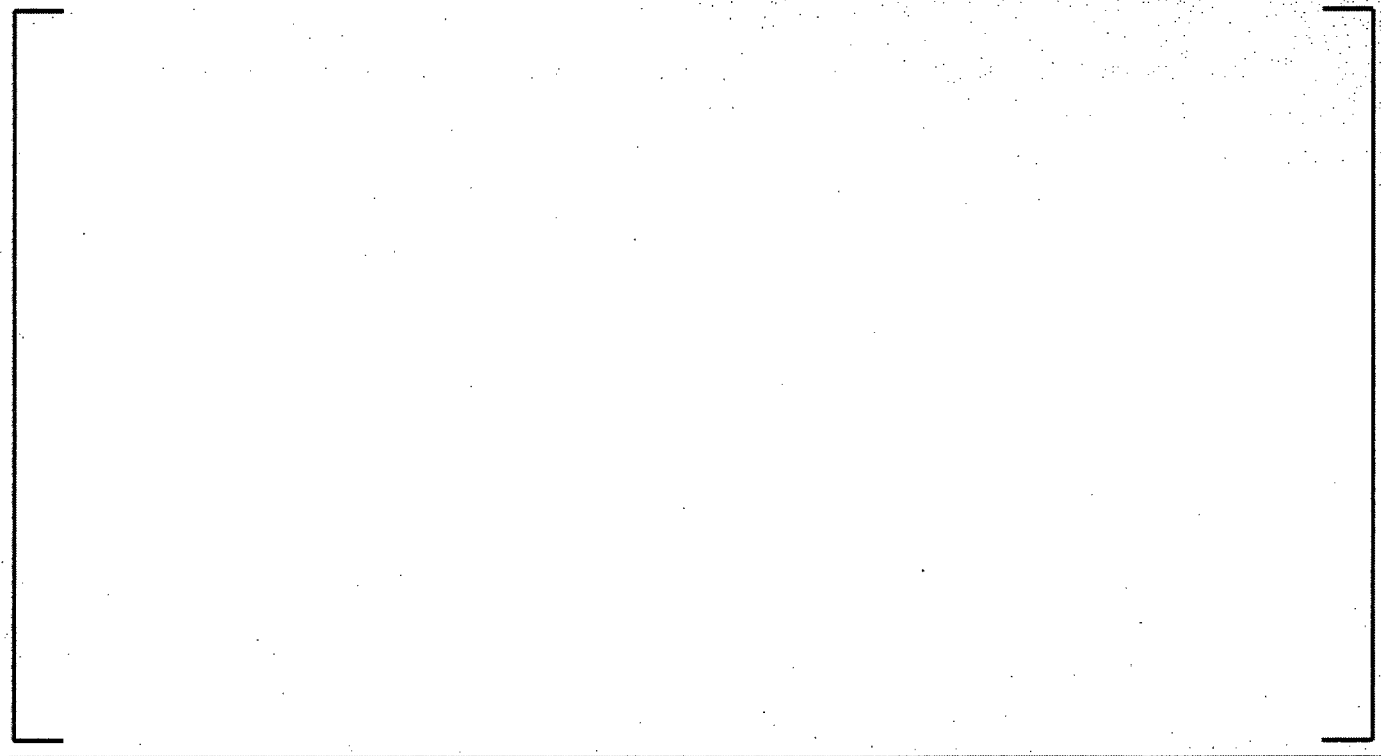
- AP1000 Core Reference Report
  - Reviewed and approved by the NRC via LAR process
  - Addresses final changes to the methods, core, fuel and core components design prior to initial core load

- Core Reference Report to be submitted to the NRC consistent with construction schedule to maximize opportunity to incorporate fuel and core design evolutions.
  - Allow sufficient time for NRC review
  - Follow Topical/LAR Process

Controls Rods (RCCAs) are different from Gray Rods (GRCA)

- Black Rods (RCCAs) have different design purposes from Gray Rods (GRCAs)

a, c



GRCA use in MSHIM Operation

- AP1000 uses MSHIM control strategy for reactivity changes associated with power level, power distribution and temperature control.
- MSHIM operation allows significant simplification in CVCS by eliminating previous requirements for boron change associated with power change.
- Operational boron change requirements with MSHIM are limited to startup, shutdown and fuel depletion.
- MSHIM control strategy fully automated in AP1000 power control system at power levels [ ]^{a,c}

GRCA Design Evolution

[a, c]

DRAFT

Westinghouse

Advanced GRCA Design

a, c

DRAFT

Westinghouse

Summary

[a, c]

DRAFT

Overview of other Fuel Assembly and Core Components

- Fuel Assembly
  - Base design is Westinghouse Robust Fuel Assembly (RFA)
  - 14 foot active fuel length (South Texas, EDF, and Doel 4 use the 14', RFA design)
  - Features adapted to AP1000 requirements
- Core Components
  - Core components are based on standard designs
  - GRCAs have been adapted from RCCAs to enable utilization of MSHIM control strategy
  - Core components and top nozzle have been adapted to allow top mounted in-core instrumentation

AP1000 Fuel Design Based on RFA

- AP1000 basic fuel assembly design is derived from the Westinghouse 17X17 Robust Fuel Assembly (RFA) XL design
- Westinghouse has significant experience with the RFA design

[ ] a, c

- Detailed AP1000 fuel dimensions defined to meet specific AP1000 design requirements

DRAFT

Westinghouse

AP1000 Fuel Features

a, c

DRAFT

Westinghouse

Summary

- DCD 12 is the current GRCA Design

- Westinghouse is developing an advanced GRCA design utilizing Tungsten as a gray material

- AP1000 Core Reference Report
  - Reviewed and approved by the NRC via LAR process
  - Addresses final changes to the methods, core, fuel and core components design prior to initial core load

DRAFT

???

DRAFT

Westinghouse

BWR Fuel Performance Update

Westinghouse/NRC Fuel Update Meeting
Columbia, SC
Feb 20, 2008

DRAFT

Westinghouse

Outline of Presentation

1. Statistics
   - Deliveries
   - Burnup
   - Failures

2. In-Reactor Performance
   - Cladding
   - Channel
   - Pellet

BWR Fuel Deliveries

a, b, c

DRAFT

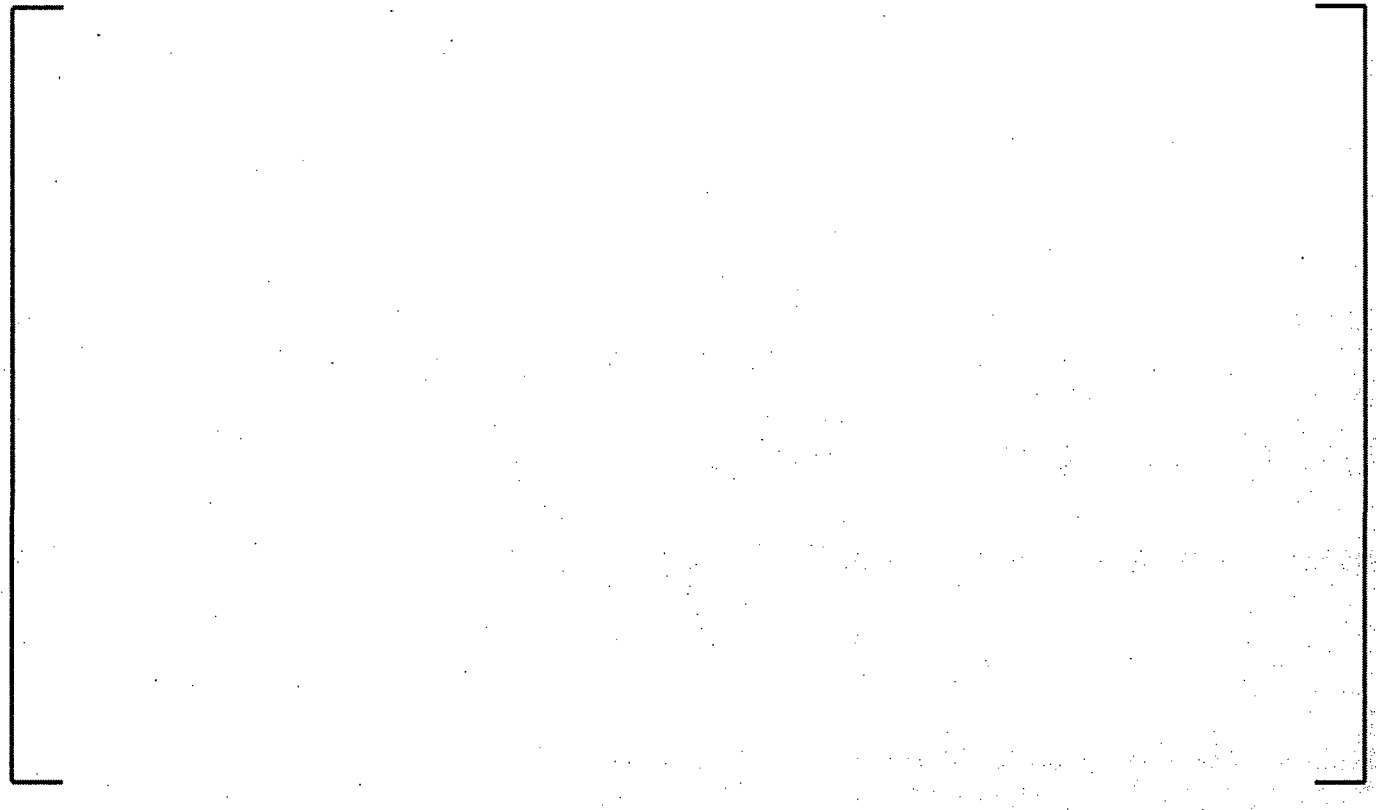
Westinghouse

BWR Fuel Burnup Experience, 2005

DRAFT

Westinghouse

Primary Fuel Failures Westinghouse BWR Experience



DRAFT

Westinghouse

Westinghouse 10x10 Fuel Primary Failures

a, b, c

DRAFT

Westinghouse

Westinghouse 10x10 Fuel Primary Failures

a, c

Outline of Presentation

1. Statistics
   - Deliveries
   - Burnup
   - Failures

2. In-Reactor Performance
   - Cladding
   - Channel
   - Pellet

Cladding

- Improve high burnup performance
  - Development of LK2+ and LK3
- Verify high burnup performance
  - Pool-side and hot-cell examinations of leading fuel rods
    - Corrosion
    - Rod growth
    - Hydriding

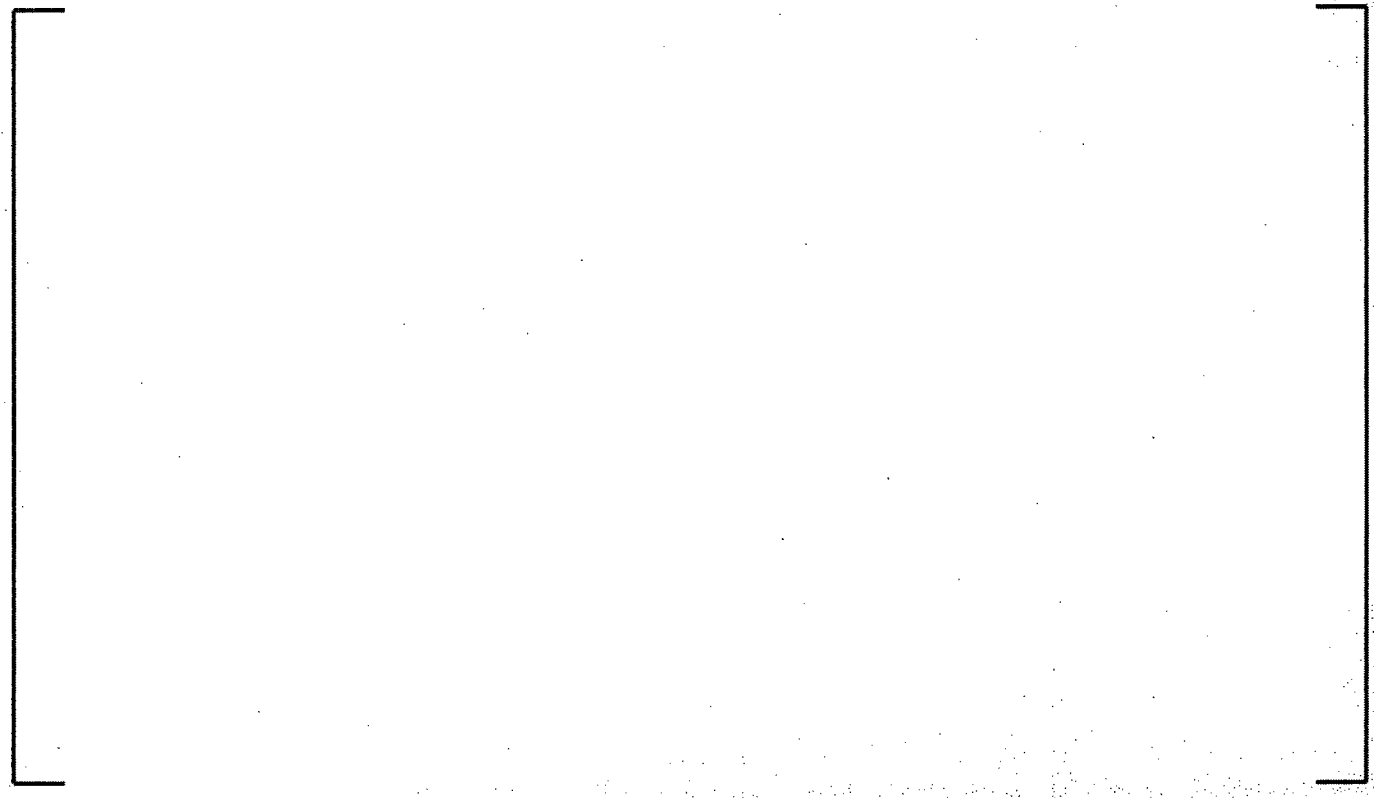
[ ] a, b, c

DRAFT

Westinghouse

LK3 - Achieved Burnup

a, b, c

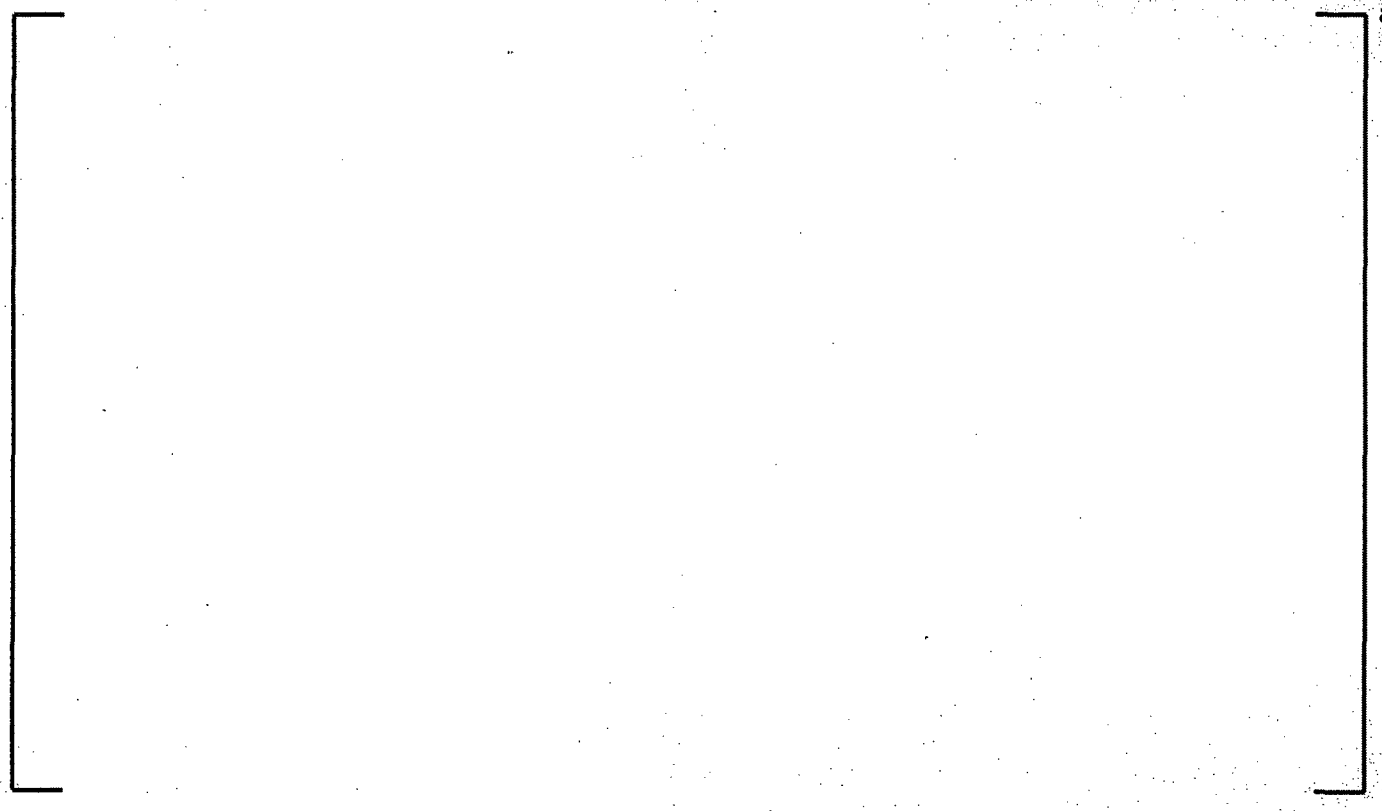


DRAFT

Westinghouse

Two-Life Rods [ ]a, c

a, b, c



DRAFT

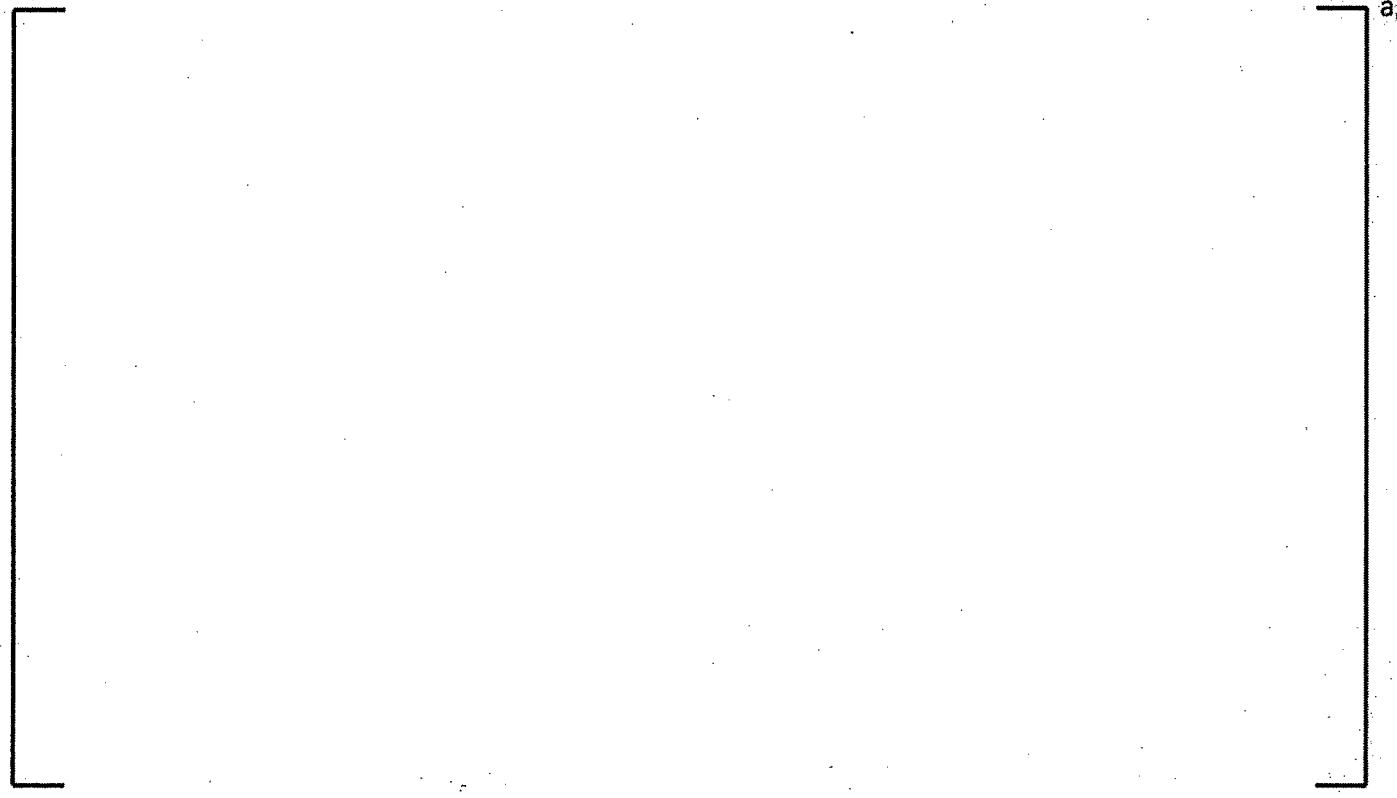
Westinghouse

Two-Life Rods Power History

a, b, c

Rod Growth By Cladding Type

a, b, c



BWR Fuel Performance Channel

[ ]a, c

DRAFT

Westinghouse

Channel Corrosion

a, b, c

Hydrogen Pick-Up

a, b, c

Hydrogen Pick-Up Outer Zry-2 Channel at 45 MWd/kg U

a, b, c

Channel Bow & Irradiation Induced Growth

a, c

DRAFT

Westinghouse

Channel Growth

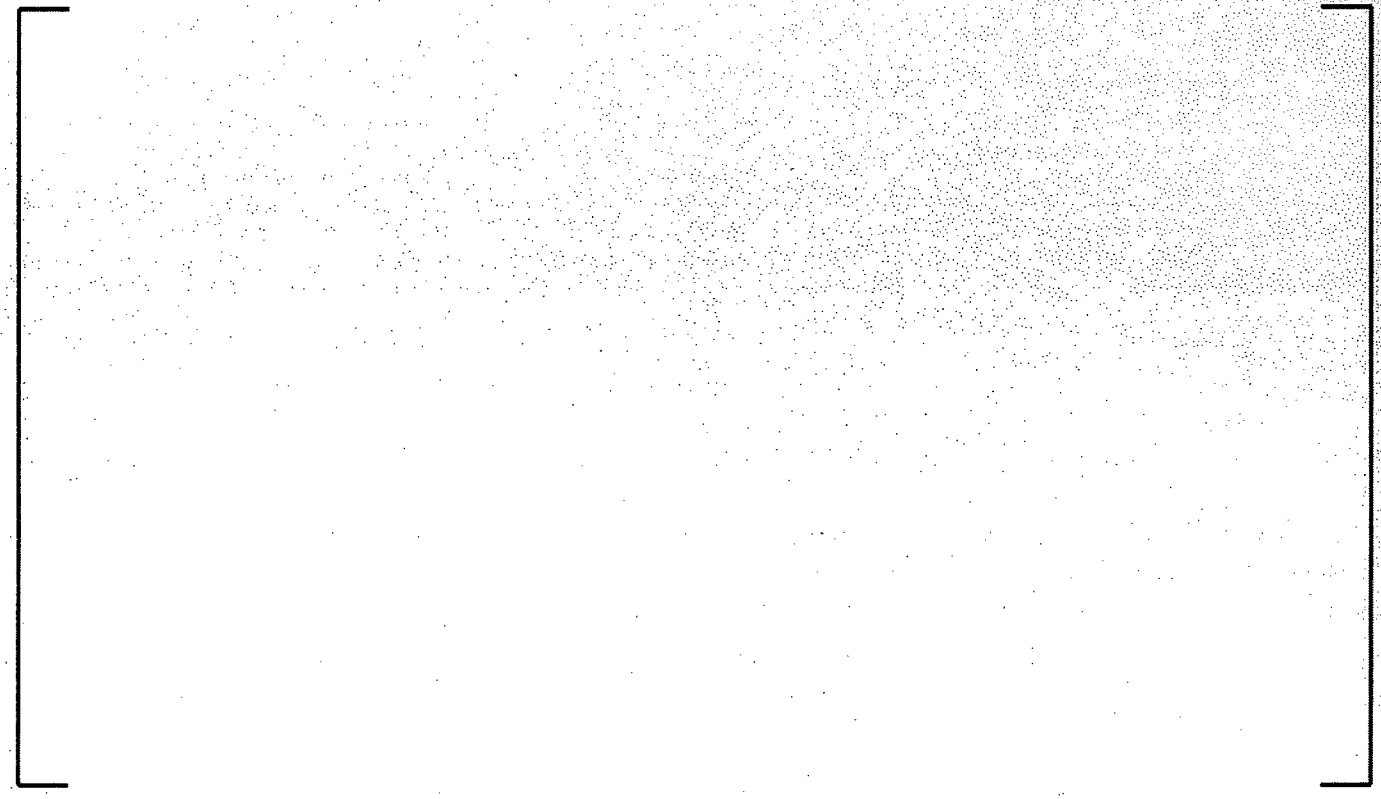
a, b, c

DRAFT

Westinghouse

Channel Bow in Asymmetric Lattice

a, b, c



DRAFT

Westinghouse

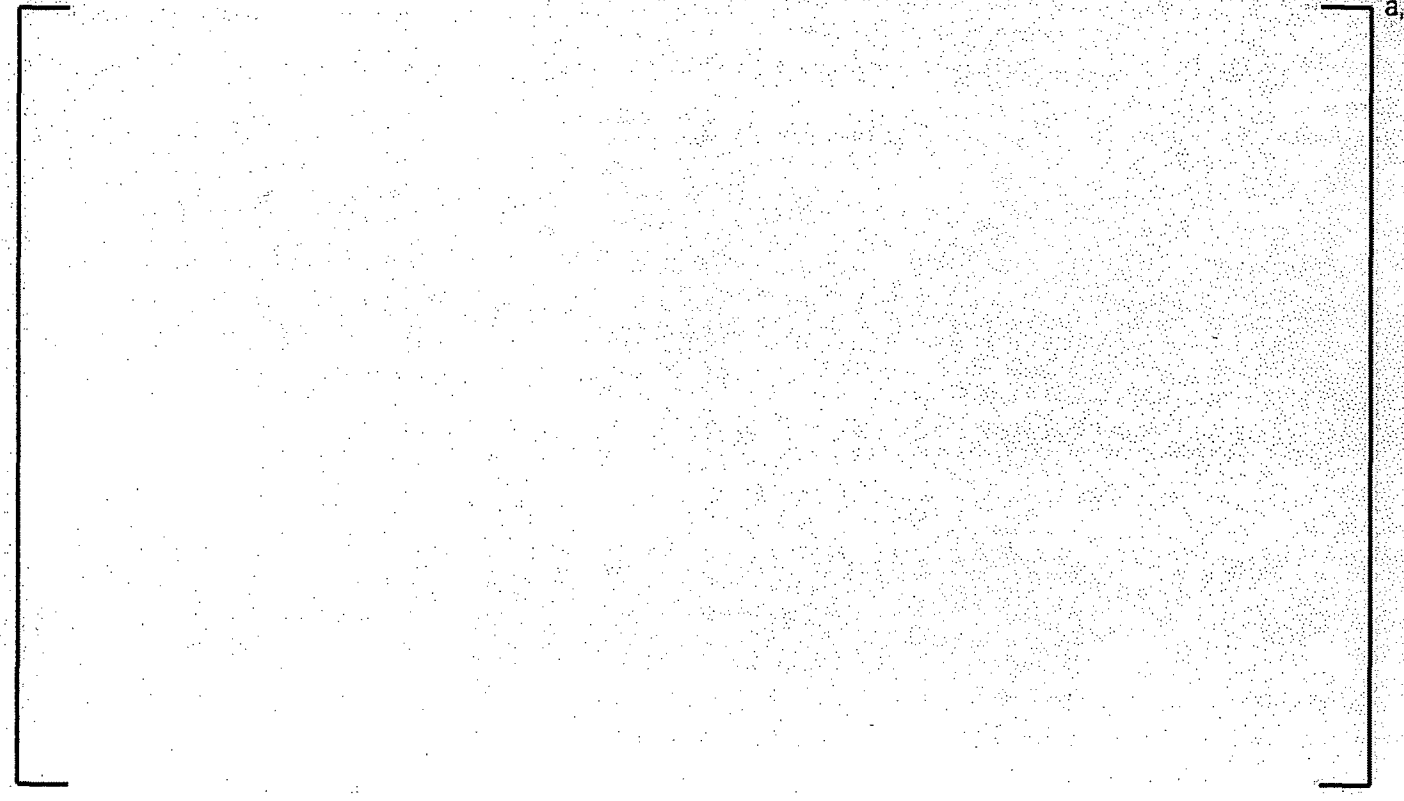
Channel Bow in Symmetric Lattice

a, b, c

DRAFT

Westinghouse

Fission Gas Release



DRAFT

Westinghouse