ABB

December 15, 1999
LD-1999-0063

50-317/318

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Transmittal of Meeting Slides concerning Corrosion Behavior of OPTIN Cladding at Calvert Cliffs (Proprietary Information)

Dear Sir:

ABB C-E Nuclear Power, Inc., (ABB) provides herewith for your use one proprietary and one non-proprietary copy of the following material. This material was discussed during the meeting between BG&E and ABB with the NRC on December 14, 1999.

- *"Corrosion Behavior of OPTIN Cladding at Calvert Cliffs," Meeting Slides dated December 14, 1999.*

Certain information contained in this transmittal is proprietary in nature. It is requested that this information be withheld from public disclosure in accordance with the provisions of 10 CFR 2.790 and that it be appropriately safeguarded. The reasons for the classification of this information as proprietary are delineated in the attached affidavit. Please destroy these proprietary meeting slides when you have completed your review.

Please feel free to contact Virgil Paggen of my staff at 860-285-4700 or me if you have any questions.

Sincerely,

Ian C. Rickard, Director
Nuclear Licensing

Enclosure: As Stated
Attachment: Proprietary Affidavit
cc: Alex Dromerick (NRC)

Change POR Ltr Encl 1 INP

Apol 1 Prop 1 INP

ABB Combustion Engineering Nuclear Power, Inc.

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Phone 860-285-9678 Fax 860-285-3253

I, Ian Rickard, depose and say that I am the Director, Nuclear Licensing, of ABB C-E Nuclear Power, Inc. (ABB), duly authorized to make this affidavit, and have reviewed or caused to have reviewed the information which is identified as proprietary and described below. I am submitting this affidavit in conformance with the provisions of 10 CFR 2.790 of the Commission's regulations for withholding this information.

I have personal knowledge of the criteria and procedures utilized by ABB in designating information as a trade secret, privileged, or as confidential commercial or financial information. The information for which proprietary treatment is sought, and which document has been appropriately designated as proprietary, is contained in the following:

- *"Corrosion Behavior of OPTIN Cladding at Calvert Cliffs," Meeting Slides dated December 14, 1999.*

Pursuant to the provisions of paragraph (b)(4) of Section 2.790 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure, included in the above referenced document, should be withheld.

1. The information sought to be withheld from public disclosure is owned and has been held in confidence by ABB. It consists of technical data and post-exposure evaluation results of OPTIN-clad fuel bundles.
2. The information consists of summary data or other similar data concerning a process, method or component, the application of which results in substantial competitive advantage to ABB.
3. The information is of a type customarily held in confidence by ABB and not customarily disclosed to the public.
4. The information is being transmitted to the Commission in confidence under the provisions of 10 CFR 2.790 with the understanding that it is to be received in confidence by the Commission.
5. The information, to the best of my knowledge and belief, is not available in public sources, and any disclosure to third parties has been made pursuant to regulatory provisions or proprietary agreements that provide for maintenance of the information in confidence.
6. Public disclosure of the information is likely to cause substantial harm to the competitive position of ABB because:
   a. A similar product is manufactured and sold by major competitors of ABB.
   b. Development of this information by ABB required hundreds of thousands of dollars and thousands of manhours of effort. A competitor would have to undergo similar expense in generating equivalent information.
   c. The information consists of technical data and qualification information for ABB-supplied products, the possession of which provides a competitive economic advantage. The availability of such information to competitors would enable them to design their product to better compete with ABB, take marketing or other actions to improve their product's position or impair the position of ABB's product, and avoid developing similar technical analysis in support of their processes, methods or apparatus.
   d. In pricing ABB's products and services, significant research, development, engineering, analytical, manufacturing, licensing, quality assurance and other costs and expenses must be included. The ability of ABB's competitors to utilize such information without similar expenditure of resources may enable them to sell at prices reflecting significantly lower costs.

Sworn to before me this
8th day of December, 1999

Ian C. Rickard
Director, Nuclear Licensing

Laurie J. White
Notary Public
My commission expires: 8/31/04

Corrosion Behavior of OPTIN Cladding at Calvert Cliffs

Presented by Penney File

BGE

December 14, 1999

Purpose

- Describe Inspections and Observations
- Summarize Evaluation Supporting Operability of Current Cores
- Describe Approach for U1C15

Outline

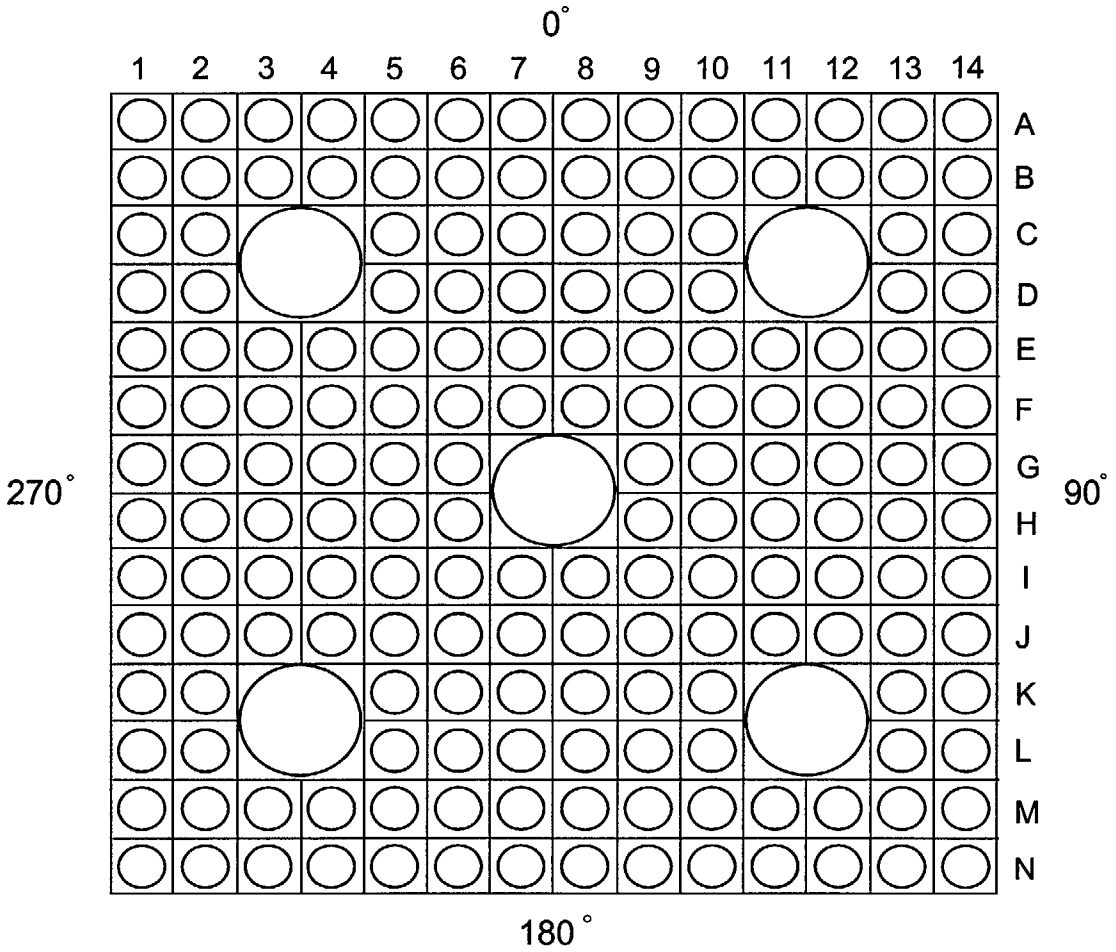
- Describe Inspections and Observations
- Describe Immediate Actions
- Describe Longer Term Actions
- Summarize

Calvert Cliffs Background

- 24 Month Cycles
- 650 EFPD
- Tcold - 546.5
- Thot - 592
- Average LHGR - 6.25 Kw/Ft
- Tech Spec Fr - 1.65
- High Duty - 2 24 Month Cycles
- Low Duty - 3 24 Month Cycles

Calvert Cliffs Fuel Assembly Schematic

Upper End Fitting Serial Number Side



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July 1999 Initial Inspection Scope

- C2NT Test Assemblies Discharged in Spring 1999
  - 4 Assemblies Visually Examined
  - 1 Assembly Reconstituted to Allow ECT and Oxide Thickness Measurement [ ]
- Visual Examination of Discharged Assemblies to Characterize the Effects of Duty
  - C1 Batch N and P (4 total, Assembly Average Burnups [ ] GWD/MTU)
  - C2 Batch M and N (4 total, Assembly Average Burnups [ ] GWD/MTU)

High Duty Fuel Observations

- Oxide [ ]
- No Evidence of [ ]
- More Detailed Examination Required

Expanded Examination Scope

- 2 High Duty and 1 Low Duty Assembly Reconstituted to Allow Single Rod Exams
  - [ ] Measured to Characterize Oxide Thickness
  - [ ] Visually Examined to Characterize Appearance
- Visual Examination of [ ] High Duty Assemblies to Quantify Population of [ ]

Cladding Oxide Thickness Determination

- ECT Technique Used to Measure Liftoff From Base Metal
- Measurements Performed on Individual Rods After Removal From Assembly
  - Four Full Length Axial Traces Performed at 90° Azimuthal Orientations
  - Thickness Data for Each Trace Stored Digitally as a Function of Elevation (0.050 Inch Intervals)
- Data Reduction
  - Axial Traces Combined to Generate Composite
  - Maximum Circumferentially Averaged Oxide Thickness Calculated From Digital Composite as Running Average Over 1 Inch Interval (80 Measurements)

Low Duty Observations

- [ ] Assembly
- [ ]
- Measured Oxide [ ]
- No Blistering/Spalling

High Duty Observations

- [ ] Assemblies
- [ ]
- Accuracy of Oxide Predictions Dependent on [ ]
- Blistering/Slight Spalling Observed, [ ]

Blistering/Spalling

- Spalling Is a Process That Begins [ ]
- [ ] Progresses To Blistering
- Blistering Progresses To "Spallation"

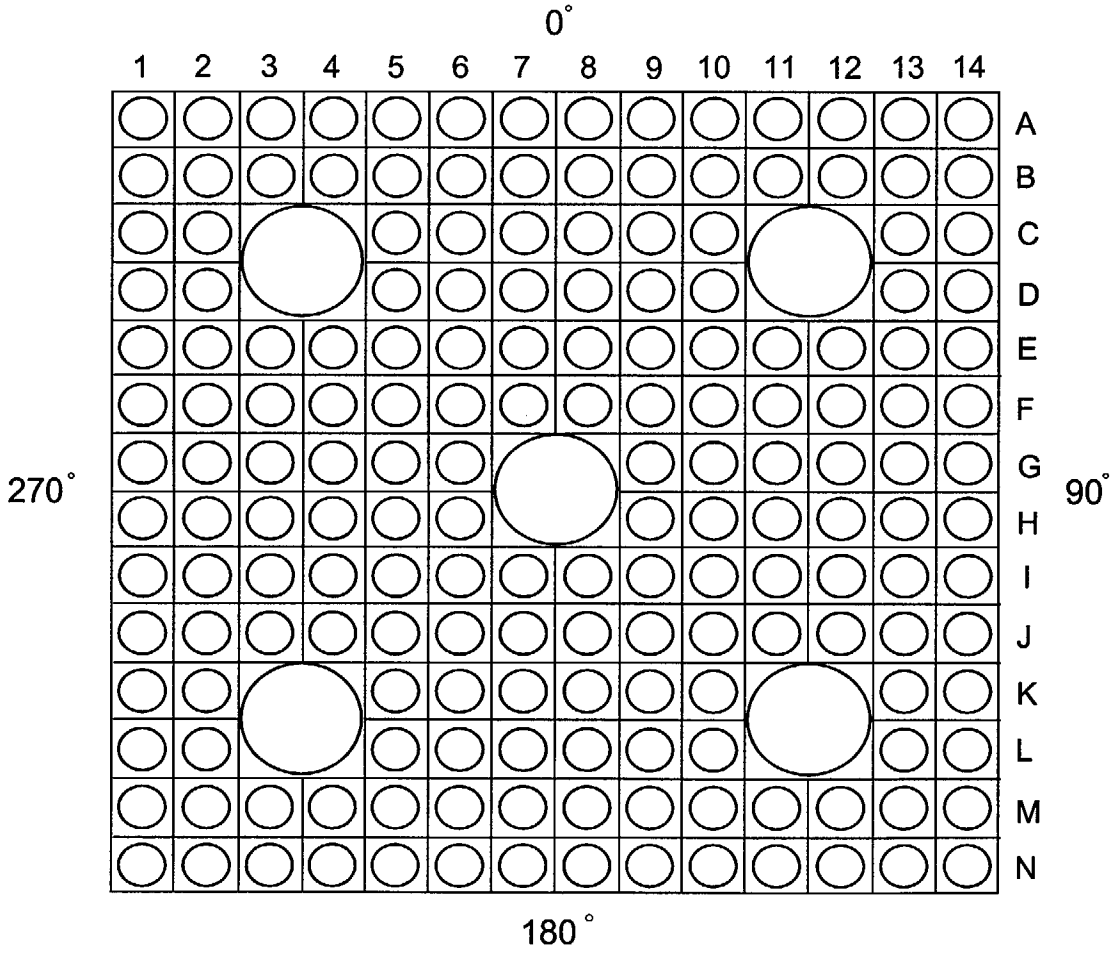
Photograph not provided in handout

High Duty Corrosion Results

Oxide Traces for Adjacent CC2N [ ] Rods

Calvert Cliffs Fuel Assembly Schematic

Upper End Fitting Serial Number Side



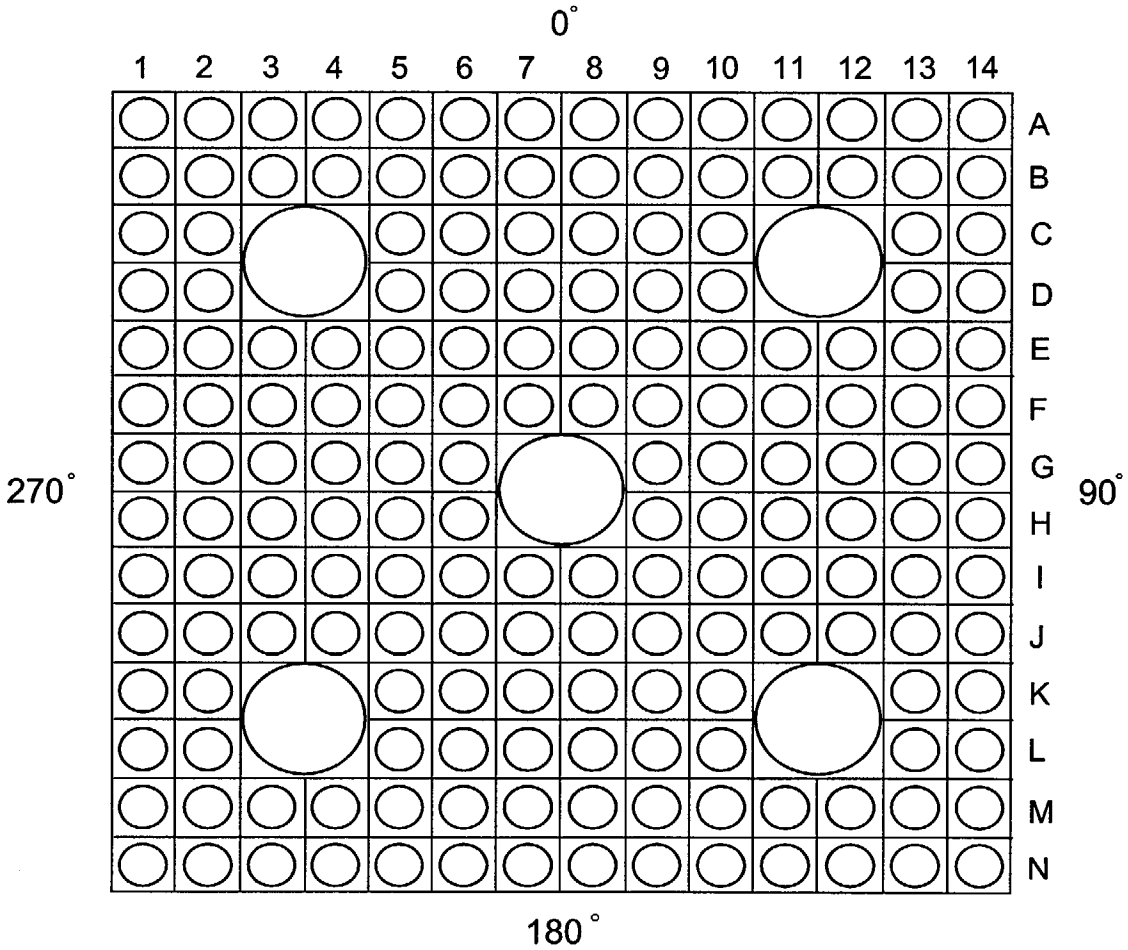
OPTIN Corrosion Performance in Calvert Cliffs-1 & 2

High Duty Blistering/Spalling

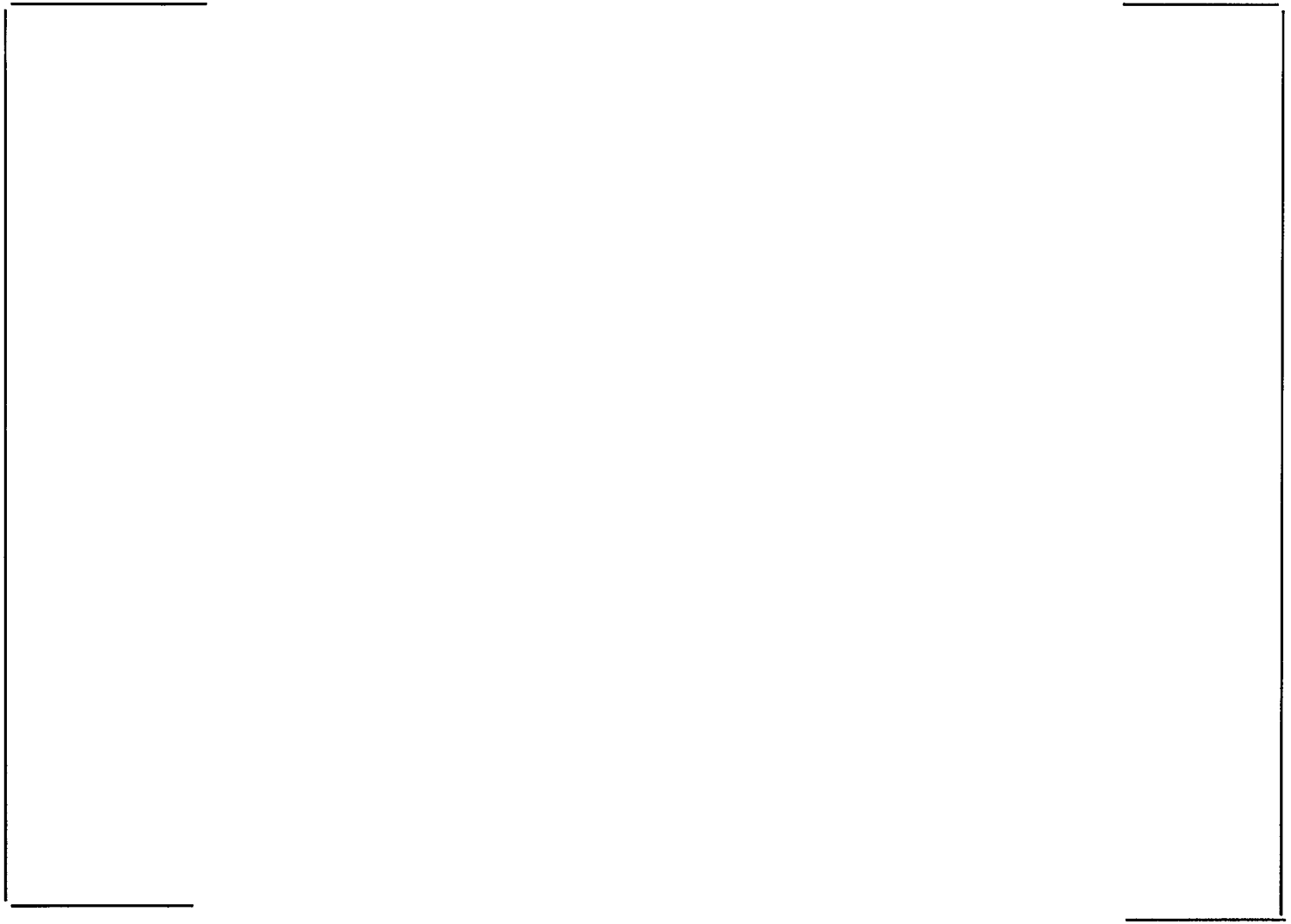
- Blistering/Spalling [ ]
- Behavior Observed on Rods With 57 Microns of Oxide at 51 GWD/MTU

Calvert Cliffs Fuel Assembly Schematic

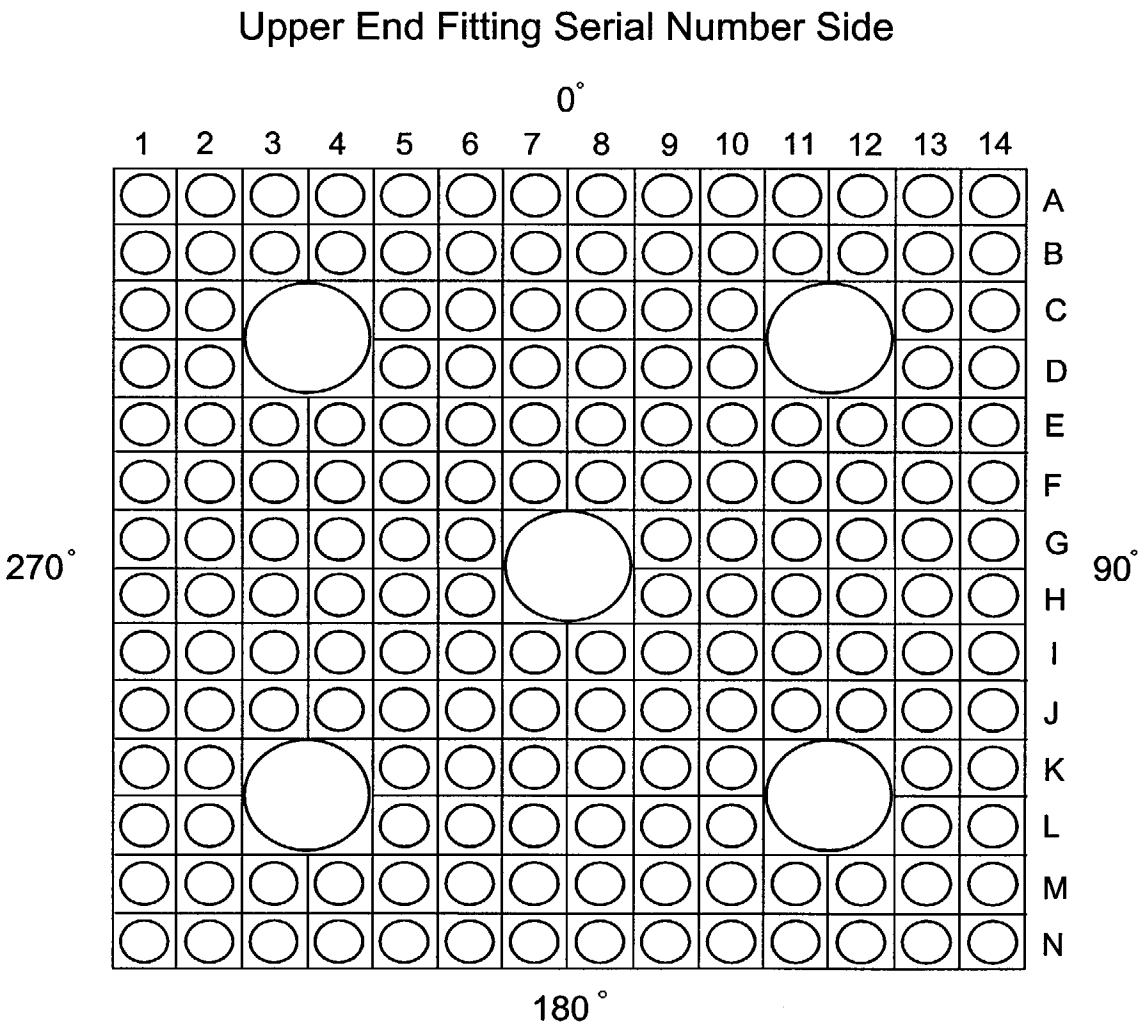
Upper End Fitting Serial Number Side



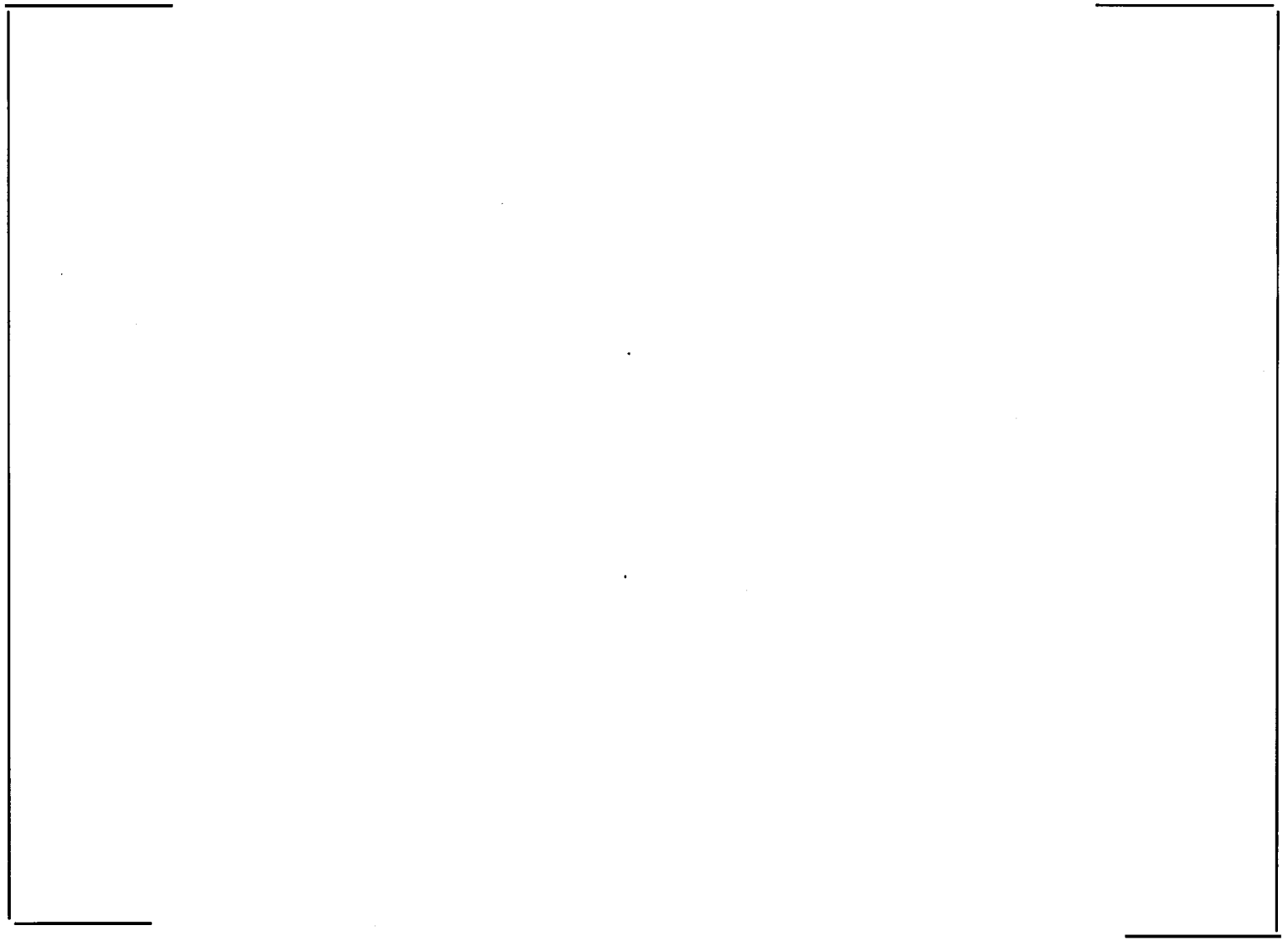
Observed Blisters on [ ] Rods



Calvert Cliffs Fuel Assembly Schematic

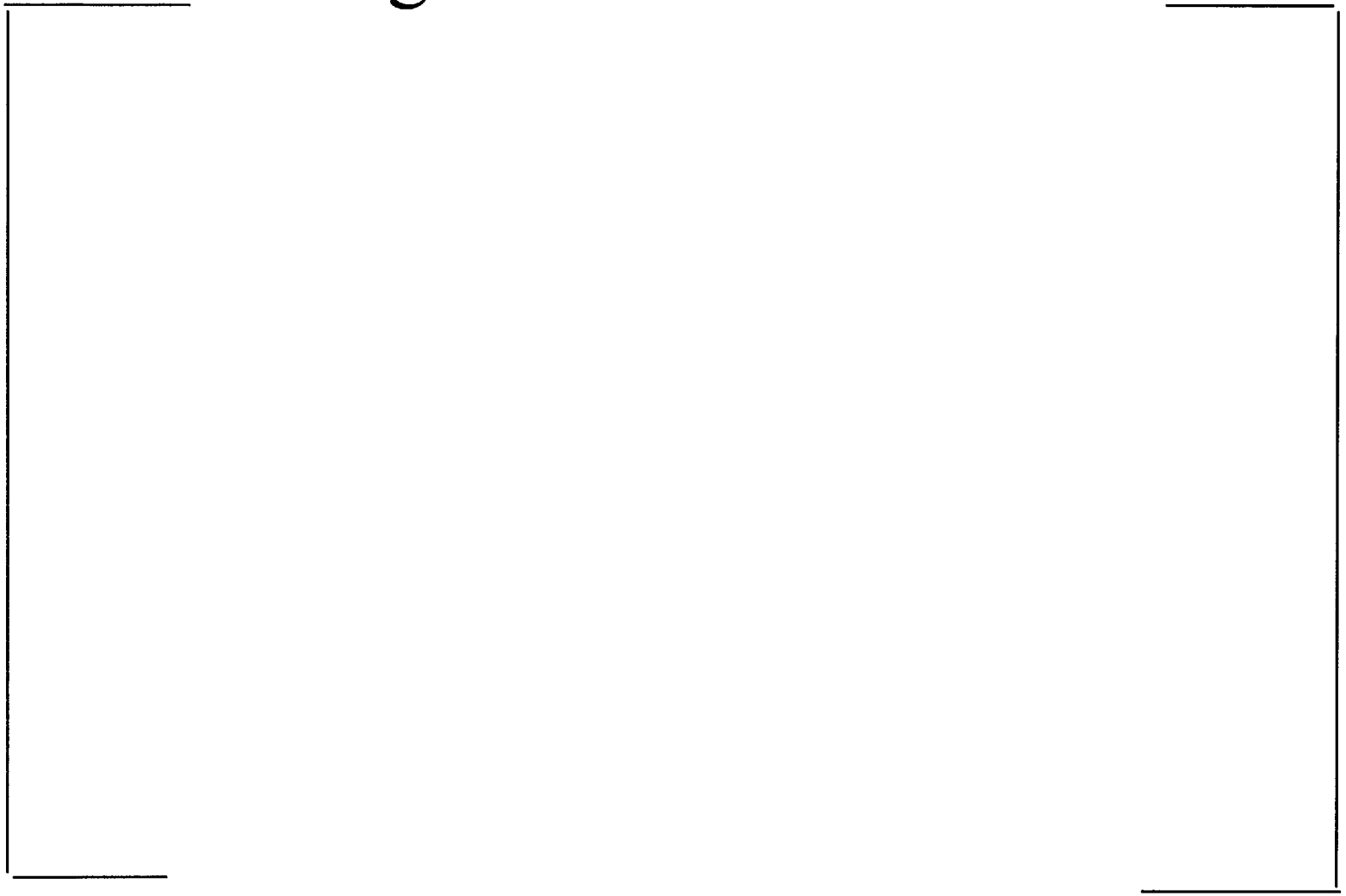


Fraction of Examined [ ]



Corrosion Performance of C2N High Duty Fuel Rods

Comparison of Measured to Predicted Oxide Using Current Model



Summary Of Observations

- Low Duty Fuel Exhibits [ ]
- High Duty Fuel Exhibits [ ]
- Some Populations of Rods Exhibit [ ]

Outline

- Describe Inspections and Observations
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- Summarize

Immediate Actions Taken

- Voluntary LER
- Root Cause Evaluation Initiated
- Operability Evaluation Performed to Support Current Cycles of Operation

Root Cause Conclusions

- Factors Such as [ ] Not Identified as Primary Contributors
- Factors Affecting Fuel Duty [ ] Are Primary Contributors

Factors Affecting Fuel Duty

- Improved Operating History
- Reduced RCS Flow Due to Plugged Steam Generator Tubes
- Rod Location Within The Assembly
- Rod Power and Adjacent Rod Power
- Subcooled Boiling
- T-H Effects Due to Geometry
- Others

Operability Evaluation

- No Concern For Normal Operation
- Addressed Accidents and Transients

Operability Evaluation - Accidents and Transients

- Effect of [ ]
- Effect of [ ]
- Effect of [ ]
- Bottom Line Operability Issue - [ ]

PROTOTYPE Test Rods

- Test Rods With High Tin Zr-4 Clad/Modified Pellet Designs
  - Irradiated for 5 Cycles, Discharged 1988
- [ ]
- Subset of Rods Examined in Hot Cell (Rod Average Burnups of [ ] GWD/MTU)
- Mechanical Property Tests Indicate

Photograph not provided in handout

[ ] Evaluation for Operability

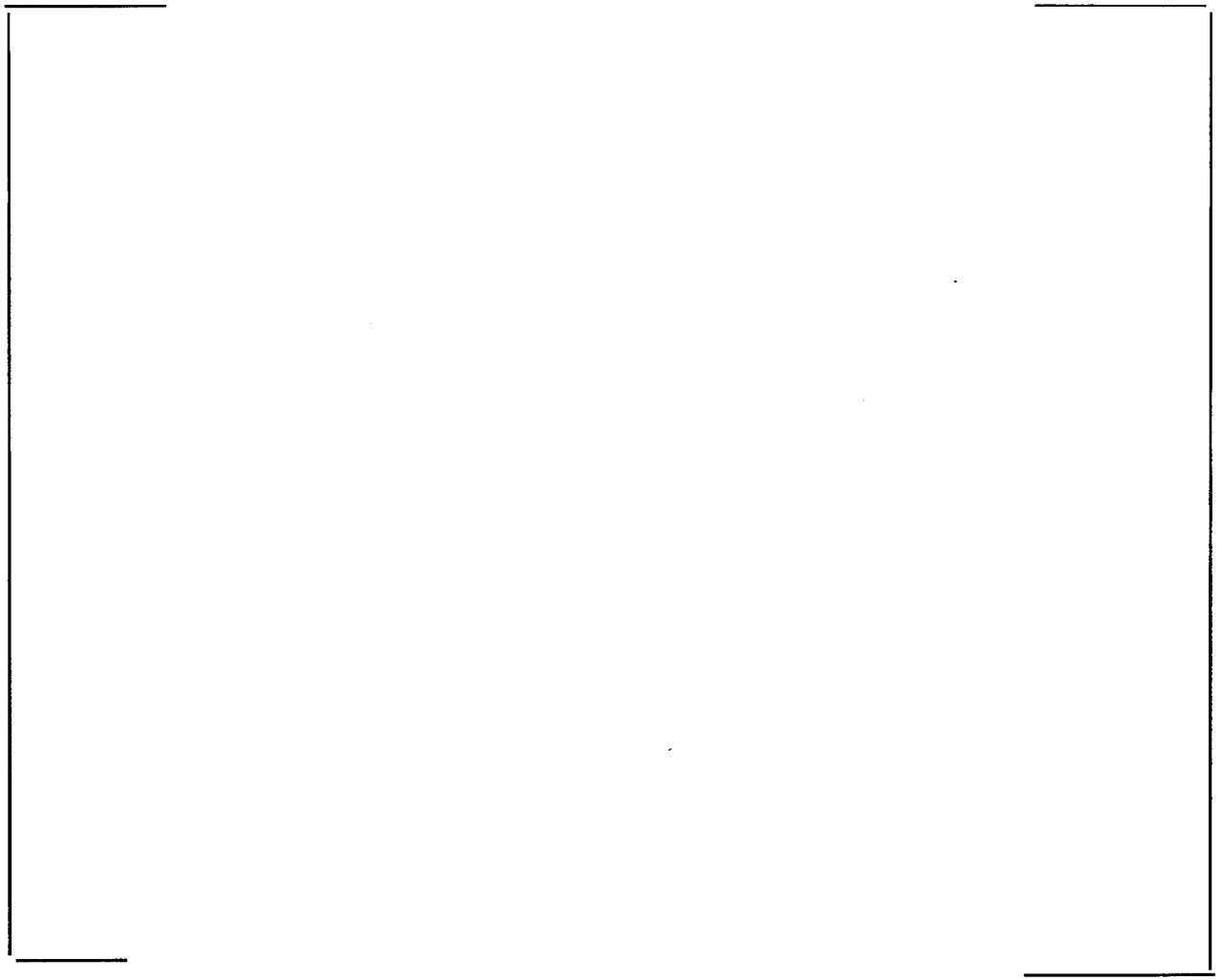
Operability - Accidents and Transients

- [ ] Demand Calculated at [ ]
- Even Heavily Spalled Prototype Rod [ ]
- CC2N Rod Capability [ ]

[ ] in CC1 Prototype and CC2N Models

[ ] for Prototype and CC2N Spalled Rods

[ ] in CC1 Prototype and CC2N Models



Clad [ ]

Total [ ] due to Spalling

Operability (Continued)

- Current Cycles - U1C14 and U2C13
- CC2M Fuel - 580/638 EFPD (U2C10/11)
- CC2N Fuel - 638/640 EFPD (U2C11/12)
- U1C13/C14 Fuel - 590/620 EFPD
- U2C12/C13 Fuel - 640/658 EFPD
- Key Parameters - [ ]

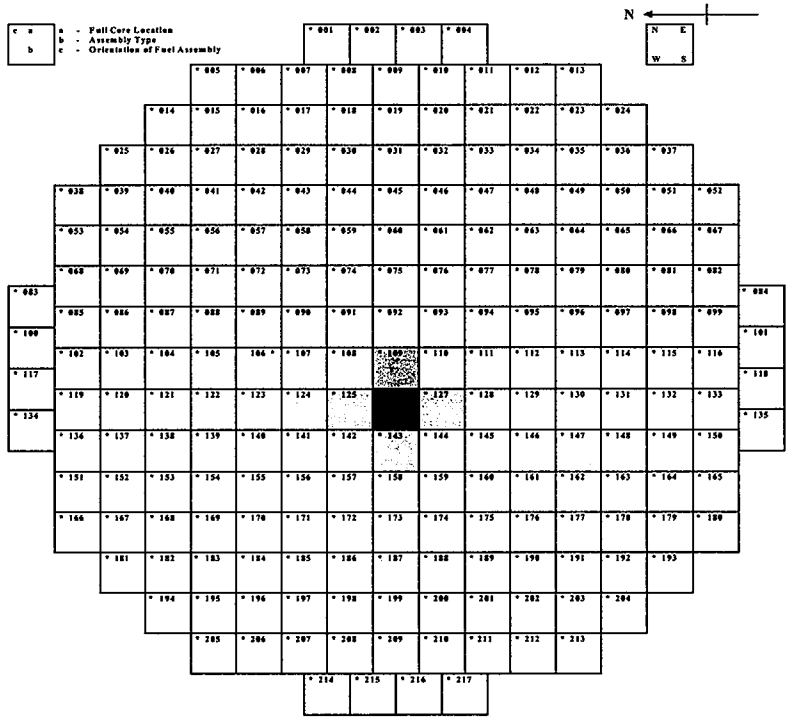
Fuel Duty Comparisons

- Fuel Duty Comparisons Were Made Between CC2N and Past & Current Batches
- A Preliminary Fuel Duty Model Was Developed by ABB CENP Which Uses an Improved Corrosion Model
- A Fuel Duty Index Was Evaluated Which is an [

  ]
- Results Show That Fuel Duties are Similar to CC2N for Current Cycles

Fraction of Examined [ ]

Unit 2 Cycle 12 Core Schematic



Calvert Cliffs Fuel Assembly Schematic

Summary of Operability Evaluation

- [ ] Demand Evaluated
- PROTOTYPE [ ] Show Heavily Spalled Rod [ ] Matches Demand
- [ ]
- Current Operating Cores Projected to Have Similar Fuel Duty to CC2N
- Conclusion - Current Cores are Operable

Outline

- Describe Inspections and Observations
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10CFR50.59 Approach for U1C15/U2C14

- Assess Fuel Duty Based on [ ]
- Evaluate Impact of Incremental Increase in Duty on Anticipated Corrosion Behavior Including Blistering/Spalling
- Ensure [ ]
- Acquire Data on CC1R Fuel at EOC14 (Spring 2000) to Further Characterize Phenomenon

Beyond U2C14

- Replacement Steam Generators
- Evaluate TURBO Assembly Design
- Pursue Advanced Cladding Alloy

Summary

- [ ]
- Current Cores Operable
- Subsequent Cores Will Be Handled Under 10CFR50.59
- Longer Term Actions Expected To Mitigate Problem

Questions