June 14, 2000

MEMORANDUM TO: Stuart A. Richards, Director
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

FROM: Stewart N. Bailey, Project Manager, Section 2
Project Directorate III
Division of Licensing Project Management /RA/
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF THE JUNE 1, 2000, MEETING WITH FRAMATOME ON INCREASING THE BURNUP LIMIT ON MARK-BW FUEL ASSEMBLIES

On June 1, 2000, the U.S. Nuclear Regulatory Commission (NRC) staff met with Framatome Cogema Fuels, Inc. (FCF), to discuss a future submittal to increase the burnup limit on Mark-BW fuel assemblies to 62 GWD/MTU. FCF's Mark-B fuel is currently licensed to 62 GWD/MTU, but the Mark-BW fuel, which seems slightly higher in temperatures, is limited to 60 GWD/MTU. The submittal would include a revision of Topical Report BAW-10186, "Extended Burnup Evaluation," and a clarification of Topical Report BAW-10227, "Evaluation of Advanced Cladding and Structural Material (M5) in PWR Fuel."

FCF and the staff discussed (1) the fuel performance data that FCF has taken since the last revision of BAW-10186, which set the current burnup limits, (2) the comparison between the performance of Zircalloy 4 cladding and M5 cladding, and (3) other design considerations of increasing the burnup limit. The staff asked FCF, in its submittal, to clarify the effects of using M5 cladding *and/or* M5 structural material. The staff also noted that the majority of the data for the Mark-BW fuel was limited to approximately 53 GWD/MTU, so that increasing the Mark-BW burnup limit to 62 GWD/MTU would rely on an extrapolation of the available data and on the similarity of the Mark-BW fuel to the Mark B fuel, which has data at higher burnup levels.

A list of those attending the meeting is provided as Attachment 1. The non-proprietary slides used by FCF during the meeting are provided as Attachment 2.

Project No. 693

Attachments: 1. List of Meeting Attendees
2. FCF's Non-Proprietary Slides

cc w/atts: See next page

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FRAMATOME COGEMA FUELS, INC.
MEETING ON INCREASING MARK-BW FUEL BURNUP LIMIT
JUNE 1, 2000

NAME	AFFILIATION
Stewart Bailey	NRC/NRR/DLPM
Ralph Caruso	NRC/NRR/DSSA/SRXB
Muffet Chatterton	NRC/NRR/DSSA/SRXB
Shih-Liang Wu	NRC/NRR/DSSA/SRXB
Garry Garner	FCF
Frank McPhatter	FCF
Rick Williamson	FCF
John Willse	FCF
Millan Straka	NUSIS
Ian Rickard	Westinghouse

NRC/FCF Meeting on Mark-BW Burnup Limit

Rockville, Maryland

C. F. McPhatter

June 1, 2000

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Attachment 2

Agenda

- Introduction and Background for Increasing Mark BW Burnup Limit
- Presentation of Data
- Discussion
- Conclusion

Objectives

- Agree that the proposed burnup limit for the Mark-BW fuel is justified
- Develop plan for providing documentation and obtaining NRC approval

Reference Documents

- BAW-10153P, Extended Burnup Evaluation, April 1986
- BAW-10172P, Mark-BW Mechanical Design Report, SER, December 1989
- BAW-10186P-A, Rev. 1 Extended Burnup Evaluation, April 2000
- BAW-10227P-A, Evaluation of Advanced Cladding and Structural Material (M5™) in PWR Reactor Fuel, February 2000

Background

- The SER for BAW-10153P-A allows burnups up to 45 GWd/mtU batch average for Mark-B fuel
- The SER for BAW-10172P allows burnups up to 60 GWd/mtU rod average for Mark-BW fuel
- The SER for BAW-10186P allows burnups of 60 GWd/mtU and 62 GWd/mtU rod average for Mark-BW and for Mark-B fuel respectively
- The SER for BAW-10227P allows burnups of 60 GWd/mtU and 62 GWd/mtU rod average for Mark-BW and for Mark-B fuel respectively

Demonstration Of The Ability For The Mk-BW Fuel Assembly To Achieve 62 GWd/mtU Pin Burnup

- Show sufficient data has been obtained to demonstrate accuracy of models to 62 GWd/mtU
- Show that the data is well behaved so that the models are reliable design tools to 62 GWd/mtU

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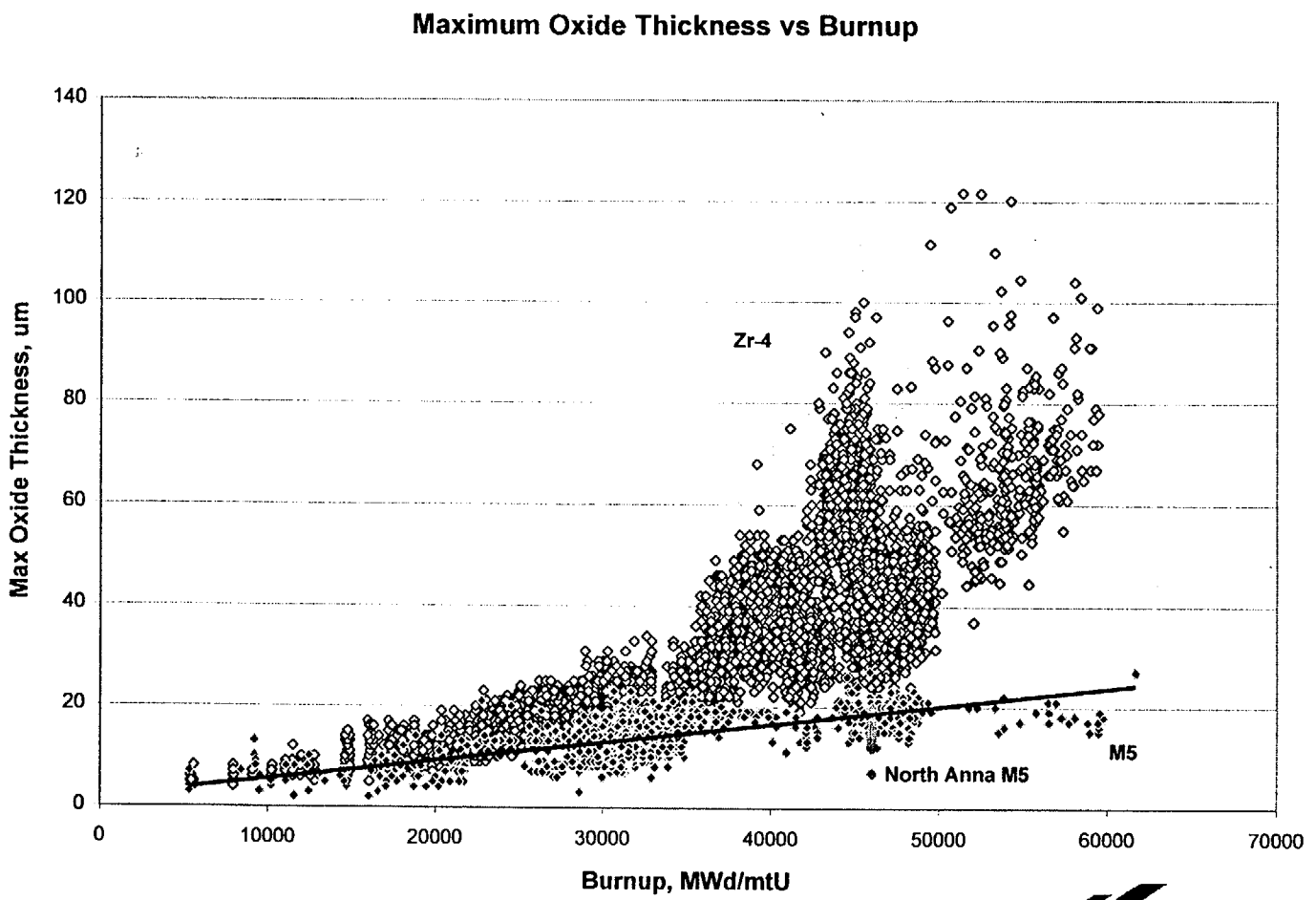
Justification For Burnup Limit Of 62 GWd/mtU For Mk-BW

- Data will be presented for both the MK-BW and the Mk-B for comparison
- Mk-B and Mk-BW are very similar designs that perform in a consistent manner
- Key data that justifies the new limit
  - Fuel rod oxide
  - Irradiation experience
  - Fuel assembly growth
  - Shoulder Gap
  - Guide tube oxide
  - Fuel Rod Reliability

FRAMATOME TECHNOLOGIES

Fuel Rod Oxide No Longer Limits Burnup With M5 Cladding



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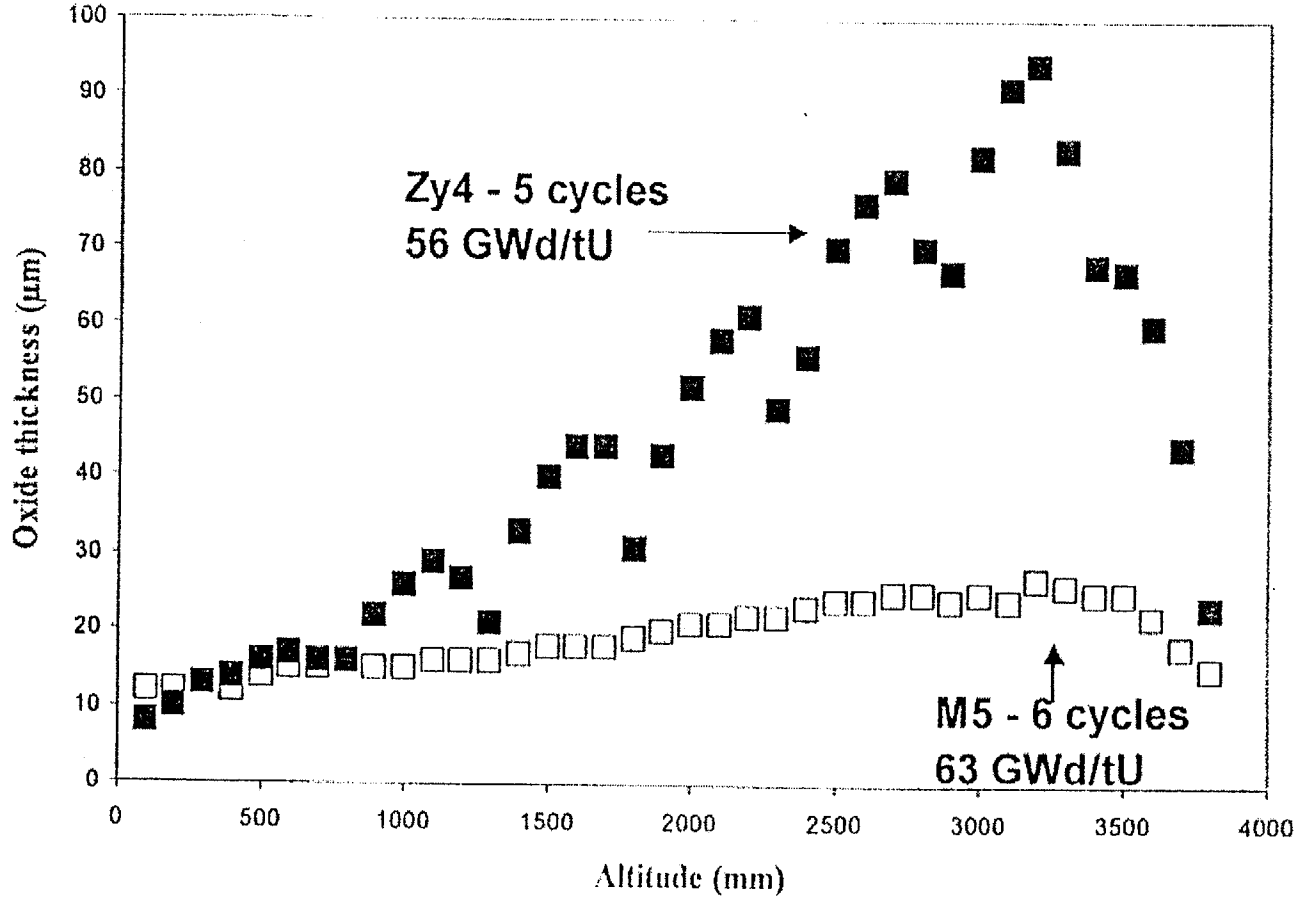
M5 Has Low Sensitivity To Duty



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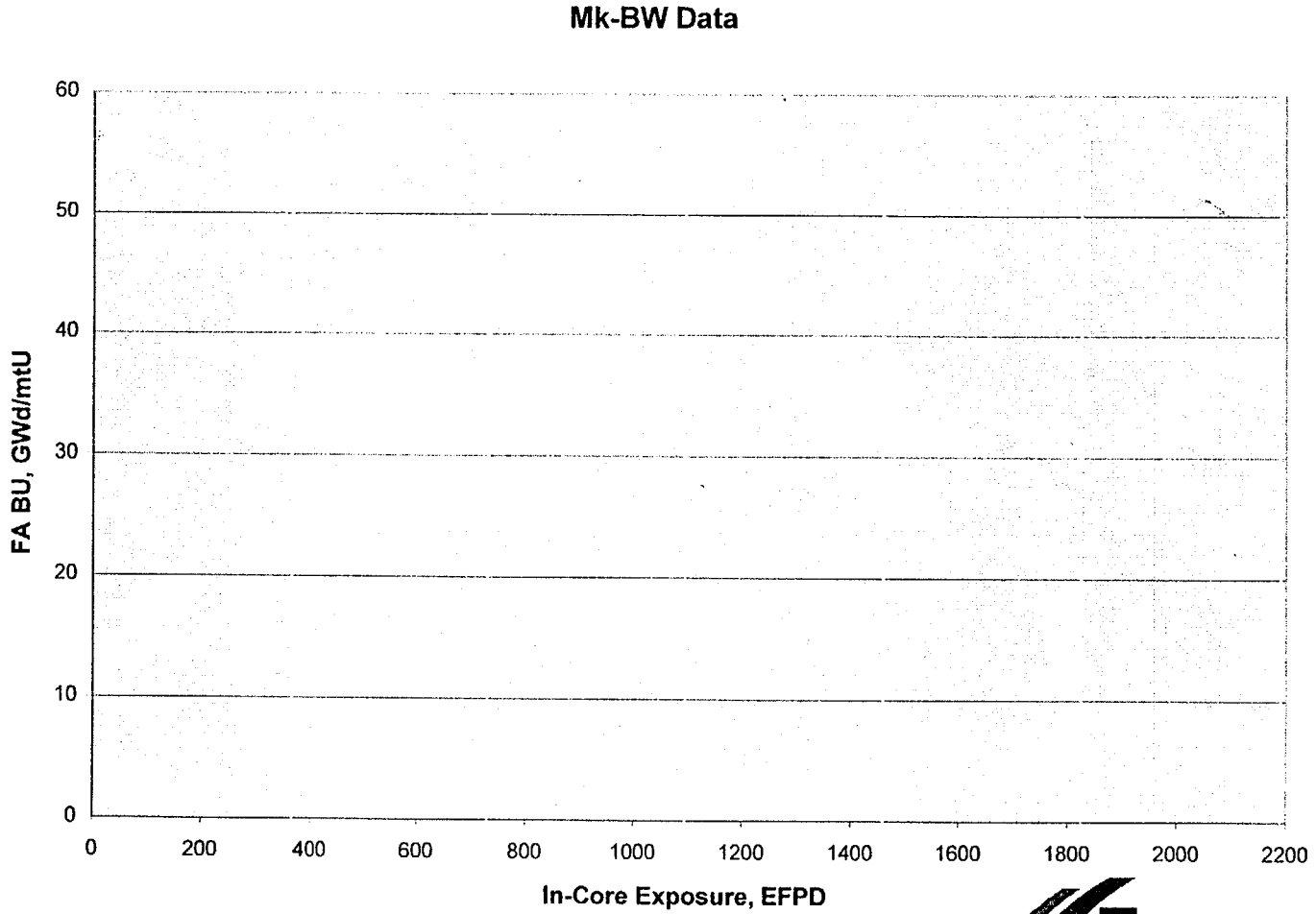
Additional Data Obtained Since Topical Representative Of High Burnup Cycles



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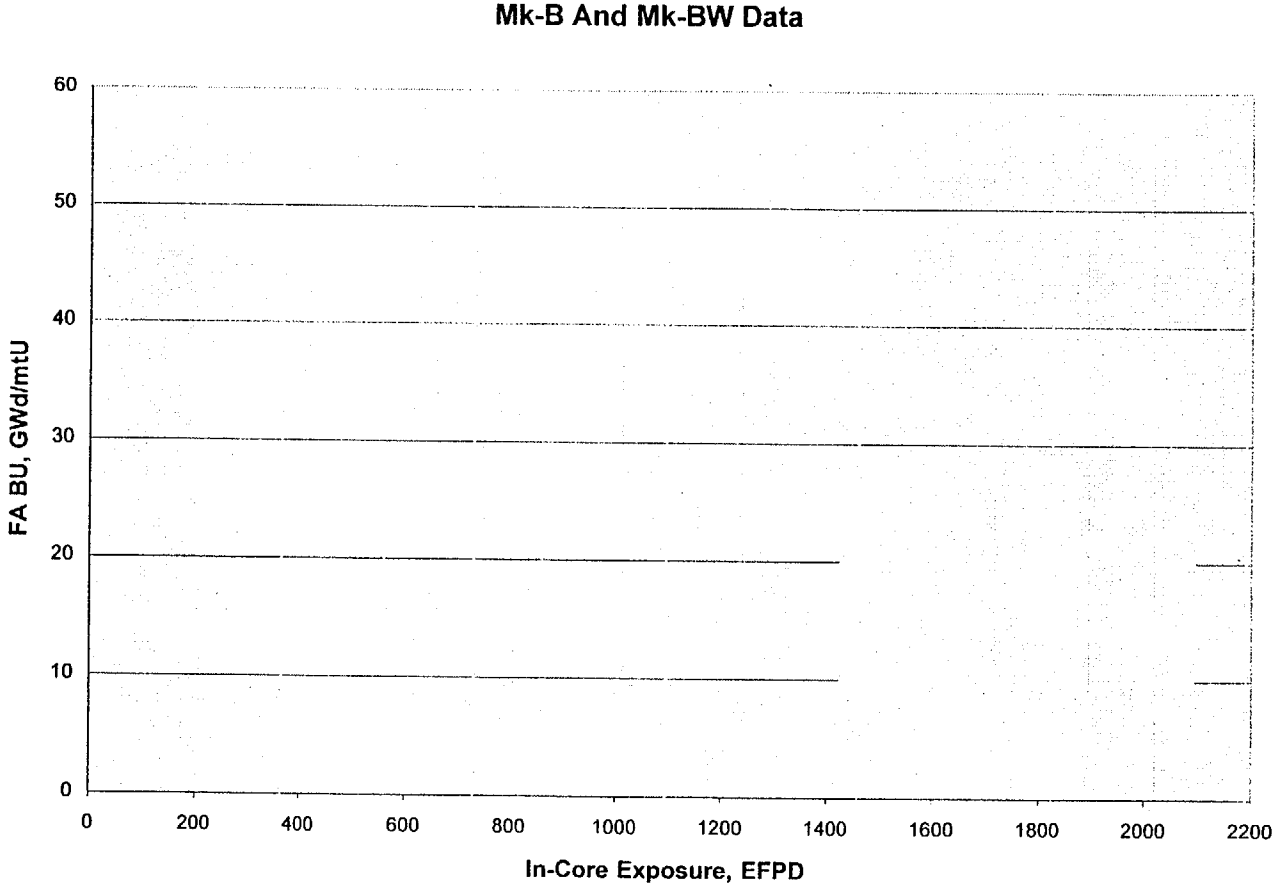

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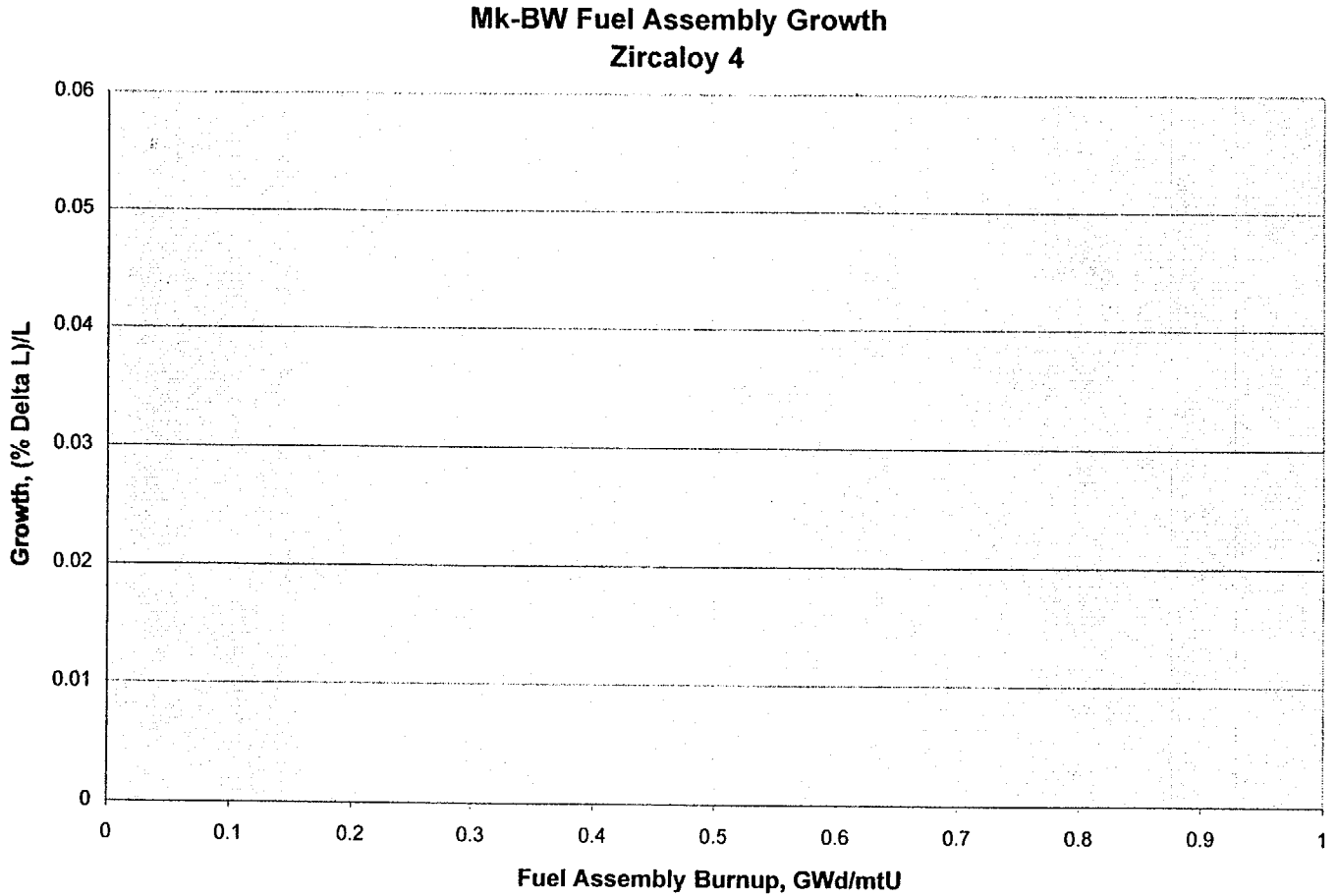
Fuel Assembly Growth Data Matches Model



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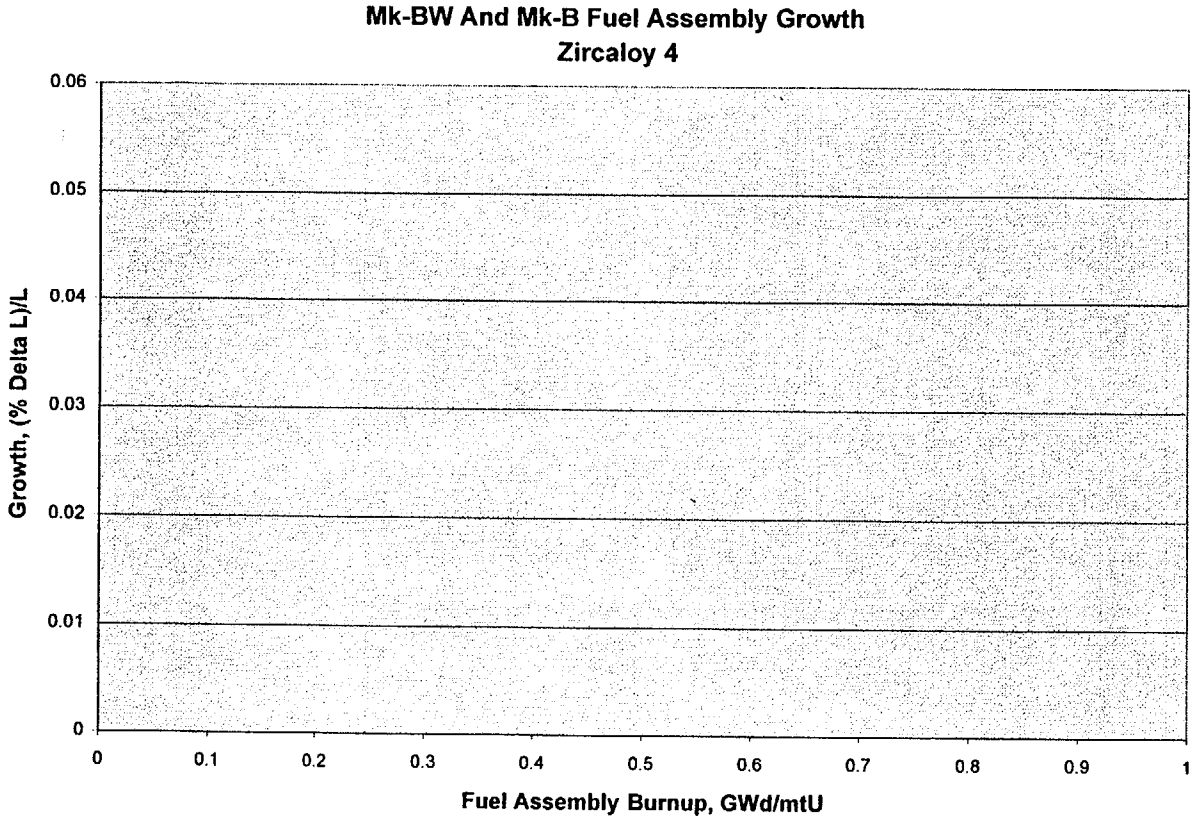
Mk-BW And Mk-B Fuel Assembly Growth Data are Consistent



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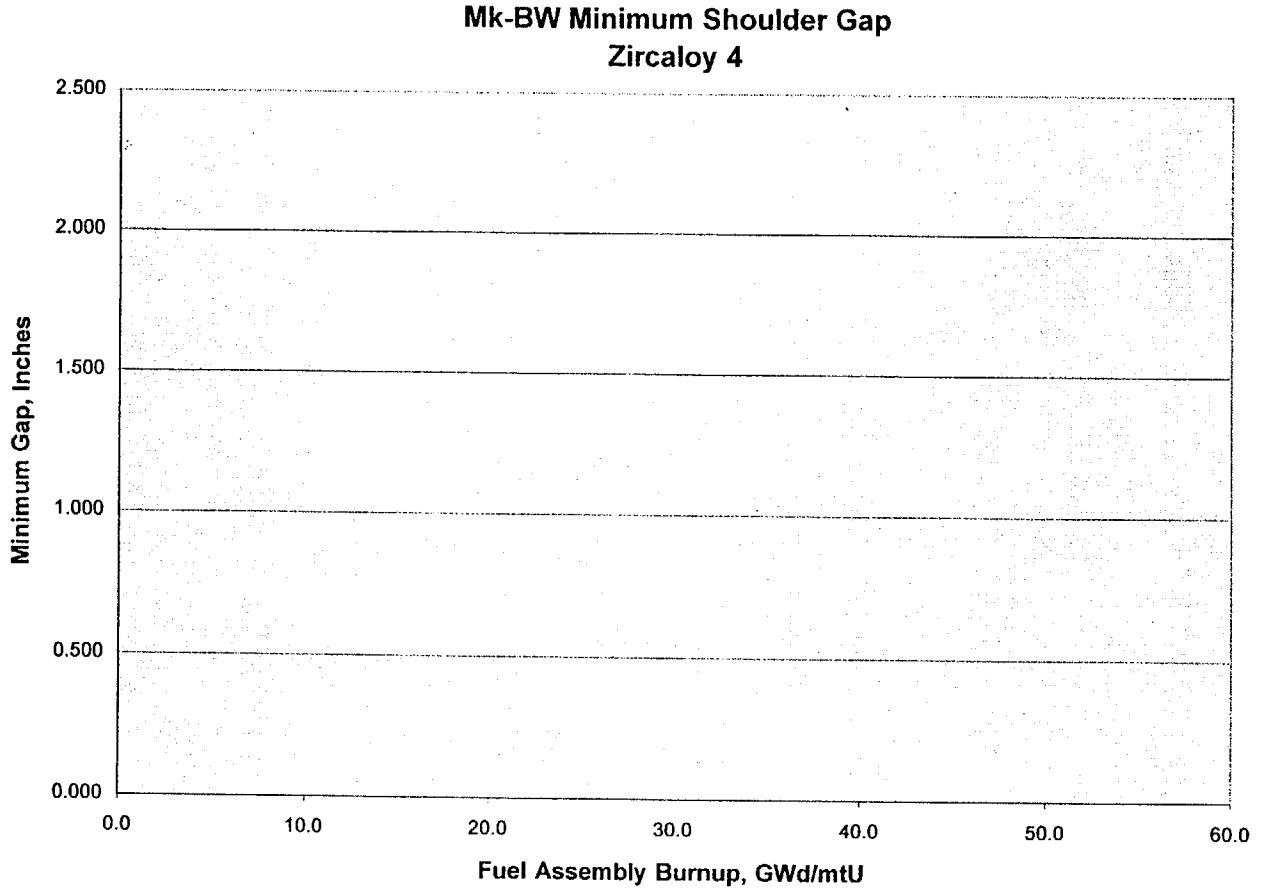
Shoulder Gap Data Well Behaved With Excess Margin Available



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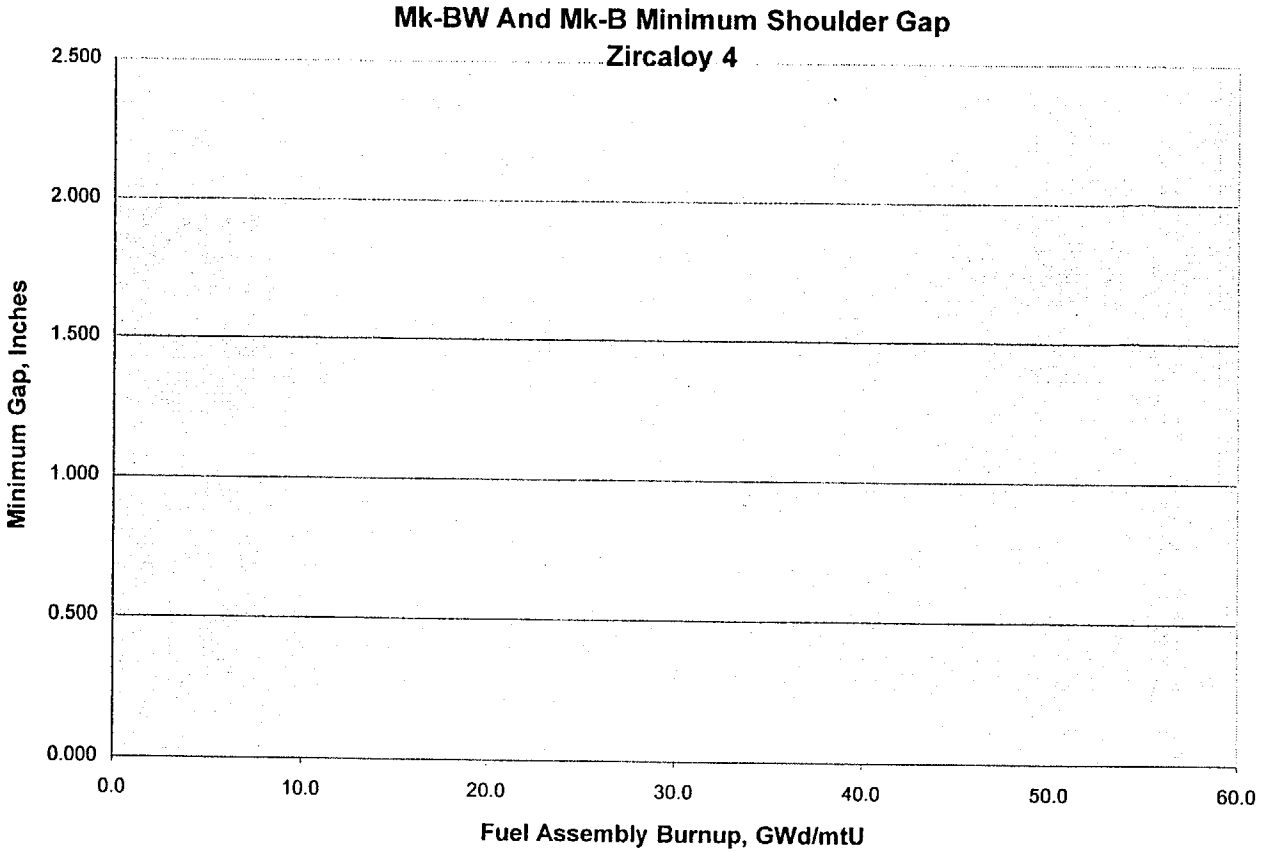

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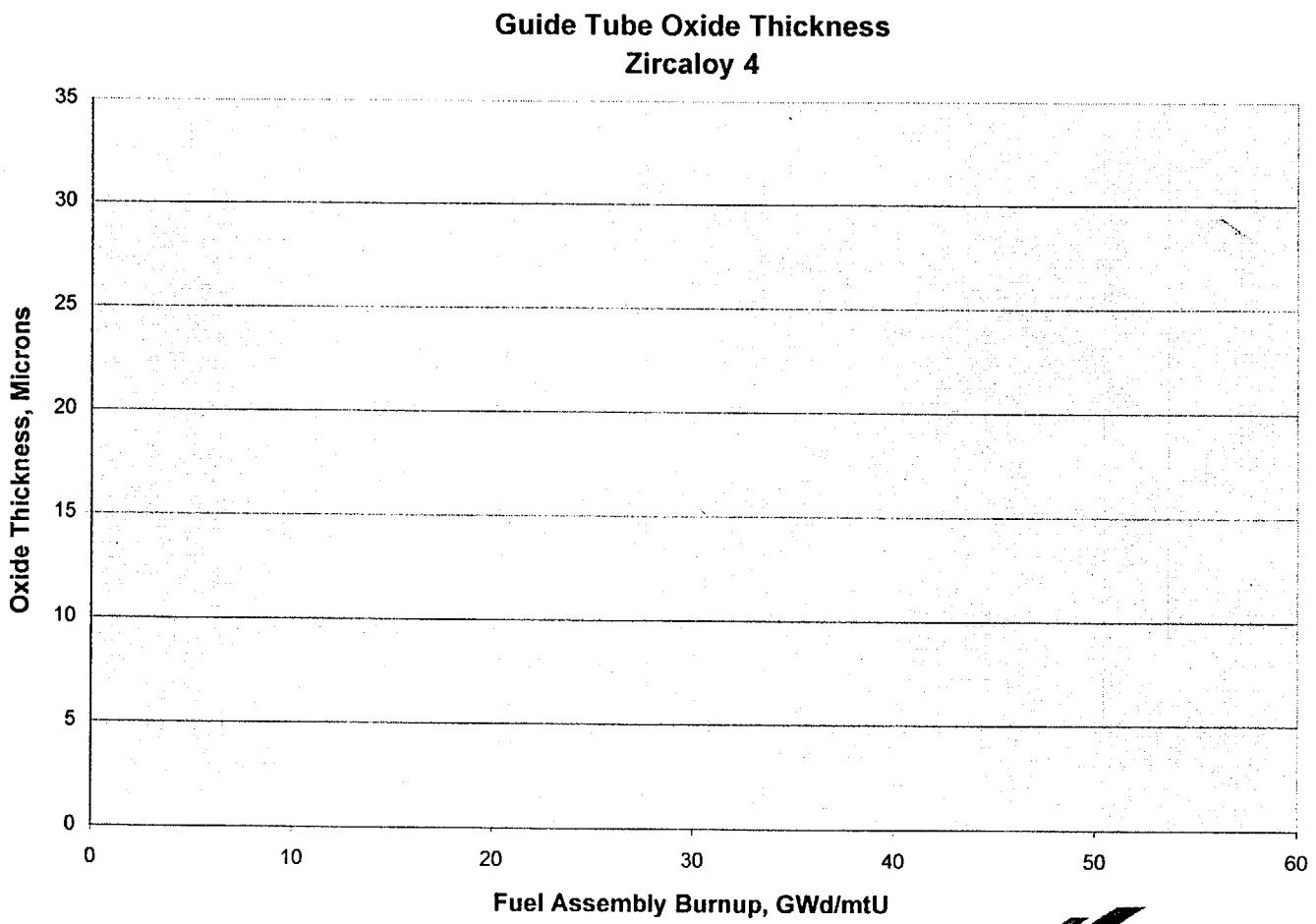
Guide Tube Oxide Thickness Data Demonstrates Significant Margin



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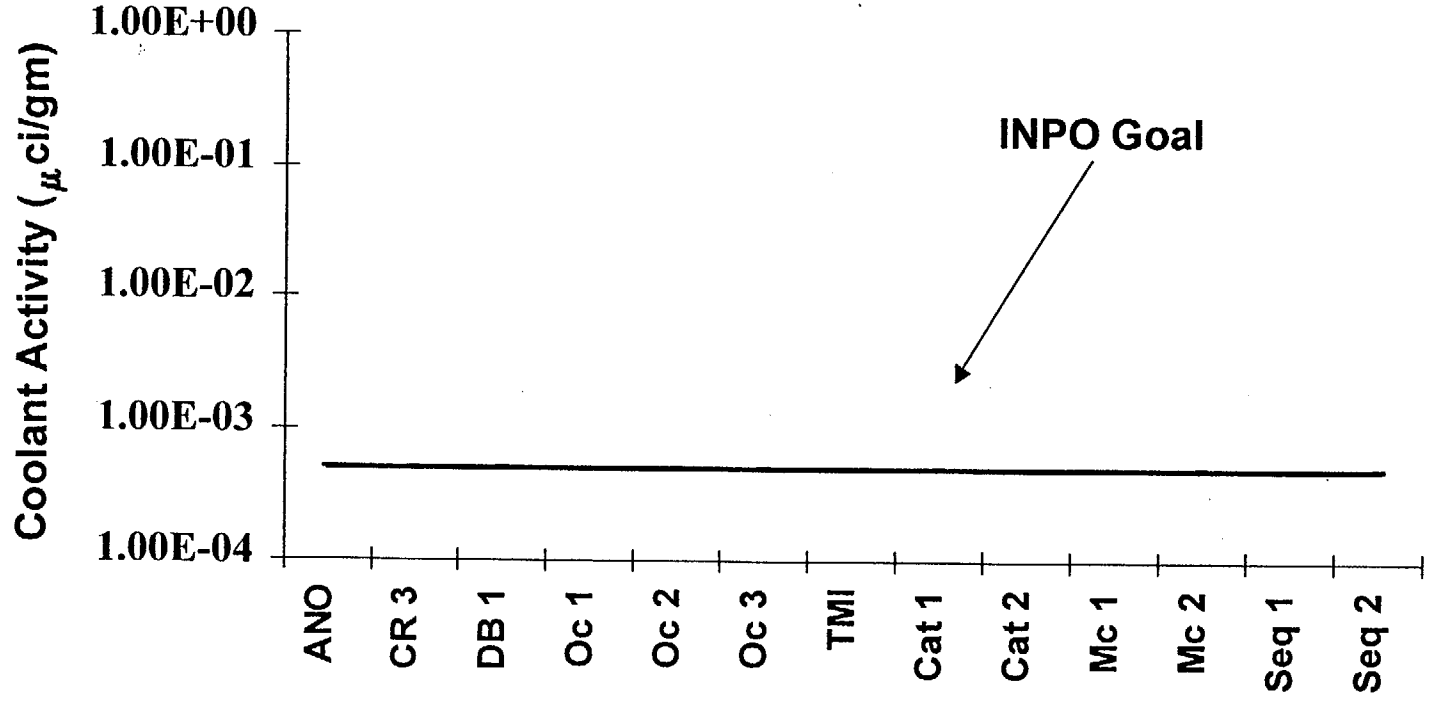
Fuel Performance Status
as of 5/00



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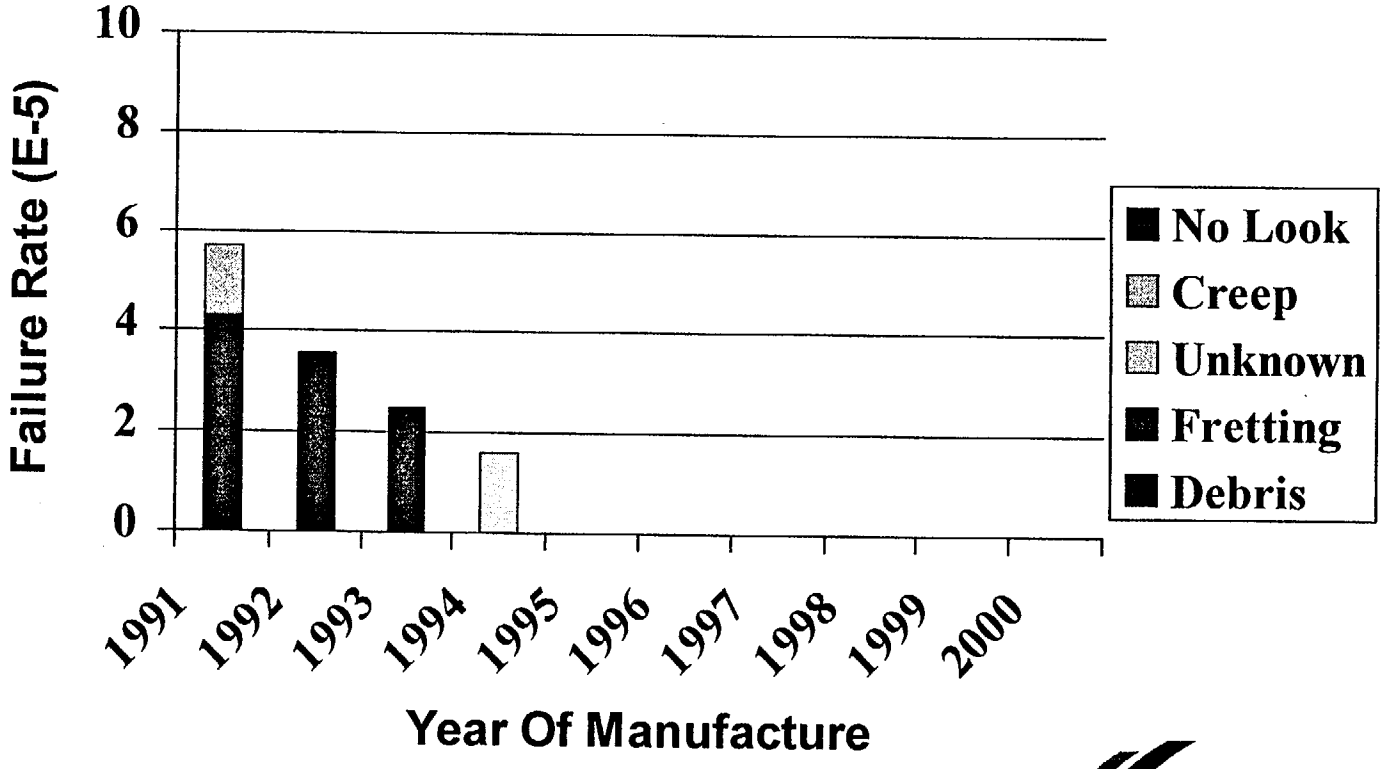
Failure Rate For Mark-BW Fuel By Year Of Manufacture



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Conclusion

- Mk-BW fuel assembly has performed well through 53 GWd/mtU
- Sufficient data exists to verify design models are accurate to a fuel rod burnup of greater than 62 GWd/mtU
- Models provide the tools to design a fuel assembly capable of irradiation to 62 GWd/mtU, rod average

FRAMATOME TECHNOLOGIES

Conclusion

- On the basis of the information presented today the proposed burnup limit for Mark-BW fuel is justified
- Define process for obtaining NRC review and approval of the proposed limit