UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 2, 1997

MEMORANDUM TO: David B. Matthews, Chief
Generic Issues and Environmental
Projects Branch
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

FROM: Claudia M. Craig, Senior Project Manager
Generic Issues and Environmental
Projects Branch
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF MEETING WITH WESTINGHOUSE TO DISCUSS MECHANICAL MODEL ASSOCIATED WITH THE INCOMPLETE ROD CLUSTER CONTROL ASSEMBLIES (RCCA) INSERTION ISSUE

The subject meeting was held at the Nuclear Regulatory Commission (NRC) offices in Rockville, Maryland on June 17, 1997, between representatives of Westinghouse and the NRC staff. The meeting was held for Westinghouse to continue discussions on the additional work performed with the mechanical model developed for the incomplete RCCA insertion issue. Attachment 1 is a list of meeting participants. Most of the meeting was closed to the public due to the proprietary nature of the information being discussed. By letter dated June 13, 1997, Westinghouse provided both proprietary and non-proprietary versions of the material presented at the meeting. Attachment 2 is a copy of the non-proprietary version of the presentation material.

Westinghouse provided the results of the sensitivity studies performed to determine bow sensitivity to oxide and bow/growth sensitivity to power history. Westinghouse described the results of calculating the fuel assembly bow impact on drag compared to the measured value. The results of benchmarking the model against data from South Texas were also discussed. Westinghouse provided the staff with further details of the mechanical model. Westinghouse drew a number of conclusions related to the thimble bow/drag, fuel assembly growth, holddown spring loads, and grid drag loads.

Westinghouse described what actions are being taken for fuel already in reactors and for future reloads. For operating fuel, Westinghouse is performing an analysis to determine what fluence/burnup leads to a specified drag. Westinghouse is also performing measurements after they reach that limit and determining what specific features impact incomplete RCCA insertion. Westinghouse is performing similar activities with regard to future reloads and is determining the 95/95 confidence level. Westinghouse also discussed proactive actions to address incomplete rod insertion for a number of plants.

Proj-700
97-133

Westinghouse plans to submit a topical report containing the mechanical model and describing the work discussed in the meetings. The topical report should be submitted in the near future. Westinghouse indicated that review of the topical is considered to be Westinghouse's top priority.

Project No. 700

Attachments: As stated

cc w/atts: See next page

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WESTINGHOUSE / NRC MEETING

MECHANICAL MODEL UPDATE FOR THE INCOMPLETE RCCA INSERTION ISSUE

JUNE 17, 1997

MEETING PARTICIPANTS

NAME	ORGANIZATION
Claudia Craig	NRC/NRR/PGEB
V. F. Esposito	Westinghouse/CNFD
H.F. Conrad	NRC/NRR/DE/EMCB
Harold H. Scott	NRC/RES/DST
Muffet Chatterton	NRC/NRR/SRXB
H.L. Ornstein	NRC/AEOD
Howard Menke	Westinghouse/CNFD
James Reavis	Westinghouse/CNFD
Rick Kohrt	Wisconsin Electric/WOG
Mike Schoppman	Florida Power & Light
Francis T. Grubelich	NRC/NRR/EMEB

ATTACHMENT 1

Incomplete RCCA Insertion

Program Status

NRC Meeting

June 17, 1997

Agenda

- Bow Sensitivity to Oxide
- Bow / Growth Sensitivity to Power History
- Fuel Assembly Bow Impact on RCCA Drag
- South Texas - Model Benchmark Results
- Impact of Lower Span Drag on Upper Span Drag
- Wolf Creek Model Renormalization
- Model Presentation

Bow Sensitivity to Oxide

Growth and Bow vs. Relative Time - Span 6 (Zircaloy & ZIRLO)

a,b,c

Bow Sensitivity to Oxide

ZIRLO Growth and Bow vs. Oxide Thickness - Span 6

[ ] a,b,c

Bow Sensitivity to Oxide

Zircaloy 4 Growth and Bow vs. Oxide Thickness - Span 6

[ ] a,b,c

Power History Sensitivity

- Ground Rule:

  Burnup is conserved @ 50,000
  to determine allowable power
  histories(P1,P2,P3)

- Example:
  - 3, 18month cycles
  - WC H-50 FA used to generate study
  - Represents a limiting condition
  - Specific only to this design(V5H,noIFM)

Bow/ Growth Sensitivity to Power History

Cycle 3 Power vs. Power History

[ ] a,b,c

Bow/ Growth Sensitivity to Power History

Span 1 Bow vs. Power History

[ ] abc

Bow! Growth Sensitivity to Power History

Assembly Growth vs. Power History

[ ] a,b,c

Fuel Assembly Bow Impact on RCCA Drag

Calculations & Assumptions

[ ] abc

Fuel Assembly Bow Impact on RCCA Drag

Calculations & Assumptions

[ ] a,b,c

Fuel Assembly Bow Impact on RCCA Drag

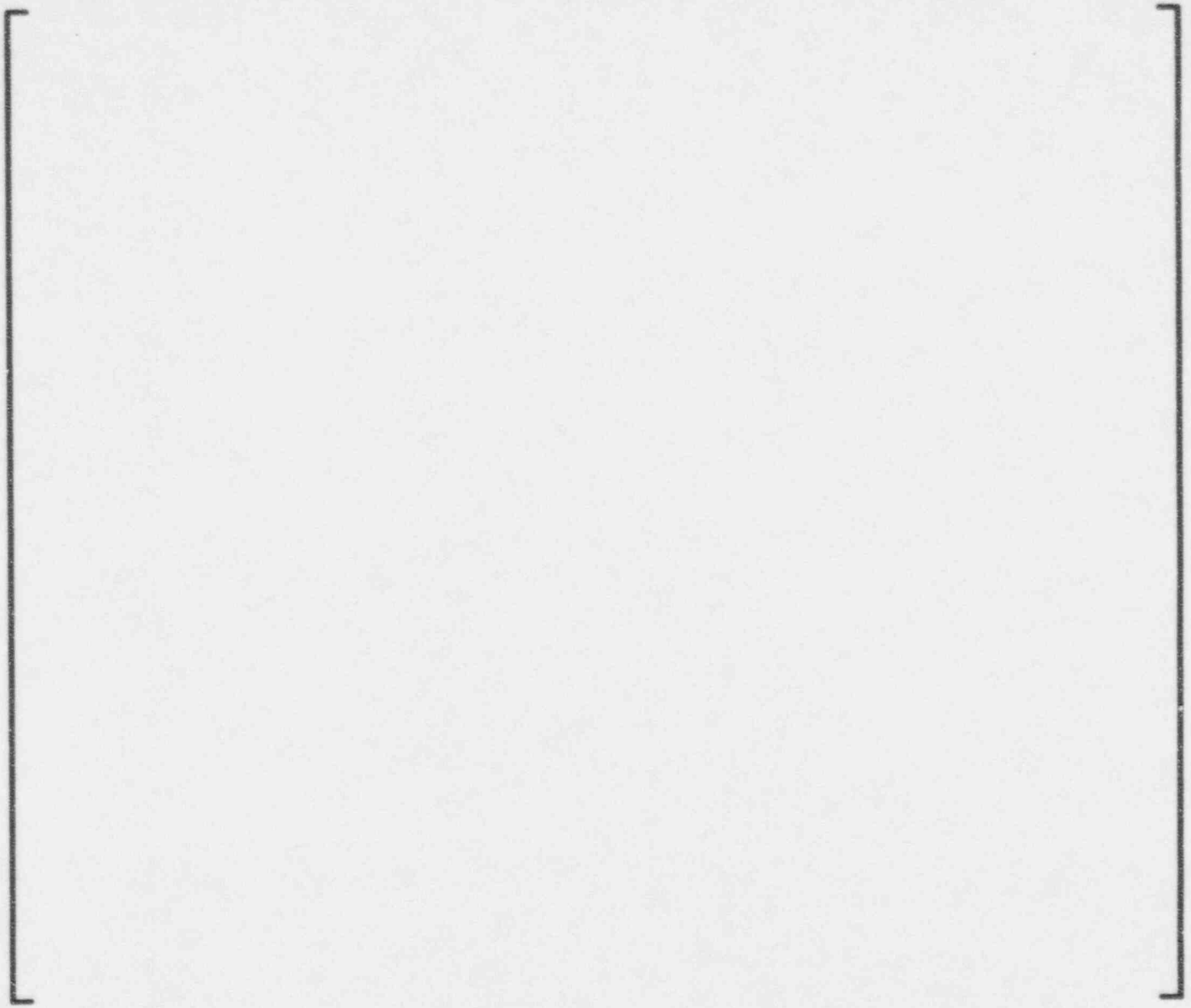
Selected Assembly Bow and Drag Results - Wolf Creek Data

[ ] a,b,c

Fuel Assembly Bow Impact on RCCA Drag

Selected Assembly Bow and Drag Results - South Texas Data

a,b,c



Fuel Assembly Bow Impact on RCCA Drag

Results and Conclusions

[ ] a,b,c

Mechanical Model Applied to South Texas

South Texas - Model Benchmark Results

Measured vs. Predicted Assembly Growth

[ ] a,b,c

South Texas - Model Benchmark Results

Measured vs. Predicted Total Drag

[ ] abc

South Texas - Model Benchmark Results

Measured vs. Predicted Upper Span Drag

[ ] a,b,c

South Texas - Model Benchmark Results

Measured vs. Predicted Dashpot Drag

[a,b,c]

Impact of Lower Span Drag on Upper Span Drag

[ ] abc

Impact of Lower Span Drag on Upper Span Drag

[ ] a,b,c

Impact of Lower Span Drag on Upper Span Drag

[a,b,c]

Impact of Lower Span Drag on Upper Span Drag

[ ] a,b,c

Impact of Lower Span Drag on Upper Span Drag

[ ] a,b,c

Impact of Lower Span Drag on Upper Span Drag

[ ] a,b,c

Wolf Creek Model Renormalization

Measured vs. Predicted Assembly Growth

[ ] a,b,c

Model Presentation

Fuel Assembly Schematic and GROBOW Model Representation

[ ] a,b,c

Model Presentation

Thimble Growth and Bow Model Calculation Schematic

[ ] abc

SPECIFY SYSTEM PARAMETERS

[a,b,c]

SKELETON ROD LOADING

[a,b,c]

APPLY EXTERNAL FORCES

[a,b,c]

MAKE BOC LOAD ADJUSTMENTS

[ ]a,b,c

ROD/THIMBLE GROWTH
CREEP LOADS

[a,b,c]

RATIO OF ZORBA TO REVNAC PREDICTIONS IN WC H50

a,b,c

[ ]

MODEL FOR AXIAL GROWTH DUE TO OXIDE

a,b,c

[ ]

MPR GROWTH vs FLUENCE

a,b,c

[ ]

MPR GROWTH vs FLUENCE

a,b,c

[ ]

THIMBLE BOW/DRAG

a,b,c

[

]

Thimble and RCC Bow Interference

[

a,b,c

]

FUEL ASSEMBLY GROWTH

[a,b,c]

HOLDDOWN SPRING LOADS

[a,b,c]

GRID DRAG LOADS

[a,b,c]

ZIRC Grid Spring Force Relaxation

a,b,c

INCONEL 718 Grid Spring Force Relaxation

a,b,c

a,b,c

[

]

Drag Work vs Fluence for Different Design Type

- Fuel Types :
  - 17x17 w/o IFM
  - 17x17 w IFM
  - 15x15 OFA
  - 14x14 OFA

  Fuel Features not considered explicitly BUT will have a positive on IRI: ZIRLO,P-grid

  Operating Parameters not consider explicity will have impact:Temperature,cycle length

Figure 5a

IRI Fuel Category Study - 14 OFA

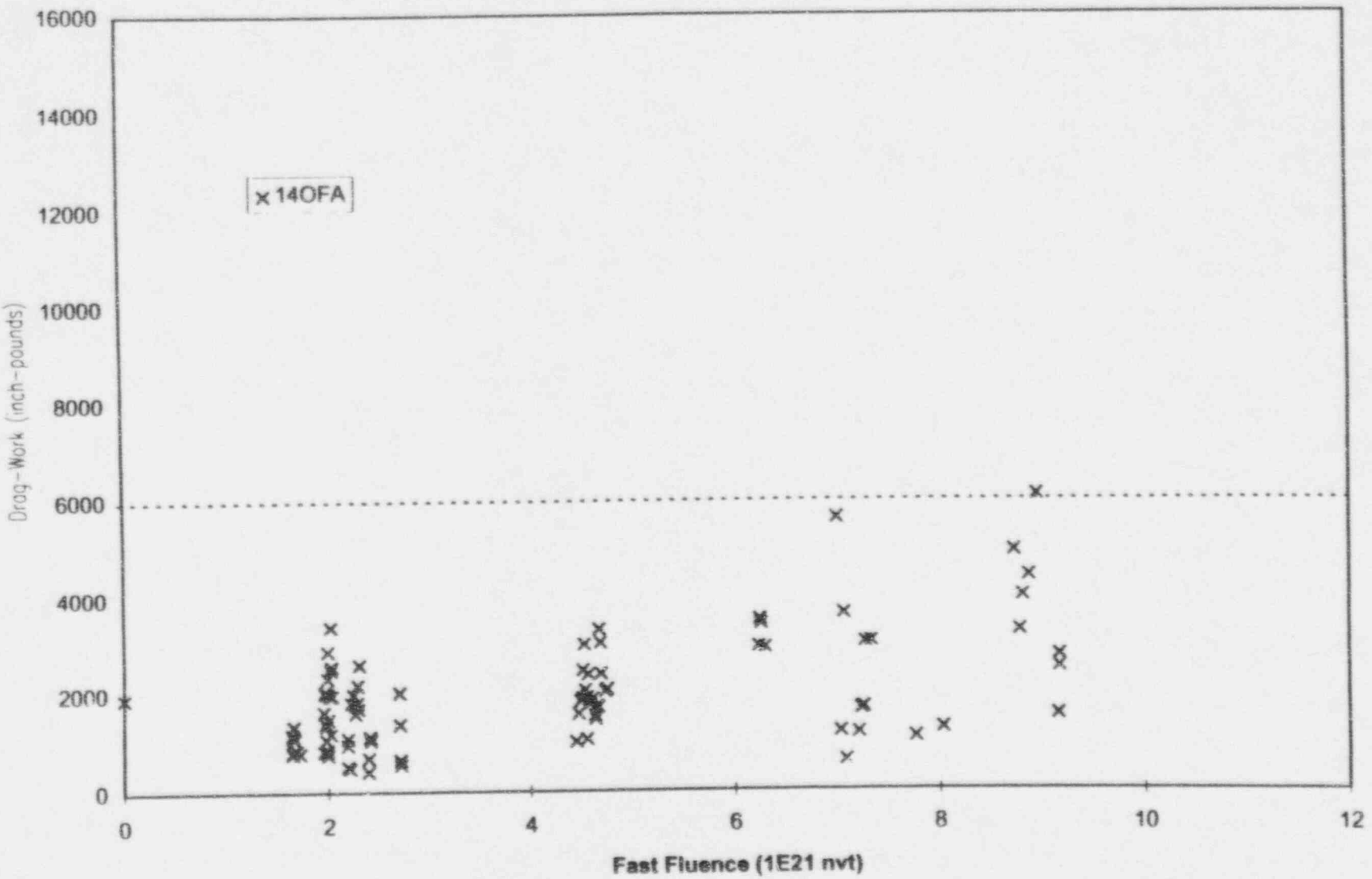


Figure 5b

IRI Fuel Category Study - 15OFA

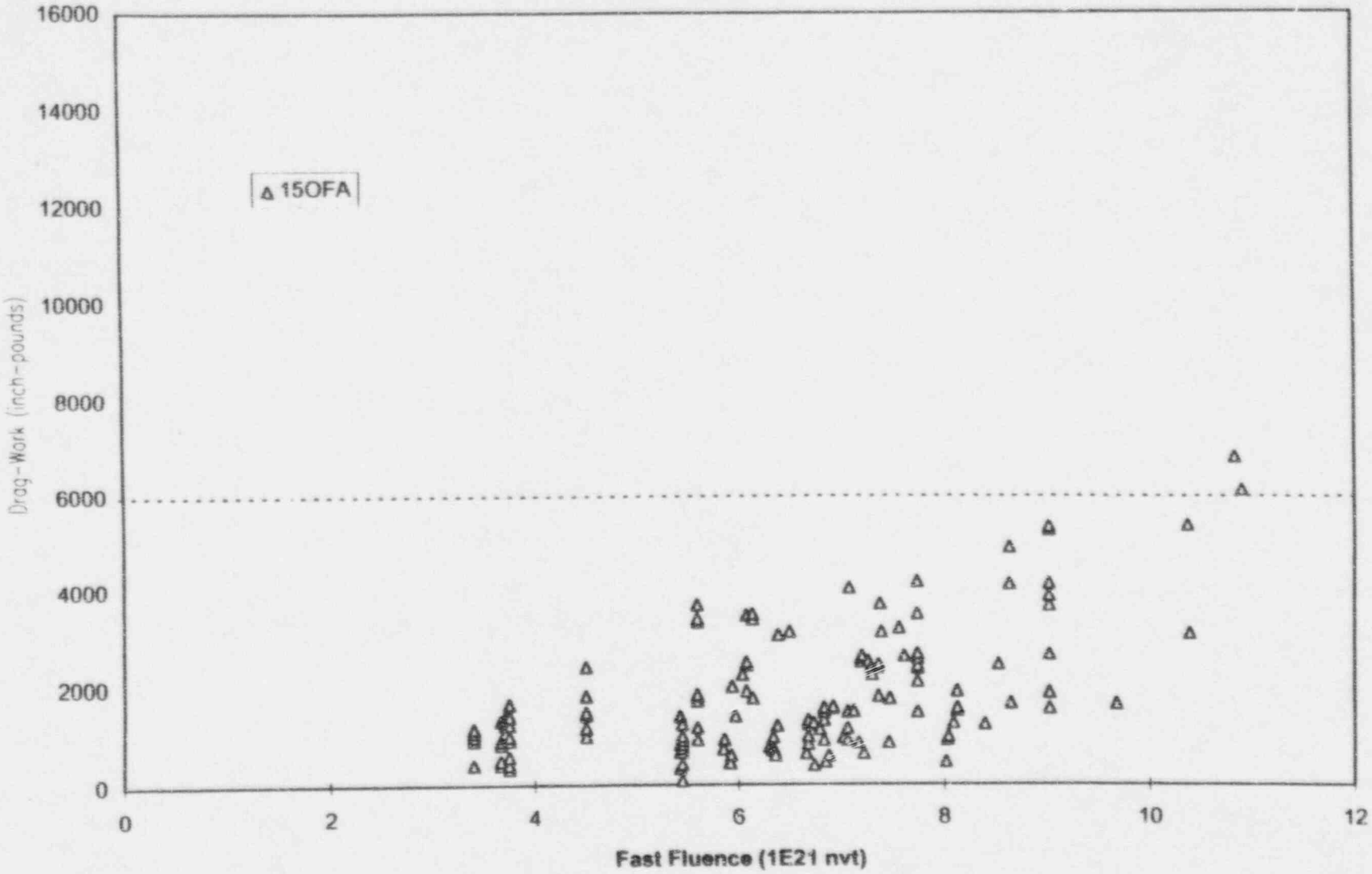


Figure 5d

IRI Fuel Category Study - 17 w IFMs

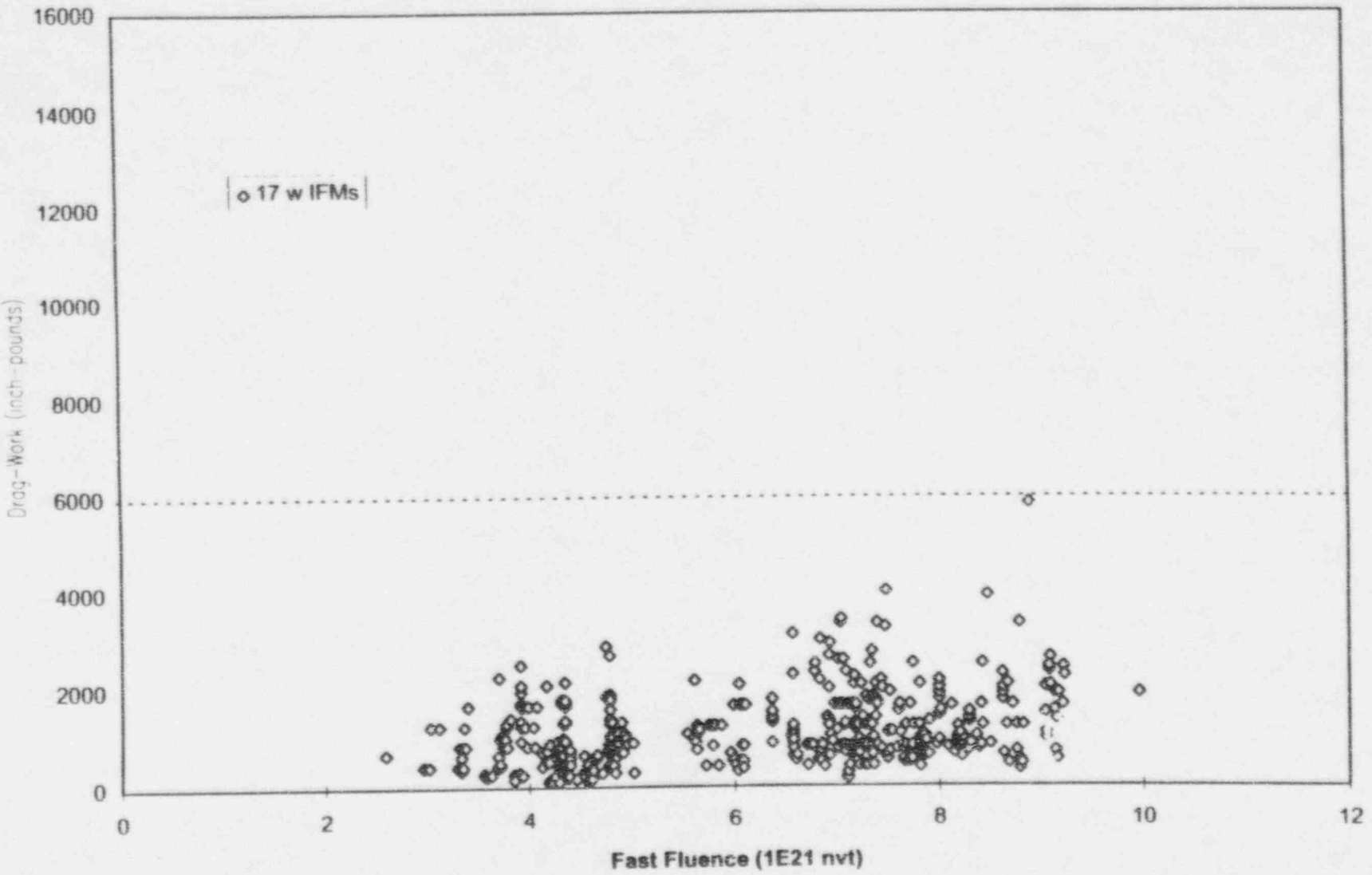
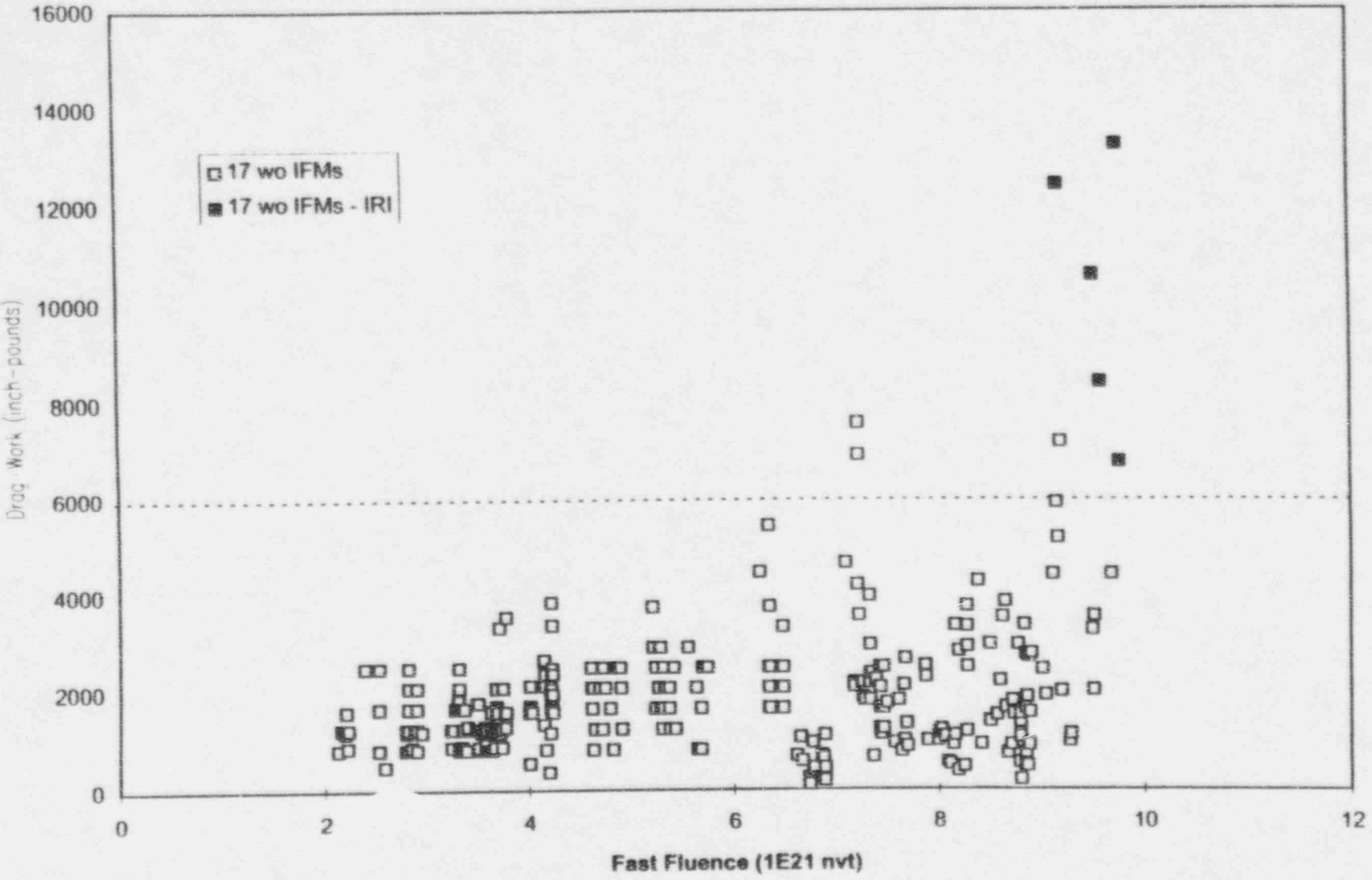


Figure 5e

IRI Fuel Category Study - 17 wo IFMs



•Proactive Actions to Address IRI

- Recommend use of ZIRLO for Skeleton especially for high temperature plants and P-grids

South Texas : ZIRLO guide thimble,P-grids (Fall '97)

Introduction of Thicker Guide Thimble

Wolf Creek 8 LTA: ZIRLO Skeleton

Thicker GuideThimble(25%inc)

P-grids

MV5R mid - grids

IFMs

Proactive Actions to Adress IRI

- Additional Field Data and PIE

  Praire Island: Oxide measurement,drag test, length, ZIRLO Inst Tube to Hot Cell

  North Anna : Drag tests/length/oxide measurment

  South Texas : Drag tests/length/oxide

  VC Summer : ZIRLO skeleton to hot cell(high Bup)

- Redesign of Double Dashpot

  First application in '98 in Europe