FRAMATOME COGEMA FUELS

February 8, 2000
GR00-015.doc

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Subject: NRC/BWOG Meeting to Discuss Recent Control Rod Performance Issues

Gentlemen:

Enclosed is a copy of the material to be presented to the NRC staff on February 9, 2000. In accordance with 10 CFR 2.790 FCF requests that the enclosed information be considered proprietary and withheld from public disclosure. Attachment 1 is the proprietary version of the material. Attachment 2 is an affidavit supporting the proprietary classification of the information. Attachment 3 is the non-proprietary version.

Very truly yours,

T Holeman

T. A. Coleman, Vice President
Government Relations

cc: S. N. Bailey, NRC
M. S. Chatterton, NRC
M. A. Schoppman

FRAMATOME TECHNOLOGIES

Framatome Cogema Fuels
3315 Old Forest Road, P.O. Box 10935, Lynchburg, VA 24506-0935
Telephone: 804-832-3000 Fax: 804-832-3663

T007

Attachment 2

AFFIDAVIT OF THOMAS A. COLEMAN

A. My name is Thomas A. Coleman. I am Vice President of Government Relations for Framatome Cogema Fuels (FCF). Therefore, I am authorized to execute this Affidavit.

B. I am familiar with the criteria applied by FCF to determine whether certain information of FCF is proprietary and I am familiar with the procedures established within FCF to ensure the proper application of these criteria.

C. In determining whether an FCF document is to be classified as proprietary information, an initial determination is made by the Unit Manager, who is responsible for originating the document, as to whether it falls within the criteria set forth in Paragraph D hereof. If the information falls within any one of these criteria, it is classified as proprietary by the originating Unit Manager. This initial determination is reviewed by the cognizant Section Manager. If the document is designated as proprietary, it is reviewed again by personnel and other management within FCF as designated by the Vice President of Government Relations to assure that the regulatory requirements of 10 CFR Section 2.790 are met.

D. The following information is provided to demonstrate that the provisions of 10 CFR Section 2.790 of the Commission's regulations have been considered:

(i) The information has been held in confidence by FCF. Copies of the document are clearly identified as proprietary. In addition, whenever FCF transmits the information to a customer, customer's agent, potential customer or regulatory agency, the transmittal requests the recipient to hold the information as proprietary. Also, in order to strictly limit any potential or actual customer's use of proprietary information, the substance of the following provision is included in all agreements entered into by FCF, and an equivalent version of the proprietary provision is included in all of FCF's proposals:

"Any proprietary information concerning Company's or its Supplier's products or manufacturing processes which is so designated by Company or its Suppliers and disclosed to Purchaser incident to the performance of such contract shall remain the property of Company or its Suppliers and is disclosed in confidence, and Purchaser shall not publish or otherwise disclose it to others without the written approval of Company, and no rights, implied or otherwise, are granted to produce or have produced any products or to practice or cause to be practiced any manufacturing processes covered thereby.

Notwithstanding the above, Purchaser may provide the NRC or any other regulatory agency with any such proprietary information as the NRC or such other agency may require; provided, however, that Purchaser shall first give Company written notice of such proposed disclosure and Company shall have the right to amend such proprietary information so as to make it non-proprietary. In the event that Company cannot amend such proprietary information, Purchaser shall, prior to disclosing such information, use its best efforts to obtain a commitment from NRC or such other agency to have such information withheld from public inspection.

Company shall be given the right to participate in pursuit of such confidential treatment."

(ii) The following criteria are customarily applied by FCF in a rational decision process to determine whether the information should be classified as proprietary. Information may be classified as proprietary if one or more of the following criteria are met:

a. Information reveals cost or price information, commercial strategies, production capabilities, or budget levels of FCF, its customers or suppliers.

b. The information reveals data or material concerning FCF research or development plans or programs of present or potential competitive advantage to FCF.

c. The use of the information by a competitor would decrease his expenditures, in time or resources, in designing, producing or marketing a similar product.

d. The information consists of test data or other similar data concerning a process, method or component, the application of which results in a competitive advantage to FCF.

e. The information reveals special aspects of a process, method, component or the like, the exclusive use of which results in a competitive advantage to FCF.

f. The information contains ideas for which patent protection may be sought.

The document(s) listed on Exhibit "A", which is attached hereto and made a part hereof, has been evaluated in accordance with normal FCF procedures with respect to classification and has been found to contain information which falls within one or more of the criteria enumerated above. Exhibit "B", which is attached hereto and made a part hereof, specifically identifies the criteria applicable to the document(s) listed in Exhibit "A".

(iii) The document(s) listed in Exhibit "A", which has been made available to the United States Nuclear Regulatory Commission was made available in confidence with a request that the document(s) and the information contained therein be withheld from public disclosure.

(iv) The information is not available in the open literature and to the best of our knowledge is not known by Combustion Engineering, Siemens, General Electric, Westinghouse or other current or potential domestic or foreign competitors of Framatome Cogema Fuels.

(v) Specific information with regard to whether public disclosure of the information is likely to cause harm to the competitive position of FCF, taking into account the value of the information to FCF; the amount of effort or money expended by FCF developing the information; and the ease or difficulty with which the information could be properly duplicated by others is given in Exhibit "B".

I have personally reviewed the document(s) listed on Exhibit "A" and have found that it is considered proprietary by FCF because it contains information which falls within one or more of the criteria enumerated in Paragraph D, and it is information which is customarily held in confidence and protected as proprietary information by FCF. This report comprises information utilized by FCF in its business which afford FCF an

opportunity to obtain a competitive advantage over those who may wish to know or use the information contained in the document(s).

T A Coleman

THOMAS A. COLEMAN

State of Virginia)
) SS. Lynchburg
City of Lynchburg)

Thomas A. Coleman, being duly sworn, on his oath deposes and says that he is the person who subscribed his name to the foregoing statement, and that the matters and facts set forth in the statement are true.

T A Coleman

THOMAS A. COLEMAN

Subscribed and sworn before me
this 8th day of February 2000.

Wanda L. Wade
Notary Public in and for the City
of Lynchburg, State of Virginia.

My Commission Expires 8/31/01.

EXHIBITS A & B

EXHIBIT A

BWOG Material on Control Rod Performance
Issues Presented to NRC on February 9, 2000.

EXHIBIT B

The above listed document contains information which is considered proprietary
In accordance with Criteria c and d of the attached affidavit.

Attachment 3

February 2000 NRC Meeting on Incomplete Rod Insertion

The B&W Owners Group and
Framatome-Cogema Fuels

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Agenda

- Review of October 1999 meeting
- Recent plant data
- What have we learned
- Corrective actions and future improvements taken by FCF and utilities

Review of October 1999 TMI IRI Meeting

- A significant amount of TMI data was collected and analyzed
- Improvements were made to the TMI Cycle 13 core
- TMI Startup data showed acceptable control rod drop times
- Based on the corrective actions, continuous operation was justified for TMI Cycle 13.
- No safety significance
- TMI will perform drop time testing for all shutdowns when testing has not been performed within four months
- TMI will submit a supplement LER within 18 months evaluating available new data and analyses and determining if additional monitoring is warranted.

TMI IRI Root Cause

Root Cause for the TMI IRI was identified as excessive Guide Tube Deformation

Guide Tube Deformation can be caused by:

- hold-down spring force
- lateral loads
- fuel assembly growth
- creep

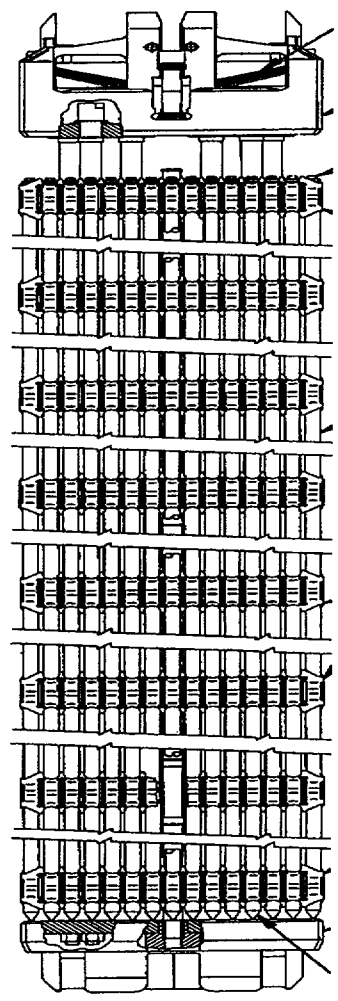
Background on IRI and Guide Tube Deformation

Hold down spring force must prevent FA lift

Spring is "plastically set" during cold shutdown due to differential thermal expansion

Fuel rod clad grows due to irradiation and material creep

Guide tubes grows due to irradiation and material creep



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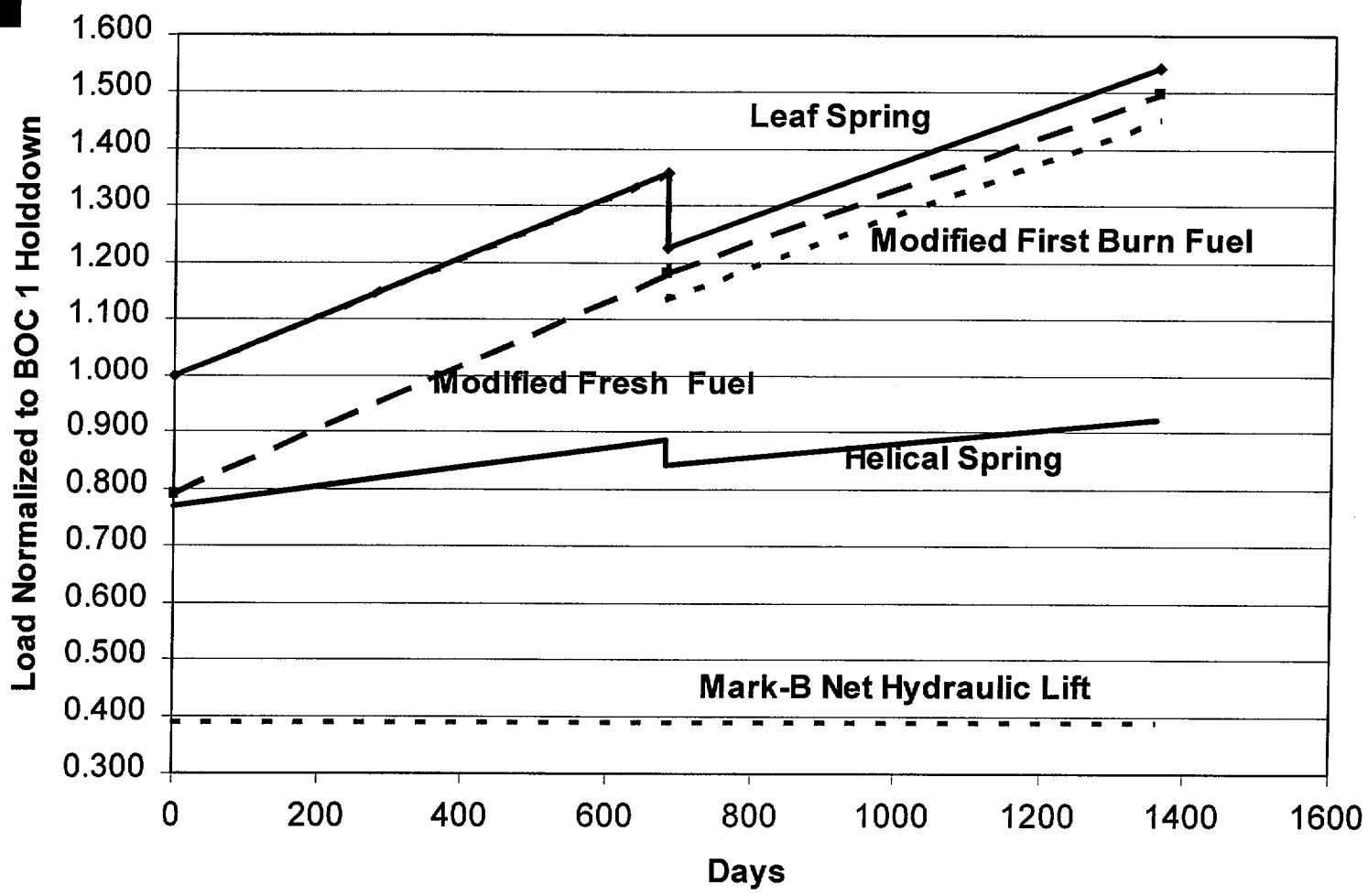
Immediate Corrective Actions Taken at TMI

Guide tube deformation:	Corrective Actions:
•Hold-down spring force	•Plastically set spring
•Lateral loads	•Minimized "same quadrant shuffle"

Possible Future Improvements

Guide tube deformation:	Future improvements:
•Hold-down spring force	•Redesign Mark-B10 leaf-spring
•Lateral loads	•Finalize shuffle guidelines
•Fuel assembly growth	•Low growth material (M5™)
•Creep	•Low growth material (M5™)

Mark-B Spring Hold-Down: Setting Springs



Mark-B Data and Analysis

Gary Williams
FCF Team Leader
Mechanical Analysis and Development

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Agenda for Mark-B Data and Analysis

- Data taken before TMI IRI observations
- TMI drop times and summary
- Crystal River-3 drop times and summary
- Oconee-2 drop times and summary
- Control rod drag work
- Compare 18-month and 24-month cycles
- Effect of cold shut-down

Latest Cycle Data for Mark-B Units

Plant	Cycle	EFPD	Outage Date	Max FA Burn-Up
ANO-1	15	473.8	9/11/99	[c,d]
Crystal River-3	11	684.8	10/1/99	[c,d,]
Davis-Besse	11	645.3	4/10/98	[c,d]
TMI-1	12	680.6	9/10/99	[c,d]
Oconee-1	18	435.4	5/20/99	[c,d]
Oconee -2	17	501.8	11/4/99	[c,d]
Oconee -3	17	502.4	10/8/98	[c,d]

Mark-B Data Taken before TMI-1 IRI Observations

Oconee-3 (502 EFPD)

- No IRI or significant increase in control rod drop time
- Mark-B10 leaf spring
- Type C CRDM

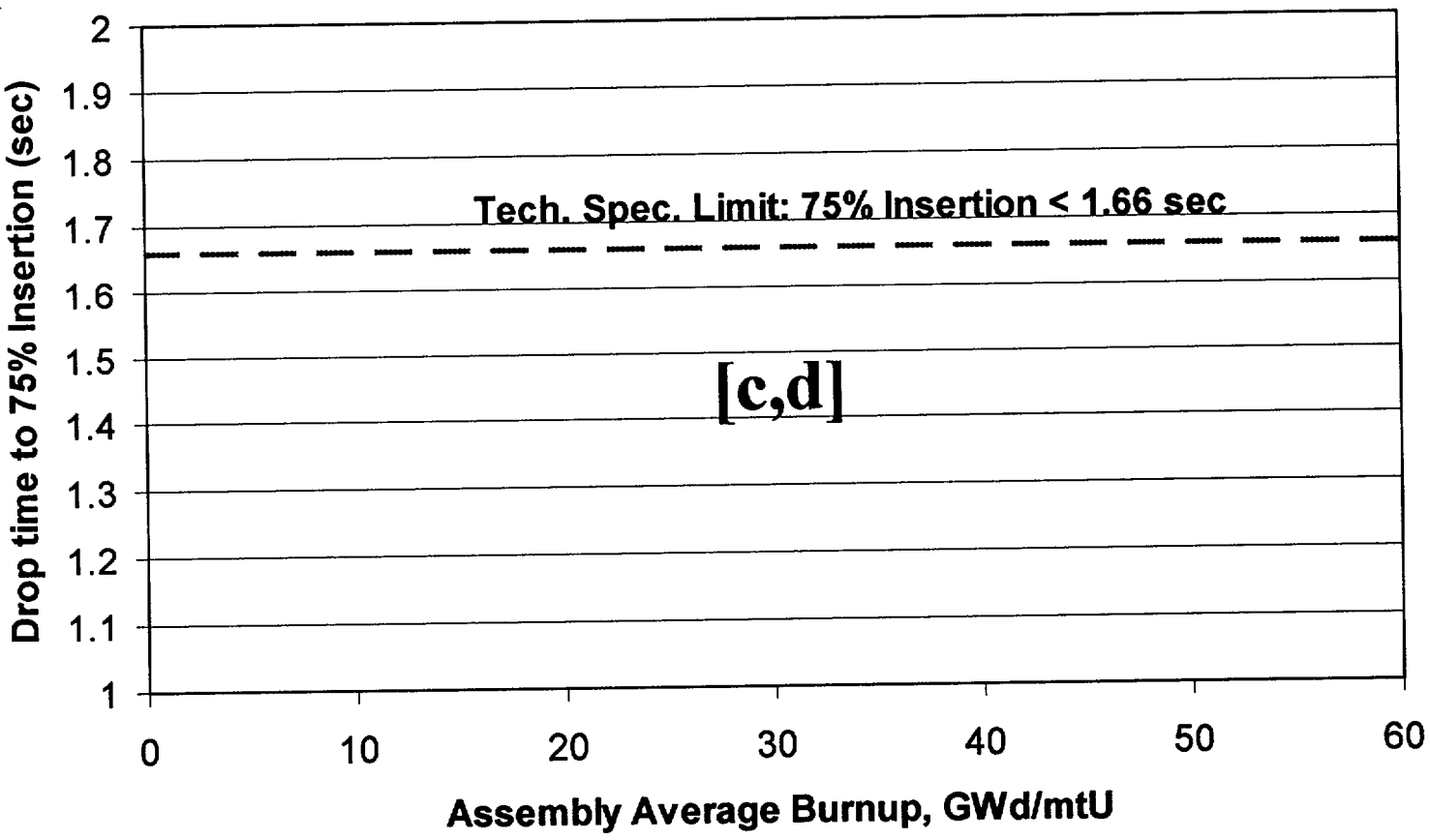
Davis Besse (645 EFPD)

- No IRI
- Mark-B10 leaf spring
- Type C CRDM

ANO-1 (474 EFPD)

- No IRI or significant increase in control rod drop time
- No trends that would indicate future problems
- Helical hold-down spring
- Type B CRDM

Mark-B Drop Time Variation with Burnup



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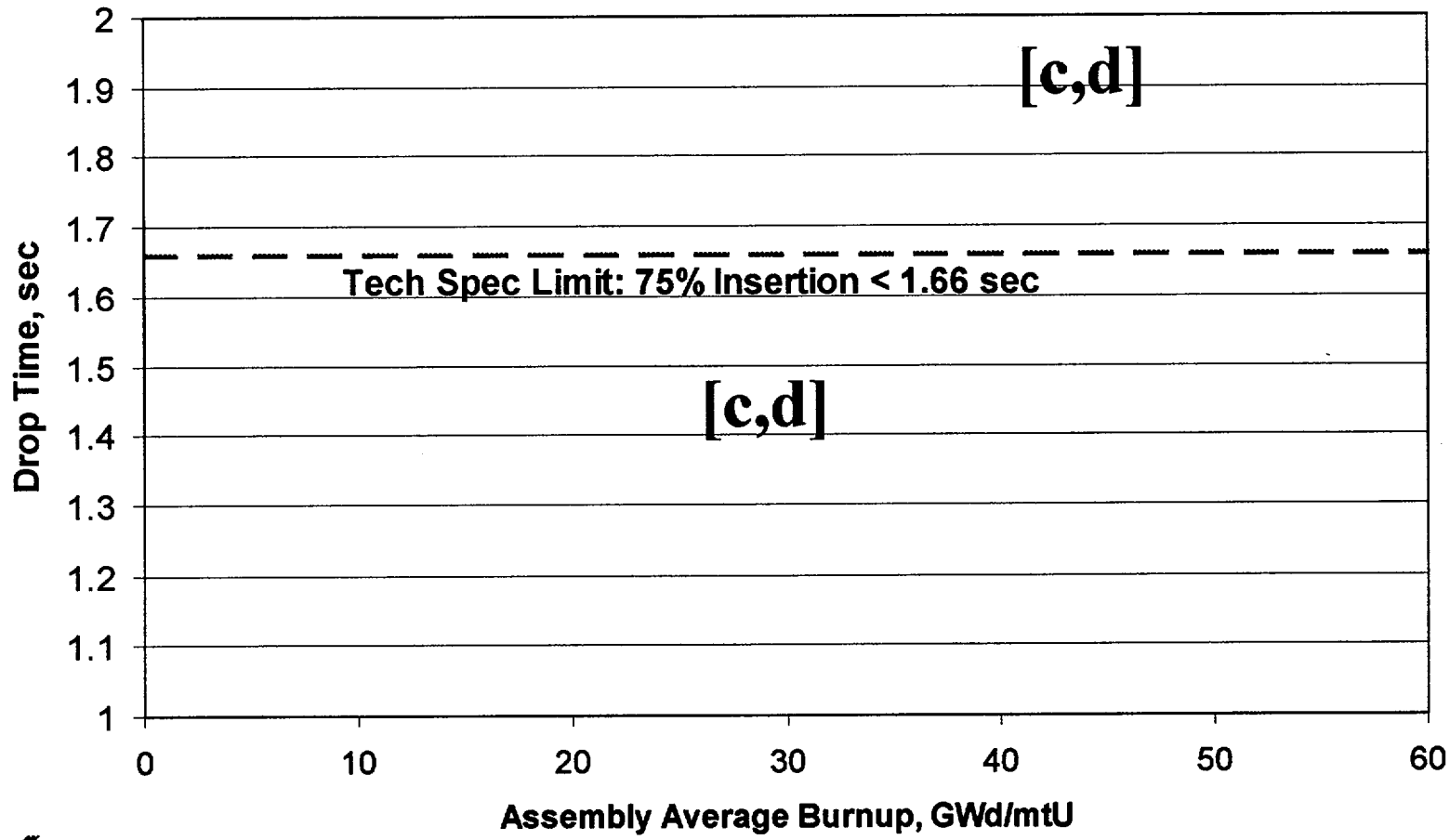
Summary of TMI-1 Data

TMI-1 (681 EFPD, previous cycle ~660 EPFD)

- Two control rods did not fully insert
  - E11 was 26% withdrawn
  - G9 was 7% withdrawn
- Both are leaf spring designs (Mark-B10) with a burnup of approximately 50 GWd/mtU
- Both stayed in the same quadrant for both cycles
- Both showed significant guide tube distortion
- TMI had two long, continuous-operation, cycles

TMI-1 Drop Time Variation with Burnup



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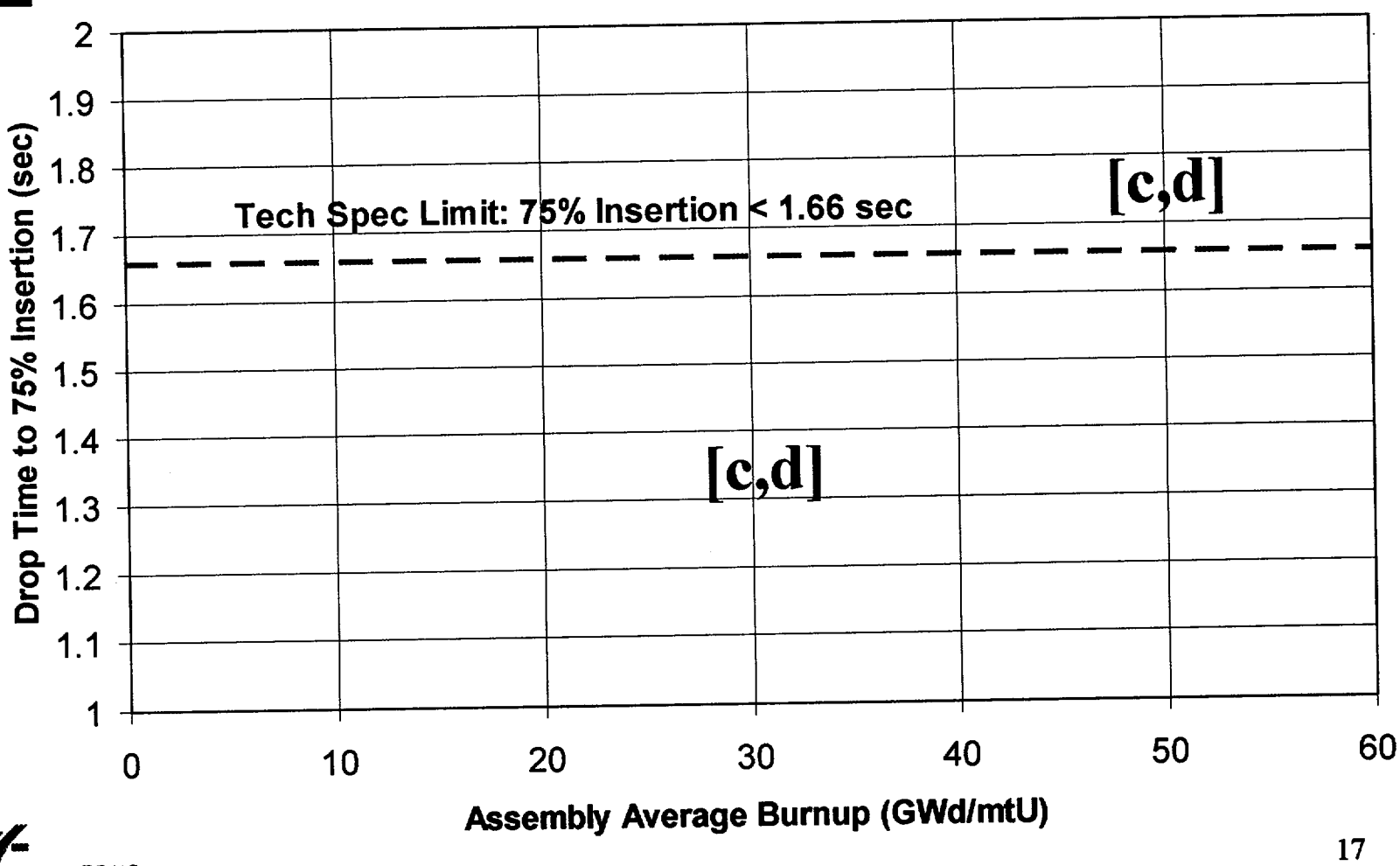
Summary of Crystal River-3 Data

Crystal River-3 (685 EFPD)

- 24-month cycle
- Two fuel assemblies (FA), with old CRDM/thermal barriers, did not meet the 1.66 sec drop time criteria
- A third FA, with Mark-B10 leaf spring design, stopped at 8% withdrawn and slowly fully inserted
- This third FA was measured to have significant control rod drag
- A fourth FA (with an old CRDM/thermal barrier) did not initially meet the 1.66 sec drop time criteria at startup
- After exercising the CRDM, the fourth FA met the drop time criteria

Crystal River 3 Drop Time Variation with Burn-up, EOC 11



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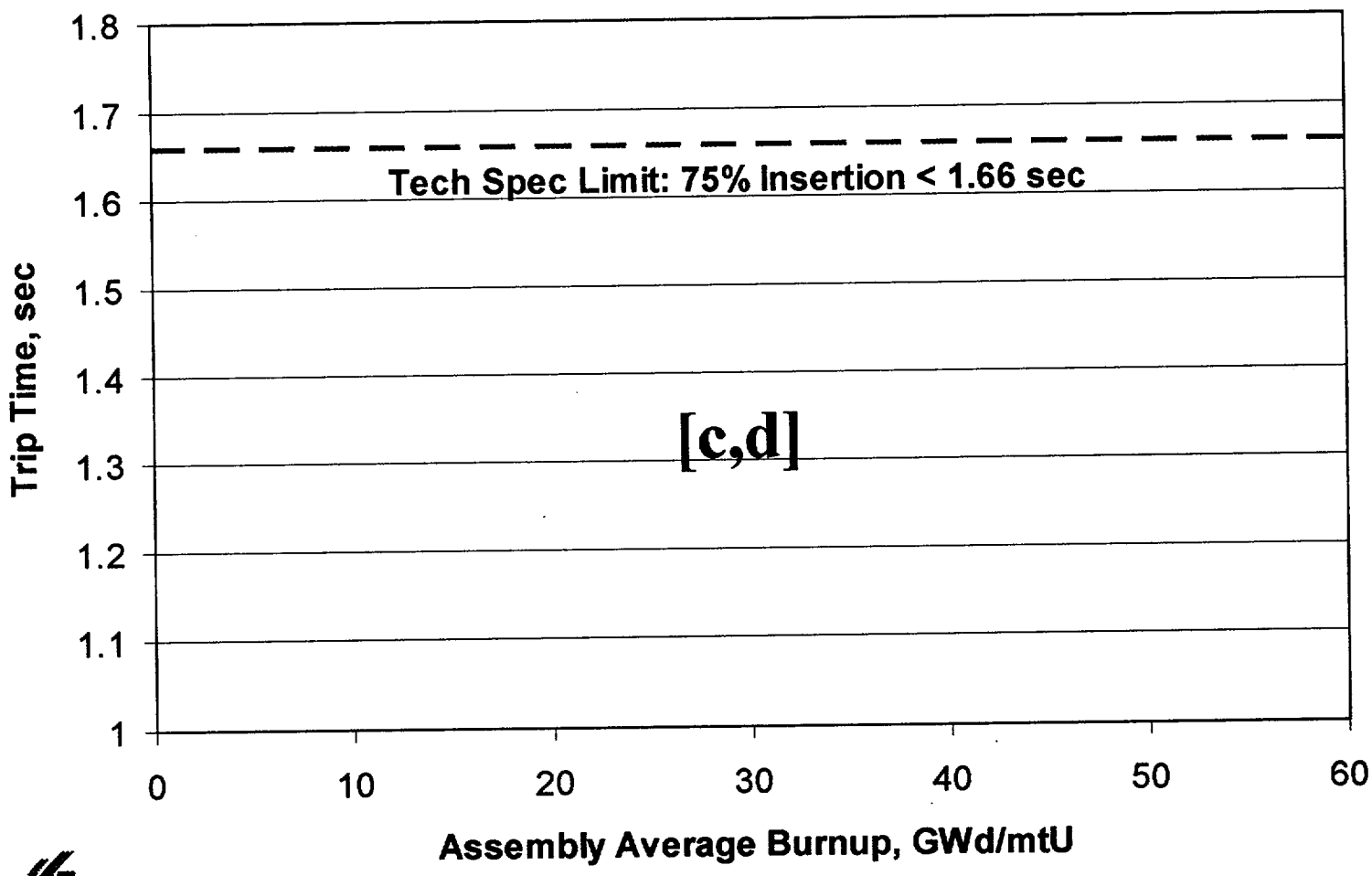
Summary of Oconee-2 Data

Oconee-2 (502 EFPD)

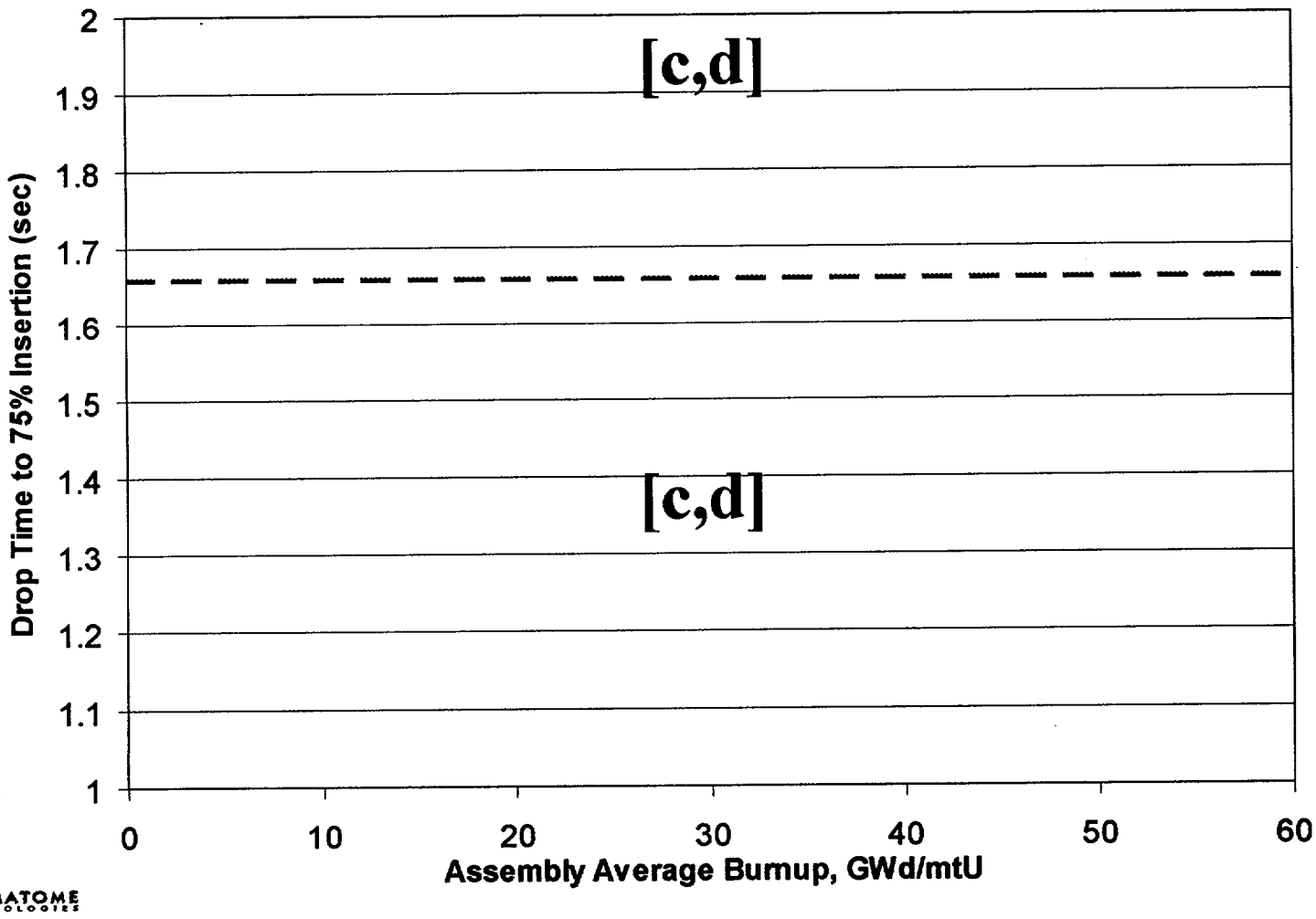
- No IRI or significant increase in control rod drop time
- No trends that would indicate future problems
- Mark-B10 leaf-spring

Oconee-2 Cycle 17 Drop Time Variation with Burnup



FRAMATOME TECHNOLOGIES

Oconee-2 Drop Time Variation with Burnup



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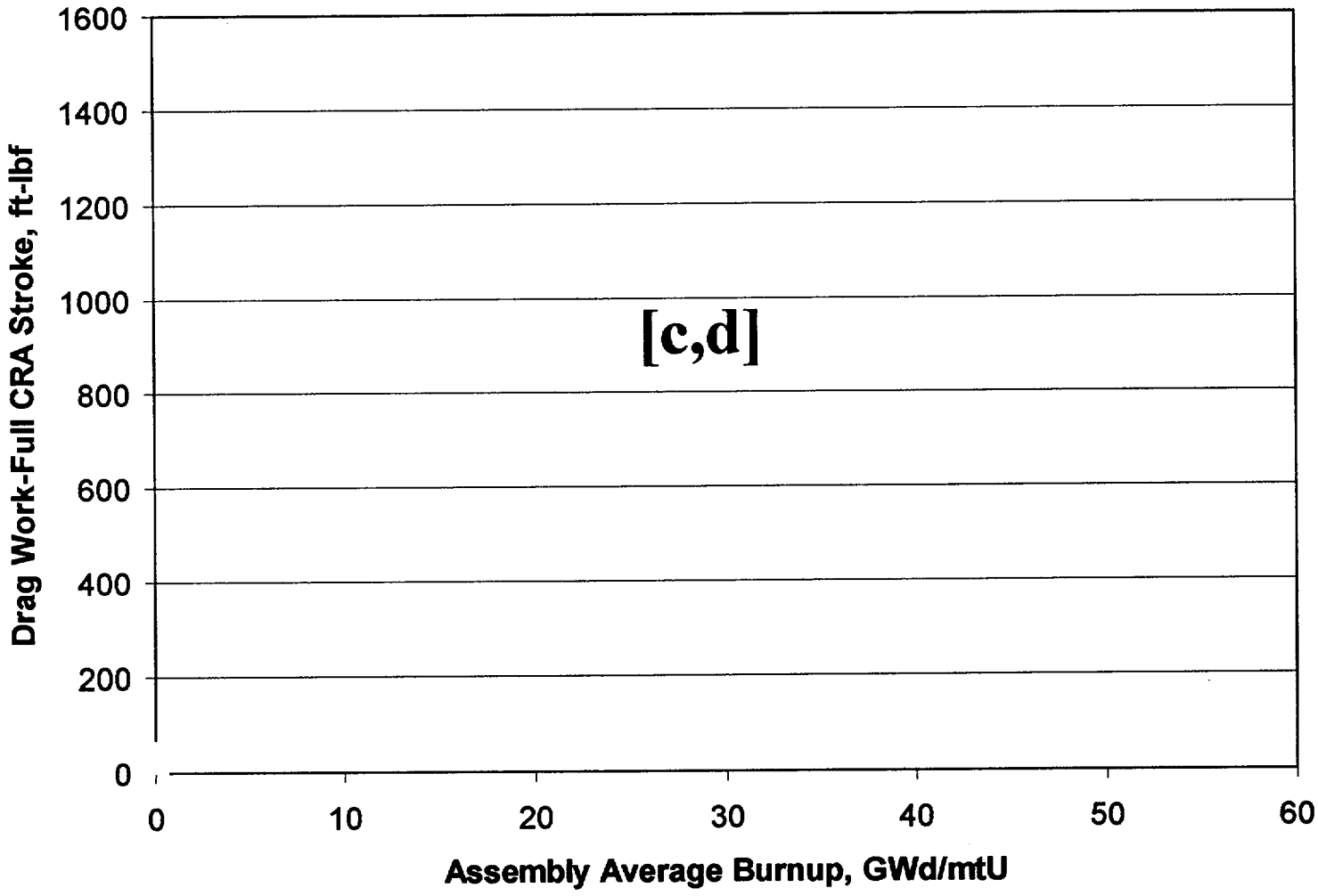
Control Rod Assembly Drag Work

- Integration of mechanical drag force over the length of the GT acting on the control rod assembly (CRA)
  - Slows, and potentially stops, CRA during insertion
- Increases with increased guide tube distortion
- Obtained by analyzing CRA drag profiles
- Used as a measure of margin to incomplete rod insertion

Control Rod Drag Work as a Function of Burn-up



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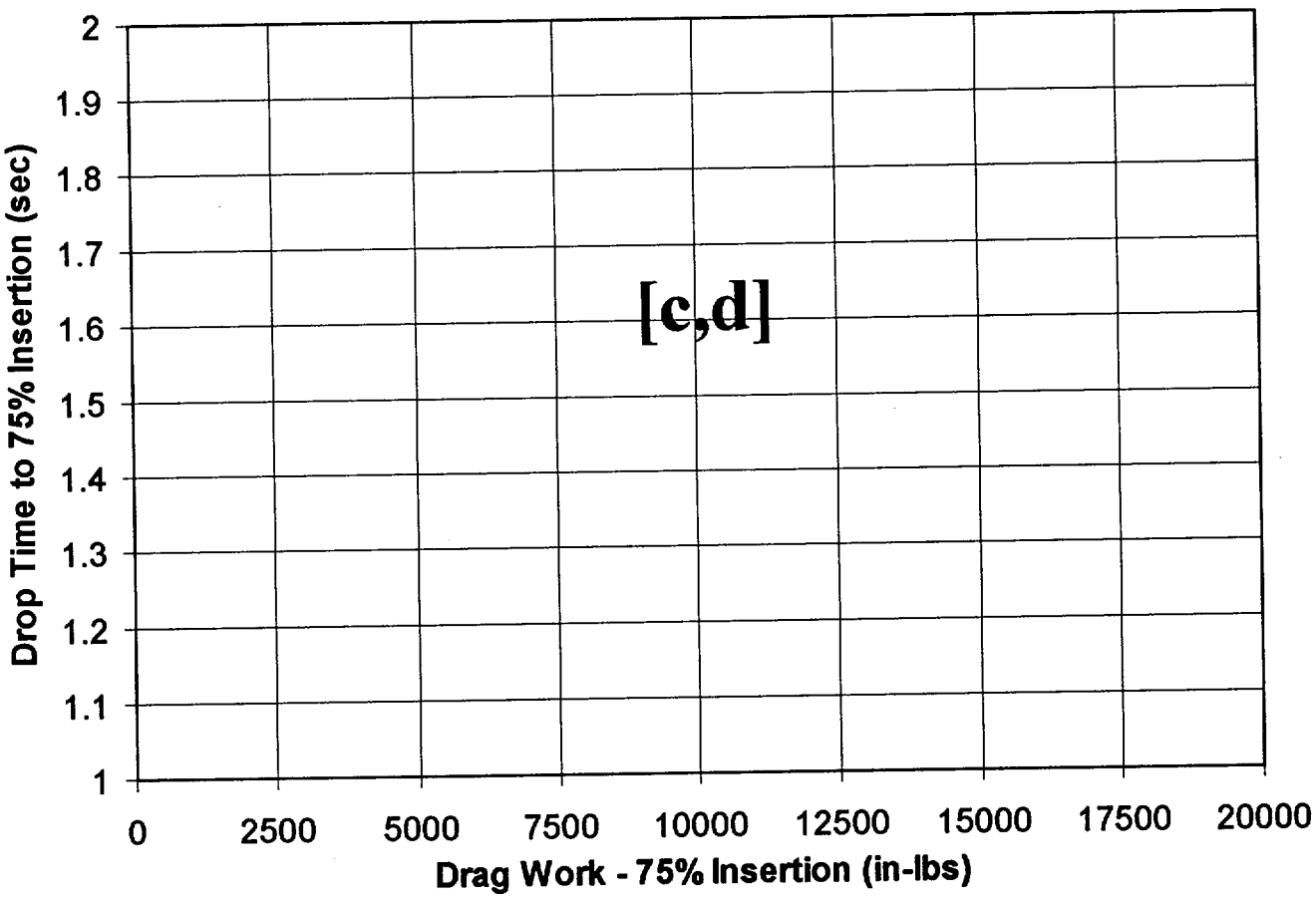
Control Rod Drop Time Variation with Drag Work, TMI-1 Cycle 12



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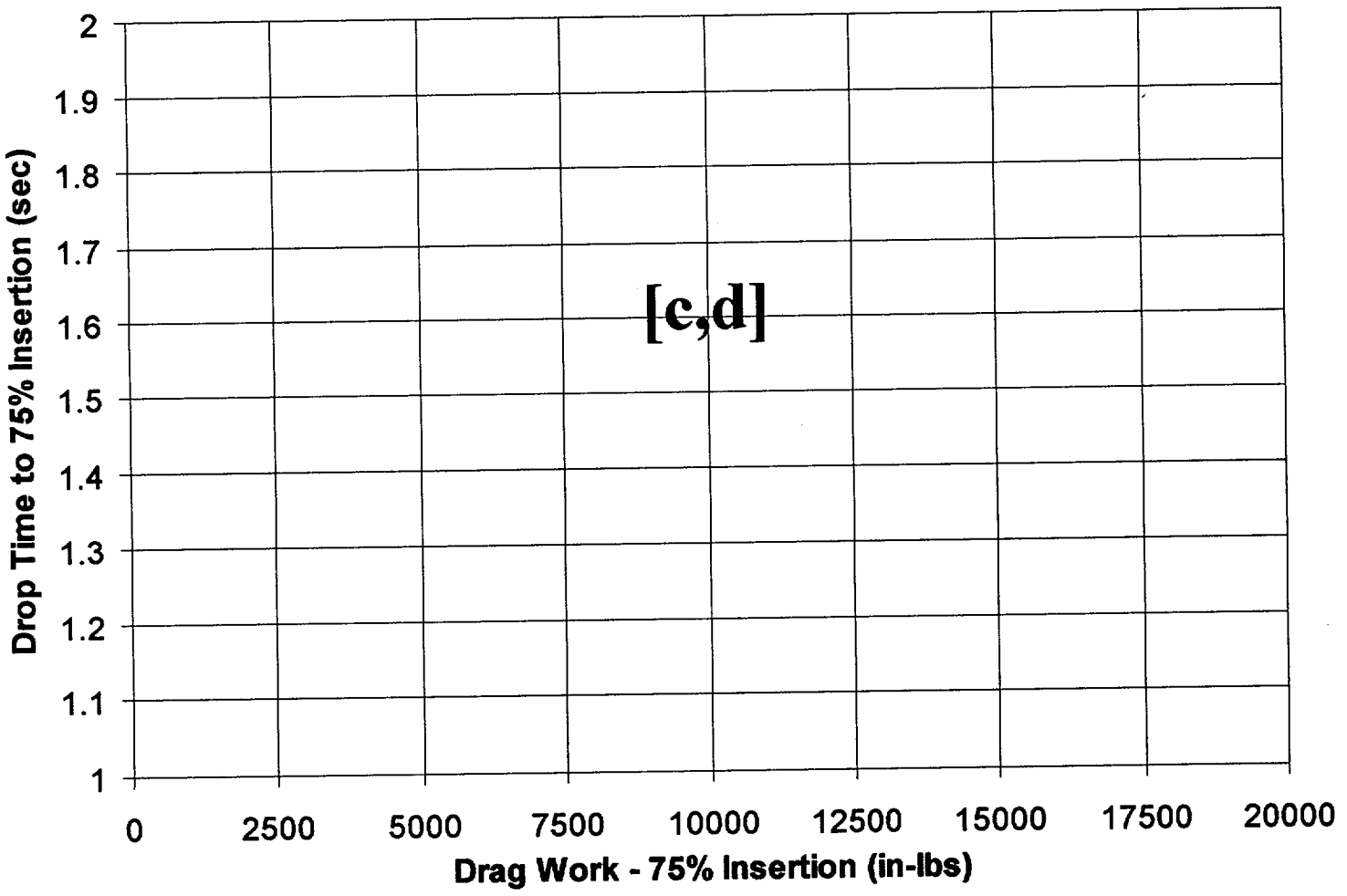
Control Rod Drop Time Variation with Drag Work, CR-3 Cycle 11



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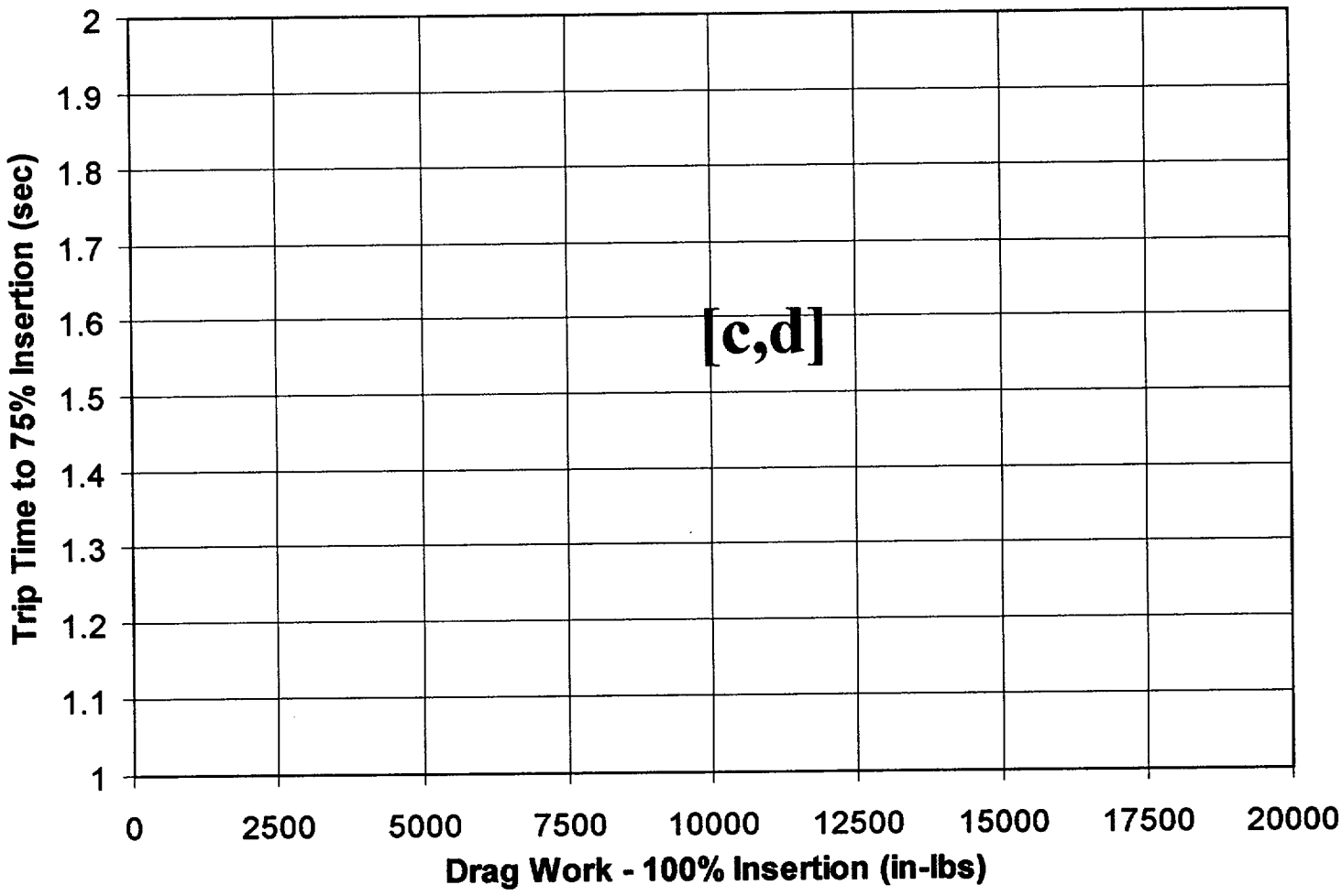
Control Rod Drop Time Variation with Drag Work Oconee-2 Cycle 17 (18-month cycles)



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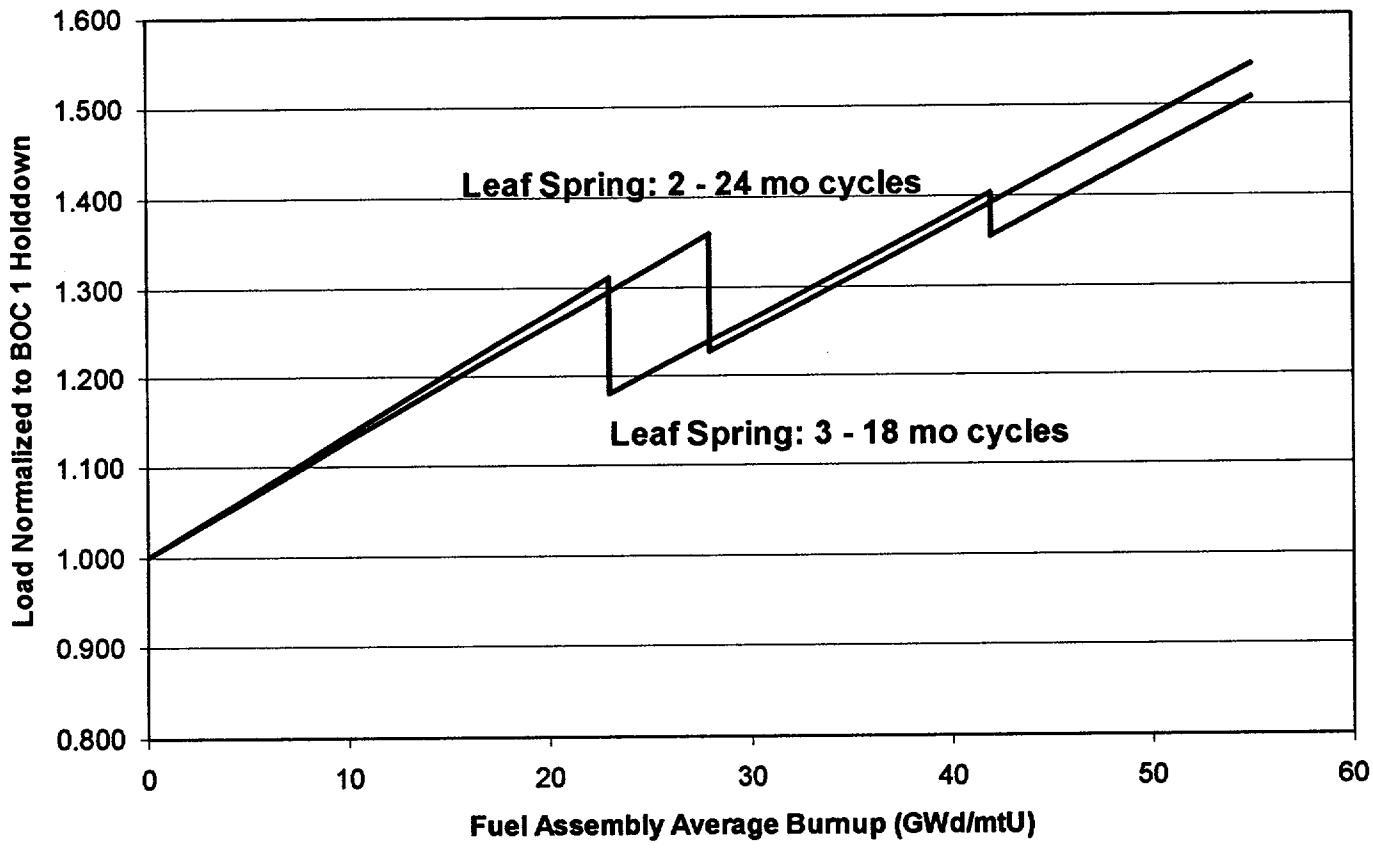
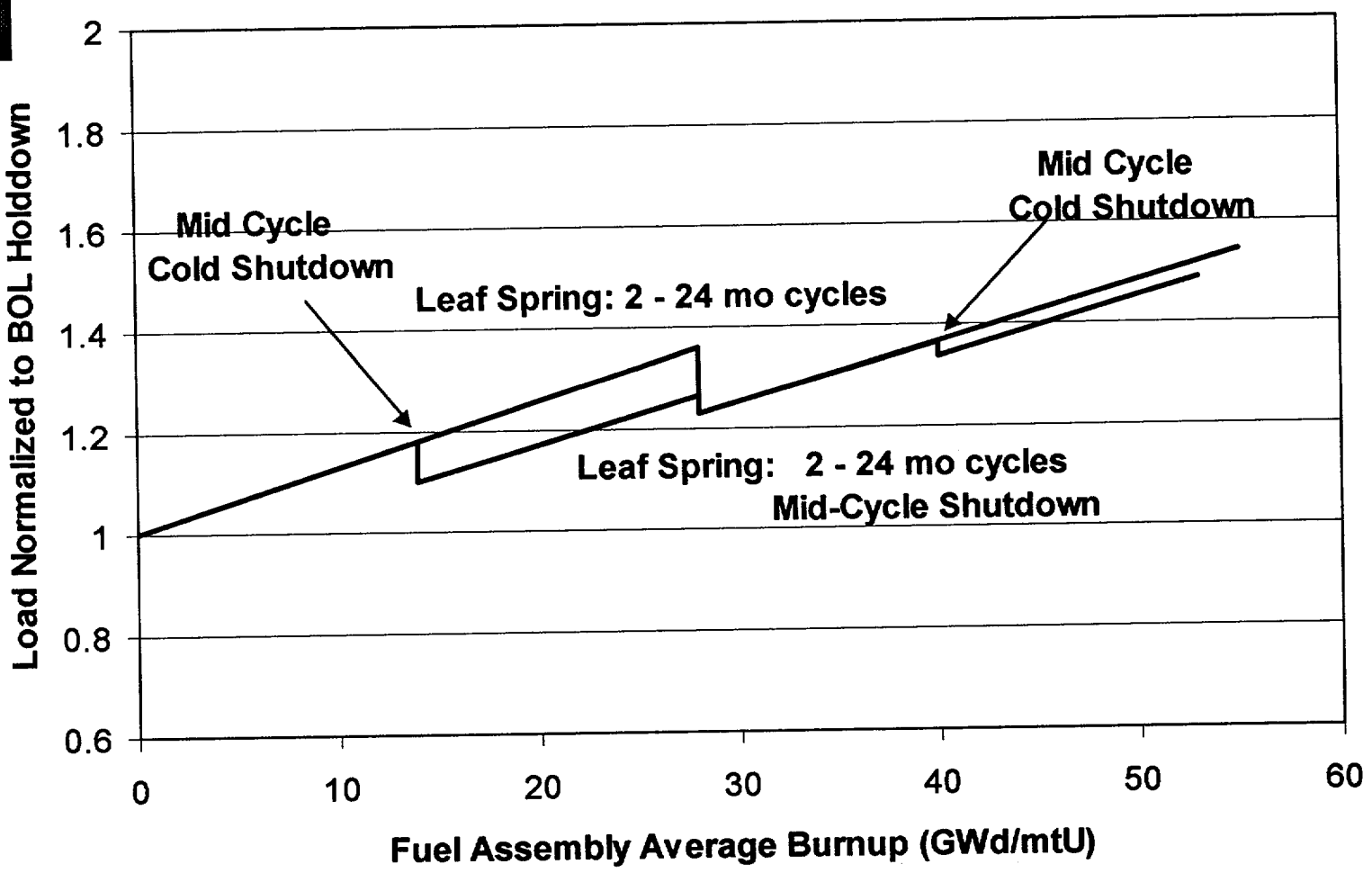
Mark-B Spring Hold Down: 24 Month and 18 Month Cycles



Mark-B Spring Hold Down: Effect of Cold Shutdowns at Davis-Besse



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Oconee 2 PIE Data Collection

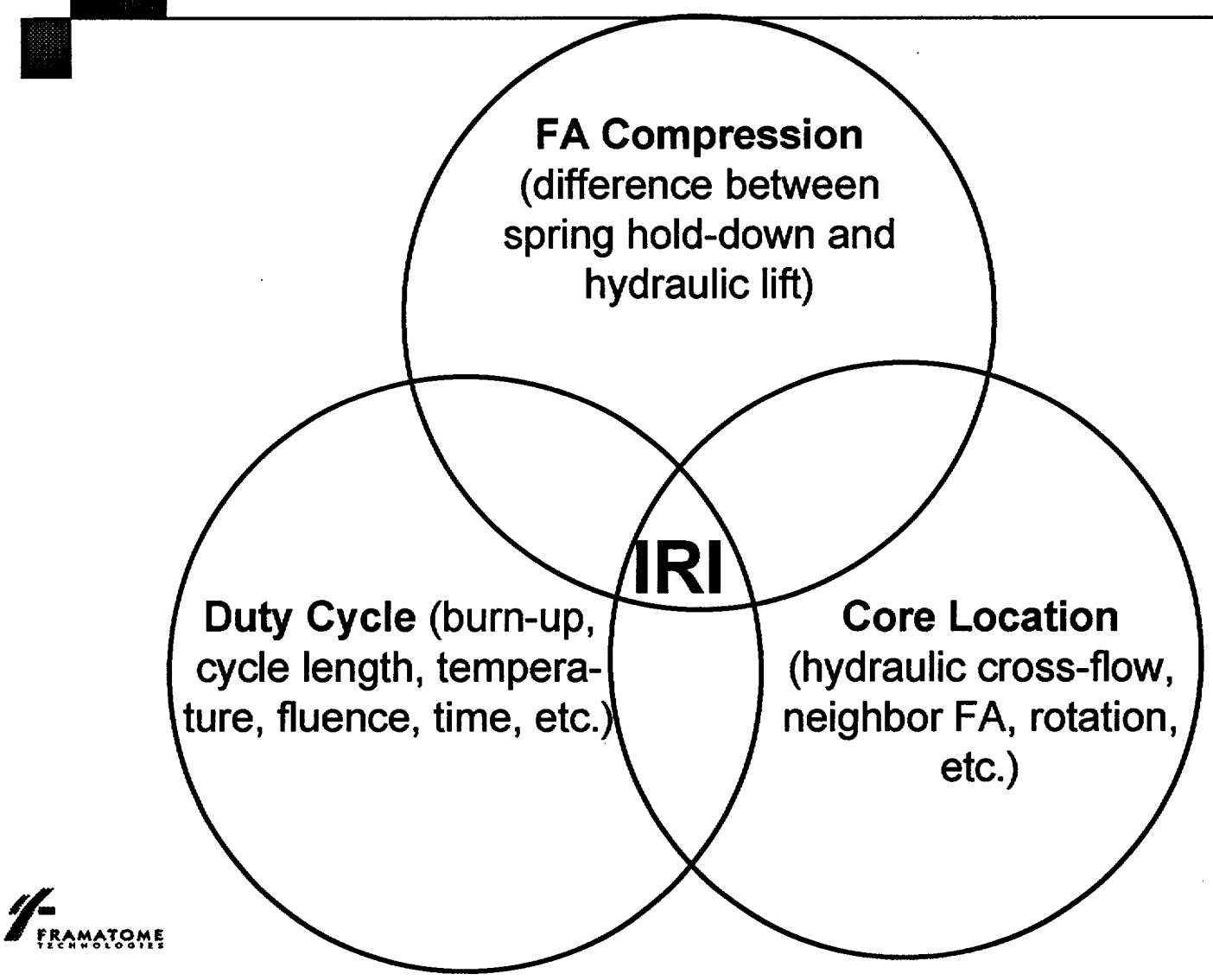
- Fuel Assembly (FA) Growth
- FA Bow
- Guide Tube (GT) Plug Gauge
- GT Oxide Measurements
- FA Spacer Grid Oxide & Growth
- Fuel Rod Corrosion & Growth
- Fuel Rod Diameter
- Spring Force Verification
- Control Rod Assembly Drop Times
- Control Rod Assembly Drag

- Results show no anomalous behavior or unfavorable trends

Conclusions From Mark-B Plant Observations

- Plants with 18 month cycles have not had IRI, significant increase in control rod drop times, or undesirable trends
- TMI and Crystal River-3 (24 month cycles) have had increased guide tube deformation that yielded slower drop times and/or IRI
  - Both units had long continuous operations
  - Both units had Mark-B10 leaf springs
  - Both units had same quadrant shuffles

IRI Variables



Corrective Actions

Bernie Copsey

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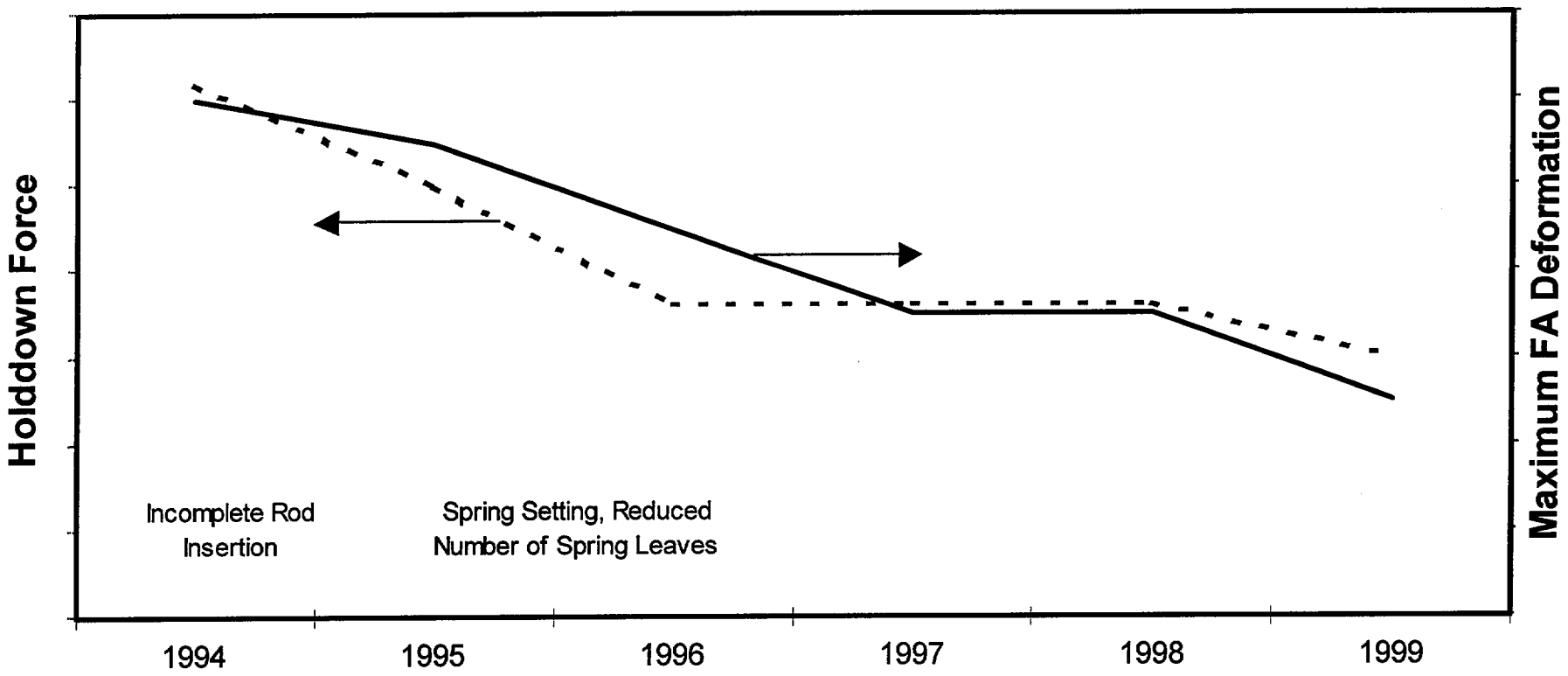
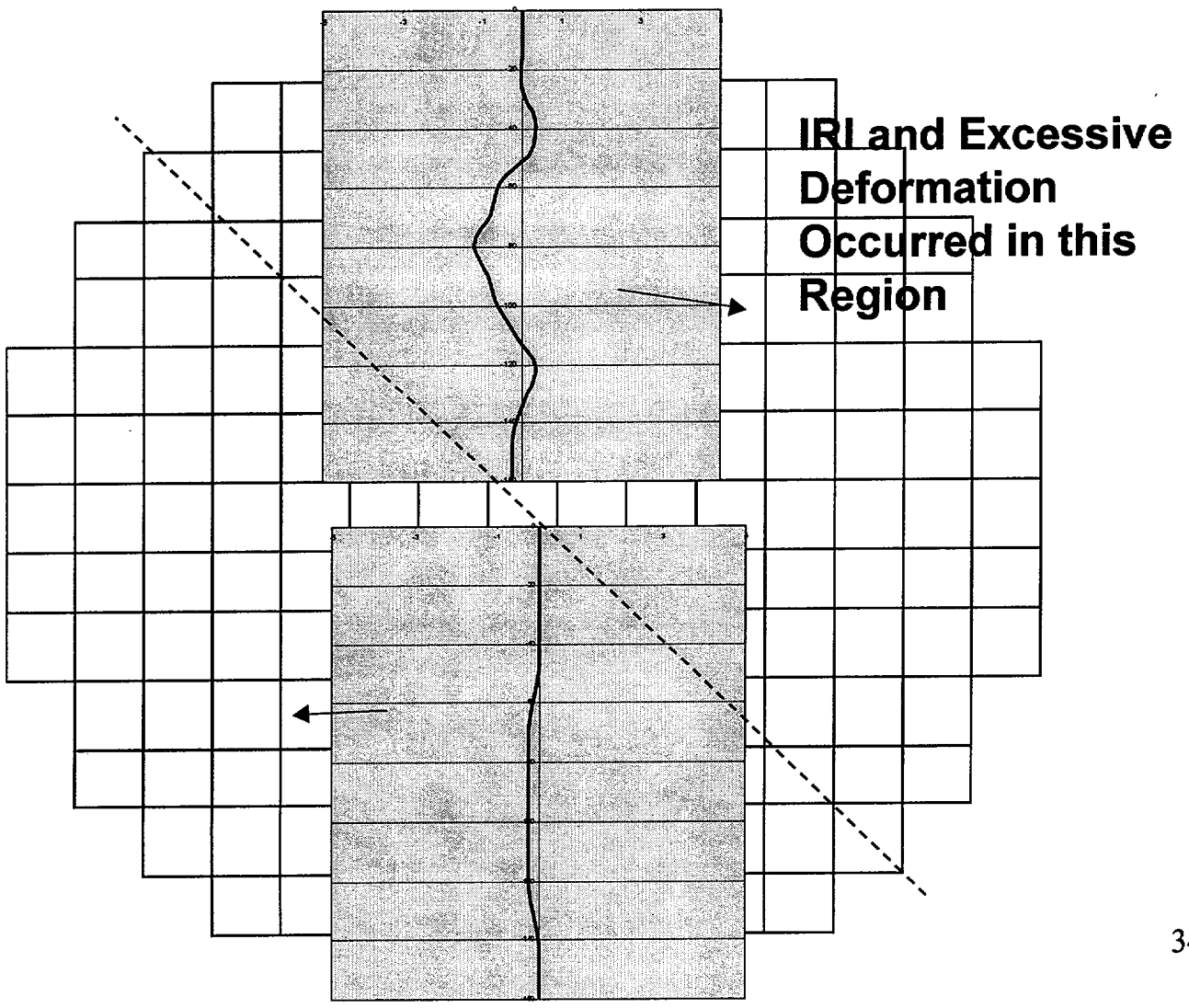
Corrective Actions Performed at Each Unit

	Set Fresh Fuel Leaf-Spring	Set Burned Fuel Leaf-Spring	Minimize Same Quadrant Shuffle
Recent:			
ANO	**N/A**	**N/A**	**N/A**
TMI	✓	✓	✓
Crystal River	✓	✓	✓
Oconee-2	✓	✓	✓
Future:			
Davis Besse	✓	✓	✓
Oconee-3	✓	**under evaluation**	✓
Oconee-1	**set spring or use redesigned spring**	**under evaluation**	✓

Improvements in FA Deformation at Ringhals



Guide Tube Deformation at TMI is Core Location Dependent

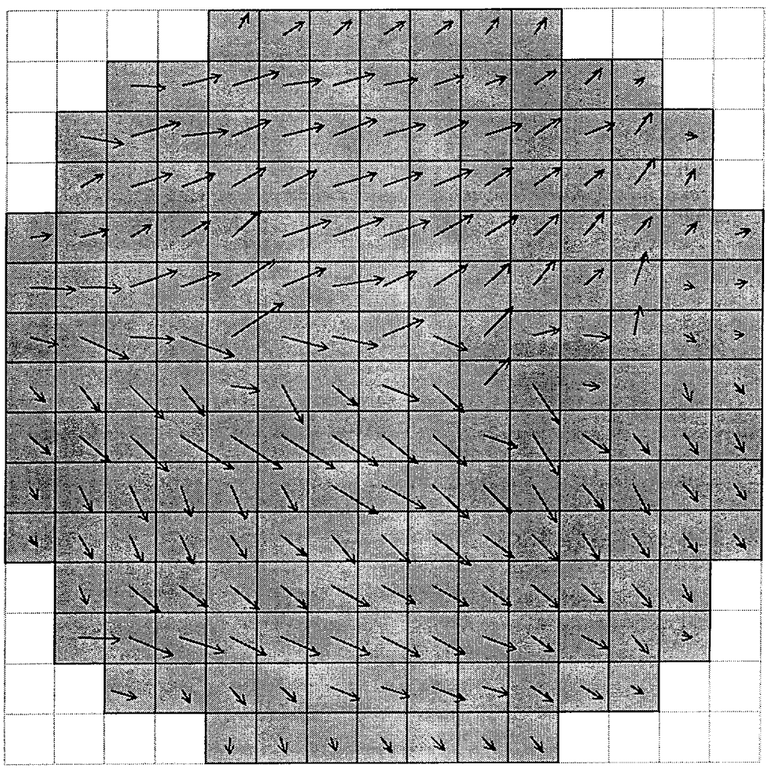


Framatome Also Observed that GT Deformation is Core Location Dependent

4-Loop Framatome PWR Units

Approximately 10 Units Measured

Guide tube deformation is observed to have the same trend for all plants of the same type



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Analytical Models Being Developed

- Single Fuel Assembly Model
  - evaluate guide tube deformation as a function of spring loads, material properties, temperature, etc.
- Core-Wide Fuel Assembly Model
  - evaluate core-wide deformation as a function of FA characteristics
- CRA Drop Model
  - evaluate CRA drop time as a function of CRA drag

Effect of Corrective Action

- Analytical models developed by Framatome show that the corrective actions have reduced susceptibility to IRI
- Framatome France data demonstrates that the corrective actions will reduce susceptibility to IRI

Davis-Besse Corrective Actions

- Planned Corrective Actions
  - Plastic setting of hold-down springs
  - Minimize "same quadrant shuffle"

- Other Beneficial Effects
  - Low growth fuel rod clad material (M5™)
    - Reduced growth-induced hold-down load

Davis-Besse Tentative Plans

- End-of-cycle drop time measurements
- Additional actions being evaluated
  - CRA drag measurements
    - In Vessel Drag, and/or
    - Spent Fuel Pool Drag

Planned Future Actions and Events

- Analysis
  - Finite element models
  - CRA drop time models
  - Continued data analysis
- Update TMI LER within 18-months
- Davis Besse will shutdown in April
  - Will provide data on the effect of mid-cycle cold shutdowns
- Mark-B10 leaf spring re-design
  - Improved hydraulic lift methodology
- Advanced material, M5™
  - Clad is currently available, if desired
  - M5™ guide tubes are in North Anna and are going into selected Davis Besse and Sequoyah locations
- Shuffle guidelines will be formalized

Conclusions

- Based on the observed data, there are no significant safety issues
- Corrective actions have been taken to further reduce susceptibility
- We are continuing to monitor data and develop analytical tools

Mark-B Plant Plans for Drop Time Data Acquisition

- Oconee
- ANO
- Crystal River
- TMI
- Davis Besse

Attachment 1