



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

Docket File

50-454

50-456

October 25, 1996

LICENSEE: Commonwealth Edison Company (ComEd)  
FACILITIES: Braidwood Station, Unit 1 and Byron Station, Unit 1  
SUBJECT: SUMMARY OF A MEETING DISCUSSING THE TECHNICAL BASIS FOR  
COMED'S PENDING PROPOSAL TO DELETE THE BRAIDWOOD 1 MID-CYCLE  
STEAM GENERATOR EDDY CURRENT INSPECTION - OCTOBER 4, 1996

A meeting was held in Rockville, Maryland, on October 4, 1996, between members of the NRC staff and representatives of the Commonwealth Edison Company (ComEd, the licensee) regarding a proposal by ComEd to delete a Braidwood, Unit 1 mid-cycle steam generator (SG) eddy current inspection (ECI). A list of attendees is provided in Enclosure 1. A copy of the material discussed at the meeting is provided in Enclosure 2.

The staff had approved in its letter dated May 22, 1996, a prior request by ComEd to defer a mid-cycle SG ECI from July 1996 to a date no later than October 15, 1996. This ECI was to be conducted to determine the extent and severity of circumferential outer diameter stress corrosion cracking (ODSCC) in the Braidwood 1 SG tubes in the roll transition zone at the top of the tubesheet. The date scheduled by ComEd for the start of this ECI was October 11, 1996. Subsequent to the issuance of the staff's letter cited above, ComEd proposed in its letter dated August 2, 1996, to delete this Braidwood 1 mid-cycle ECI, thereby allowing this unit to operate without interruption to the end of the present fuel cycle in March 1997.

Two previous meetings on this proposal were held in August 1996 and a request for additional information (RAI) was sent to the licensee on September 9, 1996. The licensee submitted a complete response to this RAI on September 24, 1996. The staff then issued a second RAI on this matter in its letter dated October 3, 1996. The purpose of the subject meeting was to discuss the licensee's responses to both the first and second RAIs cited above.

The staff stated at the beginning of this meeting that it had not had sufficient time to review the licensee's submittal dated September 24, 1996, and reach a conclusion regarding the acceptability of ComEd's proposal of August 2, 1996. This position was originally transmitted to ComEd by telephone on September 30, 1996, and subsequently documented in the staff's letter dated October 3, 1996.

At the conclusion of the subject meeting, the staff again stated that while it still could not reach any conclusion regarding the acceptability of the proposed deletion of the Braidwood 1 mid-cycle ECI, it believed that the meeting was useful in that it assisted additional members of the staff in understanding the technical basis of ComEd's pending proposal.

DPD/11

In response to a ComEd proposal to delay the mid-October Braidwood 1 ECI by four to six weeks to allow the staff additional review time, the staff responded that it had no basis to conclude that it could reach a favorable decision within the proposed extension. The staff reiterated its prior estimate that it would be able to issue a third RAI on the pending proposal prior to October 25, 1996.

At the end of the meeting, ComEd informed the staff that it planned to submit by October 18, 1996, a proposal to delete the Byron 1 mid-cycle ECI which is presently scheduled for September 1997. This proposal would be based on the same methodology and database supporting the August 2, 1996, proposal for Braidwood 1. ComEd also stated that for reasons of scheduling reactor outages in an orderly manner, it would request the staff to provide a decision on this forthcoming proposal by the end of November 1996.

Subsequent to this meeting, ComEd started the Braidwood 1 mid-cycle ECI on October 11, 1996.

Original signed by:

M. David Lynch, Senior Project Manager  
Project Directorate III-2  
Division of Reactor Projects - III/IV  
Office of Nuclear Reactor Regulation

Docket Nos. STN 50-456, STN 50-454

Enclosures: 1. Attendance Sheet  
2. Meeting Agenda

cc w/encs: see next page

Hard Copy:  
OGC, 015B18

Docket File  
ACRS, T2E26

PUBLIC

PDIII-2 r/f

E-Mail:  
J. Roe, JWR  
R. Assa, RRA  
P. Rush, PJR1  
S. Coffin, SMC1

F. Miralia, FJM  
E. Adensam, EGA1  
G. Dick, GFD  
T. Sullivan, EJS  
B. McCabe, BCM

A. Thadani, ACT  
R. Capra, RAC1  
C. Moore, ACM  
K. Karwoski, KJK1  
R. Lanksbury, RDL

R. Zimmerman, RPZ  
M. D. Lynch, MDL  
E. Jordan, JKR  
K. Wichman, KRW

DOCUMENT NAME: BRAID-BY\BB1004.MTS

To receive a copy of this document, indicate in the box: "C" = Copy without enclosures "E" = Copy with enclosures "N" = No copy

OFFICE	PM-PDIII-2	LA:PDIII-2	D:PDIII-2	E				
NAME	DELINCH, Jar	CMOORE	RCAPRA	ROC				
DATE	10/22/96	10/24/96	10/25/96					

OFFICIAL RECORD COPY

Byron/Braidwood Power Stations

cc:

Ms. I. Johnson  
Acting Manager, Nuclear Regulatory Services  
Commonwealth Edison Company  
Executive Towers West III  
1400 Opus Place, Suite 500  
Downers Grove, Illinois 60515

Mr. William P. Poirier, Director  
Westinghouse Electric Corporation  
Energy Systems Business Unit  
Post Office Box 355, Bay 236 West  
Pittsburgh, Pennsylvania 15230

Joseph Gallo  
Gallo & Ross  
1250 Eye St., N.W.  
Suite 302  
Washington, DC 20005

Michael I. Miller, Esquire  
Sidley and Austin  
One First National Plaza  
Chicago, Illinois 60603

Howard A. Learner  
Environmental law and Policy  
Center of the Midwest  
203 North LaSalle Street  
Suite 1390  
Chicago, Illinois 60601

U.S. Nuclear Regulatory Commission  
Byron Resident Inspectors Office  
4448 North German Church Road  
Byron, Illinois 61010-9750

Regional Administrator, Region III  
U.S. Nuclear Regulatory Commission  
801 Warrenville Road  
Lisle, Illinois 60532-4351

Ms. Lorraine Creek  
Rt. 1, Box 182  
Manteno, Illinois 60950

Chairman, Ogle County Board  
Post Office Box 357  
Oregon, Illinois 61061

Mrs. Phillip B. Johnson  
1907 Stratford Lane  
Rockford, Illinois 61107

George L. Edgar  
Morgan, Lewis and Bochiuss  
1800 M Street, N.W.  
Washington, DC 20036

Ms. Bridget Little Rorem  
Appleseed Coordinator  
117 North Linden Street  
Essex, Illinois 60935

Attorney General  
500 South Second Street  
Springfield, Illinois 62701

EIS Review Coordinator  
U.S. Environmental Protection Agency  
77 W. Jackson Blvd.  
Chicago, Illinois 60604-3590

Illinois Department of  
Nuclear Safety  
Office of Nuclear Facility Safety  
1035 Outer Park Drive  
Springfield, Illinois 62704

Commonwealth Edison Company  
Byron Station Manager  
4450 North German Church Road  
Byron, Illinois 61010

Kenneth Graesser, Site Vice President  
Byron Station  
Commonwealth Edison Station  
4450 N. German Church Road  
Byron, Illinois 61010

U.S. Nuclear Regulatory Commission  
Braidwood Resident Inspectors Office  
Rural Route #1, Box 79  
Braceville, Illinois 60407

Mr. Ron Stephens  
Illinois Emergency Services  
and Disaster Agency  
110 East Adams Street  
Springfield, Illinois 62706

Chairman  
Will County Board of Supervisors  
Will County Board Courthouse  
Joliet, Illinois 60434

Commonwealth Edison Company  
Braidwood Station Manager  
Rt. 1, Box 84  
Braceville, Illinois 60407

Document Control Desk-Licensing  
Commonwealth Edison Company  
1400 Opus Place, Suite 400  
Downers Grove, Illinois 60515

Mr. H. G. Stanley  
Site Vice President  
Braidwood Station  
Commonwealth Edison Company  
RR 1, Box 84  
Bracemille, IL 60407

# ATTENDANCE

October 10, 1996

Name	Affiliation	Telephone
Dave Lynch	NRC/NRR/DRPW/PDIII-2	(301) 415-3023
Phillip Rush	NRC/NRR/DE/EMCB	(301) 415-2790
Ted Sullivan	NRC/NRR/DE/EMCB	(301) 415-3266
Ken Karwoski	NRC/NRR/DE/EMCB	(301) 415-2754
Keith Wichman	NRC/NRR/DE/EMCB	(301) 415-2757
Stephanie M. Coffin	NRC/NRR/DE/EMCB	(301) 415-2778
Roman Gesior	ComEd	(630) 663-7671
Denise Saccamondo	ComEd/NLD	(630) 663-7283
Ron Gamble	Sartrex	(301) 468-6403
Bob Keating	Westinghouse	(417) 722-5086

ENCLOSURE 1

# Braidwood Unit 1 Cycle Length Assessment

October 4, 1996

# Meeting Objectives

- Obtain NRC Concurrence to Change ComEd Commitment for Braidwood 1 Operation to March 29, 1997 (Additional 165 Days > 500°F)
- Summarize the Technical Basis for Braidwood 1 Full Cycle Operation



# Agenda

- Meeting Objectives
  - John Blomgren
- Background
  - John Blomgren
- Conclusions
  - John Blomgren
- Key Points
  - John Blomgren
- Technical Basis for Braidwood 1
  - Roman Gesior
- Full Cycle Operation
- Conclusions
  - John Blomgren
- Schedule
  - Roman Gesior



# Background

- Braidwood Meeting (5/14/96) and Subsequent Submittal
  - Approval for Operation to October 15, 1996 (296 Days > 500°F)
- Byron Meeting (6/20/96)
  - Basis for Full Cycle Operation of 448.5 Days > 500°F
- ComEd August 2, 1996 Submittal for Braidwood 1
  - Justification for Full Cycle Operation (461 Days > 500°F)
- ComEd September 10, 1996 Submittal for Braidwood 1
  - Three Distribution Approaches (POD, Look-Back, EOC)
  - Response to Several RAI Questions
- ComEd September 17 Submittal
  - Response to Additional RAI Questions
- ComEd September 25 Submittal
  - Response to All 31 RAI Questions

# Conclusions

- Braidwood 1 Can Operate Full Cycle And Meet Tube Integrity Requirements
  - Braidwood 1 EOC Distributions Have Been Evaluated Using the Guidelines in GL 95-05
    - Probability of Burst  $< 10^{-2}$
    - Leak Rate  $<$  Site Allowable Limit (26.8 gpm)

# Key Points

- Technical Approach Consistent With the Guidelines in GL 95-05
- Conditional Probability of Failure for the EOC Distribution  $<10^{-2}$
- Leak Rate is Less Than the Site Allowable Limit at 95% Confidence Level
- Sensitivity Study Performed to Assess Variations Associated With EOC Distribution, Burst Correlation, and Leak Rate Methods
- Site Allowable Leak Rate to be Increased for Defense in Depth Consistent With Guidelines in GL 95-05
- Evaluation Demonstrates Braidwood Can Operate One Full Cycle and Maintain Margins Consistent With GL 95-05

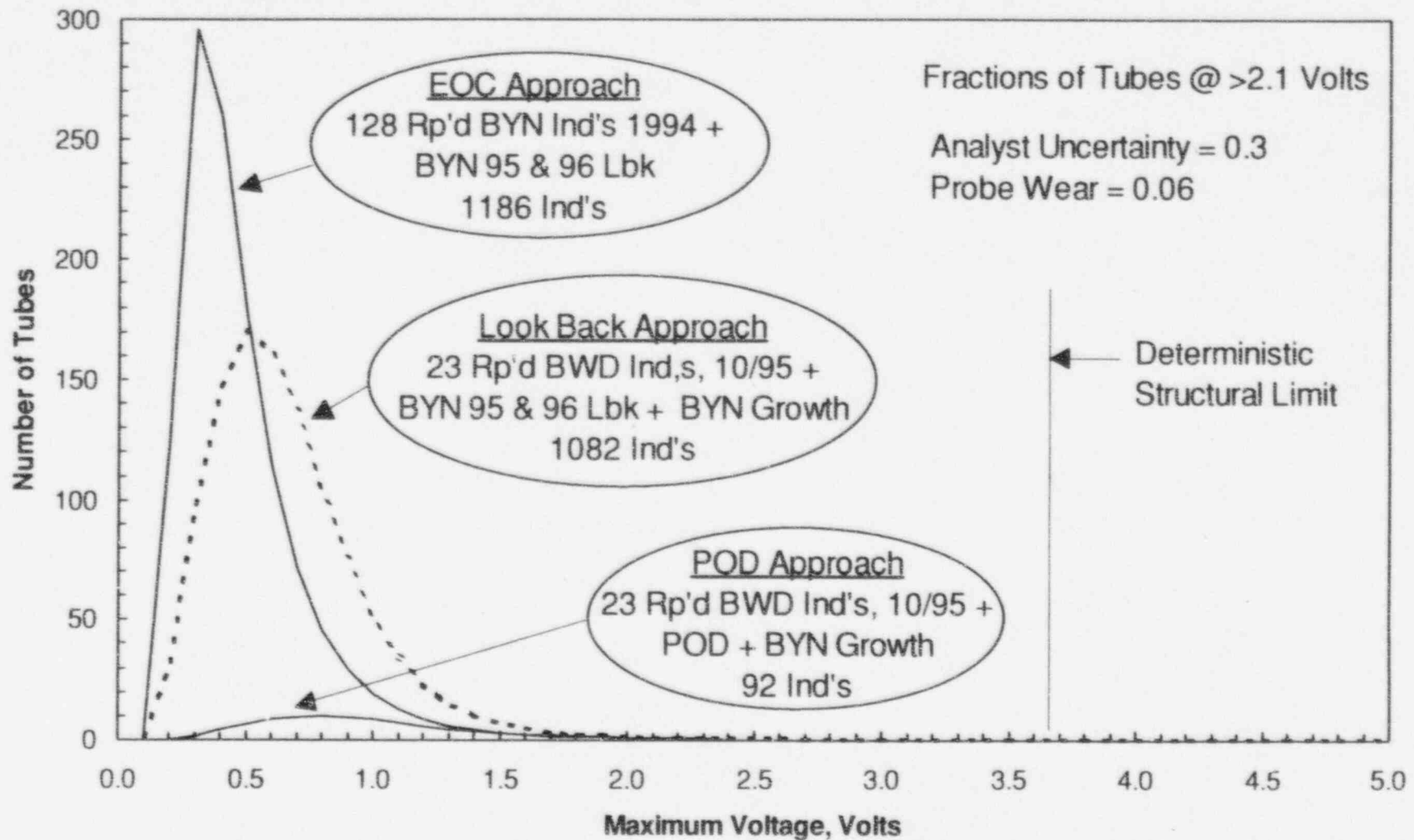
# Technical Basis For Braidwood 1 Cycle Length

- Distributions and Input Assumptions
- Evaluation Procedure
- Sensitivity Study/Results
- Normalization and Coil Size Factors
- Growth Rate Evaluation
- Conclusions

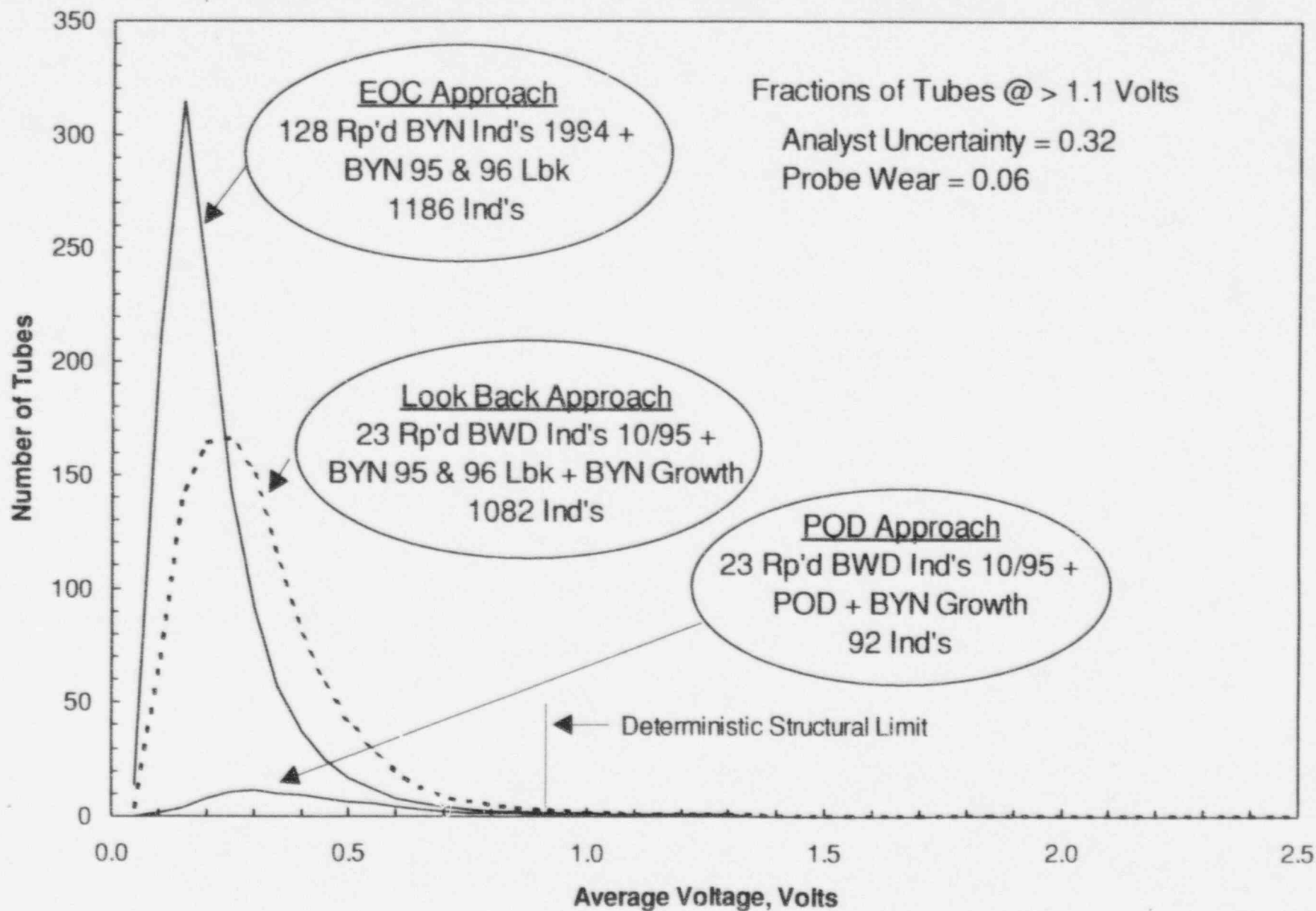
# Distributions and Input Assumptions

- Three Approaches Considered
  - Probability of Detection (POD) Approach
  - Look-Back Approach
  - End-of-Cycle (EOC) Approach

## Maximum Voltage EOC Distributions: POD, Look-Back, EOC Approaches



## Average Voltage EOC Distributions: POD, Look Back, and EOC Approaches





# Distribution for Braidwood 1 Evaluation

- EOC Approach Selected Based on:
  - Represents EOC-6 at Byron 1
  - Byron 1 Operating Time at EOC-6 > Braidwood 1 at EOC-6
  - Byron & Braidwood Have Same Operating Experience, and Stress, Temperature and Material Conditions
  - Distribution has Been Evaluated Extensively, and Minimizes Uncertainty Associated With the NDE Parameter and Growth Rate

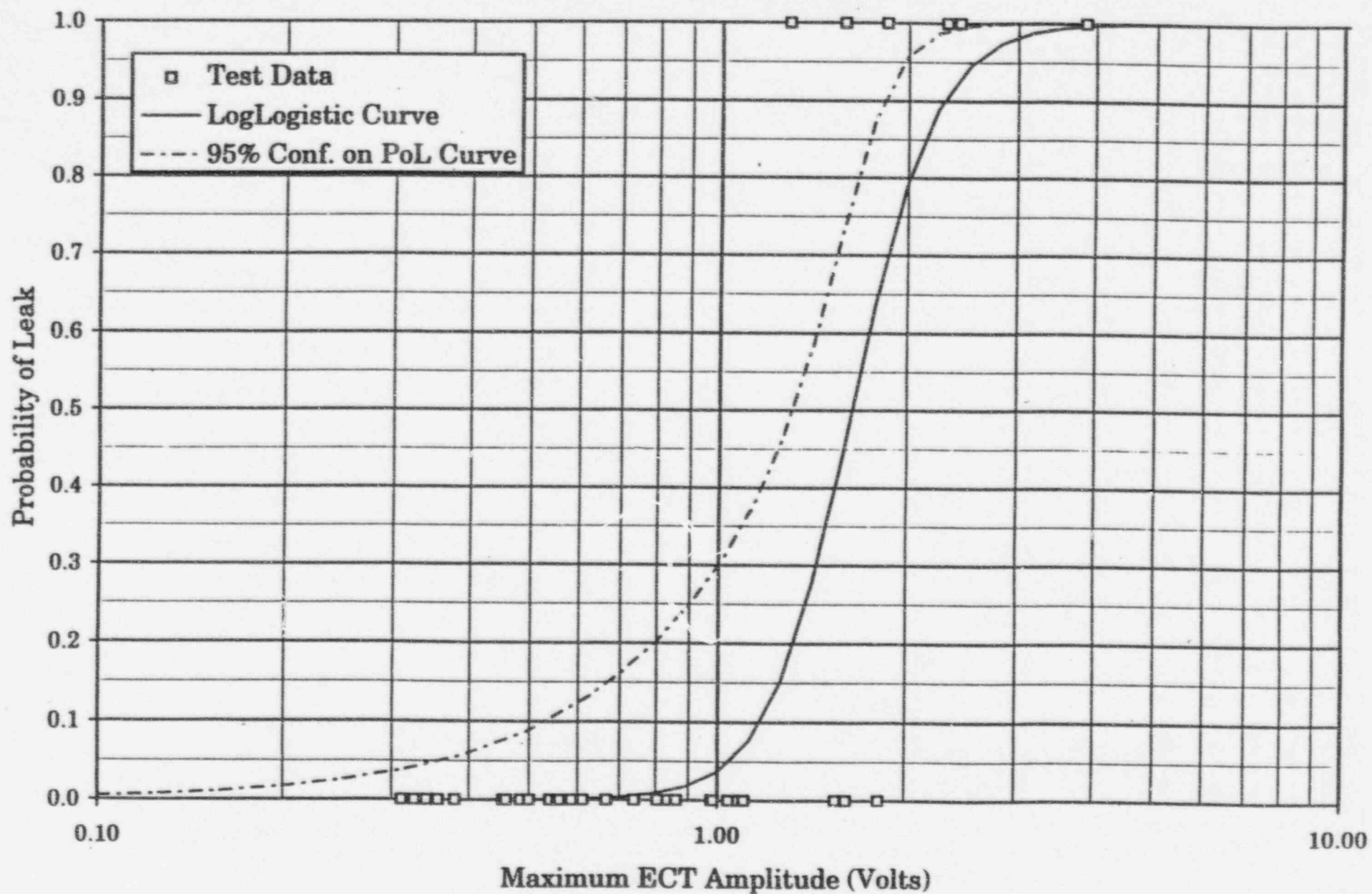
# Distribution for Braidwood 1 Evaluation

- POD Approach Not Selected Because it Does Not Fully Address the Possibility of Inspection Transients
- Look-Back Approach Not Selected Because it Represents Two Full Operating Cycles to EOC-7 at Braidwood 1. This is Unnecessarily Conservative and not Representative of Service Experience at Byron and Braidwood

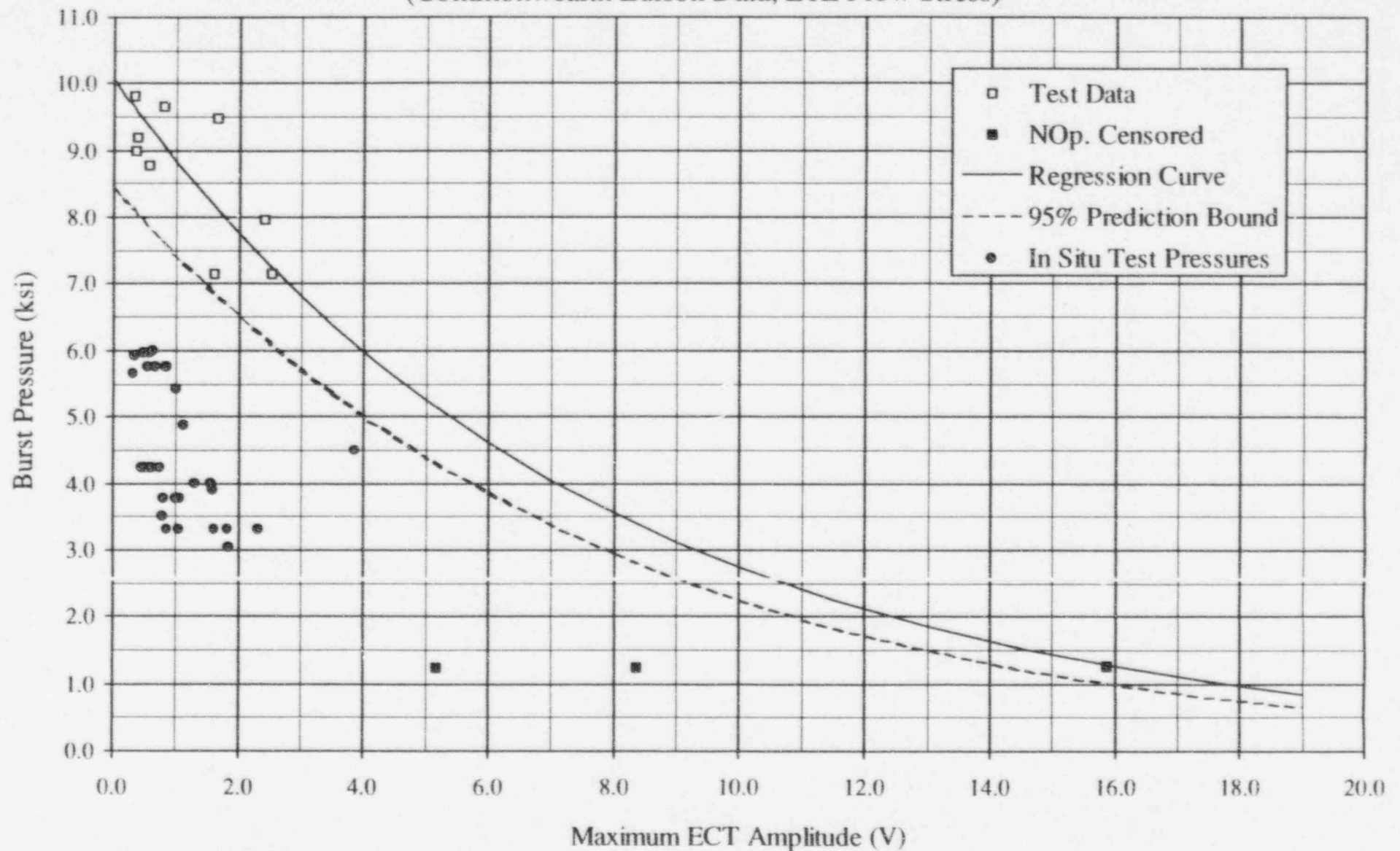
# Evaluation Procedure

- Based on the Guidelines in GL 95-05
- Distribution From EOC Approach
- Leak Rate Evaluation
  - Maximum Voltage
  - LogLogistic POL (95% Confidence Level)
  - Leak Rate for all Voltages = 0.16 gpm (max from leak tests)
- Burst Margin Evaluation
  - Conditional Probability  $< 10^{-2}$
  - Maximum and Average Voltages
  - Extended Industry Data Base
  - Log Burst Pressure Fit (Best Fit, Valid Correlation, Covers Required Voltage Range)

**Figure 16 (9/24/96): Probability of Leak vs. Maximum ECT Amplitude**  
(Commonwealth Edison Data)

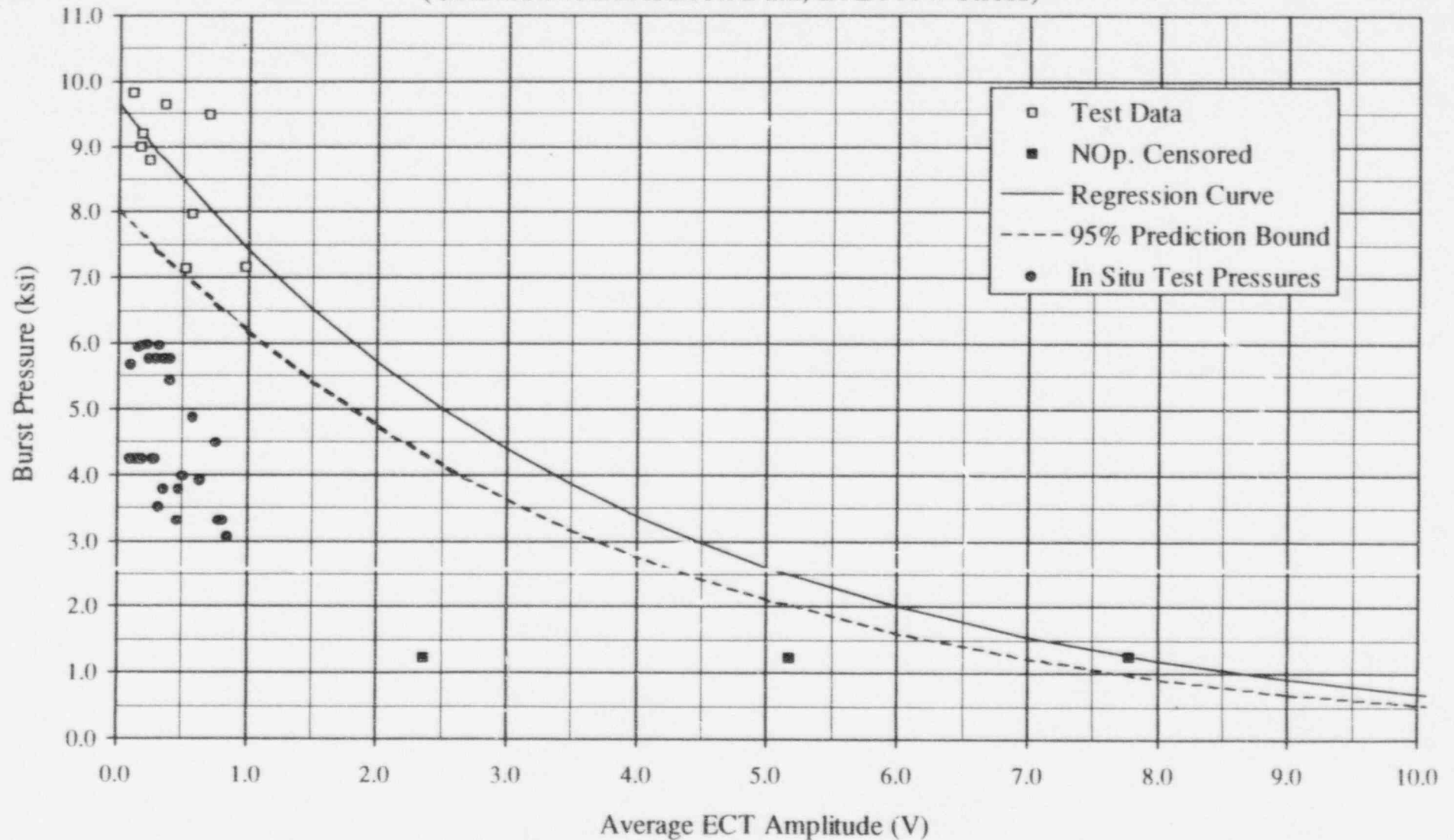


**Figure 8c: Burst Pressure vs. Maximum ECT Amplitude**  
 (Commonwealth Edison Data, LTL Flow Stress)



- Conclusions: 1. Log Burst pressure vs. maximum volts provides best fit of burst data  
 2. Correlation of data satisfies NRC GL 95-05 "p" test 5% requirement

**Figure 8d: Burst Pressure vs. Average ECT Amplitude**  
(Commonwealth Edison Data, LTL Flow Stress)



Conclusions: 1. Log Burst pressure vs. average volts provides best fit of burst data  
2. Correlation of data satisfies NRC GL 95-05 "p" test 5% requirement

# Results

- EOC Distribution Approach
- Leak Rate
  - Circ Ind's: 19.0 (LogLogistic 95% Confidence Level)
  - TSP ODSCC: 6.99
  - Unfaulted S/Gs: 0.3
  - Total: 26.3 gpm
- Conditional Probability of Burst
  - Maximum Voltage =  $5.2\text{E-}5$
  - Average Voltage =  $1.1\text{E-}4$



# Sensitivity Study

- Distributions
  - POD, Look-Back, EOC Approaches
- Leak Rate
  - Probabilistic (95% Confidence LogLogistic)
  - Deterministic
    - Threshold = 1.29 Volts
    - Leak Rate Above Threshold = 0.16 gpm (max from leak tests)
- Conditional Probability of Tube Burst
  - Log Burst Pressure Fit (Best, Valid Fit)
  - Linear Fit (Second Best, Valid Fit)

# Sensitivity Study-Max Volts

Results for Maximum Volts	Approach		
	POD (EOC-6)	Look-Back (EOC-7)	EOC (EOC-6)
Conditional Burst Probability			
Log (Pb) Fit	2.0E-6	4.4E-5	5.2E-5
Linear (Pb) Fit			3.9E-3
Leak Rate (gpm)			
LogLogistic (95% Confidence)	12.0	36.3	26.3
Deterministic	10.5	15.5	11.5

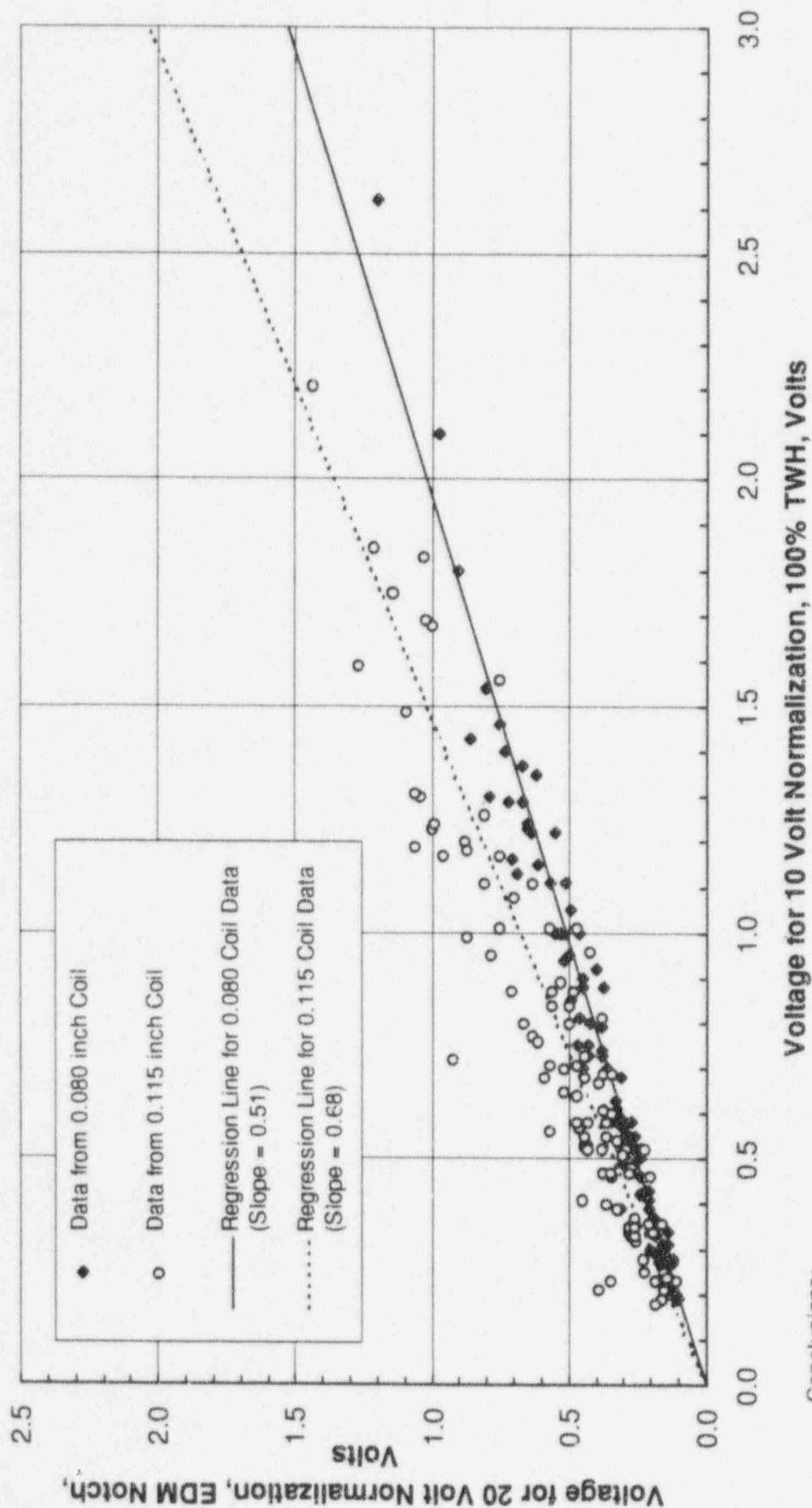
- Conclusions:
1. Using EOC Approach Meets Probability of Burst and Leak Requirements
  2. All Approaches Provide Similar Leak Rate Results

# Sensitivity Study-Avg Volts

Results for Average Volts	Approach		
	POD (EOC-6)	Look-Back (EOC-7)	EOC (EOC-6)
Probability of Burst			
Log (Pb) Fit (PW= 0.06)	2.5E-5	8.3E-5	1.1E-4
Linear (Pb) Fit (PW=0.06)			1.1E-2
Log (Pb) Fit (PW=0.075)			2.2E-4

Conclusions: Probability of Burst Requirements are Satisfied

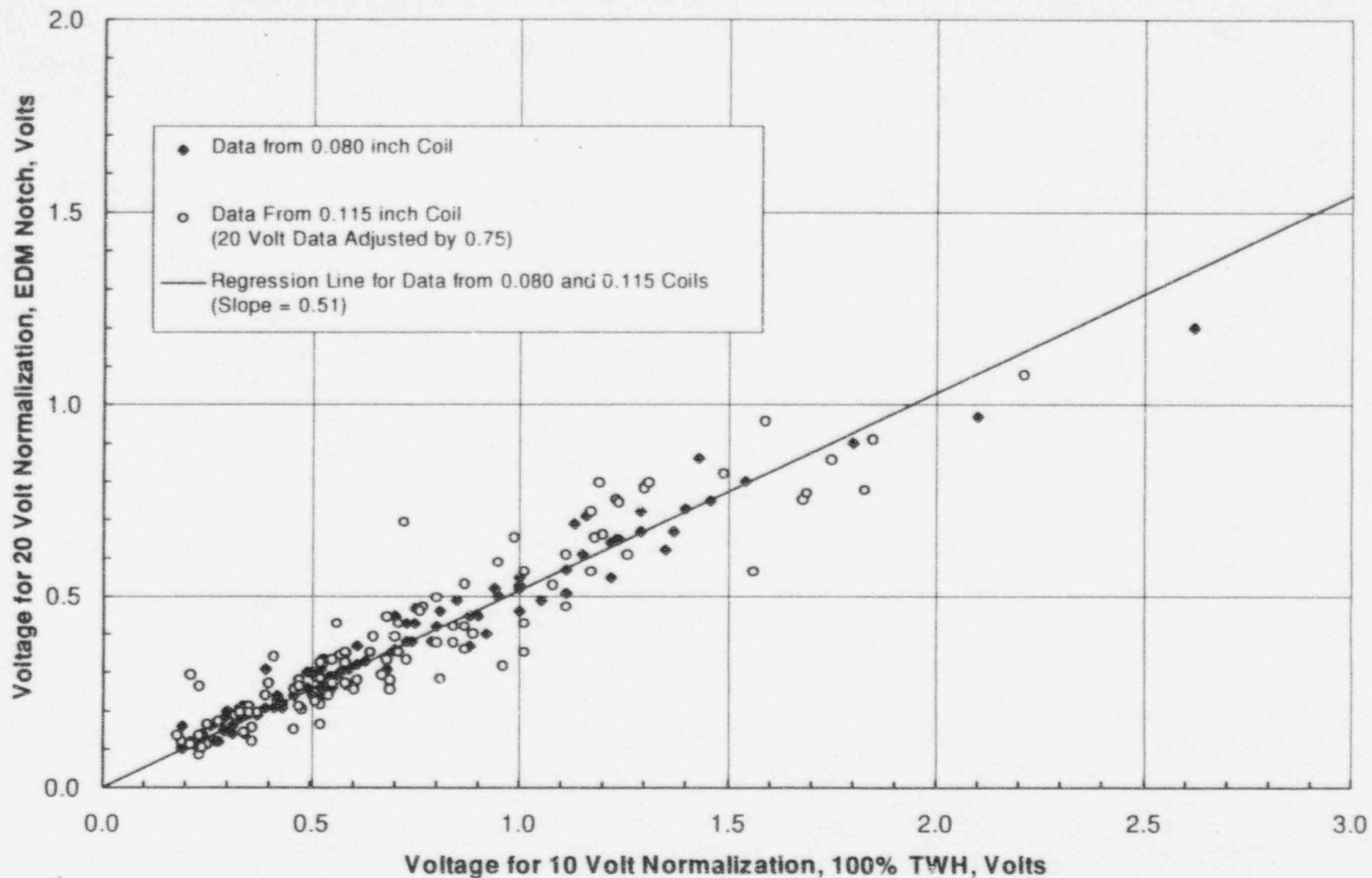
**Figure 19: Voltage Normalization Regression Analysis, 0.080 and 0.115 inch Coils, Maximum and Average Voltage**



**Conclusions:**

1. Linear Regression Analysis of Field Data, Using Two Different Voltage Normalizations Used for Braidwood Unit 1 Assessment, Provides Normalization Correction Factors for 0.115" and 0.080" RPC Coils (0.68 and 0.51 respectively)
2. Ratio of the slopes of the 0.080" RPC and 0.115" RPC Lines Provides the Coil Size Correction Factor (0.75)

**Figure 20: Correlation of 20 Volt to 10 Volt Normalization Data,  
0.115 inch/20V Coil Data Adjusted by 0.75 Factor, Average & Maximum Voltage**

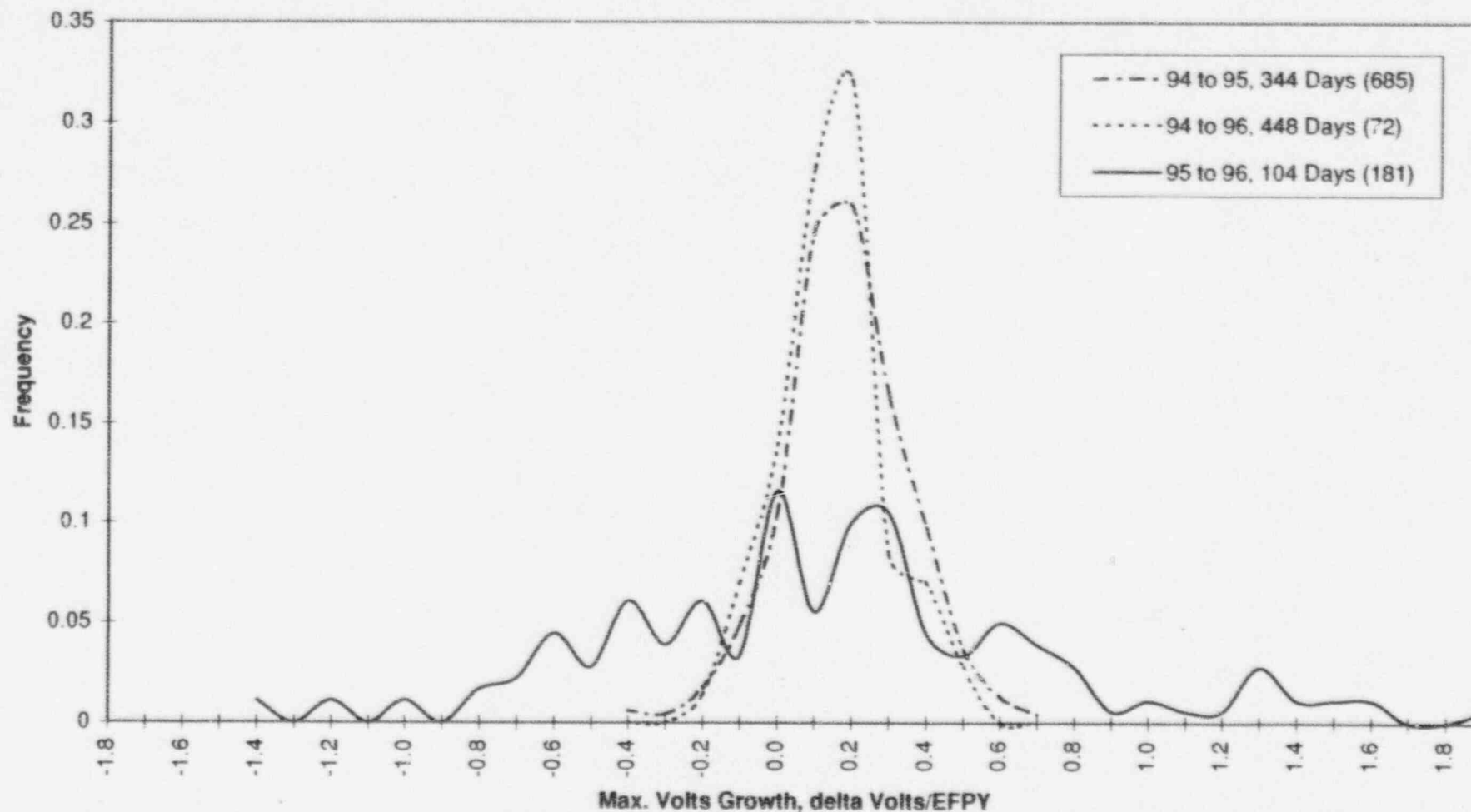


Conclusion: Linear Regression Analysis of 0.080" and adjusted (0.75) 0.115" RPC Data Provides the Same Normalization Correction Factors, this Indicates that the Coil Size Correction Factor of 0.75 is Correct

## Growth Rates

- EOC Approach Does Not Require Application of Growth Rates
  - Distribution Best Characterizes Braidwood 1 EOC-6 by Using Well Established Byron 1 EOC-6 Distribution
- Short Interval Growth Rates are not Applied
  - Short Operating Period Growth Rates are not Representative of Actual Degradation Over a Full Operating Cycle
  - No Significant Change in Byron 1 Distribution as would be Expected from Growth Rates for the Short Interval

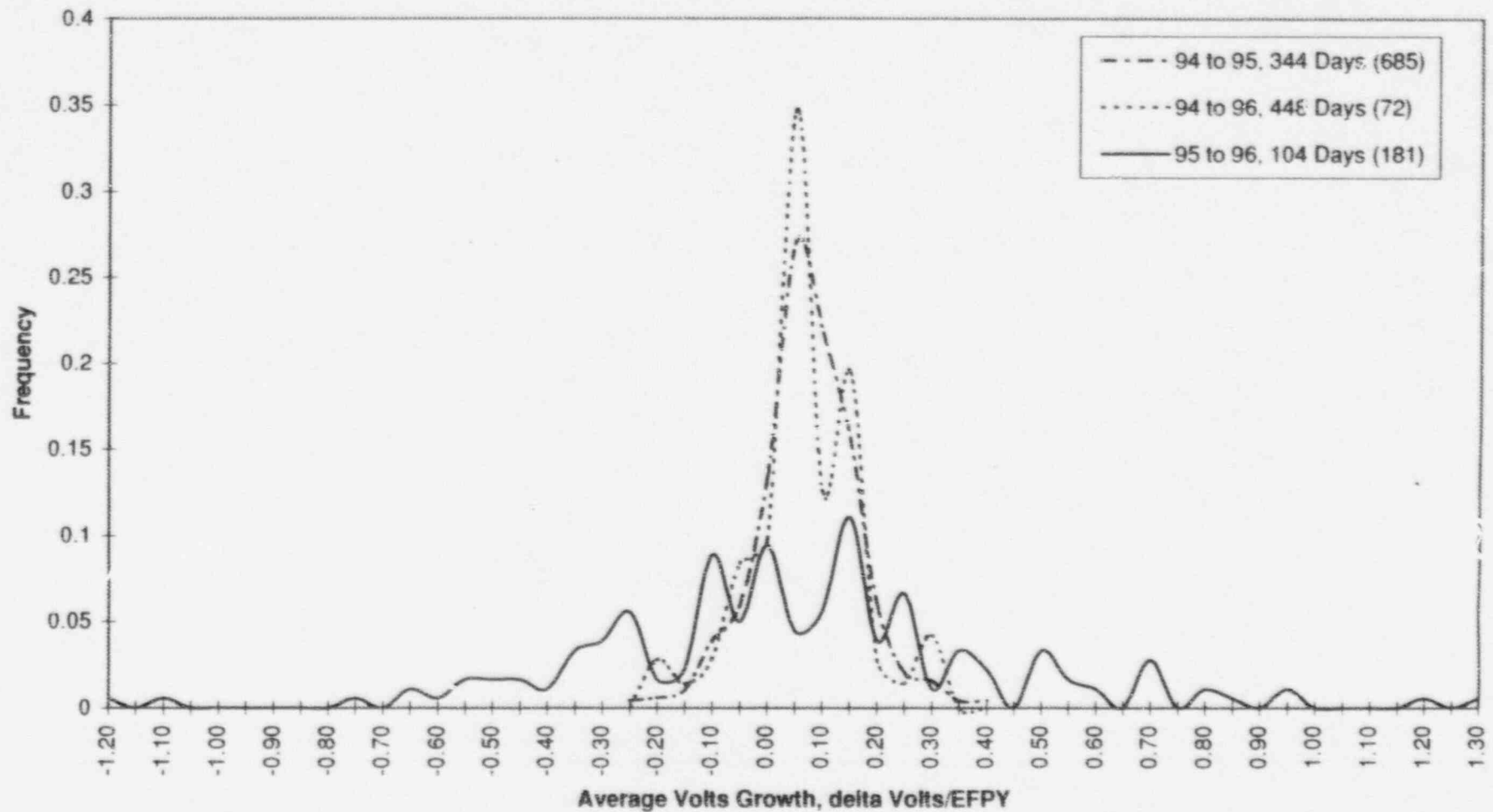
### Evaluation of Byron Maximum Voltage Growth for Three Operating Intervals



Conclusion: Significant Difference in the Short Cycle Growth Rate Distribution Compared to the Growth Rate Distributions Obtained from Full Cycle Operation

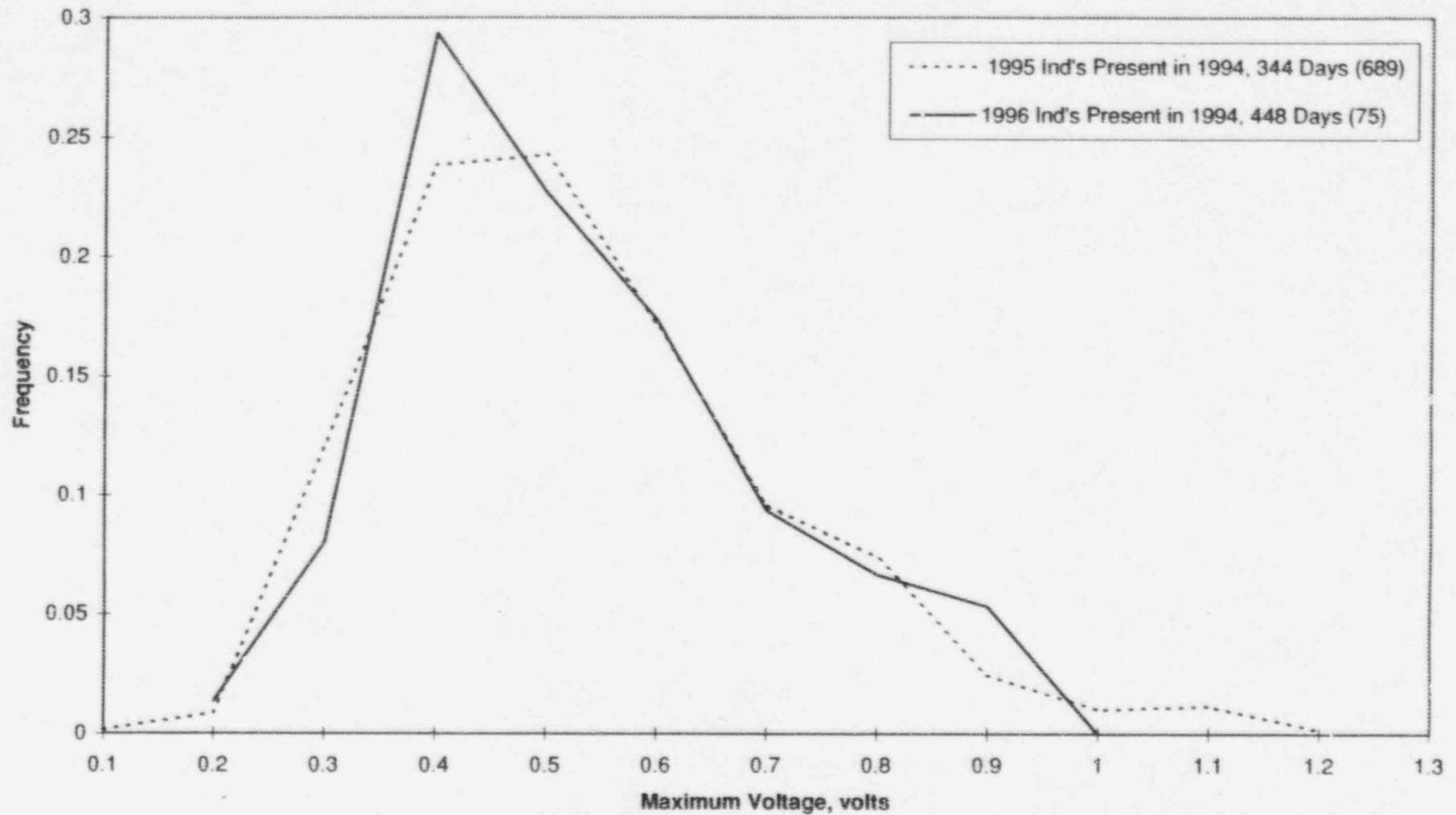


### Evaluation of Byron Average Voltage Growth for Three Operating Periods



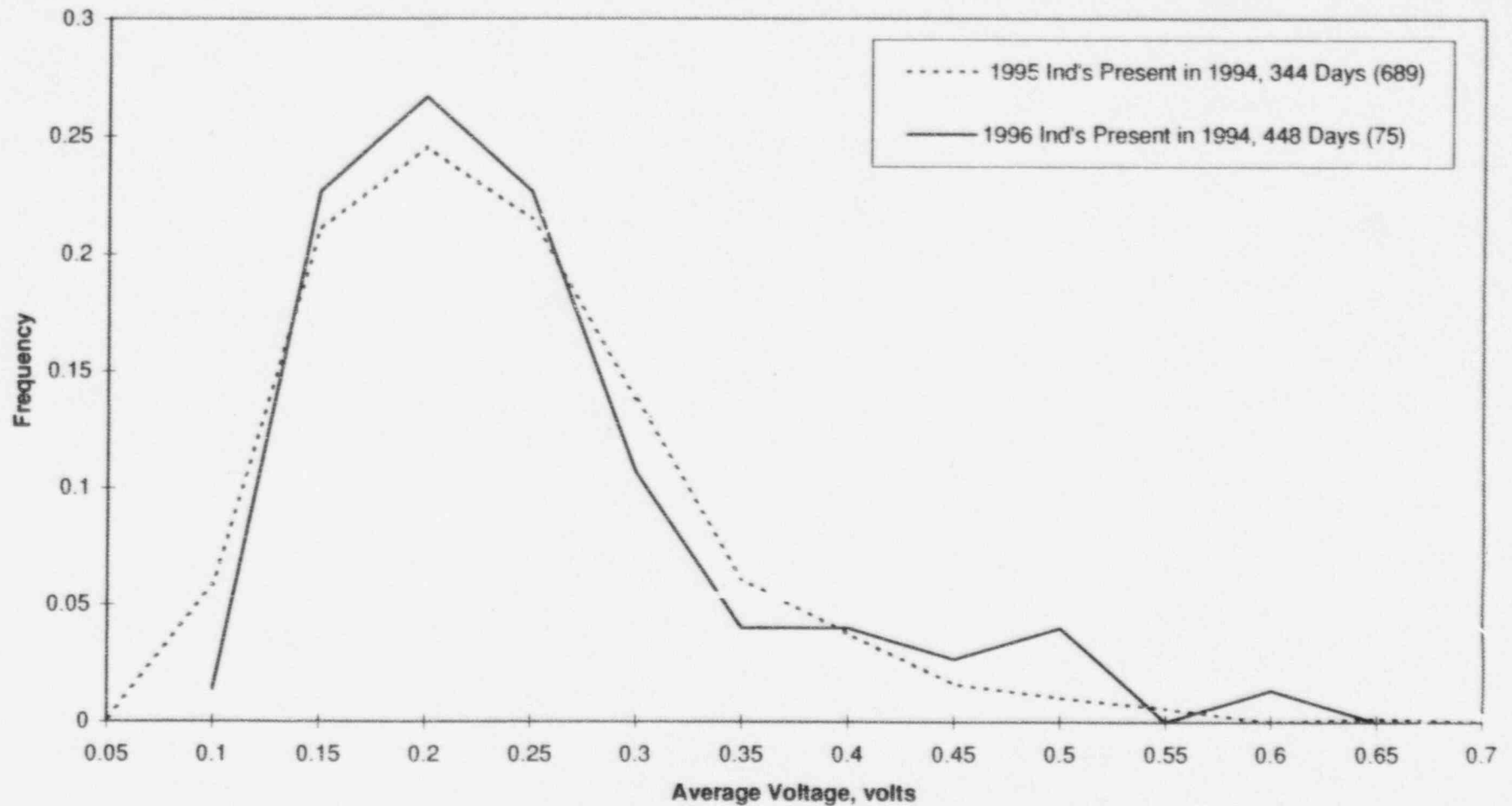
Conclusion: Significant Difference in the Short Cycle Growth Rate Distribution Compared to the Growth Rate Distributions Obtained from Full Cycle Operation

### Byron Unit 1 1996 & 1995 Indications In Service Since 1994



Conclusions: No Significant Difference in Size of Indications Present from 1994 - 1995 Compared to 1994 - 1996. This Indicates that Full Cycle Growth Rates are Appropriate for a Full Operating Cycle

### Byron Unit 1 1996 & 1995 Indications In Service Since 1994



Conclusions: No Significant Difference in Size of Indications Present from 1994 - 1995 Compared to 1994 - 1996. This indicates that Full Cycle Growth Rates are Appropriate for a Full Operating Cycle

# Conclusions

- Braidwood 1 Can Operate Full Cycle And Meet Tube Integrity Requirements
  - Braidwood 1 EOC Distribution Have Been Evaluated Using the Guidelines in GL 95-05
    - Probability of Burst  $< 10^{-2}$
    - Leak Rate  $<$  Site Allowable Limit (26.8 gpm)

## Schedule

- Byron Unit 1 Extended Cycle Length Assessment (600 Days) Report – October 18, 1996
- NRC Approval of Byron Unit 1 Extended Cycle Length – November 15, 199<sup>6</sup>~~7~~