50-454

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

May 31, 1996

LICENSEE: Commonwealth Edison Company

FACILITY: Byron Station, Unit 1

SUBJECT: SUMMARY OF MAY 14, 1996, MEETING TO DISCUSS THE APPLICATION OF PRIOR BYRON 1 EDDY CURRENT INSPECTION DATA TO ESTABLISH A BASIS FOR THE OPERATING INTERVAL BETWEEN STEAM GENERATOR TUBE INSPECTIONS

A meeting was held on May 14, 1996, in Rockville, Maryland, between representatives of Commonwealth Edison Company (ComEd) and the NRC staff. The purpose of the meeting was to discuss the results of ComEd's "lookback" program which reevaluated the data from the prior eddy current inspections (ECIs) of the Byron 1 steam generator (SG) tubes. One of the two main objectives of ComEd was to establish that the finding of a large number of circumferential indications in the ECI conducted in the present Byron 1 refueling outage (spring 1996) and in the fall 1995 mid-cycle ECI outage, represented an "inspection transient." The other objective was to establish a basis for ComEd to operate Braidwood 1 from its fall 1995 startup to the early fall of 1996. Enclosure 1 is a list of the meeting attendees. Enclosure 2 is a copy of the material presented by ComEd.

ComEd had previously met with the staff on May 6, 1996, to discuss the salient features of its "lookback" program. At the end of this previous meeting, the staff had stated that it was not prepared to reach any conclusions regarding the "lookback" program other than it appeared to be a reasonable approach. At the subject meeting, ComEd indicated that the "non-blind" portion of its "lookback" program could identify a large fraction of the circumferential indications found in the Byron 1 spring 1996 ECI outage as being present in the reevaluation of the 1994 and 1995 ECI data when using the methodology employed in the spring 1996 ECI outage. From this, ComEd concluded that the large number of circumferential indications (i.e., about 6100) found after the latest Byron 1 fuel cycle represented an "inspection transient." ComEd attributed this phenomenon to three principal factors: (1) more sensitive eddy current probes (i.e., the plus point probe); (2) more sophisticated software used in the analysis of the ECI data (i.e., Eddynet 95); and (3) a heightened sensitivity on the part of the eddy current analysts. This last effect, in turn, is attributed to the "lessons learned" by these analysts after comparing the ECI data from the ten Byron 1 SG tubes pulled in the fall 1995 ECI outage with the results of the destructive metallurgical examination of the circumferential indications of these ten SG tubes.

ComEd further concluded from this that: (1) the circumferential indications exhibit a relatively slow growth rate; (2) the circumferential indications are difficult to detect below some threshold, especially with the less sensitive methodology previously used; and (3) the slow growth rate indicates that neither the structural integrity nor the leaktightness of the SG tubes were

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challenged even though the circumferential indications were present, but not identified by less sensitive methods. ComEd stated its conclusion on the last item was buttressed by the relatively high burst pressure found in the tests of four of the ten Byron 1 SG tubes pulled in fall 1995 and in the Byron 1 in-situ pressure tests conducted in spring 1996.

The overall ComEd conclusion from (1) both the "non-blind" and "blind" portions of its "lookback" program, (2) the successful pressure testing of the pulled and in-situ SG tubes, and (3) the morphology of the circumferential indications of all the SG tubes pulled by ComEd and the industry, supports its belief that the Byron 1 SG tube operability bounds that of Braidwood 1. In turn, ComEd stated its position that its conclusions on the issue of circumferential indications justify continued operation of Braidwood 1 to a mid-cycle ECI outage to start no later than October 15, 1996.

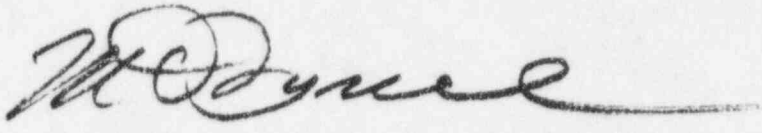
In the event that the staff could not accept its pending formal proposal on extending the Braidwood 1 operating interval from mid-July 1996 to mid-October 1996, ComEd indicated that it was prepared to start a Braidwood 1 mid-cycle ECI outage by May 25, 1996. In this regard, ComEd asked the staff to respond no later than May 24, 1996, to a formal request on this matter to be submitted no later than May 17, 1996. The staff stated that it believed it could reach a decision on the extension of the Braidwood 1 ECI outage within the requested time frame.

ComEd also proposed that it defer any SG tube pulls for circumferential indications at Braidwood 1 until the refueling outage inspection in spring 1997. During this refueling outage inspection, ComEd will be removing SG tubes in support of the 3.0 volt locked tube support plate repair criteria and would like to coordinate the two different SG tube pulls. Since inspection of the tube support plate intersections will not occur during the mid-cycle inspection, ComEd would not be able to identify the SG tubes to pull in accordance with the locked tube support plate repair criteria during the Braidwood 1 mid-cycle inspection. The staff stated that this might be acceptable provided there would be no unusual results (i.e., results which indicate that structural and/or leakage integrity was not maintained) from either the ECI or from the in-situ pressure tests. Since the operating time for the first portion of the Braidwood 1 cycle would be longer than the second part of the cycle if an October mid-cycle inspection is approved, it is expected that the circumferential indications in October 1996 would be larger than the circumferential indications which might be detected in spring 1997. Accordingly, the staff suggested that ComEd consider identifying in October 1996, if this ECI outage extension is approved, potential SG tube candidates with circumferential indications which might be pulled in spring 1997.

The staff further suggested that ComEd submit its plan for a mid-October 1996 ECI outage well in advance of its implementation. This proposed ECI program should discuss how the ECI data would be gathered (i.e., which probes would be used), how this ECI data would be analyzed, and how the eddy current analysts would be trained. With respect to in-situ pressure testing of circumferential indications, the staff suggested that ComEd also provide criteria for

selecting and pressure testing SG tubes in the Braidwood 1 fall 1996 ECI outage if the requested operating extension is approved.

At the end of the subject meeting, the staff encouraged ComEd to submit its pending proposal on the docket, quickly, with the understanding that any staff decision on the proposed extension of the Braidwood 1 operating interval would need to be reviewed by NRC senior management. The staff suggested that ComEd ensure that the level of training of eddy current analysts for future ECI outages be at a level of sensitivity comparable to that in the Byron 1 spring 1996 ECI outage. Finally, the staff requested ComEd to submit confirmatory information relating ECI voltage data to the structural integrity of the 30 SG tubes with circumferential indications pulled by industry to date. In this regard, the staff also suggested that ComEd address, among other considerations, how the voltages from various ECIs were normalized, the transfer standard that was used and how the adjustment for SG tube wall thickness was made.



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

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

Enclosures:
1. Attendance Sheet
2. ComEd Handout

cc w/encl: see next page

cc:

Mr. D. L. Farrar
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 Bochius
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

ATTENDANCE SHEET

Bechtel

Theresa Sutter

Commonwealth Edison Company

Dennis Farrar, Licensing
Harry Smith, SGRPNV
Roman Gesior, SGRPV
John Hosmer, Eng
John Blumgren, S/G
Dave Wozniak, Byron Station
Denise Saccomando, NLD

Southern Technical Services

Lynn Connor
Vince Noonan

U.S. Nuclear Regulatory Commission

M. David Lynch, PDIII-2/DRPW/NRR
George Dick, PDIII-2/DRPW/NRR
Edmund Sullivan, EMCB/DE/NRR
Brian Sheron, DE/NRR
Jack Strosnider, EMCB/DE/NRR
Geoff Hornseth, EMCB/NRR
Gus Lainas, DE/NRR
Ken Karwoski, EMCB/DE/NRR
John Tsao, EMCB/DE/NRR
Melvin S. Holmberg, DRS/RIII

ENCLOSURE 1

ComEd Circumferential Indication Status Meeting

May 14, 1996

ENCLOSURE 2

Agenda

- Objectives & Introduction	- John Blomgren
- Insitu Pressure Test Results	- Roman Gesior
- Byron 1 1996 & 1995 Indication Look-back Results	- Roman Gesior
- Byron 1 Blind Test Results	- Harry Smith
- Summary	- John Blomgren
- Proposed Braidwood 1 Cycle Length	- John Blomgren

Meeting Objectives

- Demonstrate that Byron Unit 1 1995 & 1996 Circumferential Indications are an Inspection Transients
  - Therefore Growth of an Indication is Low
  - No Challenge to Structural/Leakage Integrity of Braidwood Unit 1 Steam Generators
- Obtain Concurrence to Move Braidwood 1 Outage to 10/15/96

Introduction

- 2/6/96 Meeting With Staff
  - Byron Unit 1 Tube Pull Results
  - Braidwood Unit 1 Cycle Length Assessment Plan
- 2/23/96 Braidwood 1 Cycle Length Assessment Report
  - Equivalent to Byron Unit 1 Operation Between 10/94 & 10/95 Inspections
  - Byron Unit 1 Structural Integrity Demonstrated by Tube Pull Results (1994 & 1995)
  - Conservative Leakage Analysis Demonstrates Margin to Site Allowable Leakage Limits
  - Braidwood Unit 1 10/95 Inspection Improvements Over Byron Unit 1 10/94 Inspection
  - Number & Size of Braidwood Indications << Byron

Open Issue

- Were the 1995 & 1996 Byron Unit 1 Results Due to an Inspection Transient?

Year	Coil	Software	Actual Repaired	Look-Back Results	Plus Point
1996	+Pt, 0.080, 0.115	EddyNet95 w/Filters	3487	768	
1995	+Pt, 0.080, 0.115	Anser	2578	2768	
1994	0.080, Circ Coil	EddyNet	132	2661	3457 *
		Total	**6197**	**6197**	

2768 x .24 +2661 + 132

While This Shows Significant Differences in the Analyst, Software and Probe, **SG Tube Integrity Is Not Challanged**

Therefore; Byron Unit 1 1995 & 1996 Results are Due to an Inspection Transient

Proposed Braidwood 1 Cycle Length

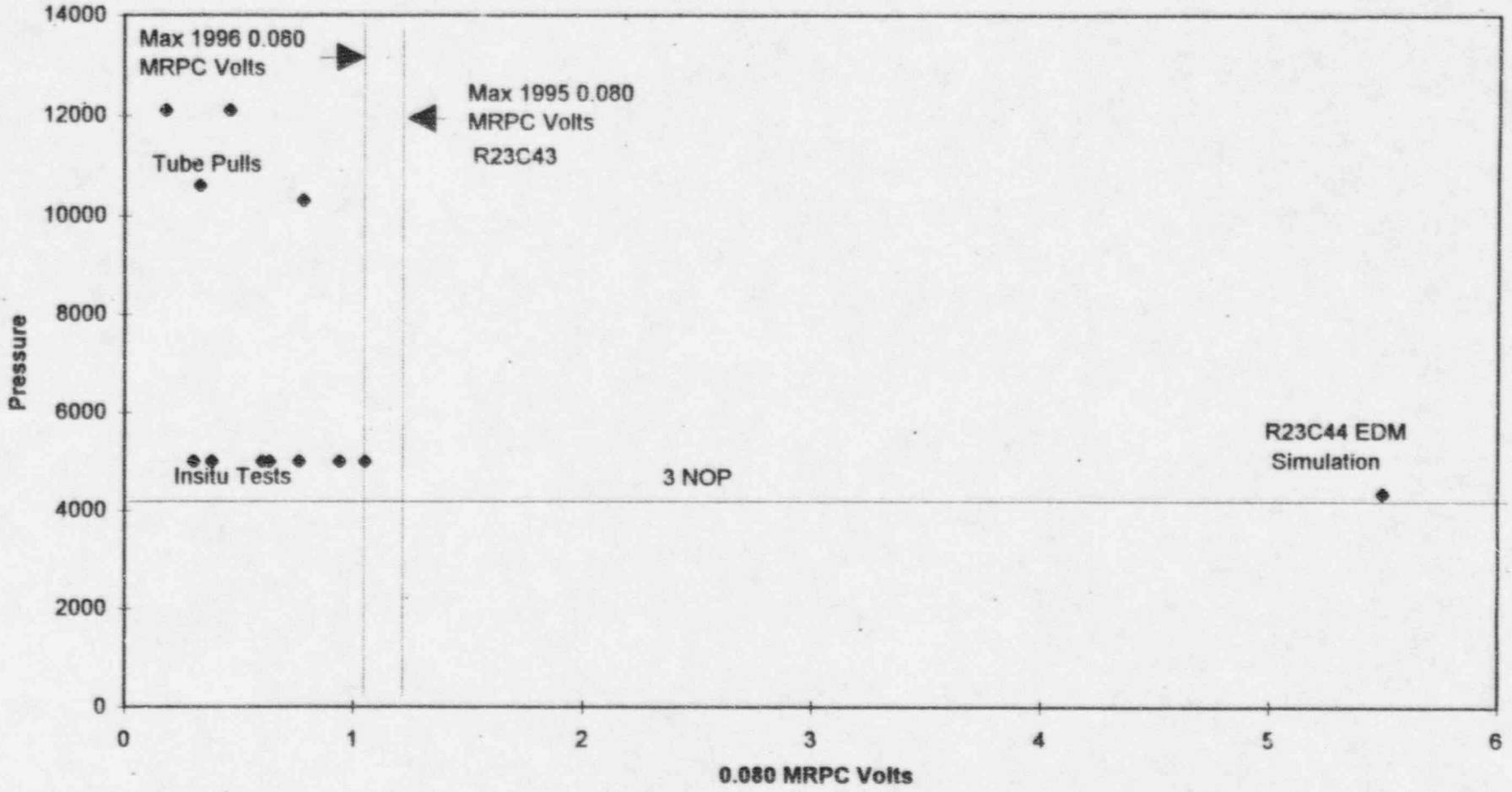
- Braidwood Unit 1 October 15, 1996 Mid-Cycle
  - 90 Day Extension to Existing Commitment
  - Bounded By Byron Unit 1 342 Day Cycle Prior to 10/95 Tube Pulls
- Insitu Pressure/Leak Test During Mid-Cycle
- Pull Tubes Concurrent with 3.0 V IPC Tube Pulls in Spring 1997 Outage
- Continue to Assess Circumferential Indication Sizing Improvements and Cycle Length Determination Methods

Structural Integrity Basis

- Most Structurally Limiting Indication Pulled 1994 (S/G A R23C44)
  - No Leakage In Service
  - Had Structural Integrity
- All 1995 & 1996 Indications Bounded By (S/G A R23C44)
- Based On Braidwood 1 Data Re-evaluation (As Measured By Voltage)
  - Byron 1 Largest is 2X Size of Braidwood 1 Largest 2/95
  - Byron 1 Largest is 4X Size of Braidwood 1 Largest 10/95
- Insitu Pressure Test At Byron
  - No Leakage @ 5000 PSI
  - 2 Indications Present in 1994
  - Largest Indications in Braidwood 1 10/95 Comparable to Byron 1 Tubes Pressure Tested in 1996

Insitu Pressure Test

Byron Unit 1 Voltage Vs Insitu and Burst Test Pressure

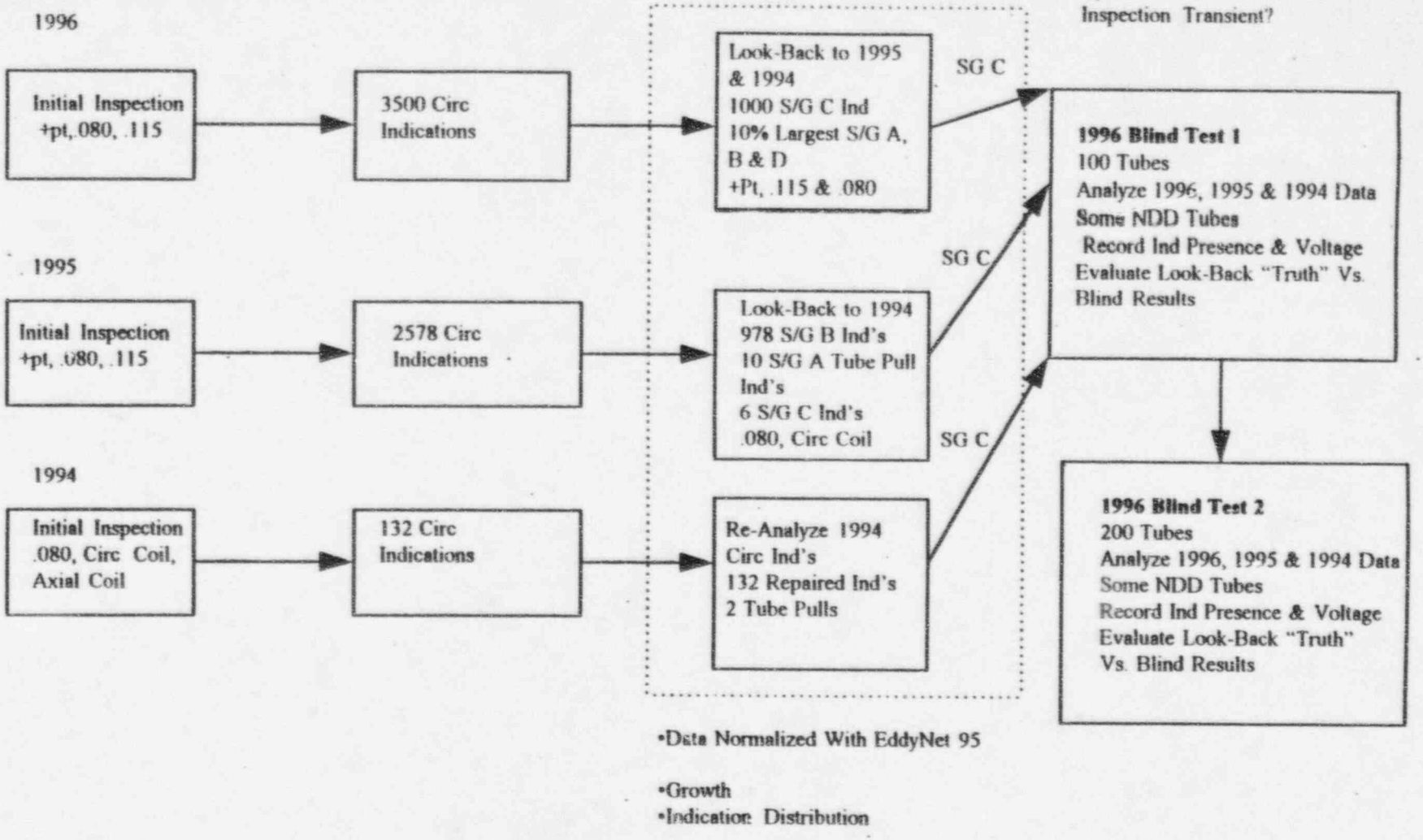


Most Structurally Limiting Tube, 0.080 MRPC Indication Voltage & MET Sizing Has Margin to Structural Limit and is 4X Larger Than Indications at Byron & Braidwood (Fall 1995 & 1996)

Byron Unit 1 Look-Back

Byron Unit 1 Circumferential Indication Studies

Question:
Byron 1996 # of Indications an Inspection Transient?



- Data Normalized With EddyNet 95
- Growth
- Indication Distribution

Byron Unit 1 TTS Indication Look-Back

Objectives:

- Analyze Data for Presence of Circumferential Indications to Ensure Slow Growth (Inspection Transient)
- Determine Relative Growth
  - Vert Max Voltage, Arc Length, Peak to Peak Voltage (1996 Look-Back & +point only)

Protocol:

- EddyNet 95 Analysis Software with Filters
- Independent Re-analysis of 1994 - 1996 Data

Conclusions:

- Byron Unit 1 Results Due to an Inspection Transient
- Slow Growth of Circumferential Indications
- Analysis of Results with 0.080, 0.115 & +Pt Support these Conclusions

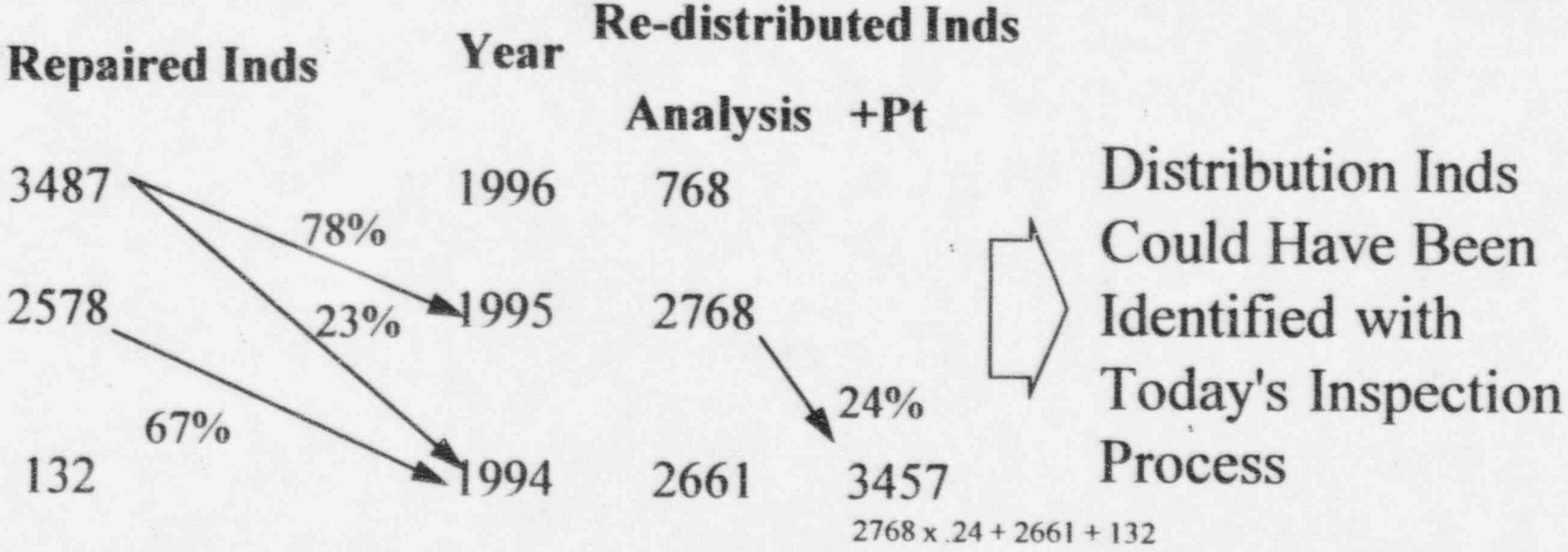
Inspection Transient Conclusion:

The Byron Unit 1 1995 & 1996 Number of Indications are the Result of an Inspection Transient

Byron Unit 1 Look-Back Indication Tracking

Year Indications Present	1996 Look-Back Data	1995 Look-Back Data
1995	974 of 1242 78%	n/a
1994	291 of 1242 23%	670 of 993 67%

Byron Unit 1 Re-distributed Indications



Conclusion: Byron Unit 1 1995 & 1996 Inspection Transients

Growth Conclusion:

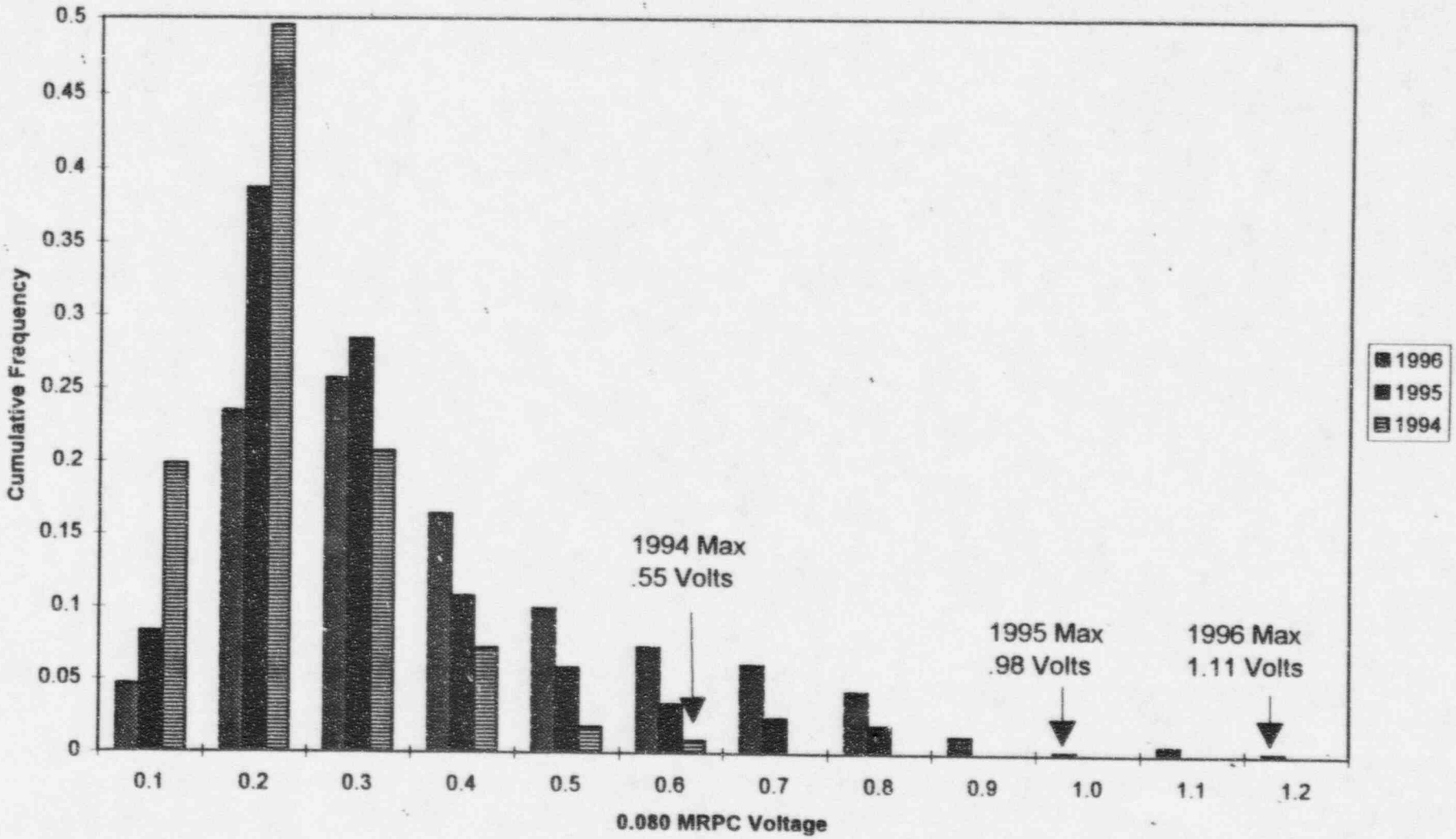
Using 0.08 MRPC Voltage as the Parameter After 1 Full Cycle of Operation (1994 to 1996) the Maximum Voltage Grew from 0.55 to 1.11 Volts (0.56 Volts)

This Does Not Threaten the Structural Integrity of Steam Generator Tubes

This Conclusion is Supported by the Plus Point Peak to Peak and Vert Max Voltages and the 0.115 MRPC Vert Max Voltages

Conclusions are Supported by the 1995 Look-Back

Byron Unit 1 1996 Look-Back Results for 0.080 MRPC Voltage Vs. Cumulative Distribution Frequency (Same Tubes)



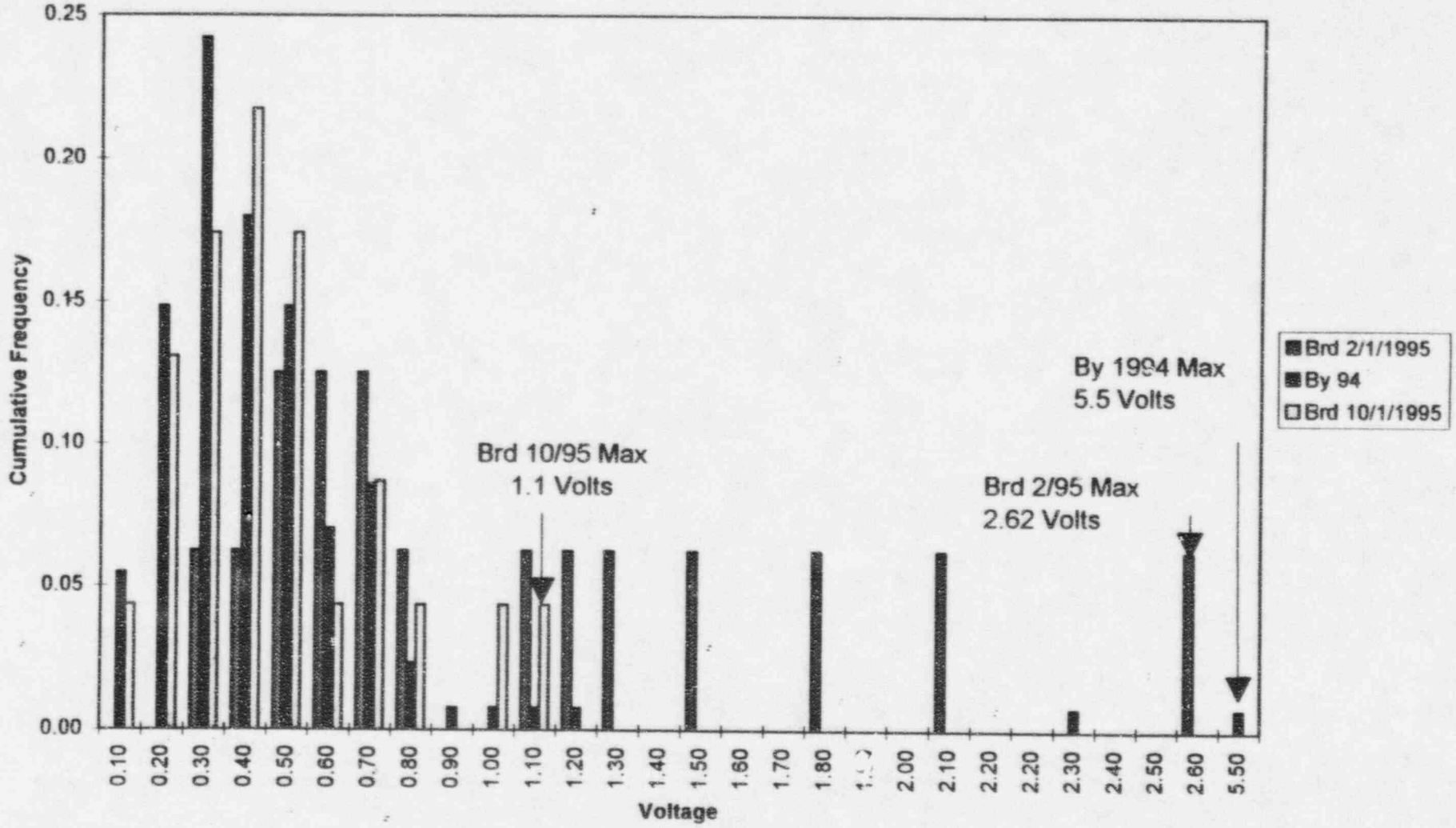
Braidwood Conclusion:

Largest Indication in 10/95 Braidwood 1 Inspection is Significantly Smaller Than Byron 1 1994 Inspection (4X)

Byron 1 1994 Indication Significantly Greater Than Distribution of Indications Seen at Byron 1 1995 & 1996

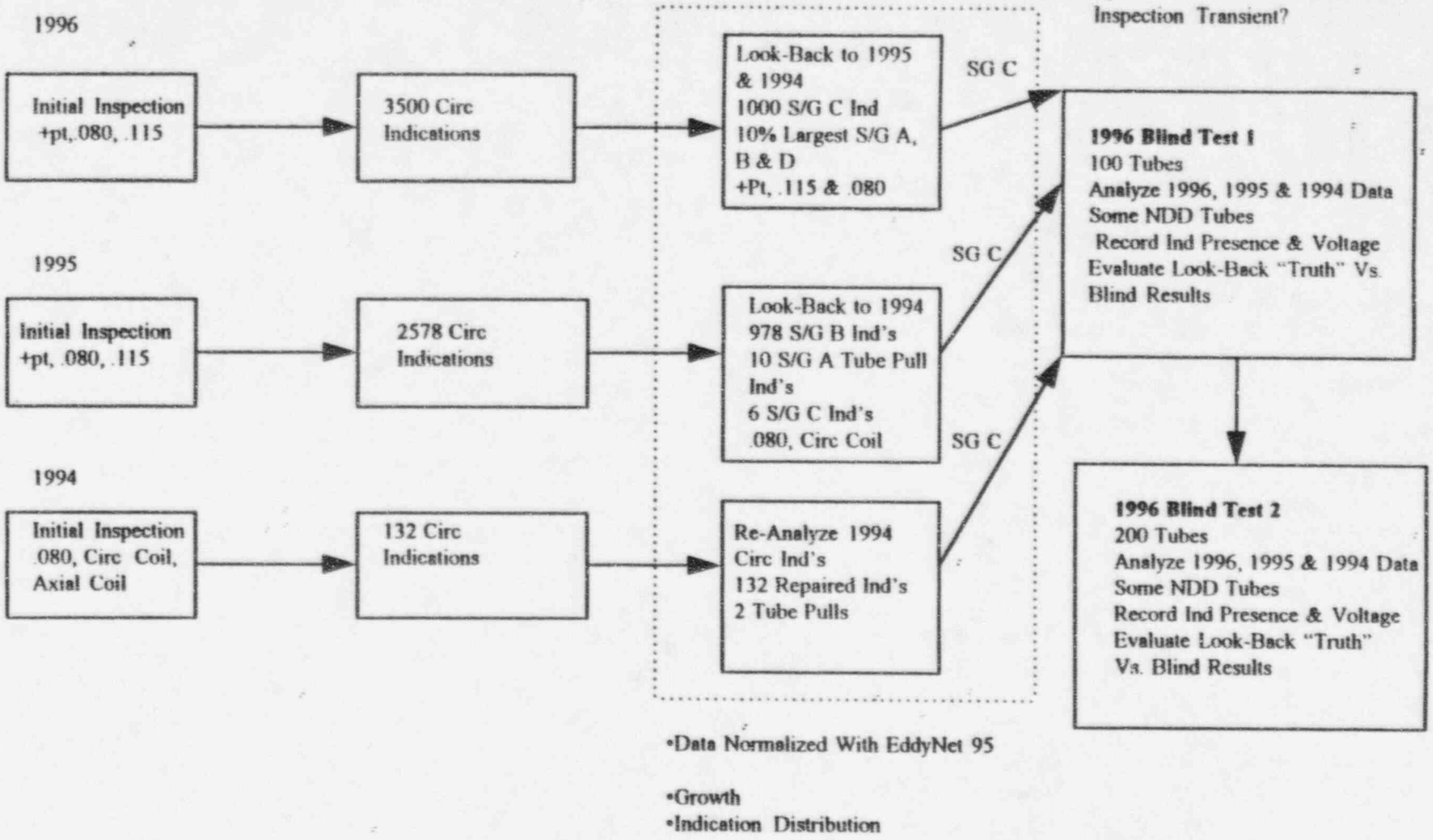
Byron 1 Indications Bound Braidwood 1

Braidwood & Byron Unit 1 0.080 MRPC Voltage Vs. Cumulative Distribution Frequency
(Repaired Tubes)



Blind Test

Byron Unit 1 Circumferential Indication Studies



•Data Normalized With EddyNet 95

•Growth
•Indication Distribution

Byron Unit 1 1996 Indication Blind Test

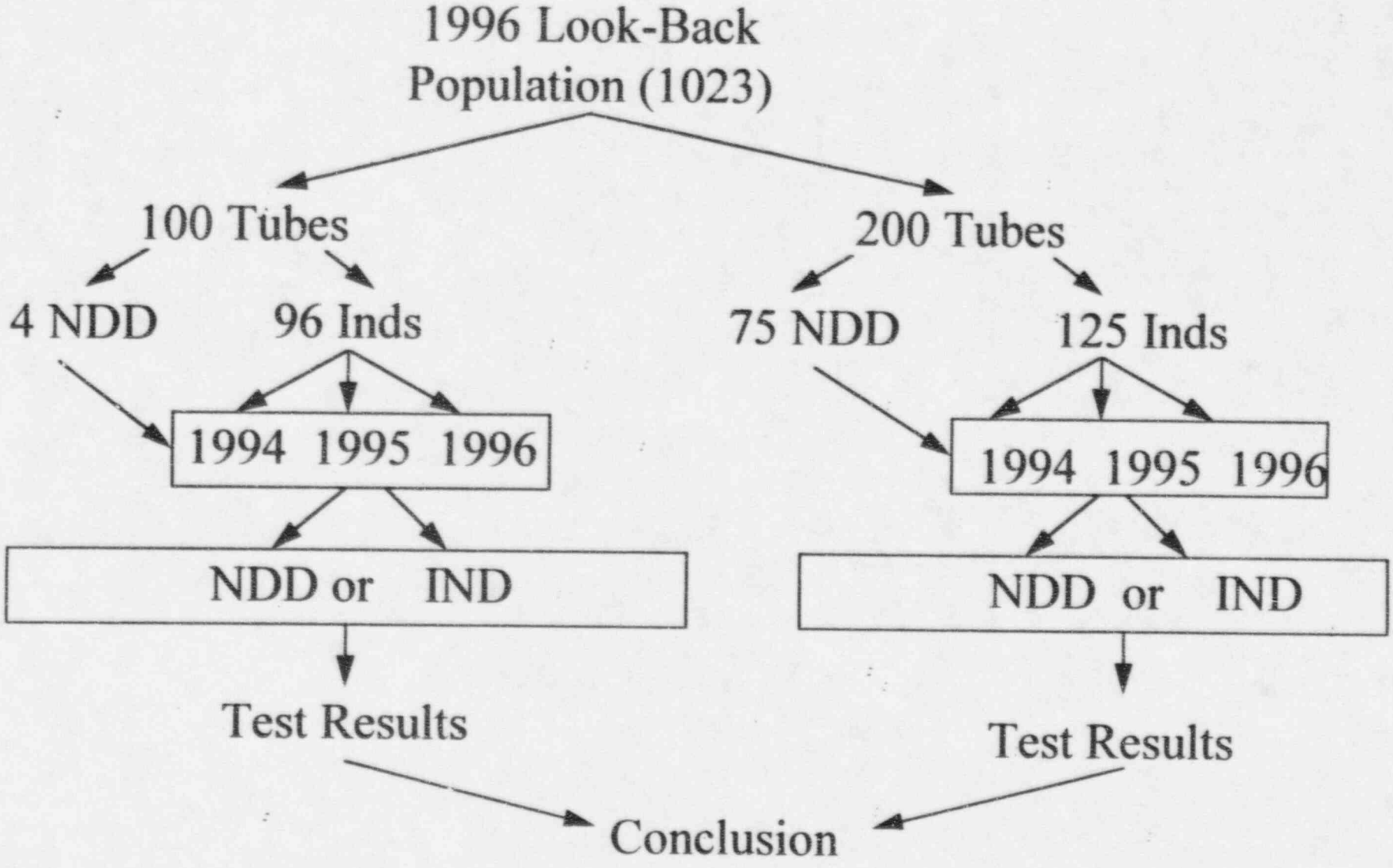
Objectives:

- Validate Conclusion That 1995 & 1996 are an Inspection Transient
- **Demonstrate Analyst Consistency in Detection**

Protocol:

- Range of Indication Sizes Selected From 1996 SG C Look-Back Results
- Created Two Tests (100 & 200 Tubes) Randomly Ordered Tubes
- Data Evaluated for 1994, 1995 & 1996 in that Order
- Four Analysts Participated
- Eddynet 95 Used For Blind Test
- Test Controlled by Proctor (ComEd ECT Level III)
- Results Scored and Reported by EPRI "Site Shell" Program

Blind Test Development



Blind Test Conclusions

- With 1996 Analysts Training and Experience High POD
  - 97% Correct for 100 Tube Test
    - Actual POD 92% @ 98% CL
      - Met 90% POD @ 95% CL
  - 85% Correct for 200 Tube Test

- Blind Test Validates Look-Back; Demonstrates Byron Unit 1 Inspection Transient

Byron Unit 1 1996 Blind Test Results

100 Tube Blind Test		200 Tube Blind Test	
1994		**1994**	
Truth Flaws	20	Truth Flaws	272
Student Flaws	20	Student Flaws	174
Percent Correct	1.000	Percent Correct	0.639
POD	0.86	POD	0.81
Confidence Level	0.951	Confidence Level	0.955
NDD Overcalls/NDD	101/388	NDD Overcalls/NDD	111/540
1995		**1995**	
Truth Flaws	156	Truth Flaws	447
Student Flaws	150	Student Flaws	426
Percent Correct	0.938	Percent Correct	0.953
POD	0.920	POD	0.930
Confidence Level	0.970	Confidence Level	0.971
NDD Overcalls/NDD	53/252	NDD Overcalls/NDD	33/120
1996		**1996**	
Truth Flaws	300	Truth Flaws	584
Student Flaws	295	Student Flaws	567
Percent Correct	0.983	Percent Correct	0.971
POD	0.96	POD	0.95
Confidence Level	0.98	Confidence Level	0.99
NDD Overcalls/NDD	0/16	NDD Overcalls/NDD	31/304
3 Year Total		**3 Year Total**	
Truth Flaws	476	Truth Flaws	1303
Student Flaws	465	Student Flaws	1167
Percent Correct	0.97	Percent Correct	0.8956
POD	0.92	POD	0.88
Confidence Level	0.98	Confidence Level	0.983
NDD Overcalls/NDD	154/656	NDD Overcalls/NDD	175/964

Meeting Objectives

- Demonstrate that Byron Unit 1 1995 & 1996 Circumferential Indications are an Inspection Transients
  - Therefore Growth of an Indication is Low
  - No Challenge to Structural/Leakage Integrity of Braidwood Unit 1 Steam Generators
- Obtain Concurrence to Move Braidwood Unit 1 Outage to 10/15/96

Summary

- Byron Unit 1 1995 & 1996 Inspection Results are Inspection Transients
- Braidwood 1 Clearly Bounded by Byron 1
- Concurrence on Braidwood 1 Operation to 10/15/96 Requested as Soon as Possible

Proposed Braidwood 1 Cycle Length

- Braidwood Unit 1 October 15, 1996 Mid-Cycle
  - 90 Day Extension to Existing Commitment
  - Bounded By Byron Unit 1 342 Day Cycle Prior to 10/95 Tube Pulls
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- Continue to Assess Circumferential Indication Sizing Improvements and Cycle Length Determination Methods

selecting and pressure testing SG tubes in the Braidwood 1 fall 1996 ECI outage if the requested operating extension is approved.

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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 50-454, STN 50-456

Enclosures:
1. Attendance Sheet
2. ComEd Handout

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G. Dick, GFD (w/encl 2)
C. Moore, ACM
E. Sullivan, EJS
J. Strosnider, JRS2
G. Lainas, GCL
J. Tsao, JCT
B. McCabe, BCM
C. Jacobson, JMJ3
PUBLIC (w/encl 2)
OGC, O15B18
F. Miraglia, FJM
J. Roe, JWR
R. Capra, RAC1
D. Lynch, MDL
E. Jordan (e-mail to JKR)
B. Sheron, BWS
G. Hornseth, GPH
K. Karwoski, KJK1
M. Holmberg, MSH
L. Miller, LFM (w/encl 2)
R. Assa, RRA

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