



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

Docket File

November 7, 1994

Docket Nos. 50-237, 50-249
and 50-254, 50-265

LICENSEE: Commonwealth Edison Company (ComEd)

FACILITIES: Dresden, Units 2 and 3, and Quad Cities, Units 1 and 2

SUBJECT: MEETING SUMMARY OF OCTOBER 14, 1994

On October 14, 1994, in a public meeting, the NRC staff met with representatives from ComEd to discuss their response to Generic Letter (GL) 94-03, "Intergranular Stress Corrosion Cracking of Core Shrouds in Boiling Water Reactors" for Dresden, Unit 2, and Quad Cities, Unit 2. ComEd also updated the NRC staff on the status of the additional information they were preparing in response to the NRC staff safety evaluation issued on July 21, 1994, concerning the degraded core shrouds in Dresden, Unit 3, and Quad Cities, Unit 1. A list of attendees is enclosed (Enclosure 1).

ComEd made a presentation to the staff providing their basis for believing that there will be no existing through-wall cracks in the core shrouds at Dresden, Unit 2, and Quad Cities, Unit 2 for the remainder of their current operating cycles. These units have not had their core shrouds inspected for cracking and have approximately 6 months of operation each left on their existing fuel cycles until the units shut down for a refueling outage and inspection of the core shrouds. ComEd also presented their safety assessment of the consequences of through-wall cracking of the core shrouds following design basis and beyond design basis events. Enclosure 2 is a copy of ComEd's handout. During the meeting the NRC staff raised a number of questions that ComEd could not fully answer. In the meeting, the NRC staff indicated that all the requests for additional information would be formalized and forwarded to the licensee.

ComEd also briefed the staff on the progress they have made on the responses for addition information requested by the NRC staff contained in the NRC safety evaluation dated July 21, 1994. The July 21, 1994, safety evaluation requested that all information be provided by December 15, 1994. ComEd indicated that they were making good progress in the resolution of issues and may be able to provide the staff with all the required information prior to December 15, 1994.

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Memo 4
DFOI

In the meeting, ComEd also presented the preliminary design modification to fix the core shrouds at Dresden and Quad Cities. Enclosure 3 is a picture of the proposed design. ComEd indicated in the meeting that an evaluation concerning the repair modification would be provided to the staff for review.

Original signed by

John F. Stang, Project Manager
Project Directorate III-2
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Enclosures:

1. List of Attendees
2. Licensee's Handout
3. Proposed Design

cc w/encls: see next page

DISTRIBUTION (w/all encl):

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OFFICE	LA:PDIII-2	PM:PDIII-2	PD:PDIII-2			
NAME	C. Moore	J. Stang:lm	R. Capra			
DATE	10/3/94	10/3/94	10/7/94	10/ /94	10/ /94	

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LIST OF ATTENDEES
for October 14, 1994 Meeting

NRC

Mark Rubin
Gary Holahan
Jack Roe
Ashok Thadani
Brian Sheron
Robert Jones
Robert Capra
Michael McNeil
Jack Strosnider
Robert Pulsifer
R. H. Wessman
John Stang
Matthew Mitchell
Robert Hermann
Amy Cubbage
Kerri Kavanagh
P. Patnaik
Joeseeph Staudenmeier
Mary Miller
Ed Hackett
Gus Lainas

ComEd

John Purkis
Joe Williams
Tom Spry
John Hosmer
Tom Behringer
Mark Uhrich
Gerald Whitman
Pete Piet
Dennis Farrar
Niagara Mohawk
W. David Baker

GE

Hwang Choe

Dresden/Quad Cities Unit 2 Core Shroud Meeting

October 14, 1994

ComEd

Enclosure 2

Agenda

Background/History	John Hosmer
Plant Status	John Hosmer
Basis for No Existing Through-Wall Cracking	Tom Spry
Safety Assessment of Assumed Through-Wall Cracking	Joe Williams
Status of Open Issues	Jack Purkis
Conclusion/Discussion	John Hosmer

ComEd Representation

Jerry Whitman	Vessel Internals Program Engineer
Mark Uhrich	Plant Support Lead Mechanical Engineer
Dennis Farrar	Regulatory Services Manager
Pete Piet	Nuclear Licensing Administrator
Hwang Choe	GE Principal Engineer
Tom Behringer	ComEd Structural Consultant

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Background/History

- 7/21 - NRC Safety Evaluation Report
 - Permits 15 months operation for Dresden 3 & Quad Cities 1
 - ComEd Additional Work
 - UT Accuracy
 - Asymetric & other load validation (TRACG)
 - Support BWR-VIP Initiative
- 7/25 - Generic Letter 94-03
- 8/23 - ComEd Response to GL 94-03
- 9/27 - NRC RAI on ComEd Response to GL 94-03
 - Dresden/Quad Cities (D/QC) Unit 2 response relative to H2/H3
- 10/4 - NRC Conference call on Dresden/Quad Cities Unit 2
- 10/7 - ComEd response to 9/27 RAI
- 10/13 - Supplement to ComEd RAI Response



Plant Status

Unit	Sch. S/U	Next Scheduled Refueling Outage	Inspection Status
Dresden Unit 2	10/31/94	3/95	'95 Outage, Vertical Welds Needed for Shroud Repair
Dresden Unit 3	10/15/94	3/96	Baseline Done, Planning Shroud Repair
Quad Unit 2	November 1994	1/95	'95 Outage, Vertical Welds Needed for Shroud Repair
Quad Unit 1	November 1994	9/95	Baseline Done, Planning Shroud Repair

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Basis for No Through-Wall Cracking

Tom Spry

ComEd

Basis for Postulating No Existing Through-Wall Cracks

Summary of Crack Size Estimation

- Uninspected units (D2, Q2) bounded by inspected units (D3, Q1)
- Crack depth estimates for D2 and Q2 show large structural margins

Dresden 2 and Quad Cities 2

Crack Growth Considerations

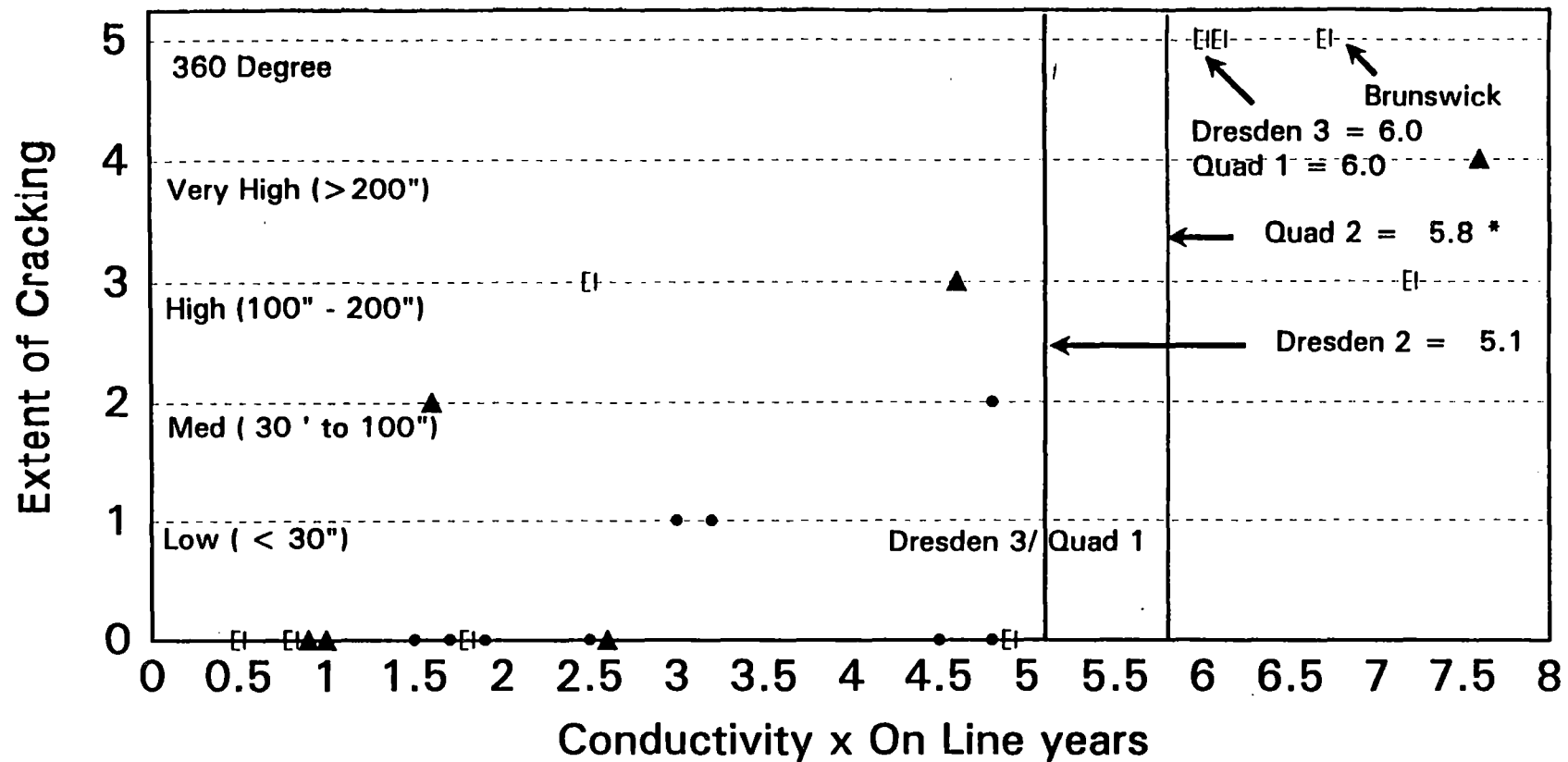
- Operating time and early conductivity
- Hydrogen Water Chemistry (HWC)
- PLEDGE model crack growth rates

Dresden 2

Operating Time and Conductivity

- Correlation between (early conductivity x operating time) and extent of shroud cracking
 - D2 has 2 more years than D3
 - D2 early conductivity better than D3
- Good early conductivity at D2 offsets higher operating time

Worst Plant Cracking vs. Conductivity x On Line Years



□ Welded Plate ▲ Forged Rings • Plate Material Unknown
 ■ Dresden 2 ■ Quad 2

* Quad 1 on line years were incorrectly reflected in "BWR Shroud Cracking Generic Safety Assessment", Rev. 1. The correct value of on line years is 15.4.

Dresden 2

HWC

- D2 operating with HWC since 1983
- Resulting crack growth rate lower in D2
- Other RPV internals reflect less aggressive D2 environment

RPV Internals IGSCC Event Comparison Dresden Unit 2 & 3

Inspection	Unit 2	Unit 3
Jet Pump Beams	2	12
Jet Pump Riser Braces	0 (Note 1)	3
Shroud Head Bolts	1	30
Shroud Access Hole Covers	0	0
Core Spray Sparger/Piping	0 (Note 1)	2
In Core SRM/IRM Tubes	1	1
Top Guide Bolts	0 (Note 1)	3
Total	4	51

Note 1 - Previous inspections may not have been performed at the sensitivity used to detect the cracking at Unit 3.

Dresden 2

PLEDGE Model Crack Growth Rates

- D2 crack growth rate 1/30 of D3
 - H3/H5 ECP differential taken into account
- Current D2 bounding crack depth 0.64"
 - Assume initiation at 3 EFPY and 1.25 ppm HWC beginning in 1983
 - Compare with 1.30" crack depth for D3 using SER methodology
- D2 margin factor currently > 65 based on MS LOCA + DBE, no credit for fillet

Quad Cities 2

Operating Time and Conductivity

- Q2 (early conductivity x operating time) < Q1
 - Q2 operating years 0.6 less than Q1
 - Q1 and Q2 early conductivity nearly equal
- Q2 cracking no worse than Q1

Quad Cities 2

HWC

- Q1 and Q2 HWC history nearly equal

Quad Cities 2

PLEDGE Model Crack Growth Rates

- Crack growth rate based on non-HWC ECP
- Q2 crack depth bounded by 1.30" of Q1 based on SER methodology
- Q2 margin factor currently > 21 based on MS LOCA + DBE, no credit for fillet weld

Basis for Postulating No Existing Through-Wall Cracks

Summary of Crack Size Estimation

- Uninspected units (D2, Q2) bounded by inspected units (D3, Q1)
- Crack depth estimates for D2 and Q2 show large structural margins

Safety Assessment of Assumed Through-Wall Cracking

Joe Williams

Safety Assessment

Postulated Through-wall Failures of Shroud Ring Welds H2, H3,
or H5 at Dresden 2/Quad 2

- Design Basis Events Considered
 - Normal Operation
 - Operation Transients
 - Design Basis Earthquake (DBE)
 - Design Basis Main Steam Line Break (MSLB)
 - Design Basis Recirculation Line Break (RLB)

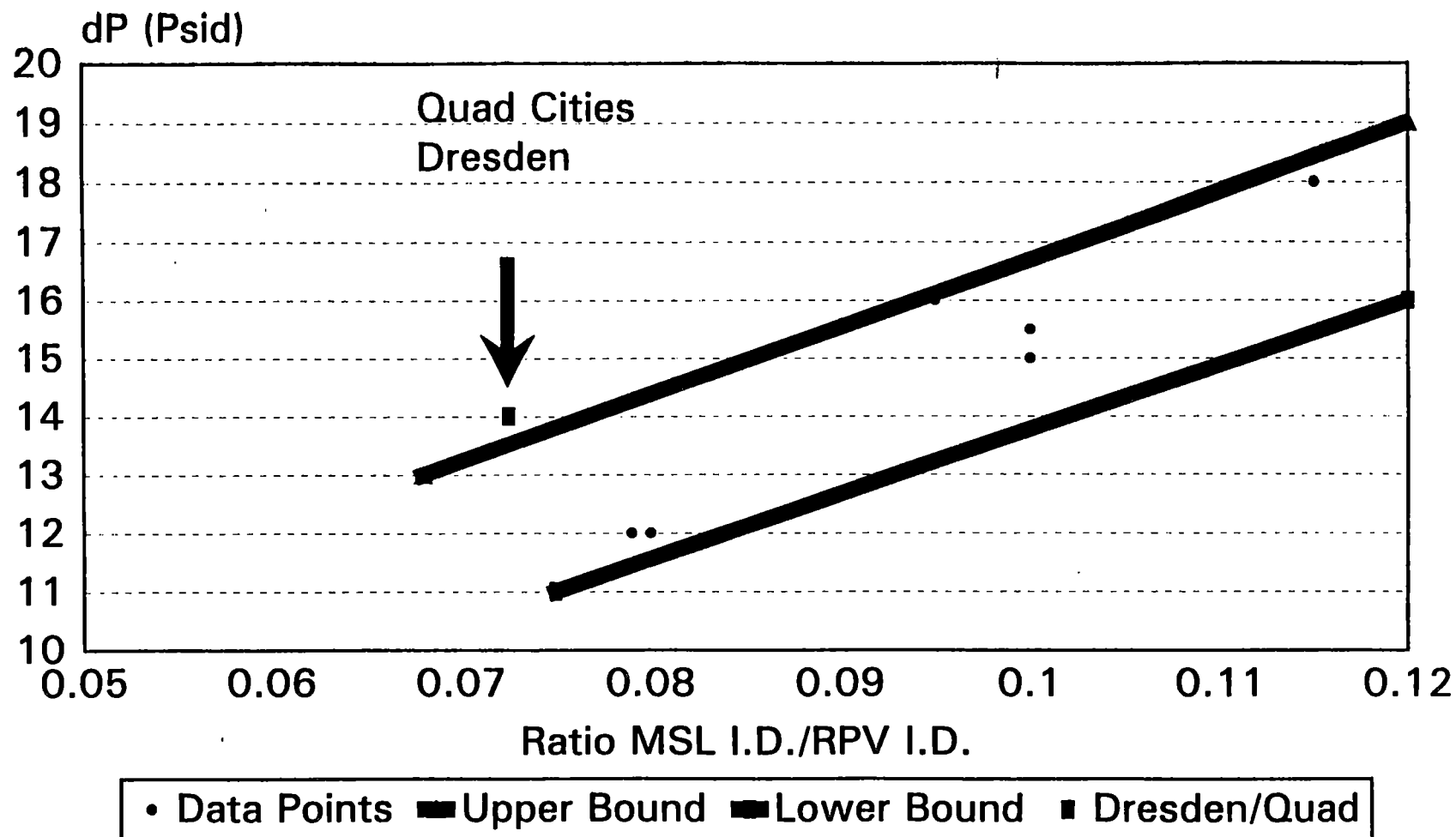
Safety Assessment (Cont.)

- Event Load Definition
 - Seismic Events
 - Quad Plant-Specific Seismic Model (Dresden Model in progress)
 - Housner Synthetic Time History Produced and used for input to both Dresden/Quad
 - Housner displacements bound Golden Gate and El Centro Displacements for Through-wall failure

Safety Assessment (Cont.)

- Main Steam Line Break
 - Previous Load Definition 12 psid @ Dresden & 20 psid @ Quad (LAMB Code)
 - TRACG model results for 6 units correlated to MSL ID vs. RPV ID. Results indicate 14 psid value for Dresden/Quad
 - Plant-specific Dresden/Quad TRACG model is in progress

Shroud Head dP due to MSLB



Safety Assessment (Cont.)

- Recirculation Line Break
 - Previous UFSAR generic loads - 17 kips max. blowdown load above H5 and 225 kips peak acoustic load applied uniformly (WHAM Code).
 - Plant specific TRACG Model developed and validated: 15 axial levels, 14 azimuthal sectors and 2 rings: validated by sensitivity studies, experimental results, and by BWR-VIP

Safety Assessment (Cont.)

Recirculation Line Break, (Cont.)

- Peak Acoustic load converted into static equivalent load per BWR-VIP
- Revised plant-specific peak blowdown load - 67 kips above H5
- Results
 - H2 and H3 results finalized in RAI response, preliminary H5 results

Dresden 2/ Quad Cities 2 Safety Assessment Results

Success Criteria	CONTROL ROD INSERTION-Top Guide Relative Vertical Displ. <14.5"	CONTROL ROD INSERTION-Top Guide Relative Lateral Displ. <4.8"-Timing May Be Affected	CONTROL ROD INSERTION- Core Plate Relative Lateral Displ. <1.5"-Timing May Be Affected	FLOODABLE VOLUME- Floodable Volume To 2/3 Core Height Maintained By Intact Shroud or Intact RCPB	BORON INJECTION FUNCTION- Injection Line Into RPV Remains Intact With Intact RCPB	CORE SPRAY FUNCTION -<=5" Shroud Rel. Vertical Displ. For Spray Inside Shroud Or Any Displ. For RPV Annulus Injection
Normal Operation	2.6" AT QC H3	NO LATERAL DISPLACEMENT	NO LATERAL DISPLACEMENT	MAINTAINED BY INTACT RCPB AND SHROUD	MAINTAINED	5" AT QC H2
DBE	3.6" AT QC H3	RODS INSERT IN AN OSCILLATORY PATTERN	LESS THAN 0.05" FOR D/QC	MAINTAINED BY INTACT RCPB	MAINTAINED	INJECTION INSIDE RPV ANNULUS
MSLB	10.1" AT D/QC H3	NO LATERAL DISPLACEMENT	ZERO DISPLACEMENT	MAINTAINED BY INTACT RCPB	MAINTAINED	INJECTION INSIDE RPV ANNULUS
RRLB	2.6" at QC H3	LESS THAN 1" FOR D/QC H5	NO LATERAL DISPLACEMENT	FOR D/QC H5, MAXIMUM 1/4" OPENING ALL AROUND, ACCEPTABLE BYPASS FLOW	NOT DESIGNED TO FUNCTION IN RRLB	FOR QC H2, 5" SHROUD LIFT

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Safety Assessment Conclusion

- Summary
 - Defined Specific Success Criteria for the D/QC Safety Functions
 - Analyzed Shroud Behavior
 - Compared Results with Criteria
- Conclusion
 - With postulated through-wall failure at H2, H3, or H5 safe shutdown will still be achieved for all design basis events.

ComEd

Status of Open Issues

Jack Purkis

Status of Open Issues

- Inspection Capabilities
- Current Modification Status

Inspection Capabilities

- GE UT and VT Equipment committed through mid-November
- ComEd visual Capabilities (no UT available)
 - 3 IVVI Inspectors Qualified per BWR-VIP
 - IVVI Equipment available
 - Refuel bridges being replaced at Dresden - not available until 12/94

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Current Modification Status

Unit	Seismic Model Load Resolution	Stress Report	Material Ordered	Hardware/ Tooling Complete
Quad 2	Completed	10/17/94	10/6 Complete	12/31/94
Dresden 2	In Progress	11/7/94	10/27	1/23/95

Conclusion

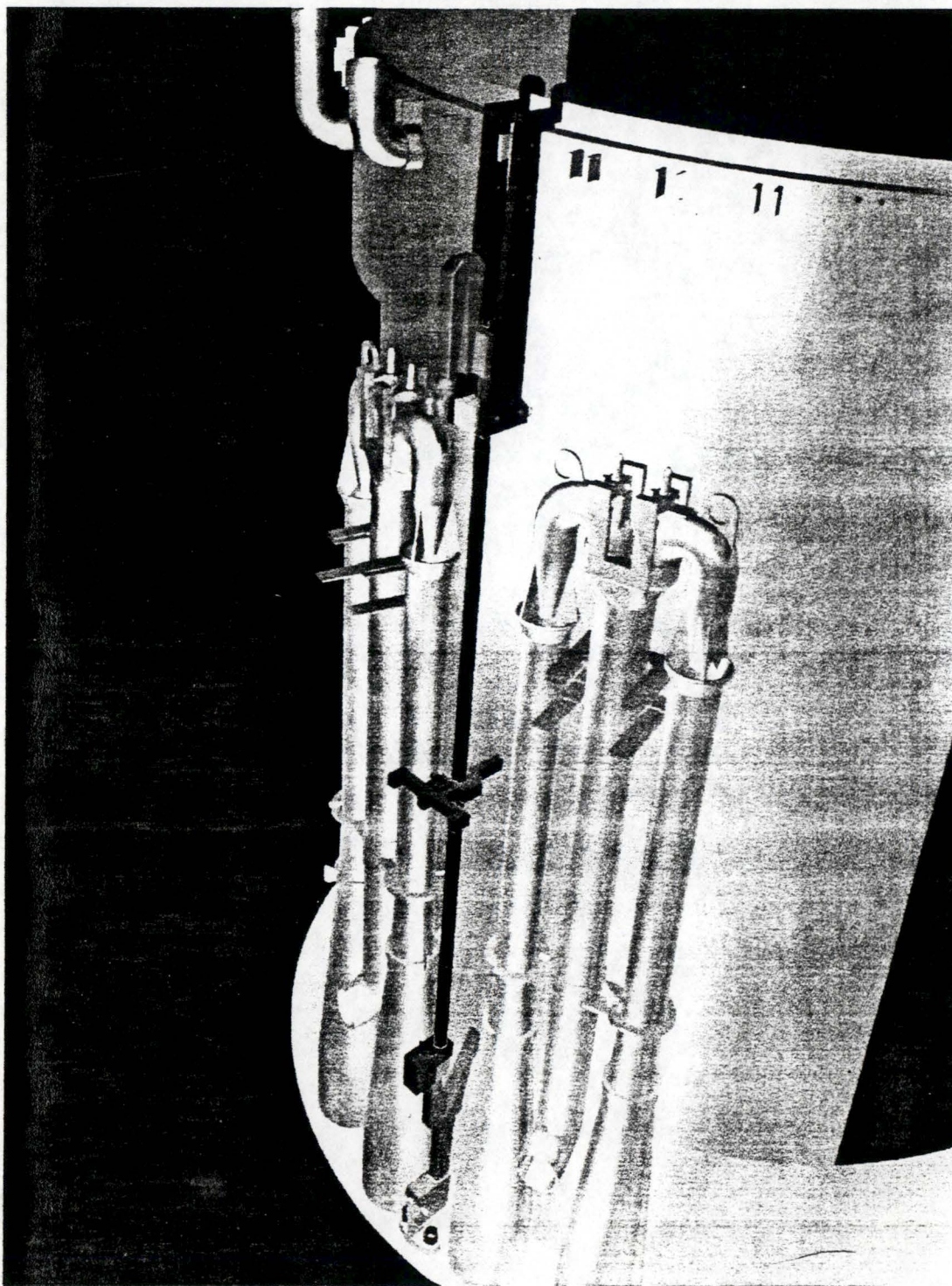
John Hosmer

Conclusion

- Uninspected Units Bounded: No Through- Wall Cracking for Q2/D2
- Safety Assessment
 - Acceptance Criteria Established
 - Weld Specific Analysis Complete
 - All Safety Functions Met
- Remaining ComEd Actions
 - MSLB TRACG 11/15/94
 - Finalize H5 Displacements 12/15/94
 - Dresden Seismic Model 10/30/94

ComEd

**QUAD CITIES 2
CORE SHROUD MODIFICATION PRELIMINARY DESIGN**



10/11/94