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WASHINGTON, D.C. 20565

SEP 03 1992

MEMORANDUM FOR: James E. Richardson, Director
Division of Engineering Technology

FROM: Jack R. Strosnider, Chief
Materials and Chemical Engineering Branch
Division of Engineering Technology

SUBJECT: SUMMARY OF MEETING WITH WESTINGHOUSE OWNERS GROUP (WOG)
CONCERNING PRIMARY WATER STRESS CORROSION CRACKING (PWSCC)
OF INCONEL 600

On August 18, 1992, the staff met with members of Westinghouse Owners Group (WOG) to discuss the safety significance of control rod drive mechanism (CRDM) penetration cracking and update the status of WOG's Inconel 600 program. Preliminary discussion of WOG's action plan regarding this issue was held on January 7, 1992. The subject meeting was conducted in two sessions. The first session of the meeting was open for all interested members of the public. Coordination of the activities of the owners groups on Inconel 600 CRDM penetration cracking will be done by NUMARC. The second session of the meeting was open only to members of WOG and NUMARC and NRC staff because proprietary information was presented. A list of meeting attendees and a copy of the materials presented in the first session of the meeting are attached.

The meeting started with the staff's presentation of a NRC overview regarding the PWSCC of Inconel 600. The PWSCC of Inconel 600 was first reported in the pressurizer instrument nozzles in San Onofre Unit 3 in 1986 and in pressurizer heater sleeves in Calvert Cliff Unit 2 in 1989. Recently, cracking of CRDM penetrations was reported in several French and Swedish PWRs. There are some reasons why cracking should show up first in foreign plants rather than U.S. plants. These reasons do not lead to the conclusion that cracking cannot occur in U.S. plants. As the fabrication of Swedish pressure vessels and CRD penetrations is similar to that of the U.S. plants, the staff is concerned that similar CRDM penetration cracking may also occur in U.S. plants. The staff is also concerned about corrosion from boric acid deposits on the vessel head.

In the first session of the meeting WOG briefly discussed the outline of its Inconel 600 program, which was approved in their February 1992 meeting. The subject program consists of two phases and is designed to resolve the CRDM penetration cracking issue. Phase 1 of the program is to establish the extent of the issue applicable to Westinghouse supplied plants. Phase 1 is scheduled to be completed by the end of this August. Phase 2 of the program is to

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RD-03
APC crack*

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provide a basis for continued plant operation with cracked penetrations and to establish methodology for plant susceptibility screening. Phase 2 is scheduled to be completed by October 1992. The preliminary results of the program has shown that the axial cracking in the CRDM penetrations appears not to be a safety issue because the circumferential cracking of the penetrations is not expected. WOG will be back in November, 1992 to brief the staff regarding the final results of their Inconel 600 program. In the second session of the meeting, WOG presented some proprietary details of the on-going Inconel 600 program in the following areas of (1) key parameter summary and comparison to French/other plants with cracks; (2) analytical approach schematic; (3) penetration stress analysis; (4) penetration crack growth study; (5) penetration leakage assessment; (6) penetration leakage measurement systems summary; (7) plant susceptibility summary, and (8) inspection/repair strategies. WOG suggested that other affected owners groups should also participate in the development of the acceptance criteria in flaw evaluation.

The staff continues to believe that the reported cracking in CRDM penetrations is not an immediate safety issue requiring regulatory action. There is time for a thorough, disciplined analysis of the safety significance, the approach to vessel head inspection, criteria for taking repair action and possible regulatory guidance. The bases for staff's conclusions are:

- (1) No cracks or leakage have been observed to date in U.S. plants;
- (2) No leakage was found during operation in any foreign plant;
- (3) Even if cracking has occurred, it would most likely to be axially oriented;
- (4) Even if crack was initiated, it would take time to grow through the wall;
- (5) Leak would likely be detected before the occurrence of a large failure of a penetration, and
- (6) Even if a large failure of a head penetration has occurred, the result is a SBLOCA that is within the design basis capability of the plant and in the training experience of the operators.

Therefore, the staff believes the risks to plant safety resulting from the CRDM penetration cracking are very low.

At the end of the meeting the staff requested WOG to prepare a systematic analysis of the issue, and present the results of their analysis of the following items during the November meeting:

- (1) safety analysis;
- (2) crack initiation and crack growth;
- (3) leak detection methods and sensitivity of detection;
- (4) inspection methods and sensitivity of detection;
- (5) proposed criteria for repair action;
- (6) longer term mitigation techniques, and
- (7) inspection program.

ISI Ret for

Jack R. Strosnider, Chief
Materials and Chemical Engineering Branch
Division of Engineering Technology

Enclosures:

- 1. A List of Meeting Attendees
- 2. WOG Presentation Materials

cc: B.D. Liaw
 W.T. Russell
 J. Partlow
 T. Murley
 F. Miraglia
 W. Rosin, NUMARC
 J. Taylor, B&WOG
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LIST OF ATTENDEES AT AUGUST 18, 1992 MEETING
WITH WESTINGHOUSE OWNERS GROUP (WOG) CONCERNING
PRIMARY WATER CORROSION CRACKING (PWSCC) OF INCONEL 600

<u>NAME</u>	<u>POSITION/AFFILIATION</u>	<u>TELEPHONE NO.</u>
William Koo	Sr. Materials Engineer, NRC/NRR/DET/EMCB	(301) 504-2706
Robert Hermann	Section Chief, NRC/NRR/EMCB	(301) 504-2768
Tom Murley	NRR	(301) 504-1270
Jack Strosnider	Branch Chief, NRC/NRR/EMCB	(301) 504-2795
Jim Richardson	Director, NRC/NRR/DET	(301) 504-2722
John Galembush	Westinghouse Nuclear Safety	(412) 374-5036
Bruce Bevilacqua	Westinghouse	(412) 374-6345
Gutti Rao	Westinghouse - Materials	(412) 374-6233
Seth Swamy	Westinghouse - NATD	(412) 374-6513
Hank Sepp	Westinghouse - Nuclear Safety	(412) 374-5282
Ed Rusnica	Westinghouse - NATD	(412) 374-6390
Dave Boyle	Westinghouse - NATD	(412) 374-6690
Sam Lee	Materials Engineer, NRC/NRR/DET/EMCB	(301) 504-3109
Tom Walt	General Manager, Portland General Electric	(503) 556-5670
Jim Cirilli	Senior Engineer, Northeast Utilities	(203) 665-4675
Don Wright	BG&E	(410) 787-5519
Scott Boggs	Florida Power & Light Co.	(407) 694-4207
John J. Hutchinson	Florida Power & Light Co.	(407) 694-4211
Patrick Michalkiewicz	Nuclear Systems Supervisor, Wisconsin Public Service	(414) 433-1786
Larry Walsh	North Atlantic Energy Service, Inc. (WOG)	(603) 474-9521

<u>NAME</u>	<u>POSITION/AFFILIATION</u>	<u>TELEPHONE NO.</u>
Bill Rasin	NUMARC	(202) 872-1280
Ken McCoy	Chair. WOG. EMC, Georgia Power Co.	(205) 877-7122
Melvin Arey	Engineer, Duke Power Co.	(704) 382-8619
Anthony W. Robinson	B&W Nuclear Service Co.	(804) 385-3290
David E. Whitaker	Duke Power Company	(704) 382-7246
Jim Taylor	B&W Nuclear Technologies	(804) 385-2817
David Miskiewicz	Florida Power Corp.	(813) 866-4414
Stephen Fyfilch	Supervisory Engineer, B&W Nuclear Service, Co.	(804) 385-3272
Gordon Bischoff	CROG Project Manager (ABB/CE)	(203) 285-5494
Krish Ravan	Manager, ABB-CE Nuclear Services	(615) 752-2835
Theresa Meisenheimer	Bechtel	(301) 417-4868
William A. Cross	STS	(301) 652-2500
A.J. Butcavage	Rochester Gas & Electric	(716) 546-2700
G.L. Calhoun	Westinghouse Nuclear Service Div.	(412) 374-4244
J.F. Duran	Westinghouse NATD	(412) 374-6375
Steve Hunt	DEI (Representing EPRI)	(703) 790-5544
Jim Davis	Materials Engineer, NRC/NRR/DET/EMCB	(301) 504-2713
Joseph A. Burack	ML&P (DED)	(512) 972-7382
Gary R. Sherwood	Wisconsin Electric	(414) 755-2321
Tom Spry	Commonwealth Edison	(708) 515-7268
Patrick J. Naughton	Staff Eng. ISI/NDE/VA Power	(804) 273-3707
Kevin Tzeming	B&W Nuclear Service Co.	(804) 355-2893
W. Russell*	NRR	(301) 504-1274

*attended meeting at about 10:00 am

**REACTOR VESSEL CLOSURE HEAD ALLOY 600
PENETRATION ISSUE**

**NRC /WESTINGHOUSE OWNERS GROUP
AUGUST 18 AGENDA**

NON-PROPRIETARY OVERVIEW

- 8:30** ● **NRC Overview**

- 8:50** ● **Outline of WOG Activities Related
to Alloy 600**
 - a) Past**
 - b) Program Elements**

- 9:00** ● **Summary of Plant Operational
Experience**
 - a) Leakage**
 - b) Penetration Cracking**
 - c) Exposure Summary**

- 9:30** ● **Summary of 50.59 Safety
Evaluation**

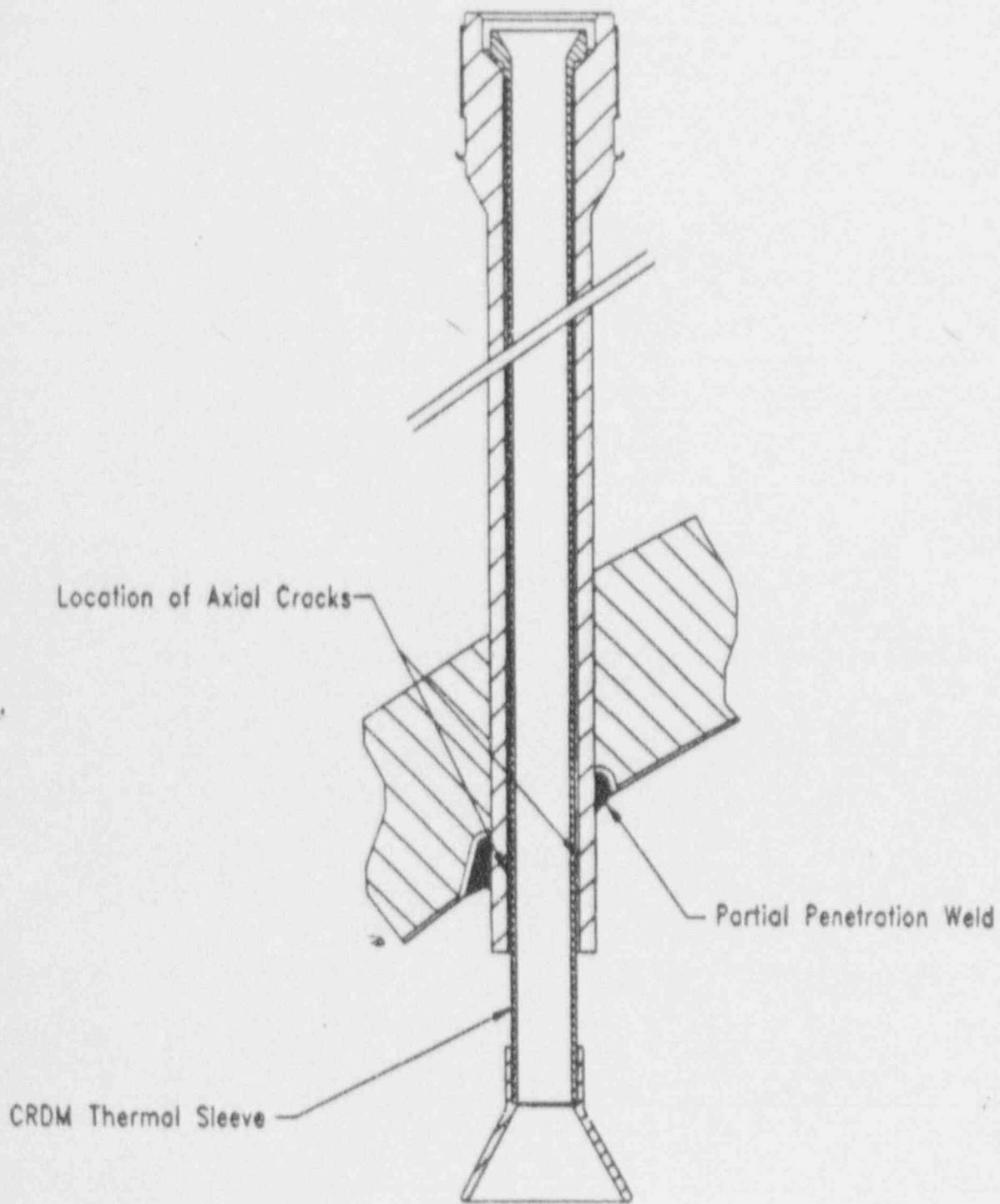
- 10:00** ● **Inspection**
 - a) Techniques**
 - b) Application**

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

NRC OVERVIEW

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

PENETRATION TUBE



R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

OUTLINE OF WOG ACTIVITIES

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

PROGRAM ELEMENTS - Phase 1

● OBJECTIVES

- Establish the extent of the issue applicable to Westinghouse supplied plants

● SCOPE OF WORK

- Monitor French program, assess and report root cause of cracking
- Obtain "Key Parameter" data relative to French plants
- Compare French data to processes utilized on Westinghouse plants
- Determine stress distributions (Operational & Residual) in a typical Westinghouse penetration

● SCHEDULE - 8/92

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

PROGRAM ELEMENTS - Phase 2

● OBJECTIVES

- Provide a basis for Continued Plant Operation with cracked penetrations
- Establish Methodology for Plant Susceptibility Screening

● SCOPE OF WORK

- Plant Operability Assessment with Cracked Penetrations
 - Finite Element Analysis (Elastic/Plastic)
 - Crack Propagation/Acceptable Flaw Size
 - Penetration Leakage/Vessel Wastage Assessment
 - Safety Evaluation per 10CFR-50.59
- Plant/Penetration Categorization/Penetration Susceptibility
 - Plant Screening/Susceptibility Criteria
 - Material Microstructure Characteristics
 - Leakage Detection Methods Survey

● SCHEDULE - 10/92

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

WOG PROGRAM - PRELIMINARY RESULTS

- CAUSE OF AXIAL CRACKING IN EDF PLANTS IS PWSCC

- NO CIRCUMFERENTIAL CRACKING FOUND TO DATE NOR PREDICTED

- AXIAL CRACKING IS NOT A SAFETY ISSUE, i.e., A SUCCESSFUL SAFETY EVALUATION IS EXPECTED

- WOG PLANTS HEAD PENETRATIONS MAY BE SUSCEPTIBLE TO CRACKING WITHIN THE OPERATIONAL EXPECTANCY OF THE PLANT

- SOME PLANTS MAY BE RELATIVELY LESS SUSCEPTIBLE THAN OTHERS

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

SUMMARY OF PLANT OPERATIONAL EXPERIENCE

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

SUMMARY OF PLANT OPERATIONAL EXPERIENCE

● LEAKAGE

- No Leakage Ever Reported During Plant Operation
- Only Leakage Detected Occurred at Bugey 3 During Hydrotest

● PENETRATION CRACKING

Plant	Hou. of Operation (K)	Total No. of Penetrations	No. of Penetrations Inspected	No. of Penetrations Cracked
Bugey 3	80	65	65	2
Bugey 4	81	65	65	8
Bugey 5	80	65	55	2
Fessenheim 1	86	65	26	1
Fessenheim 2	87	65	30	0
Paluel 1	47	78	78	0
Paluel 3	38	74	17	0
Paluel 4	36	74	31	5
St. Alban 1	35	74	4	2
Flamanville 2	31	74	4	0
Ringhals 2	112	65	65	6
Ringhals 3	96	65	60	0
Beznau 2	155	36	27	0
TOTALS		865	527	26

5% of Inspected Penetrations Have Cracks

3 loops
908 MW
clear to
20 plants
2 loops

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

SUMMARY OF PLANT OPERATIONAL EXPERIENCE

● EXPOSURE SUMMARY

● Typical Values for Bugey Plants

- TV Inspection on the Outside of the R/V Head ~ 18 Rem
- Dismantling 65 CRDMs ~ 25 Rem
- Removal of 65 CRDMs ~ 25 Rem
- Manual inspection (ECT & UT) for Bugey 4 ~ 25 Rem
- Robotic Inspection (ECT) for Bugey 5 ~ 10 Rem

● Ringhals 2

- Inspection ~ 21 Rem
- Repair ~ 5 Rem

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

SUMMARY OF 50.59 SAFETY EVALUATION

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

SAFETY EVALUATION

- Evaluation

The Evaluation will utilize information from the Westinghouse JCO and the original WOG program. In addition, the following items will form the basis of the successful 10 CFR 50.59 evaluation:

- **Stress Analysis** - To form the basis for the determination that the cracks will remain oriented axially, and will not be circumferential in nature.
- **Crack Propagation Analysis** - To form the basis for the determination that the cracks will not propagate beyond a predetermined point and will not lead to a catastrophic failure.
- **Limiting Crack Size** - Forms the basis for determining that the cracks will be "Tight". Also evaluating depth, critical flaw size, etc.
- **Leakage Assessment** - Will form the basis for the determination that any leakage will be extremely small and well within the normal makeup capability of the plant. The plant will remain within its licensing basis without a challenge to the SI system.
- **Corrosion Assessment** - An assessment of the effects of postulated leakage on the carbon steel of the reactor vessel head.
- **Determination of Unreviewed Safety Question**

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

INSPECTION

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

APPLIED INSPECTION TECHNIQUES

● VISUAL EXAMINATION

- Used both on I.D and OD of penetration
- Provides little information on flaw indication dimensions

● PENETRANT TEST (PT)

- Used both on ID and OD of penetration
- Requires thermal sleeve removal or modification to inspect ID
- Provides length information on flaw indications

● ULTRASONIC TEST (UT)

- Requires thermal sleeve removal or modification to perform inspection
- Provides depth and length data
- Requires couplant for application

● EDDY CURRENT TESTING (ECT)

- Applied between thermal sleeve or through thermal sleeve
- Provides length information on flaw indications

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

SUMMARY

- THIS ISSUE APPEARS NOT TO BE A SAFETY ISSUE

- DEVELOPING ACCEPTANCE CRITERIA AND EVALUATING INSPECTION/REPAIR/MITIGATION TECHNOLOGY

- NOVEMBER 92 MEETING TO REVIEW:
 - SAFETY EVALUATION
 - ACCEPTANCE CRITERIA
 - REPAIR METHODOLOGIES



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provide a basis for continued plant operation with cracked penetrations and to establish methodology for plant susceptibility screening. Phase 2 is scheduled to be completed by October 1992. The preliminary results of the program has shown that the axial cracking in the CRDM penetrations appears not to be a safety issue because the circumferential cracking of the penetrations is not expected. WOG will be back in November, 1992 to brief the staff regarding the final results of their Inconel 600 program. In the second session of the meeting, WOG presented some proprietary details of the on-going Inconel 600 program in the following areas of (1) key parameter summary and comparison to French/other plants with cracks; (2) analytical approach schematic; (3) penetration stress analysis; (4) penetration crack growth study; (5) penetration leakage assessment; (6) penetration leakage measurement systems summary; (7) plant susceptibility summary, and (8) inspection/repair strategies. WOG suggested that other affected owners groups should also participate in the development of the acceptance criteria in flaw evaluation.

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Therefore, the staff believes the risks to plant safety resulting from the CRDM penetration cracking are very low.

At the end of the meeting the staff requested WOG to prepare a systematic analysis of the issue, and present the results of their analysis of the following items during the November meeting:

- (1) safety analysis;
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- (7) inspection program.

ISI Ret for

Jack R. Strosnider, Chief
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Division of Engineering Technology

Enclosures:

- 1. A List of Meeting Attendees
- 2. WOG Presentation Materials

cc: B.D. Liaw
W.T. Russell
J. Partlow
T. Murley
F. Miraglia
W. Rosin, NUMARC
J. Taylor, B&WOG
J. Hutchinson, CEOG

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Seth Swamy	Westinghouse - NATD	(412) 374-6513
Hank Sepp	Westinghouse - Nuclear Safety	(412) 374-5282
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Anthony W. Robinson	B&W Nuclear Service Co.	(804) 385-3290
David E. Whitaker	Duke Power Company	(704) 382-7246
Jim Taylor	B&W Nuclear Technologies	(804) 385-2817
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Theresa Meisenheimer	Bechtel	(301) 417-4868
William A. Cross	STS	(301) 652-2500
A.J. Butcavage	Rochester Gas & Electric	(716) 546-2700
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Kevin Tzeming	B&W Nuclear Service Co.	(804) 355-2893
W. Russell*	NRR	(301) 504-1274

*attended meeting at about 10:00 am

**REACTOR VESSEL CLOSURE HEAD ALLOY 600
PENETRATION ISSUE**

**NRC /WESTINGHOUSE OWNERS GROUP
AUGUST 18 AGENDA**

NON-PROPRIETARY OVERVIEW

- 8:30** ● **NRC Overview**

- 8:50** ● **Outline of WOG Activities Related
to Alloy 600**
 - a) Past**
 - b) Program Elements**

- 9:00** ● **Summary of Plant Operational
Experience**
 - a) Leakage**
 - b) Penetration Cracking**
 - c) Exposure Summary**

- 9:30** ● **Summary of 50.59 Safety
Evaluation**

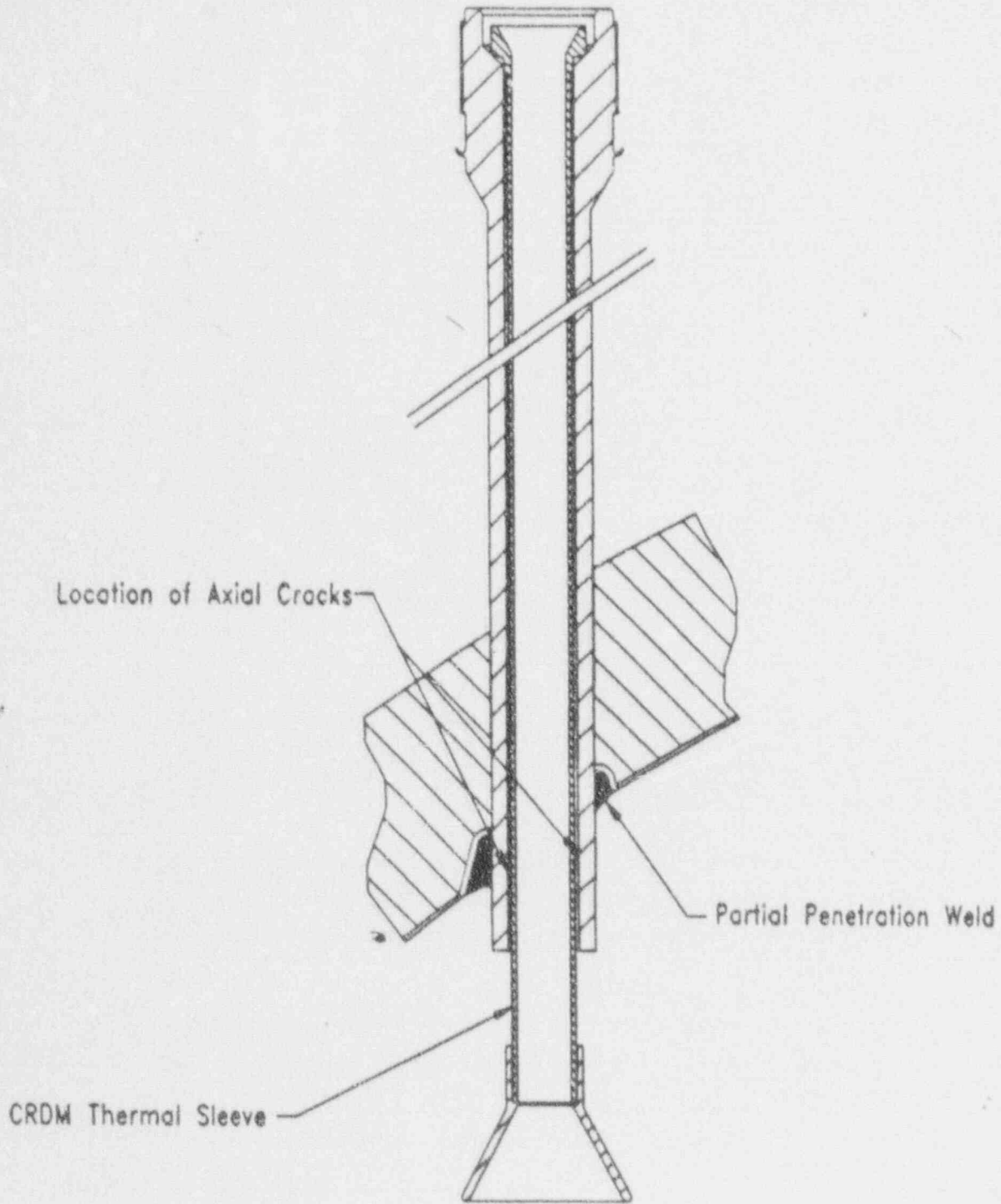
- 10:00** ● **Inspection**
 - a) Techniques**
 - b) Application**

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

NRC OVERVIEW

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

PENETRATION TUBE



R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

OUTLINE OF WOG ACTIVITIES

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

PROGRAM ELEMENTS - Phase 1

● OBJECTIVES

- Establish the extent of the issue applicable to Westinghouse supplied plants

● SCOPE OF WORK

- Monitor French program, assess and report root cause of cracking
- Obtain "Key Parameter" data relative to French plants
- Compare French data to processes utilized on Westinghouse plants
- Determine stress distributions (Operational & Residual) in a typical Westinghouse penetration

● SCHEDULE - 8/92

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

PROGRAM ELEMENTS - Phase 2

● OBJECTIVES

- Provide a basis for Continued Plant Operation with cracked penetrations
- Establish Methodology for Plant Susceptibility Screening

● SCOPE OF WORK

- Plant Operability Assessment with Cracked Penetrations
 - Finite Element Analysis (Elastic/Plastic)
 - Crack Propagation/Acceptable Flaw Size
 - Penetration Leakage/Vessel Wastage Assessment
 - Safety Evaluation per 10CFR-50.59
- Plant/Penetration Categorization/Penetration Susceptibility
 - Plant Screening/Susceptibility Criteria
 - Material Microstructure Characteristics
 - Leakage Detection Methods Survey

● SCHEDULE - 10/92

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

WOG PROGRAM - PRELIMINARY RESULTS

- CAUSE OF AXIAL CRACKING IN EDF PLANTS IS PWSCC

- NO CIRCUMFERENTIAL CRACKING FOUND TO DATE NOR PREDICTED

- AXIAL CRACKING IS NOT A SAFETY ISSUE, i.e., A SUCCESSFUL SAFETY EVALUATION IS EXPECTED

- WOG PLANTS HEAD PENETRATIONS MAY BE SUSCEPTIBLE TO CRACKING WITHIN THE OPERATIONAL EXPECTANCY OF THE PLANT

- SOME PLANTS MAY BE RELATIVELY LESS SUSCEPTIBLE THAN OTHERS

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

SUMMARY OF PLANT OPERATIONAL EXPERIENCE

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

SUMMARY OF PLANT OPERATIONAL EXPERIENCE

● LEAKAGE

- No Leakage Ever Reported During Plant Operation
- Only Leakage Detected Occurred at Bugey 3 During Hydrotest

● PENETRATION CRACKING

Plant	Hours of Operation (K)	Total No. of Penetrations	No. of Penetrations Inspected	No. of Penetrations Cracked
Bugey 3	80	65	65	2
Bugey 4	81	65	65	8
Bugey 5	80	65	55	2
Fessenheim 1	86	65	26	1
Fessenheim 2	87	65	30	0
Paluel 1	47	78	78	0
Paluel 3	38	74	17	0
Paluel 4	36	74	31	5
St. Alban 1	35	74	4	2
Flamanville 2	31	74	4	0
Ringhals 2	112	65	65	6
Ringhals 3	96	65	60	0
Beznau 2	155	36	27	0
TOTALS		865	527	26

5% of Inspected Penetrations Have Cracks

3 loops
900 MW
2 plants
2 loops

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

SUMMARY OF PLANT OPERATIONAL EXPERIENCE

● EXPOSURE SUMMARY

● Typical Values for Bugey Plants

- TV Inspection on the Outside of the R/V Head ~ 18 Rem
- Dismantling 65 CRDMs ~ 25 Rem
- Removal of 65 CRDMs ~ 25 Rem
- Manual Inspection (ECT & UT) for Bugey 4 ~ 25 Rem
- Robotic Inspection (ECT) for Bugey 5 ~ 10 Rem

● Ringhals 2

- Inspection ~ 21 Rem
- Repair ~ 5 Rem

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

SUMMARY OF 50.59 SAFETY EVALUATION

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

SAFETY EVALUATION

- **Evaluation**

The Evaluation will utilize information from the Westinghouse JCO and the original WOG program. In addition, the following items will form the basis of the successful 10 CFR 50.59 evaluation:

- **Stress Analysis** - To form the basis for the determination that the cracks will remain oriented axially, and will not be circumferential in nature.
- **Crack Propagation Analysis** - To form the basis for the determination that the cracks will not propagate beyond a predetermined point and will not lead to a catastrophic failure.
- **Limiting Crack Size** - Forms the basis for determining that the cracks will be "Tight". Also evaluating depth, critical flaw size, etc.
- **Leakage Assessment** - Will form the basis for the determination that any leakage will be extremely small and well within the normal makeup capability of the plant. The plant will remain within its licensing basis without a challenge to the SI system.
- **Corrosion Assessment** - An assessment of the effects of postulated leakage on the carbon steel of the reactor vessel head.
- **Determination of Unreviewed Safety Question**

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

INS ECTION

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

APPLIED INSPECTION TECHNIQUES

● VISUAL EXAMINATION

- Used both on I.D and OD of penetration
- Provides little information on flaw indication dimensions

● PENETRANT TEST (PT)

- Used both on ID and OD of penetration
- Requires thermal sleeve removal or modification to inspect ID
- Provides length information on flaw indications

● ULTRASONIC TEST (UT)

- Requires thermal sleeve removal or modification to perform inspection
- Provides depth and length data
- Requires couplant for application

● EDDY CURRENT TESTING (ECT)

- Applied between thermal sleeve or through thermal sleeve
- Provides length information on flaw indications

R/V CLOSURE HEAD ALLOY 600 PENETRATION ISSUE

SUMMARY

- THIS ISSUE APPEARS NOT TO BE A SAFETY ISSUE

- DEVELOPING ACCEPTANCE CRITERIA AND EVALUATING INSPECTION/REPAIR/MITIGATION TECHNOLOGY

- NOVEMBER 92 MEETING TO REVIEW:
 - SAFETY EVALUATION
 - ACCEPTANCE CRITERIA
 - REPAIR METHODOLOGIES