CERTIFIED COPY
DATE ISSUED: Jan. 8, 1988

SUMMARY/MINUTES OF THE JOINT ACRS
SUBCOMMITTEE ON METAL COMPONENTS AND
THERMAL HYDRAULIC PHENOMENA
DECEMBER 15, 1987
WASHINGTON, D.C.

The ACRS Subcommittees on Metal Components and Thermal Hydraulic Phenomenon met on December 15, 1987 in Washington, D.C. to review 1) the North Anna, Unit 1, steam generator tube rupture failure and 2) D. L. Johnson's comments on proposed revision to acceptance criteria for the ECCS rule with respect to steam generator tube integrity.

Notice of the meeting was published in the Federal Register on December 7, 1987 (Attachment A). The schedule of items covered in the meeting is in Attachment B. A list of the handouts filed with the office copy of the minutes is included in Attachment C. There were no written or oral statements received or presented from members of the public at this meeting. F. Igne and P. Boehnert were the cognizant ACRS Staff members for the meeting.

Principal Attendees:

ACRS
P. Shewmon, Chairman, Metal Components Subc.
D. Ward, Chairman, Thermal Hydr. Phenon.
C. Michelson, Member
G. Reed, Member
C. Wylie, Member
J. Ebersole, Member
P. Boehnert, ACRS Staff
E. Igne, ACRS Staff

W. Kerr, Member
T. Kassner, ACRS Consultant

NRC

J. Richardson, NRR
G. Murphy, NRR
N. Laubew, RES

VEPCO
M. L. Bowling
D. Vande Walle

Westinghouse Electric
K. Huffman

DESIGNATED ORIGINAL

Certified By EMB

E. Rodabaugh, ACRS Consultant
I. Carron, ACRS Consultant

T. Pitterle
G. Whiteman
Other
D. L. Johnson

Highlights:

1. M. L. Bowling, VEPCO, discussed the July 15, 1987 steam generator tube rupture event at North Anna, Unit 1, and the evaluations and following actions performed and planned by VEPCO. He discussed the detailed sequence of events including the response of the operators and key plant equipment, the radiological effects of the events; VEPCO's evaluation of the implementation of this emergency plans, the safety consequences and significance of the event, and the lessons learned and corrective actions taken or planned by VEPCO is a result of the event.

2. From the operational aspects, he stated that a) the safety related equipment responded as expected b) the ruptured steam generator was isolated within 13 minutes without overfilling or lifting safety valves and c) the DCS pressure stablized within 34 minutes without lifting safety valves and going solid in the pressurizer.

3. With regard to the impact on safety, he stated that a) the event was bounded by the plant's events analyzed in the updated FSAR, b) the core safety limits were not exceeded c) the shutdown and thermal margins were maintained and d) the radioactive releases were significantly less than 10 CFR 100 limits.

4. M. L. Bowling, stated that the basis for plant restart includes the following:

   . reduced local fluid forces by adding downcomer flow resistance plates,
   . preventive plugging of susceptible tubes, and
   . improved leakage monitoring.

5. With respect to leakage monitoring, the following methods are employed:

   . N-16 (continuous)
   . Air ejector radiation monitor (ever 4 hours),
   . Air ejector grab samples (every 8 hours), and
   . Primary and secondary isotopics (every 24 hours)

He stated that if leakage exceeds 100 gpd from one steam generator (or 300 gpd total), the plant will be placed in hot shutdown within 6 hours. If there is a increase in leakage from all steam generators exceeding 60 gpd between surveillances, the plant will reduce power below 50% within 90 minutes. These criteria should provide ample time to prevent tube rupture by high cycle fatigue.

6. K. Huffman, Westinghouse Electric Corp. discussed the failure mechanism which was involved in the North Anna event. The steam generator was a Model 51 manufactured by Westinghouse Electric Corp. The tubes are fabricated of mill annealed alloy 600 tubes.

The support plates are of carbon steel. The failure was caused by high cycle fatigue and had not been previously encountered.

- upper support plant denting which constrains the tubes causing lower damping and high mean stress in the tubes, and
- flow induced tube vibration which causes excessive deflection in the unsupported tube.

The excessive tube vibration, low damping, and high mean stress can result in a high cycle fatigue failure.

Westinghouse's approach to solving the problem was to reduce the flow induced vibration by adding a downcomer resistance plate. Experiments and analysis confirmed that this reduced the flow induced vibration to a level which would not cause high cycle fatigue failure.

7. Other plants which may have this same problem are being investigated by the industry and the NRC Staff. The plants identified with the potential for this same tube fatigue problem are Indian Point 2&3, Point Beach, Haddam Neck, and Salem.

8. Mr. Dan L. Johnson discussed his concerns regarding steam generator tube integrity. His concerns can be summarized as follows:

   - There have been, and are, continuing problems with loss of steam generator tube integrity caused by various degradation mechanisms (e.g. denting, fretting, corrosion, etc.)

. The hydraulic loads expected during a large break LOCA could cause multiple steam generator tube ruptures and this issue should be addressed.

. Rupture of a large number of tubes raises the issue of return to power or recriticality due to dilution of borated reactor coolant system water by the intrusion of secondary system water.

. Rupture of the right number of steam generator tubes may excerbate steam binding and hinder core refill/reflood.

In response to Mr. Reed, Mr. Johnson indicated that his concerns are greatly reduced in importance if the "classical" - large break LOCA is not deemed to have a significant probability for occurring.

N. Lanbew (RES) discussed the NRC response to Mr. Johnson's concerns. RES agrees that Mr. Johnson concerns should be evaluated. A Generic Issue (GI-141, "Large Break LOCA concurrent with Steam Generator Tube Rupture") has been established for these concerns. The Generic Issue will be prioritized by the NRC by February, 1988.

D. Ward stated that he is satisfied with the NRC Staff's approach for evaluating this issue.

****** ****** ******

NOTE: Additional meeting details can be obtained from a transcript of this meeting available in the NRC Public Document Room, 1717 H St., NW., Washington, D.C. or can be purchased from Heritage Reporting Corporation, 1220 L Street, NW., Washington, D.C. 20005, (202) 628-4888.

ATTACHMENT A

LEAR REGULATORY MISSION

Advisory Committee on Reactor Safeguards; Joint Subcommittees on Metal Components and Thermal Hydraulic Phenomena; Notice of Meeting

The ACRS Subcommittees on Metal Components and Thermal Hydraulic Phenomena will hold a joint meeting on December 15, 1987, Room 1046, 1717 H Street, NW., Washington, DC.

To the extent practical the meeting will be open to public attendance. However, portions of the meeting may be closed to discuss Westinghouse proprietary information.

The agenda for the subject meeting shall be as follows:

Tuesday, December 15, 1987—8:30 a.m. until the conclusion of business

The Subcommittees will review: (1) The North Anna steam generator tube failure, and (2) R.L. Johnson's comments on proposed revision to acceptance criteria for the ECCS rule with respect to steam generator tube integrity.

Oral statements may be presented by members of the public with the concurrence of the Subcommittee Chairman; written statements will be accepted and made available to the Committee. Recordings will be permitted only during those portions of the meeting when a transcript is being kept, and questions may be asked only by members of the Subcommittee, its consultants, and Staff. Persons desiring to make oral statements should notify the ACRS staff member named below as far in advance as is practicable so that appropriate arrangements can be made.

During the initial portion of the meeting, the Subcommittee, along with any of its consultants who may be present, may exchange preliminary views regarding matters to be considered during the balance of the meeting.

The Subcommittee will then hear presentations by and hold discussions with representatives of the NRC Staff, its consultants, and other interested persons regarding this review.

Further information regarding topics to be discussed, whether the meeting has been cancelled or rescheduled, the Chairman's ruling on requests for the opportunity to present oral statements and the time allotted therefor can be obtained by a prepaid telephone call to the cognizant ACRS staff member, Mr. Elpidio Igne (telephone 202/634-3267) between 8:15 a.m. and 5:00 p.m. Persons planning to attend this meeting are urged to contact the above named individual one or two days before the scheduled meeting to be advised of any changes in schedule, etc., which may have occurred.

Date: December 1, 1987.

Morton W. Libarkin,

Assistant Executive Director for Project Review.

[FR Doc. 87-28019 Filed 12-4-87; 8:45 am]

BILLING CODE 7590-01-M

Regulatory Guide; Issuance, Availability

The Nuclear Regulatory Commission has issued a revision to a guide in its Regulatory Guide Series. This series has been developed to describe and make available to the public such information as methods acceptable to the NRC staff for implementing specific parts of the Commission's regulations, techniques used by the staff in evaluating specific problems or postulated accidents, and data needed by the staff in its review of applications for permits and licenses.

Revision 1 to Regulatory Guide 5.62, "Reporting of Safeguards Events," provides an approach acceptable to the NRC staff for determining when and how an event should be reported. These safeguards events are those that threaten nuclear activities or lessen the effectiveness of a security system.

Comments and suggestions in connection with (1) items for inclusion in guides currently being developed or (2) improvements in all published guides are encouraged at any time. Written comments may be submitted to the Rules and Procedures Branch, Division of Rules and Records, Office of Administration and Resources Management, U.S. Nuclear Regulatory Commission, Washington, DC 20555.

Regulatory guides are available for inspection at the Commission's Public Document Room, 1717 H Street NW., Washington, DC. Copies of issued guides may be purchased from the Government Printing Office at the current GPO price. Information on current GPO prices may be obtained by contacting the Superintendent of Documents, U.S. Government Printing Office, Post Office Box 37082, Washington, DC 20013-7082, telephone (202) 275-2060 or (202) 275-2171. Issued guides may also be purchased from the National Technical Information Service on a standing order basis. Details on this service may be obtained by writing NTIS, 5285 Port Royal Road, Springfield, VA 22161.

(5 U.S.C. 552(a))

Dated at Rockville, Maryland, this 1st day of December 1987.

For the Nuclear Regulatory Commission.

Eric S. Beckjord,

Director, Office of Nuclear Regulatory Research.

[FR Doc. 87-28020 Filed 12-4-87; 8:45 am]

BILLING CODE 7590-01-M

Regulatory Guide; Issuance, Availability

The Nuclear Regulatory Commission has issued a new guide in its Regulatory Guide Series. This series has been developed to describe and make available to the public such information as methods acceptable to the NRC staff for implementing specific parts of the Commission's regulations, techniques used by the staff in evaluating specific problems or postulated accidents, and data needed by the staff in its review of applications for permits and licenses.

Regulatory Guide 1.156, "Environmental Qualification of Connection Assemblies for Nuclear Power Plants," describes a method acceptable to the NRC staff for environmental qualification of quick-disconnect connection assemblies for service in nuclear power plants. The guide endorses IEEE Std 572-1985, "Qualification of Class IE Connection Assemblies for Nuclear Power Generating Stations."

Comments and suggestions in connection with (1) items for inclusion in guides currently being developed or (2) improvements in all published guides are encouraged at any time. Written comments may be submitted to the Rules and Procedures Branch, Division of Rules and Records, Office of Administration and Resources Management, U.S. Nuclear Regulatory Commission, Washington, DC 20555.

Regulatory guides are available for inspection at the Commission's Public Documents Room, 1717 H Street NW., Washington, DC. Copies of issued guides may be purchased from the Government Printing Office at the current GPO price. Information on current GPO prices may be obtained by contacting the Superintendent of Documents, U.S. Government Printing Office, Post Office Box 37082, Washington, DC 20013-7082, telephone (202) 275-2060 or (202) 275-2171. Issued guides may also be purchased from the National Technical Information Service on a standing order basis. Details on this service may be obtained by writing NTIS, 5285 Port Royal Road, Springfield, VA 22161.

(5 U.S.C. 552(a))

Dated at Rockville, Maryland, this 1st day of December 1987.

ATTACHMENT B

DRAFT #3
IGNE5:AGENDA MC

TENTATIVE AGENDA
JOINT SUBCOMMITTEE MEETING
METAL COMPONENTS/THERMAL HYDRAULIC PHENOMENA
ON STEAM GENERATOR INTEGRITY
WASHINGTON, D.C.
DECEMBER 15, 1987

8:30 - 8:45 a.m. I. Chairman's Statements

8:45 - 10:00 a.m. II. North Anna Steam Generator Tube Failure

- VEPCO Presentation (Suggested Topics)

. Introduction & Background
. Sequence of Events
. Operators Action
. Leak rate & Detection
. Lessons Learned

10:00 - 10:15 a.m. ****** BREAK ******

10:15 - 12:15 p.m. - W Presentation

. Metalurgical Examination
. Mechanism of Failure
. Fracture Mechanics and Strength Analysis
. Stability of Tubes, Structural/ Fluid Flow Interactions
. Propose fixes and basis
. Generic Implications
. Discussion on multiple tube ruptures

~~12:15 - 1:15~~ p.m. 1:05 - 2:20 - NRR Discussion

- Will be available to answer Subcommittee's questions

12:05 - 1:05

~~1:15~~ - 2:15 p.m. ****** LUNCH ******

III. D. L. Johnson's Concern on Steam Generator Integrity

2:20

~~2:15~~ - ~~3:45~~ p.m 3:05 . Johnson's presentation

3:05 3:15 ~~3:45 - 4:00~~ p.m.	******	BREAK	******
		Discussion by NRC Staff	
3:15 4:00 ~~4:00 - 4:15~~ p.m.		- Office of Research, N. Lauben	
4:15 - 4:45 p.m. 4:00 - 4:10 p.		- Office of NRR, (Will be available to answer Subcommittee's questions)	
4:45 - 5:00 p.m.	IV.	Subcommittee Discussion & Adjournment	
		o Proposed Action Items	

Status Report to full ACRS

North Anna
P G Shewmon 15 min

D. L. Jackson's Concern
R. Ward 15 min

TENTATIVE AGENDA
JOINT SUBCOMMITTEE MEETING
METAL COMPONENTS/THERMAL HYDRAULIC
ON STEAM GENERATOR INTEGRITY
WASHINGTON, D.C.
DECEMBER 15, 1987

8:30 - 8:45 a.m. I. Chairman's Statements

8:45 - 10:00 a.m. II. North Anna Steam Generator Tube Failure

- VEPCO Presentation
(M. L. Bowling, Assistant Station Manager)
  - Introduction
  - Sequence of Events
  - Operational Aspects
  - Impact on Safety and Radiological Effects
  - Basis for Return to Service
  - Lessons Learned

10:00 - 10:15 a.m. ******* BREAK *******

10:15 - 12:15 p.m.

- W Presentation
(K. L. Huffman, Manager
NDE Center and STD Programs)
  - Failure Mechanism
  - Steam Generator 'C', R9C51 Tube Condition
  - Corrective Actions
  - Generic Considerations

ATTACHMENT C

HANDOUTS FOR DECEMBER 15, 1987
SUBCOMMITTEE MEETING

1. North Anna Unit 1, July 15, 1987 Steam Generator Tube Rupture Event Presentation, December 10, 1987, Revision 3

2. Memo to Carl H. Berlinger, Generic Communications Branch Chief, Division of Operational Events Assessment, dated December 15, 1987 from W. J. Johnson, Manager, Nuclear Safety Dept. Westinghouse Electric Corp. Subject: North Anna Unit 1 Steam Generator Evaluation

3. Slides on:
   1. High Cycle Fatigue Failure
   2. Dented, Unsupported Tubes
   3. Local Flow Effects Important
   4. Few Tubes Potentially Involved