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INDIAN POINT UNIT 2 STEAM GENERATOR TUBE FAILURE LESSONS LEARNED TASK GROUP

BRIEFING FOR NRR OFFICE DIRECTOR
OCTOBER 18, 2000

J/132

AGENDA

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1.0 INTRODUCTION

- **Charter**
  - Multi-discipline Inter-Office Team
  - Support from OGC and others
- **Scope**
- **Stakeholder Interface**
- **Comments on Report**

2.0 SAFETY SIGNIFICANCE

- **Event itself had no impact on public health and safety**
  - Plant shut down safely
  - No radiological consequences
  - Sufficient safety margin still existed
  - NRC's performance goals and measures for maintaining reactor safety were not exceeded (i.e., frequency of events < 1E-3 per year)

- **Risk assessment for Significance Determination Process (SDP)**
  - Increased risk from degraded SG tube condition over operating cycle
  - Deficiencies in Con Ed's SG tube integrity program
  - Reduced safety margin - ΔLERF order 1E-4 per year → "red" finding

- **Risk communications**
  - Difficult to communicate safety significance and risk perspectives to stakeholders

- **Generic implications**
  - SGTRs have occurred and will occur again (frequency approx. 5E-3/ry)
  - SGTR can be an important risk consideration at all PWRs

- **Recommendations**
  - Con Ed must correct deficiencies in its SG tube integrity program
  - NRC and industry should improve oversight of licensee SG integrity programs
  - NRC should incorporate experience from IP2 event and SDP process into initiatives on risk communication

3.0 CON ED AND INDUSTRY INITIATIVE NEI 97-06

- **Con Ed**
  - Corrective actions should proceed in accordance with process

- **Industry Initiative NEI 97-06 - effective way to proceed**
  - NRC/NEI - High Priority - Use SECY 00-0116 process
  - NEI implement lessons learned at plants
  - NEI incorporate lessons learned into framework
    - Technical Specifications
    - Vendor oversight by licensees
  - NRC issue generic communication

4.0 EPRI GUIDELINES

Recommendations for Improvements to EPRI Guidelines

- **Examination Methods**
  - Significance of qualification of techniques for sizing in assessments
  - Effect of sizing accuracy and threshold of detection in assessments
  - Guidelines for computerized screening of data
  - Applicability of generic guidance to plant-specific situations - e.g., generic vs. site validation of techniques
  - Hourglassing in flow slots - quantitative definition and how to evaluate

- **Data quality standards**
  - Negative effects of signal noise - guidance on when to consider noise excessive, source of noise, possible solutions, caution about noise in newer tubes

- **Evaluating new forms of degradation**
  - Conservative approach for screening tubes for in-situ testing
  - Examination methods that consider potential for new forms of degradation
  - Caution about reliance on predictive models

5.0 RES INDEPENDENT TECHNICAL REVIEW OF SAFETY EVALUATION

- **Conclusions**
  - Con Ed's operational assessment (i.e., 1999 response to RAI) was weak
  - Real problem stemmed back to poor inspection in 1997 by Con Ed
  - Con Ed & Westinghouse missed significance of row 2 U-bend apex crack found first time in 1997
  - Number of opportunities for Con Ed and NRC to identify problems with IP2 operational assessment
  - Knowledgeable NRC staff is essential for adequate SG oversight
  - Technical review and coordination between NRR & RES enhanced agency's ability to address SG issues
  - Coordination of review process can be improved

- **Recommendations**
  - Licensees should determine implications on SG operational assessment when a new type of degradation occurs for the first time
  - NRC should maintain SG expertise to support objectives of licensing & inspection programs
  - When NRR requests RES to perform an independent technical review of staff's safety evaluation, NRR and RES should develop a process for handling request and response

6.0 NRC REGULATORY PROCESS ISSUES

6.1 Inspection Program

- **Conclusion and Recommendations**

  - No specific guidance in the Inspection Program for the scope and depth of SG Tube inspections (ISI)

    Recommendation: Improvement in guidance, e.g. when to select SG Tube examination for inspections

  - Inspector training not designed to develop inspector expertise, therefore inspection process not designed, nor expected to preclude IP2

    Recommendation: Training to match inspection guidance and inspection objective

  - Inconsistent (untimely) communication of relevant technical information to the inspectors; and involvement of inspectors in NRR/Licensee Outage Phone Calls

    Recommendations: Factor NRR/Licensee telephone calls into inspection program (Involve regions - use as inspection preparation, aid etc..)

    Technical staff and regions to improve getting generic information to inspectors

  - No threshold in the ROP baseline inspection or PIs applicable to SG tube degradation following inspections, or primary-to-secondary leakage during power operation

    Recommendations: Establish risk-informed threshold for the results of the SG Tube examination baseline inspection and/or PI to identify SG Tube degradation

    Establish risk-informed threshold in PIs and/or SDP for primary-to-secondary leakage during power operation (indication of degradation)

    Ensure uniformity of PI reporting requirements (for normal and failed SG conditions) by all licensee

6.2 Licensing Review Process

- **Conclusions**

  - Scope and depth of the NRC review for Amendment No. 201 was consistent with guidance in OL No. 803.

  - There were two opportunities during the license review process for the NRC staff to find inadequacies in the licensee's operational assessment. However, it is not clear if further follow-up in either one of these cases would have yielded a different result (e.g., denial of the amendment request).

  - The IP2 SG tube failure occurred approximately 8 months after the originally scheduled inspection date (i.e., less than the duration justified by the recapture of the 10-month wet lay-up period). Therefore, the SG inspection interval extension of approximately 2 months, associated with the issuance of Amendment No. 201, did not contribute to the tube failure event in February 2000. This conclusion is based on the fact that the tube failure took place in less than the number of effective full power days that was allowed between SG inspections.

  - No specific guidance is available for reviewers to perform license amendment reviews associated with SG inspection interval extensions.

- **Recommendations**

  - The NRC staff SEs should be specific as to what information is relied on to form the basis for its conclusions (i.e., basis for approving the amendment). OL No. 803 should be revised accordingly.

  - The NRC staff should develop formal written guidance for technical reviewers to utilize in performing license amendment reviews related to SG tube integrity. The guidance should address when the staff should review previous licensee examination reports.

7.0 TASK GROUP EVALUATION OF INTERNAL REPORTS

7.1 Task Group Evaluation of RES Report

RES: The 48 day extension would not have appreciably increased probability of SG tube failure if the original 24-month examination interval was justified.

TG: Agrees that the 1997 SG examination performed by Con Ed was the underlying basis for the amendment and was deficient (ES; Sections 7.2, 7.3).

The February event preceded a 24-month examination extension interval if the plant had operated continuously (ES; Appendix A timeline).

RES: Could not "reconcile several statements in the SE with....information they reviewed." Licensee's response to RAI was weak and incomplete."

TG: The TG and Con Ed agreed that the RAI response was weak. (Section 7.2).

NRC staff could have pursued review of the July 1997 Con Ed examination report. It is not clear to the TG if it would have changed the outcome of the review or uncovered issues related to the root cause of the tube failure. However, if the amendment was denied, the scheduled examination would have preceded the event (ES; Section 8.1).

No review guidance existed on how to consider licensee SG examination reports. TG recommends development of review guidance and need/process for these reports (ES; Section 8.1).

Revise OF 803 regarding incorrect information in licensee submittals that was not relied on to support conclusion (Section 8.1).

RES: A more thorough operational assessment for PWSCC at a row 2 U-bend by Con Ed would have predicted an increased probability of tube leakage or rupture (discussion of first U-bend flaw discovery, denting and hourglassing, and evaluation of Con Ed discussion of growth rates provided in report).

TG: Agrees that denting and hourglassing and new U-bend flaw discovery were not thoroughly analyzed by Con Ed (ES; Region I inspection).

Projection of growth rates as discussed in RES report were not a primary contributor to tube failure (Section 6.2).

7.2 Task Group Evaluation of OIG Report

OIG: NRR's review of the SG inspection interval amendment request was not adequate.

TG: In hindsight, during the amendment review process, the issue regarding PWSCC degradation that was found in 1997 in the row 2 U-bend (SG 24, tube R2C67) could have been pursued further. However, it is not clear if this would have changed the outcome of the license amendment request.

OIG: The amendment request asked for a 1 year extension and was approved by NRR based on an SE completed by a junior engineer with limited experience in SG inspection techniques.

TG: The amendment had the effect of recapturing the time the plant was in wet lay-up (approximately 10 months) and also justified SG operation for an additional period of approximately 2 months. The SE technical considerations associated with justifying the recapture of the 10 month wet lay-up period involved assessing that chemistry conditions were maintained such that corrosion was minimized. No issues have been raised with respect to the validity of the SE conclusions regarding chemistry conditions. In addition, the additional period of approximately 2 months was considered insignificant by the NRR staff. The review was not of sufficient technical complexity such that a senior reviewer or contractor would be required. The SG inspection interval extension of approximately 2 months, associated with the issuance of Amendment No. 201, did not contribute to the tube failure event in February 2000.

OIG: During the amendment review process, the senior engineer did not review the source documents submitted by IP2 or the 1997 inspection report.

TG: Detailed review of the submittal and other source documents is normally conducted by the assigned technical reviewer (i.e., person that prepares the SE). It is not clear that senior engineer review of the Con Ed submittal (i.e., amendment application and RAI response) and the 1997 inspection report would have yielded a different result with respect to the license amendment.

OIG: Other technical expertise available to the NRR staff was not employed to review the 1997 inspection report or the amendment request.

TG: Tthe resources used in the review were appropriate given the complexity and safety significance of the proposed change. The review was not of sufficient technical complexity that a senior reviewer or contractor would be required.

OIG: Although the junior engineer was not completely satisfied with the response to the RAI, no additional questions were asked by the NRC of IP2.

TG: Review and interaction with the licensee during the review process was consistent with NRR OL No. 803. To meet staff timeliness goals, and to minimize unnecessary regulatory burden, a "goal" of the review process is to limit the RAIs to one round; however additional questions may be asked, if necessary. In discussions with the Task Group, the reviewer (i.e., "junior engineer") stated that the RAI response was considered "adequate" during the amendment review timeframe.

OIG: OIG found nearly no involvement in the amendment request review by either the NRR Project Manager assigned to IP2 or the EMCB Branch Chief.

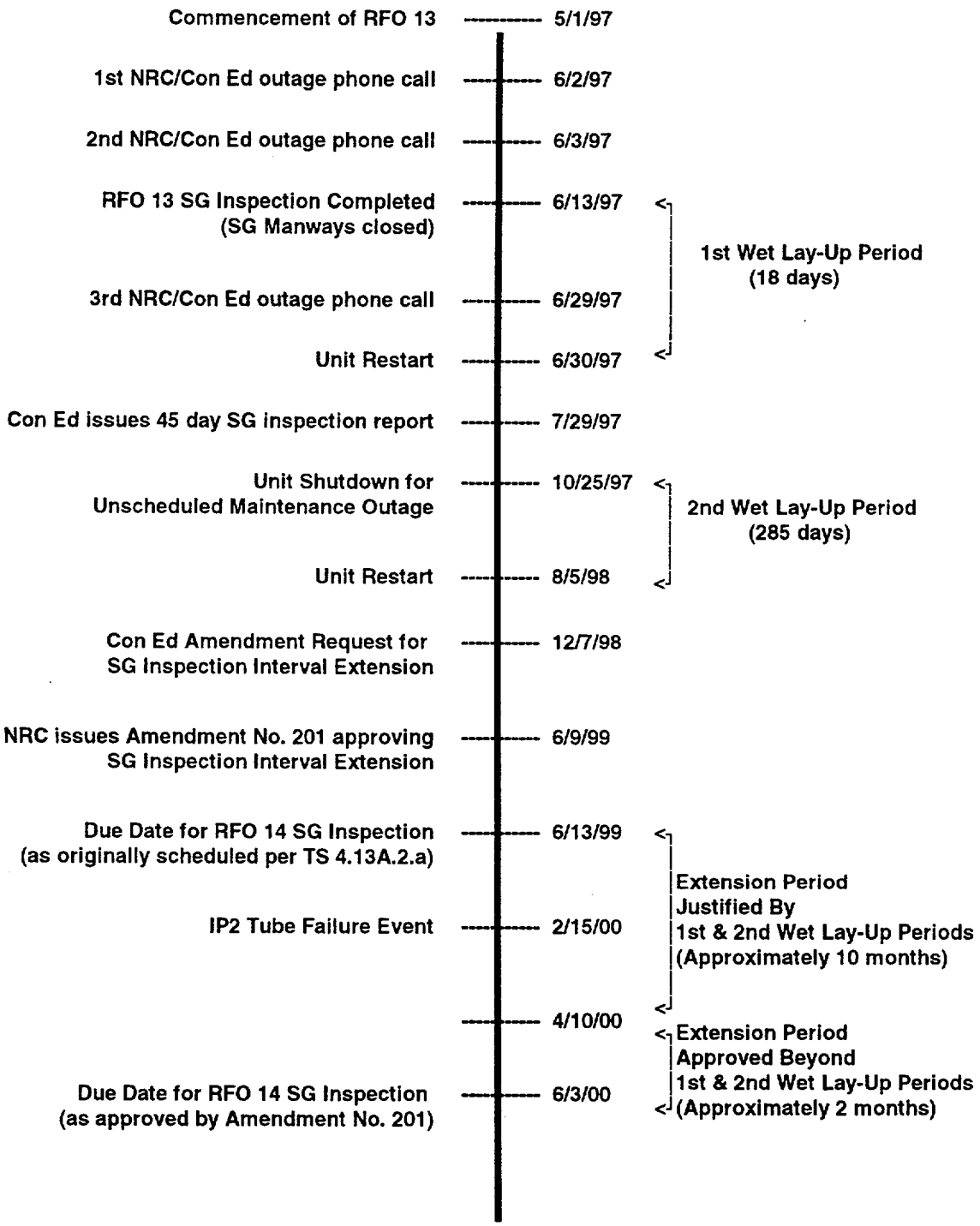
TG: The PM involvement was consistent with the guidance in OL No. 803, given the technical complexity of the review. Consistent with normal practices, EMCB branch supervision provided oversight of the technical reviewer, review of the RAI questions, and review of the completed SE.

OIG: Had the NRC staff or contractor with technical expertise evaluated the 1997 results of the IP2 SG inspection, the NRC could have identified the flaw in the U-bend of row 2, column 5, in SG 24 that was indicated in the licensee's inspection (examination) report.

TG: The NRC staff could not have identified the tube that failed from its review of the licensee's examination report.

ATTACHMENTS

IP2 SG Inspection Timeline



Background

Task Group

- Assembled in accordance with Charter
- Integrated Assessment: Technical and Process Issues
- Multi-disciplinary Team Effort: NRR, RES, Region
- Support from OGC and others as needed

Task Group

Task Group Organization:

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Task Group Objectives

1. Identify and recommend areas for improvement applicable to the NRC and/or industry based on an evaluation of the staff's technical and regulatory processes related to steam generator tube integrity.

2. Identify conclusions or issues in the NRC staff restart safety evaluation prior to restart that should be further reviewed or resolved by the NRC. (No SE)

Scope of Integrated Assessment

- Focus attention on NRC and licensee actions related to the February 15 tube failure event and operation of the current steam generators:
  - Licensee proposals on extension of the tube inspection interval and alternate repair criteria
  - Associated NRC staff Safety Evaluation Reports
  - RES March 16, 2000 Technical Review
  - Licensee Inspection and Root Cause Evaluation
  - NRC staff restart SER (terminated)
  - Related NRC inspections and oversight
  - OIG Event Inquiry, August 29, 2000 (addition)

Scope of Integrated Assessment

- The scope does NOT include review of:
  - Event followup issues not explicitly related to steam generator tube integrity - EP, degraded equipment, App. B
  - Steam Generator DPO Issues and Process
  - 2.206 Issues and Process
  - All technical aspects of NEI 97-06 and EPRI Steam Generator Program Guidelines
  - All licensee steam generator submittals (and staff reviews) from other plants
- Identification of process for resolving areas of potential weakness does NOT need to be identified

Task Group Interfaces

Stakeholder	Interface
NRC staff and management NRR RES Regions	Internal staff meetings and discussions Coordinate through line management
Consolidated Edison	Site visit
NEI/EPRI	Public meeting
ACRS	Committee brief when complete
Additional external stakeholders; e.g., Public at large Congressional staff/members IG	To be determined when complete