

March 5, 2013

MEMORANDUM TO: Gloria J. Kulesa, Chief  
Steam Generator Tube Integrity and  
Chemical Engineering Branch  
Division of Engineering  
Office of Nuclear Reactor Regulation

FROM: Christopher A. Hunt, Chemical Engineer **/RA/**  
Steam Generator Tube Integrity and  
Chemical Engineering Branch  
Division of Engineering  
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF THE FEBRUARY 6, 2013, CATEGORY 2 PUBLIC  
MEETING WITH THE ELECTRIC POWER RESEARCH INSTITUTE  
AND INDUSTRY TO DISCUSS STEAM GENERATOR ISSUES

The industry's Steam Generator Task Force (SGTF) met with U.S. Nuclear Regulatory Commission (NRC) staff on February 6, 2013, at the U.S. NRC headquarters in Rockville, Maryland. The purpose of the meeting was to discuss a variety of steam generator issues. The topics discussed are summarized in the industry's slides and NRC handout, which are available in the Agencywide Documents Access and Management System (ADAMS) under Accession Number ML13037A891 and ML13037A836, respectively. The enclosure is a list of those in attendance. This meeting was noticed as a public meeting and the meeting agenda is available in ADAMS under Accession Number ML13022A270.

During the meeting there was discussion on a number of steam generator issues. Information exchanged during the meeting that is not included in the slides is summarized below:

- Acronyms used in the industry slides include:
  - ARC: Alternate Repair Criteria
  - ASME: American Society of Mechanical Engineers
  - AVB: Anti-vibration Bar
  - BE: Burst Effective
  - Circ: Circumferential
  - CM: Condition Monitoring
  - Cr: Chromium
  - DA: Degradation Assessment
  - DBA: Design Basis Accident

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- EFPY Effective Full Power Year
  - EMF: Electro Magnetic Force
  - EPRI: Electric Power Research Institute
  - ETSS: Examination Technique Specification Sheet
  - E&R TAC: Engineering & Regulatory Technical Advisory Committee
  - FDB: Flow Distribution Baffle
  - FEM: Finite Element Modeling
  - FMEA: Failure Mode and Effects Analysis
  - FOSAR: Foreign Object Search And Retrieval
  - FS: Free Span
  - G/L: Guidelines
  - IAGL: Integrity Assessment Guidelines
  - ID: Inside Diameter
  - IG: Interim Guidance
  - MA: Mill Annealed
  - mm: millimeter
  - MWe: Mega Watts Electric
  - NDE: Non-destructive Examination
  - NEI: Nuclear Energy Institute
  - NOP: Normal Operating Pressure
  - NSAL: Nuclear Safety Advisory Letter
  - OA: Operational Assessment
  - OBE: Operating Basis Earthquake
  - ODSCC: Outside Diameter Stress Corrosion Cracking
  - POD: Probability of Detection
  - PWR: Pressurized Water Reactor
  - PWSCC: Primary Water Stress Corrosion Cracking
  - RCS: Reactor Coolant System
  - RSG: Replacement Steam Generator
  - SCC: Stress Corrosion Cracking
  - SG: Steam Generator
  - SGMP: Steam Generator Management Program
  - SGTF: Steam Generator Task Force
  - SLB: Steam Line Break
  - SMAW: Shielded Metal Arc Welding
  - TSP: Tube Support Plate
  - TSTF: Technical Specification Task Force
  - TT: Thermally Treated
  - TTS: Top of Tubesheet
  - UT: Ultrasonic Testing
- The NRC staff inquired whether the effect of cold working on the tube-to-tubesheet welds from foreign object/loose parts was part of the industry testing to evaluate stress in the tubesheet area. The industry stated that cold working from foreign objects/loose parts was not considered. The industry has developed mockups of tube-to-tubesheet

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welds that are representative of typical conditions. Plants with tube end weld damage due to foreign objects have investigated the damage on a site-specific basis.

- Industry stated that the EPRI report on steam generator channel head finite element modeling is focused only on steam generators that use alloy 690TT tubes with alloy 182 and alloy 82 welds. Since most steam generators with alloy 600MA or 600TT tubing have alternate repair criteria that moved the pressure boundary from the weld, the weld is no longer a structural or leakage concern for those plants.
- The industry stated that the failure mode and effects analysis (FMEA) for the foreign utility with SG primary channel head base metal degradation assumed that defects already existed in the channel head cladding and were not caused by something in service. The FMEA did consider boric acid corrosion rates and the size of the cavity.
- The NRC staff indicated it would review the information presented on the generic implications of the alternate repair criteria probe and if there were any remaining issues it would discuss those with the industry at the next meeting.
- The NRC staff inquired as to whether limiting the requirement to perform inspections to only after a design basis accident would be adequate to ensure tube integrity. The NRC staff stated that inspections may still be warranted following an event that was less severe than a design basis accident (e.g., to account for uncertainties in the analysis and to account for degradation that may have occurred from the event (e.g., from potential fluid elastic instabilities that may have occurred during the event)). In either case, the NRC staff would still want justification for inspections following an accident.
- The NRC staff encouraged the industry to consider revising the wording in ASME Section XI Code action BC-129 that states: "...using methods and techniques that are expected to be employed during future examinations". The NRC staff is concerned that licensees may misinterpret this wording as always requiring the use of the same examination methods (and stifling the use of more advanced techniques).
- The table on slide 73 should state "Tube Support Plate Wear" vice "Support Structure Wear".
- The NRC staff inquired as to whether eddy current testing would have detected the gap between the expanded tube and the tubesheet in a foreign plant that experienced leakage from a flaw deep into the tubesheet. The industry stated the eddy current testing may not necessarily detect such a gap, but added that the methods used to control the roll expansion technique in the foreign plant may be different from what the U.S. commercial industry uses (e.g., control expansion diameter instead of roll torque).

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- The NRC staff indicated it would facilitate discussions between the NRC's eddy current contractor and the industry.
- The NRC staff is considering drafting a generic communication concerning operating experience with free span cracking in thermally treated alloy 600 steam generator tubes.
- The NRC staff inquired about the industry guidance on evaluating and quantifying change in signal amplitude and phase during eddy current testing when substantial noise is present.
- The NRC staff indicated it would review the information presented on time dependent leak rates and if there are any additional issues/questions it would discuss those with the industry.

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Enclosure:  
Attendance List

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**ADAMS Accession Numbers:**

Package: ML13038A163

Summary: ML13047A004

Meeting Notice: ML13022A270

SGTF Presentation: ML13037A891

Signal Measurement: ML13037A836

**ADAMS ACCESSION No.:ML13047A004**

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NAME	CHunt	KKarwoski	GKulesa
DATE	02/22/2013	03/05/2013	03/05/2013

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Attendance List  
February 6, 2013, Meeting between NRC staff and the EPRI SGTF and Industry

SGTF/Industry

Kent Colgan, Areva  
Helen Cothron, EPRI  
Scott A. Redner, XCEL  
Russell Lieder, Next Era Energy  
Jay Smith, Exelon  
Viki Armentrout, Dominion  
Damian Testa, Westinghouse  
Dan Mayes, Duke  
Steve Fluit, B&W  
Randy Stark, EPRI  
Greg Kammerdeiner, FENOC  
Jesse Baron, Westinghouse  
Ray Kuyler, Morgan Lewis  
Elaine Hiruo, Platts  
Heather Feldman, EPRI  
James Benson, EPRI

Phone Participants

Bill Cullen, Westinghouse  
Rick Maurer, Westinghouse  
Anthony Martin, SNC  
P.J. Prabhu, Westinghouse

NRC

Allen Hiser  
Gloria Kulesa  
Ken Karwoski  
Greg Makar  
Charles Harris  
Andrew Johnson  
Christopher Hunt  
Aloysius Obodoako  
Seung Min  
Emmett Murphy

ENCLOSURE