

September 21, 2012

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 AUGUST 21, 2012, 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 August 21, 2012, at the Electric Power Research Institute (EPRI) offices in Washington DC. 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 ML12234A683 and ML12234A679 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 ML12212A144.

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
  - BOC: Beginning of Cycle
  - B&W: Babcock and Wilcox
  - CE: Combustion Engineering
  - CM: Condition Monitoring
  - EFPY: Effective Full Power Year
  - EPRI: Electric Power Research Institute
  - ETSS: Examination Technique Specification Sheet

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- E&R TAC: Engineering & Regulatory Technical Advisory Committee
- FMEA: Failure Mode and Effects Analysis
- FDB: Flow Distribution Baffle
- GDC: General Design Criteria
- G/L: Guidelines
- IAGL: Integrity Assessment Guidelines
- ID: Inside Diameter
- IDSCC: Interdendritic Stress Corrosion Cracking
- IG: Interim Guidance
- INPO: Institute of Nuclear Power Operations
- ISPT: In Situ Pressure Test
- LAR: License Amendment Request
- LAS: Low Alloy Steel
- LOCA: Loss Of Coolant Accident
- MA: Mill Annealed
- MWe: Mega Watts Electric
- NDD: No Detectable Degradation
- NDE: Non-destructive Examination
- NEI: Nuclear Energy Institute
- NOPD: Normal Operating Pressure Differential
- NSAL: Nuclear Safety Advisory Letter
- ODSCC: Outside Diameter Stress Corrosion Cracking
- OE: Operating Experience
- OEM: Original Equipment Manufacturer
- OTSG: Once Through Steam Generator
- PMMP: Pressurized Water Reactor Materials Management Program
- POD: Probability of Detection
- PT: Liquid Penetrant Testing
- PWR: Pressurized Water Reactor
- PWSCC: Primary Water Stress Corrosion Cracking
- QDA: Qualified Data Analyst
- R&D: Research and Development
- SE: Safety Evaluation
- SG: Steam Generator
- SGTF: Steam Generator Task Force
- SGMP: Steam Generator Management Program
- TAG: Technical Advisory Group
- TSP: Tube Support Plate
- TSTF: Technical Specification Task Force
- TT: Thermally Treated
- TTS: Top of Tubesheet
- TW: Through Wall
- UT: Ultrasonic Testing
- VT: Visual Examination Testing

- During the meeting, the industry indicated it would provide the reference that supports the threshold chromium concentration for mitigating PWSCC. It also agreed to clarify how the chromium concentration was determined for the Alloy 82 and 182 weld metals (e.g., from Certified Material Test Reports).
- There was some discussion on the ASME Code inspection requirements for the channel head and whether these inspections may provide insights on whether any cracking in the divider plate was propagating into the channel head. The industry indicated it would follow up on this issue. The industry stated that most likely only the z-seam weld (refer to slide 13) was inspected as part of the ASME Code inspection requirements, but that it would review this.
- There was some discussion on the effect of the tubesheet cladding thickness on the resultant chemistry of the tube-to-tubesheet weld. When the cladding is deposited on the tubesheet, its chemistry is modified because of “melting” with the tubesheet. In addition, when the tube is welded to the tubesheet cladding, there is also a modification in the base chemistries. The industry indicated it would investigate this topic.
- It is not clear whether the French have resized all of the cracks in the divider plate with their new techniques.
- During the meeting, the industry clarified that it is their understanding that all primary water stress corrosion cracks have been associated with Alloy 182 weld metal (with no cracking in Alloy 82 weld metal). The industry also clarified that it is their understanding that steam generator vendors clad the tubesheet primary face and then drill the holes through the tubesheet.
- The NRC staff inquired about the current schedule for completing the guidelines for auto analysis. The industry stated that the current schedule is to have a final report by the end of 2013.
- The NRC staff asked whether the industry could make the reports on channel head degradation (slide 29) and secondary side degradation (slide 34) available for NRC staff review. The industry indicated it would consider this request.
- The industry indicated that the majority of degradation of secondary side components was limited to older steam generator models with carbon steel components.
- Regarding the need to perform steam generator inspections following a design basis accident, the NRC staff inquired whether the industry would provide any guidance on how to perform the evaluations (or what to consider when performing these evaluations).

- The industry stated that the NSAL 12-01 was initially sent to utilities with Westinghouse and Combustion Engineering original and replacement steam generators, but was later sent to all utilities regardless of steam generator type or manufacturer.
- The industry indicated that none of the newer Westinghouse replacement steam generators have drain lines; however, older model Westinghouse steam generators have drain lines, (Models F, D5, 51F). A few plants with older Westinghouse steam generators have removed or plugged the drain lines.
- Regarding the six domestic units that are affected by tube-to-tube wear, the industry stated that two are recirculating steam generators and four are once through steam generators.
- Both the NRC staff and the industry agreed that additional information is needed regarding the tube that leaked as a result of a crack near the tube end and the channel head degradation observed at a foreign utility with model F steam generators.
- The industry clarified that some of the Combustion Engineering pulled tube data segments could not be correlated to the metallographic results.
- The NRC staff indicated that the results from the Sequoyah 2 inspections draw into question both the detection and sizing of flaws. The industry indicated that voltage based sizing with a rotating probe is not a concern since Zetec is the only manufacturer of rotating probes.
- The NRC staff provided feedback to the industry on several issues and indicated that some of these issues may warrant further discussion at subsequent meetings.

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Project No.: 689

Enclosures:  
Attendance List

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**ADAMS ACCESSION No.: ML12258A007**

<b>OFFICE</b>	NRR/DE/ESGB	NRR/DE	NRR/DE/ESGB
<b>NAME</b>	CHunt	KKarwoski	GKulesa
<b>DATE</b>	09/17/2012	09/20/2012	09/21/2012

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Attendance List

February 16, 2012, Meeting with the EPRI SGTF and Industry

SGTF/Industry

Helen Cothron, EPRI  
Scott A. Redner, XCEL  
Anthony Martin, SNC  
Steven Brown, Entergy  
Russell Lieder, Next Era Energy  
Jay Smith, Exelon  
Richard Maurer, Westinghouse  
Viki Armentrout, Dominion  
Damian Testa, Westinghouse  
Yong Seok Kang, KHNP  
Dan Mays, Duke  
Steve Fluit, B&W  
Rick Maurer, Westinghouse  
Daniel Folsom, TVA  
Eileen Hurley, Duke  
Edward Korkowski, Next Era  
Clayton Webber, TVA  
Greg Kammerdeiner, FENOC  
Patrick Creegan, Exelon  
Jesse Baron, Westinghouse  
Ryan Wolfe, EPRI  
Elaine Hiruo, Platts  
James Benson, EPRI

Phone Participants

Pat Wagner, Wolf Creek  
John Arhar, PG&E  
Po Cheng, Talon Capital  
Jordan Weaver, Natural Resource Defense Council  
Dick Smith, Structural Integrity Associates

NRC

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

ENCLOSURE