



# **Steam Generator Management Program**

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**Industry/NRC Executive Meeting on Materials Program**

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# Presentation Outline

- Steam Generator Task Force Overview
- SGMP High Priority Gaps
- NRC Open Technical Issues
- Tube Wear in Replacement SGs
- H\* Alternate Repair Criteria
- Plant Life Extension Issues
- Summary

# SG Task Force Overview

- Purpose
  - Maintain communications between industry and NRC staff
- SGTF Membership
  - Utility Participants
  - NSSS Vendors
  - EPRI SGMP Staff
- Periodic SGTF and NRC meetings - twice per year
  - NRC informed of industry focus areas and projects
  - Industry aware of NRC issues
  - Forum for technical exchanges, sharing of data and research results
- Standing agenda items
  - Status of open technical issues
  - Upcoming changes to industry guidelines
  - NRC comments on operating experience

# SGMP High Priority Gaps

**Steam Generator Tube Damage due to Loose Parts or Foreign Objects**

**Steam Generator Foreign Object Detection and Evaluation Improvements**

**ODSCC of Thermally Treated Alloy 600 Steam Generator Tubing**

**PWSCC Mitigation via Water Chemistry Controls**

**Steam Generator Tubing ODSCC Mitigation via Water Chemistry Technologies**

**Steam Generator Tubing Eddy Current Technology Improvements**

**Steam Generator Improved Tubing Leak Rate Modeling**

**NDE - Tools for Steam Generator Tubing Integrity Assessments**

**NDE Capability for Sizing Steam Generator Tubing ODSCC Indications**

**Steam Generator Sludge Deposits and Scale Buildup**

**Safety Significance of Cracks in Steam Generator Divider Plate**

# NRC Open Technical Issues

- **Eddy Current Noise Monitoring**

- Industry research is complete
  - NRC technical staff periodically briefed on the progress of the research
- Procedures and software tools developed to measure and monitor noise based on research results
- All SG eddy current vendors have the capability to measure ECT noise automatically
- Guidance will be included in the next revision of the SGMP PWR SG Examination Guidelines
  - Draft scheduled for December 2012

# NRC Open Technical Issues

- **AVB Position Verification**

- White paper developed incorporating information from February 2012 meeting with all SG design organizations
- Recommendations provided to the SG Integrity Assessment Guidelines Revision Committee
  - Scheduled to begin 2013
- An SGMP project has been proposed for 2013 to determine the level of deposit that would lead to occlusion of TSPs

# NRC Open Technical Issues

- **Time Dependent Leak Rate**

- Testing completed at Argonne National Lab and results published in EPRI Report No. 1022831
- NRC technical staff reviewing the report
- Industry research is complete

- **Performance Standards for Tube Integrity**

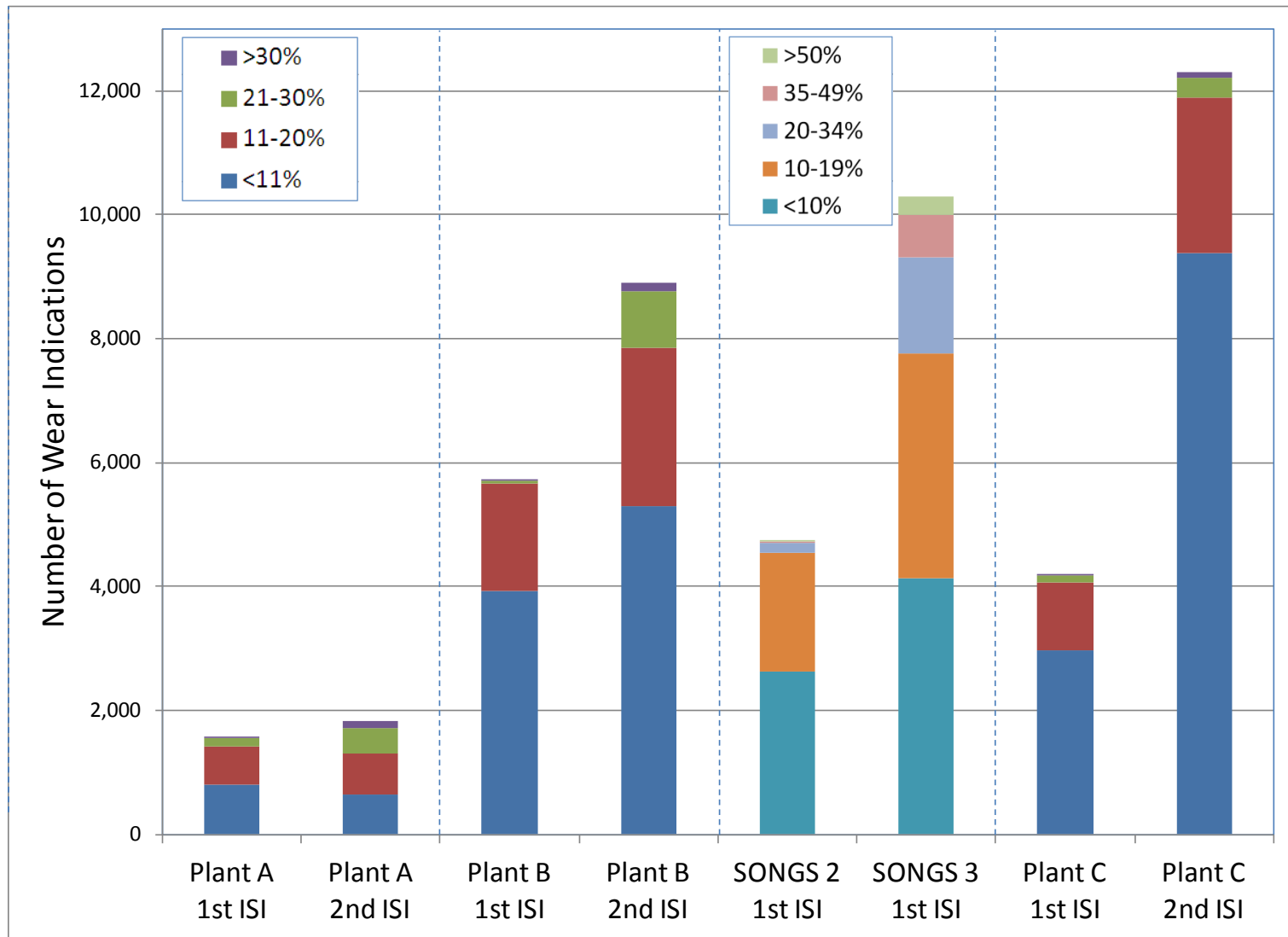
- Technical basis for SG tube integrity performance acceptance standards is documented in EPRI Report No. 1012984
- NRC technical staff reviewing the report
- Industry research is complete

# Tube Wear in Replacement SGs

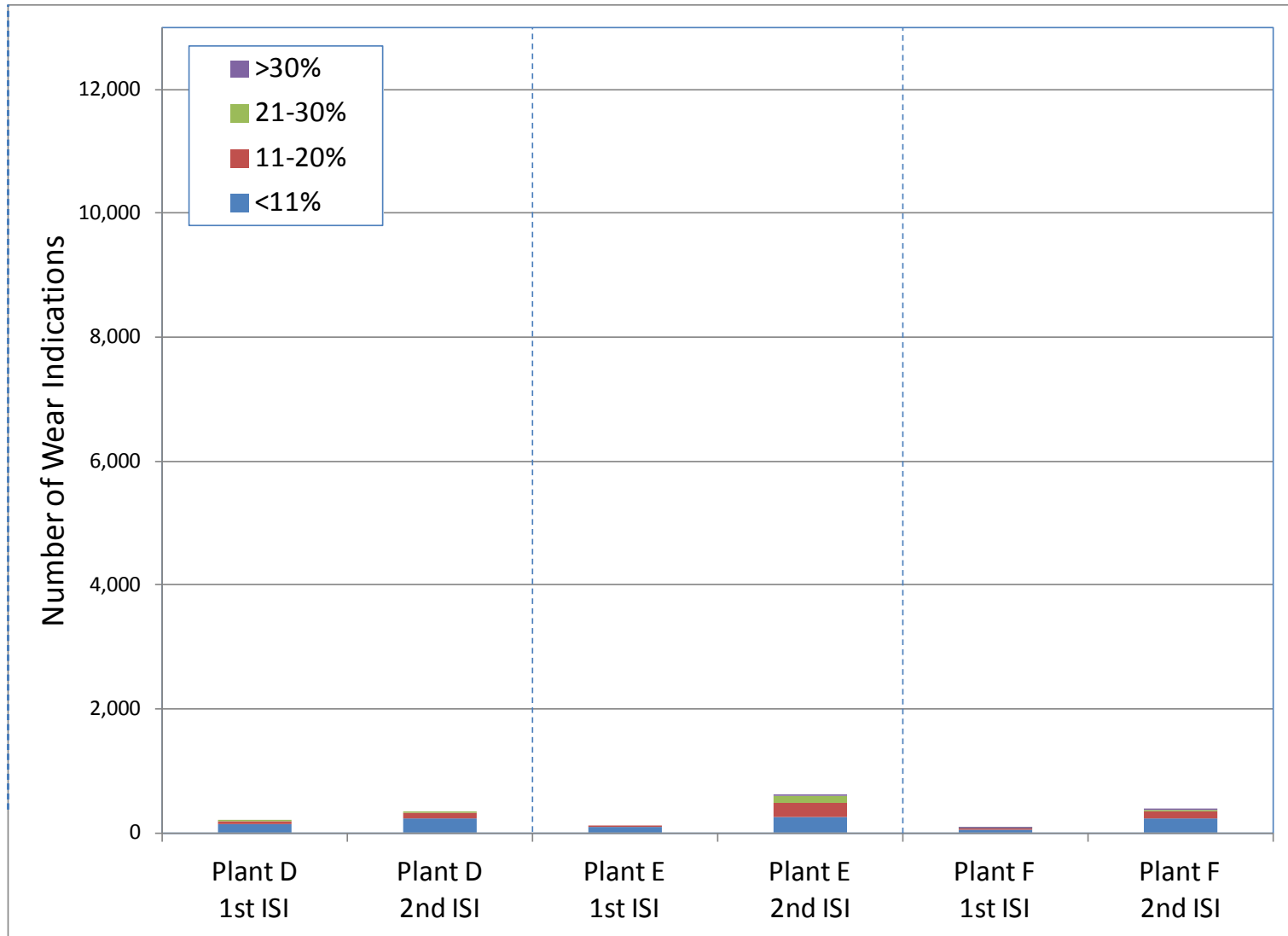
- Tube-to-Tube Wear
  - SONGS, TMI, ANO, Oconee
- Tube Support/Anti Vibration Bar Wear
  - Several plants
- SG tube leak at SONGS
  - Root cause evaluation ongoing
  - EPRI SGMP staff providing assistance
    - Root cause evaluation – expert panel participant
    - Independent review of Operational Assessment
    - Evaluation of potential mitigation processes



# Number of Wear Indications in Replacement SGs (1 of 2)



# Number of Wear Indications in Replacement SGs (2 of 2)



# H\* Alternate Repair Criteria

- 3 units have permanent H\*
- 12 units are in the submittal / review process
- 1 unit is planning to implement H\* prior to entering the extended period of operation due to questions on tube-to-tubesheet weld cracking
- 1 unit was unable to implement the generic H\* and is considering the development of a site-specific H\*

# Plant Life Extension Issues with Alloy 600 Materials in Steam Generator Channel Head Assembly

- NRC identified the following issues during license renewal review process in 2010
  - PWSCC cracks in the divider plate could propagate to the SG triple point or tubesheet and potentially affect the pressure boundary of the SG channel head or tube-to-tubesheet weld.
  - PWSCC could initiate in the 82/182 tubesheet cladding and propagate to the tube/tubesheet weld
- Some plants have included these concerns in their Aging Management Plans and have committed to inspections after the plant enters the period of extended operation

# Plant Life Extension Issues with Alloy 600 Materials in Steam Generator Channel Head Assembly

- SGMP research is ongoing
  - Literature review and data collection are complete
  - Studies underway to evaluate the stress in this area to determine if it is sufficient to propagate PWSCC through the welds by fatigue
  - No OE with PWSCC propagating as postulated
  - Development of enhanced inspection scopes of the SG channel head and tube to tubesheet regions can wait until final conclusions of this project
  - EPRI Report 1025133 documents the work completed to date

# Summary

- The SGTf transition from an NEI committee to an SGMP working group has allowed interactions between the industry and the NRC to continue
- Tube wear in replacement SGs has been observed at multiple plants, with different SG manufacturers
- Permanent H\* approvals have been approved for 3 plants, with approvals for remaining plants expected
- Research is ongoing to address plant life extension issues with Alloy 600 materials in the SG channel head assembly

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