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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

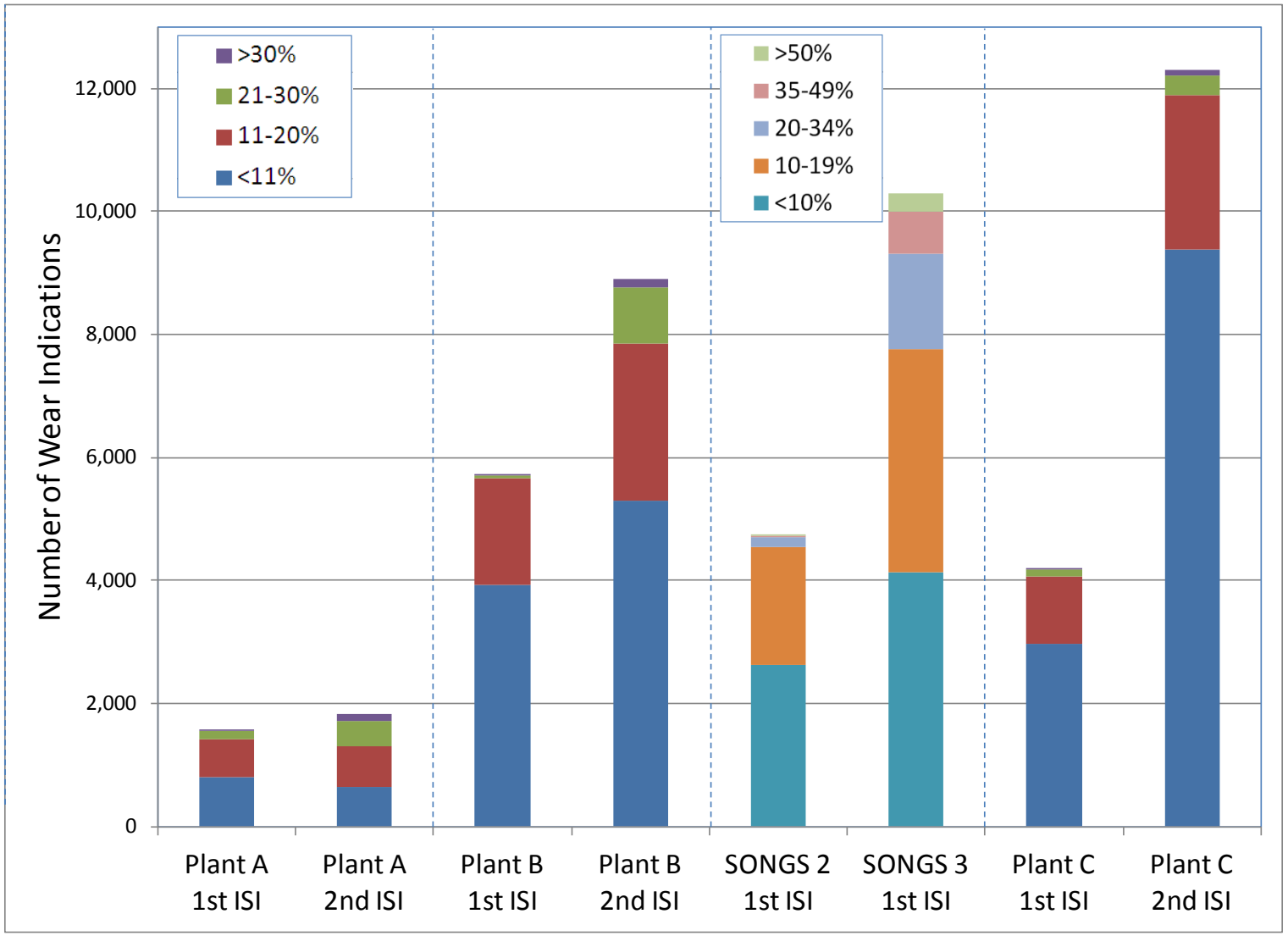
- **Time Dependent Leak Rate**
  - Testing completed at Argonne National Lab and results published in EPRI Report No. 1022831
  - NRC technical staff reviewing the report
  - Industry research is complete

- **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

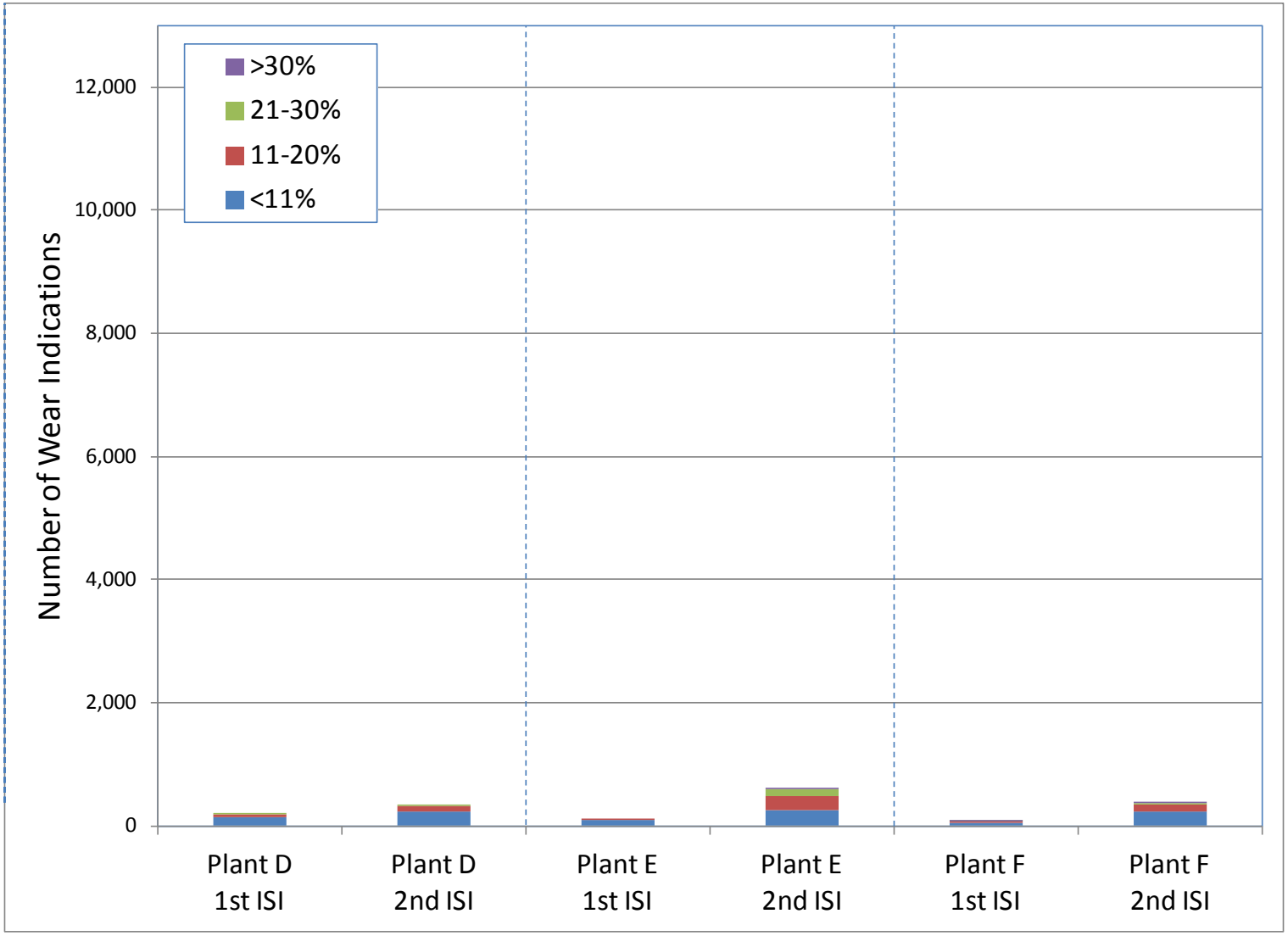
Tube Wear in Replacement SGs

- 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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