Session 1
February 27, 2001

NEI 97-06 Revision 1

NRC SG Workshop

Jim Riley, NEI

NEI

Presentation Outline

- Background
- SG Program Guidelines
- Industry SG Program Initiative
- Creation of NEI 97-06 Revision 1
- Revision 1 Changes
- Industry Communication
- Continuing Evolution
- Summary

NEI

Background

- EPRI SGMP organized in 1976 to address SG corrosion concerns
- NUMARC and SGMP worked with the NRC since 1993 to establish a framework for SGDSM and ARCs
- NEI SGIWG and SGTF chartered in 1995 to meet with the NRC on the SG rulemaking

NEI

Background

- Regulatory approach shifted from rule to Generic Letter and Draft Guide (DG 1074)
- During the same time frame the industry SGDSM framework developed into NEI 97-06
- In 1999 the NRC and industry focused on endorsing the SG Program requirements in NEI 97-06

NEI

NEI 97-06, *SG Program Guidelines*

- NEI 97-06 written as upper level guidance for SG Program requirements
  - Detailed requirements are contained within the EPRI SG Guidelines
- Framework incorporates a balance of prevention, inspection, evaluation, repair, maintenance, and leakage monitoring

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NEI 97-06, *SG Program Guidelines*

- Establishes performance criteria that define the basis for SG operability
- Defines the essential elements of a steam generator program

Degradation assessment
Integrity assessment
Leakage monitoring
Foreign material exclusion
Self assessment

Inspection
Maintenance and repair
Water chemistry
Secondary side integrity
NRC reporting

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NEI 97-06, *SG Program Guidelines*

- Requires meeting the intent of directive EPRI SG Guidelines:

SG Examination Guidelines	Primary-to-Secondary Leak
Secondary Water Chemistry	Primary Water Chemistry

- Revision 0 of NEI 97-06 issued in December 1997

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Industry SG Program Initiative

- In December 1997 the NEI NSIAC voted to adopt a formal industry Initiative on SG Program requirements:

> *Each licensee will evaluate its existing steam generator program and, where necessary, revise and strengthen program attributes to meet the intent of the guidance provided in NEI 97-06, Steam Generator Program Guidelines, no later than the first refueling outage starting after January 1, 1999.*

- Initiative committed all PWRs to the specified actions

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Creation of Revision 1

- Industry experience and NRC comments indicated that revision 0 could be improved
- SGTF and NRC met frequently between late 1998 and mid 2000 to address issues
- NEI 97-06 revision 1 incorporates the resolution to most of these issues

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Revision 1 Changes

- Users must follow the intent of the referenced EPRI SG Guidelines:

SG Examination (NDE)	• Integrity Assessment
In Situ Pressure Testing	• Primary-to-Secondary Leakage
Primary Water Chemistry	• Secondary Water Chemistry

- Structural integrity performance criteria includes safety factors against burst and requirements on yield

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Revision 1 Changes

- Accident induced leakage performance criteria related to accident analysis limits and 1 gpm
- Appendices include guidance for justifying deviations from requirements
- Revises / incorporates the definitions of tube burst, normal full power operations, SG tubing, and others

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Revision 1 Changes

- Revises NRC reporting requirements:
  - Results of inspections if the number of degraded tubes exceeds a threshold value
  - Failure to meet performance criteria during condition monitoring
  - Failure to implement a required plugging or repair

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Industry Communication

- SG Program requirements include numerous means of communicating SG experience to PWR plants
  - NEI SG Review Board interpretations (as requested)
  - Interim guidance (as needed)
  - NEI APC Letters
  - SGMP TAG (3 times a year)
  - SGMP Workshops (annually)
  - EPRI SG Guideline revision (biannually)

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Continuing Evolution

- NEI 97-06 and EPRI SG Guidelines are living documents - they are changed in response to new technologies and experience
  - NEI 97-06 revised as necessary
  - EPRI SG Guidelines are evaluated for revision biannually

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Continuing Evolution

- NEI and SGMP will continue to work with the NRC to improve the program and to address emerging issues

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Summary

- The industry is committed to safe operation
  - Long term program
  - Industry commitment to requirements
  - Prepared and guided by industry experts
  - Living documents - responsive to changes in technology and experience
  - Extensive communication
  - NRC interaction

NEI

Schedule and Documentation Structure of NEI 97-06 Generic Licensing Package

Louise Lund
NRC/NRR/DE/EMCB

NRC Steam Generator Workshop
SG Programmatic Issues Session
February 27 - 28, 2001

Regulatory Framework for SG Tube Integrity Program

Tech Specs:
- Implement **program** to ensure performance criteria are met
- Performance criteria, plugging limits, and repair methods shall be NRC approved

Licensee Controlled Document:
- Lists site-applicable, NRC approved performance criteria, plugging limits, and repair methods

Program Guidelines (NEI 97-06)
- Defines the key programmatic elements
- Provides general guidance for implementing the programmatic elements

Detailed Guideline Documents, e.g.:
- Tube examination
- In situ pressure testing
- Tube integrity assessment
- Leakage monitoring
- Water Chemistry

NEI 97-06 Generic License Change Package

- Current regulatory framework is outdated and prescriptive and not directly focused on ensuring that tube integrity is maintained throughout the period of operation between inspections

- Package represents the culmination of efforts to develop a revised and updated regulatory framework that include the following characteristics:

  - performance based: establishes performance criteria for ensuring tube integrity and limiting operational leakage

  - performance criteria are tolerable

  - flexible: manner of addressing performance criteria are up to the licensee

  - adaptable: written to address various modes of degradation, tube repair techniques and inspection technology

  - risk-informed

NEI 97-06 Generic License Change Package (cont'd)

- Provide regulatory framework for licensee management of SG tube integrity
- NEI 97-06, proposed Technical Specifications and Technical Requirements Manual in the generic license change package will be reviewed for endorsement; EPRI guidelines will not be specifically endorsed
- Outstanding technical issues (e.g., noise, data quality, POD, etc.) will exist regardless of the regulatory framework and do not need to be resolved before generic license change package can be implemented
- NRC recommending establishment of a protocol agreement with industry to resolve outstanding technical issues

Features of the New TSs and Technical Requirements Manual

- Includes structural and accident-induced leakage performance criteria in administrative TSs
- Revises operational leakage LCO to incorporate operational leakage performance criterion
- Plant-specific repair criteria (e.g., 40% plugging limit), repair methods (e.g., sleeves) and approved alternate repair criteria from existing TSs will carry forward to the TRM
- Prior NRC approval necessary to change performance criteria and associated definitions, repair criteria, repair methods, and alternate repair criteria in TRM
- Ability to use generically approved repairs and ARCs, subject to limitations in generic staff approvals
-

Regulatory Issue Summary

- Staff plans to issue the NEI 97-06 SE in a Regulatory Issue Summary (RIS)
- Target Date for Completion - 10/31/01
- RIS will discuss the basis for approval of the generic change package
- RIS will include staff expectation that the licensees will submit plant-specific TS change requests modeled on the template in the generic change package (including commitments)
- RIS will include staff expectations that licensees would commit in their amendment transmittal letter to implementing their SG management program consistent with NEI 97-06

Schedule

▪ Recommence work on NEI 97-06	1/31/01
▪ Staff completes review and draft SE of NEI 97-06 SG generic license change package	5/31/01
▪ Staff briefs CRGR on NEI 97-06 SG generic license change package	7/31/01
▪ Publish SE on NEI 97-06 SG generic license change package in FR for public comment	7/31/01
▪ ACRS review of NEI 97-06 SG generic license change package	8/31/01
▪ Staff briefs Commission on endorsing NEI 97-06 SG generic license change package	10/31/01

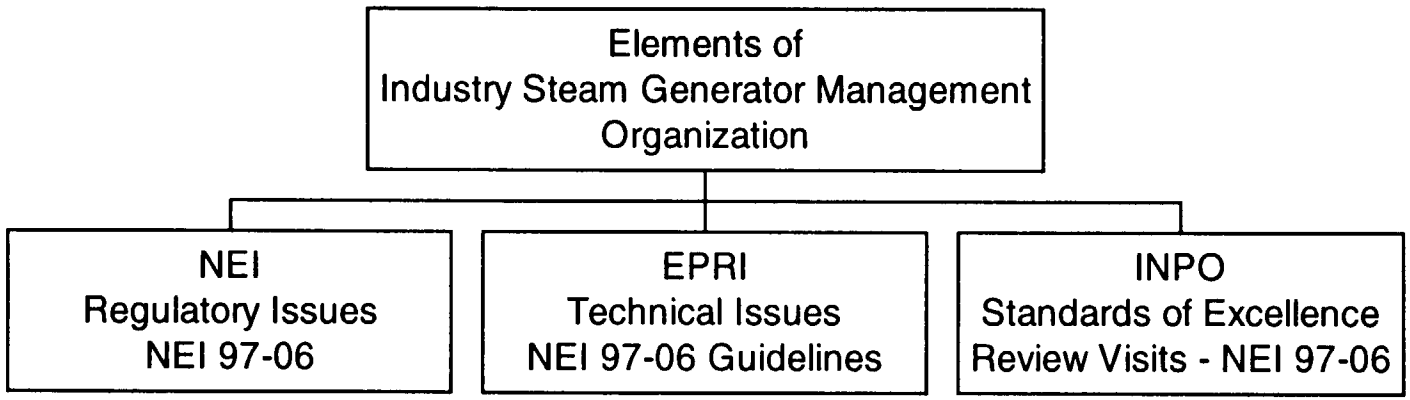
Items That Could Potentially Affect Schedule

- Resolution of the DPO
- Operability issue
- Changes made to the generic change package TS and TRM since before the IP2 event that will require resolution

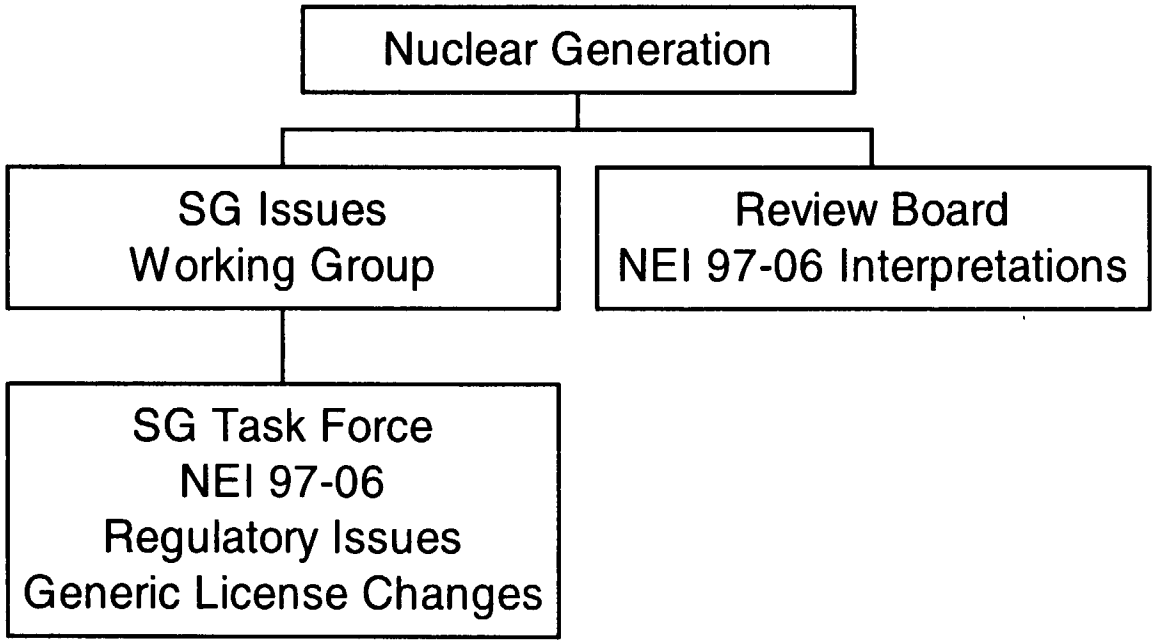
Overview of Industry Steam Generator Management Organization

Bob Exner
Pacific Gas & Electric Co
Diablo Canyon Power Plant
February 27, 2001

Industry Organization



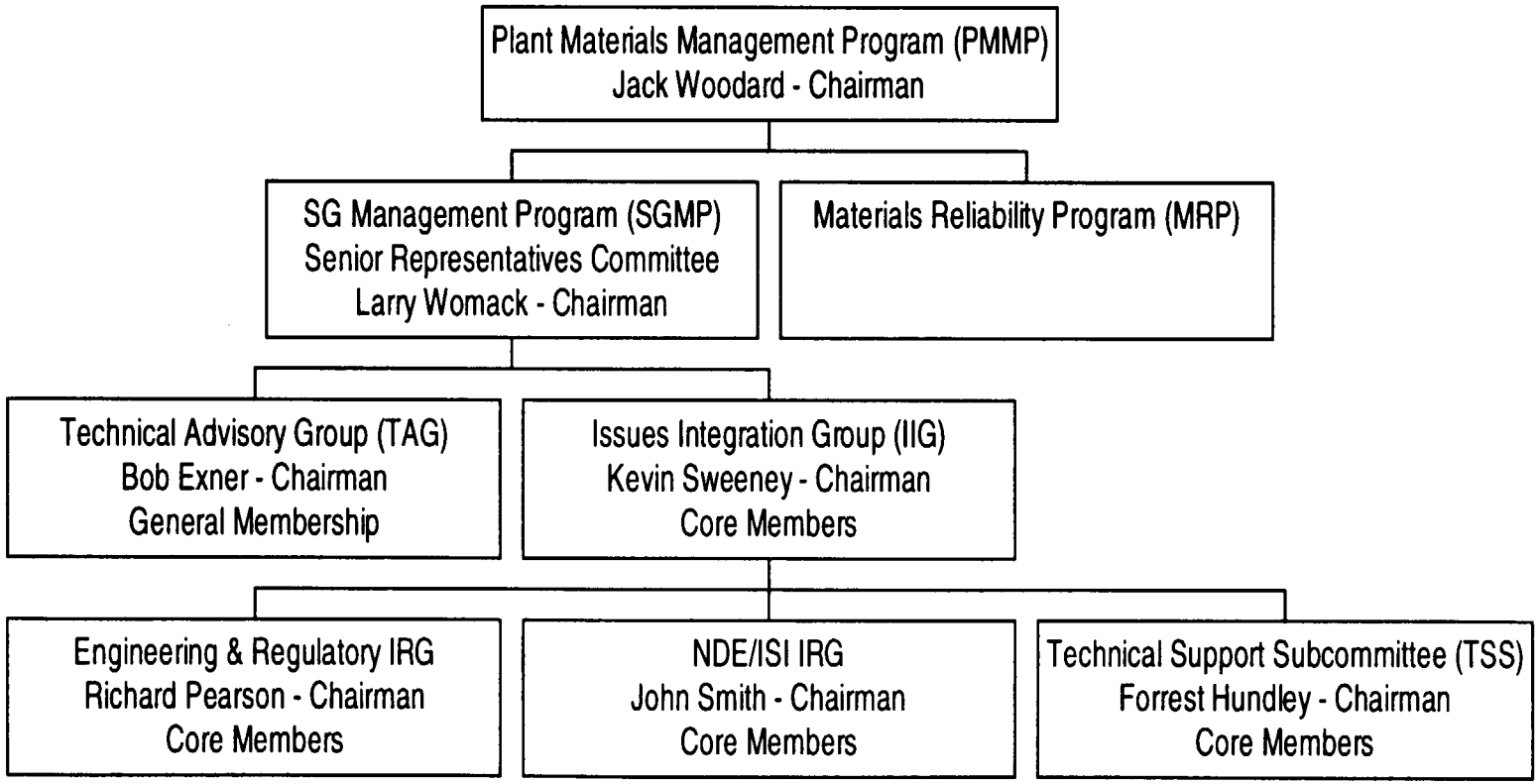
NEI Organization



NEI Organization

- NEI SG Issues Working Group/Task Force
  - Developed NEI 97-06
  - Generic License Change Package
  - SG Action Plan
  - Membership - attached
- NEI 97-06 Review Board Process
  - Resolve generic questions about NEI 97-06 and EPRI guidelines
  - Advisory Panels – Members From SGMP
  - Review Board – Members From IIG
  - Interpretations – Posted on Web
  - SGMP Administrative Procedure
  - Membership - attached

Industry/EPRI Organization



Industry/EPRI Organization

- PMMP
  - Executive Group
  - Overall Policy/Budget Approval
  - Approves EPRI Guidelines
- SGMP
  - General Organization
    - US and Foreign Utilities - Manage SG issues and technology development
  - SGMP Administrative Procedures
  - EPRI Guidelines
    - Revision process through Ad Hoc committees – include vendors and consultants
    - Guidelines assigned to specific subcommittees
  - SG Degradation Database - Website

Industry/EPRI Organization

- Technical Advisory Group (TAG)
  - Information Sharing/Working Groups/Policy Review and Approval
  - Reviews EPRI Guidelines
  - 3 Meetings/Year – 1 with Senior Reps
  - Chemists/Engineers/NDE Specialists
    People Responsible for SG Programs
  - Information Forum – NRC Presentations are Invited

Industry/EPRI Organization

- Issues Integration Group (IIG)
  - Interface between TAG and Executive Group
  - Issue Prioritization – Resource Allocation
  - Members represent all three NSSS and SG designs
- Engineering and Regulatory Issue Resolution Group (E & R IRG)
  - Respond to Engineering/Regulatory Issues
  - SG In Situ Pressure Test Guidelines
  - SG Integrity Assessment Guidelines
- In-service Inspection / Non-Destructive Examination (ISI/NDE IRG)
  - Respond to NDE Issues
  - PWR SG Examination Guidelines

Industry/EPRI Organization

- Technical Support Subcommittee (TSS)
  - Long term R&D
  - PWR Secondary Chemistry Guidelines
  - PWR Primary Chemistry Guidelines
  - PWR Primary-to-Secondary Leak Guidelines

INPO Organization

- Industry's Assessment Organization
- SG Review Visit Program
  - Peer Participation – Information Sharing
  - SG Program Recommendations and Strengths
  - Year end Summary Provided to Industry
  - Some Follow-up Items
- Operating Experience Programs
  - Notification of events
  - Information Sharing
  - Website

Summary

- Industry has a SG Management Program in place that:
  - Addresses issues promptly
  - Uses broad based utility participation
  - Encompasses all SG types/vintages
  - Issues guidelines and policy
  - Self monitors through peer reviews
  - Interfaces with NRC through NEI
  - Maintains research/improvement efforts

NEI SG Issues Working Group and Task Force

Members	SG Issues Working Group	SG Task Force
Chairman	Mike Tuckman	Kevin Sweeney
NEI Members	Dave Modeen	Jim Riley
EPRI Members	Chuck Welty	Mati Merilo, David Steininger
INPO Members	Bill Webster	
Utility Members	Jack Woodard	Helen Cothron
	Larry Womack	Bob Exner
	Jack Bailey	Greg Kammerdeiner
	Sherry Bernhoft	Dan Mayes
	David Goetcheus	Rick Mullins
	Vicki Hull	Richard Pearson
	John Jensen	Mike Short
	David Mauldin	
	Tim Olson	
Vendor Members	Gary Elder – Westinghouse	Bob Keating - Westinghouse
	Jeff Fleck - FTI	Don Streinz – W/ABB

NEI Review Board

Review Board	ISE/NDE Advisory Panel	Chemistry & P-S Leakage Advisory Panel	Tube Integrity Advisory Panel	Policy and Miscellan Advisory Panel	Secondary Side Inspection and Assessment Advisory Panel
Kevin Sweeney	Scott Redner	Rick Eaker	Roman Geisior	Rick Mullins	Helen Cothron
David Steininger (EPRI)	Mohamad Behravesh (EPRI)	Peter Millet (EPRI)	Mati Merilo (EPRI)	Jim Benson (EPRI)	Al McIlree (EPRI)
Bob Exner	Gary Henry	Scott Wilson	Rick Mullins	Craig Hengge	John Arhar
David Goetcheus	Al Metheny	Ron Baker	Darol Harrison	Ron Baker	Rick Coe
John Smith	Gary Alberti	Gail Gary	Helen Cothron	Al Metheny	Ben Mays
Forrest Hundley	Tom Bipes	Tim Olson	Joe Eastwood	Roman Geisior	Rich Freeman
Dan Mayes	Tim Hanna	Dan Meatheny	John Arhar	Tim Pettus	Ron Baker
Richard Pearson	Tim Pettus	Victor Linnenbom	Rick Coe	Darol Harrison	
Rick Barley	Steve Swilley	David Hughes		Scott Redner	
Greg Kammerdeiner	Gene Navratil	Myra Burgess			
		Sam Harvey			
		Matt Kearns			

EPRI SGMP

SGMP	IIG	E&R IRG	NDE IRG	TSS
Chairman	Kevin Sweeney	Richard Pearson	John Smith	Forrest Hundley
EPRI Project Manager	David Steininger	Mati Marilo,	Mohamad Behravesh	Paul Frattini
Core Members	Ron Baker	John Arhar	Gary Alberti	Ron Baker
	Rick Barley	Rick Barley	Tom Bipes	Debby Bodine
	Rick Eaker	Jay Cate	Al Metheny	Guy Bucci
	Bob Exner	Rick Coe	Joe Mate	Rick Eaker
	David Goetcheus	Helen Cothron	Dan Mayes	Billy Fellers
	Forrest Hundley	Steve Leshnoff	Ian Mew	Jeff Gardner
	Greg Kammerdeiner	Rick Mullins	Dave Morey	Gail Gary
	Richard Pearson	Vince Zabielski	Tim Olsen	Sam Harvey
	John Smith		Tim Pettus	
	INPO – Jeff Ewin		Scott Redner	
	NEI – Jim Riley		Harry Smith	
			Steve Swilley	

Review Process/Resources for ARCs, CM/OAs, Reports, etc.

Edmund Sullivan
NRC/NRR/DE/EMCB

Steam Generator Workshop
SG Programmatic Issues Session
February 27-28, 2001

Background

- OIG Report contained a number of criticisms of staff review processes
- NRC Lessons Learned Task Group looked at these issues. Report included recommendations in the areas of:
  - Guidance for reviewers
  - Handling of licensee inspection summary reports
  - Staff expertise
- Other lessons learned recommendations related to the Reactor Oversight Process will be discussed in the next session

Recent NRC Changes/Improvements

Expected to Increase Staff Effectiveness and Efficiency

- Guidance for Technical Reviewers
  - Not intended as a checklist
  - Sets out basic principles for review
  - Provides references, background technical information
- Internal SG Web Page
  - Being developed by SG staff at HQ
  - One-stop shopping for SG-related documents
  - Background pages on design, degradation modes, repair, replacements, inspection, events and operating experiences, NEI 97-06, SG Action Plan
  - Vehicle to share information in a timely way from SG group to other NRC staff at HQ, regions

Recent NRC Changes/Improvements (cont'd)

- SG Expertise
  - Recent reorganization - moving to 3 sections, instead of 2 sections, in Materials and Chemical Engineering Branch (EMCB)
  - Will reduce staff-to-manager ratio - section chief for SG work will have more time to focus on SG issues
  - EMCB currently recruiting more mid-level staff (GG-13)
  - EMCB will be getting interns soon - will be distributed across branch
  - Takes time for new employees to acquire expertise

NRC Staff Recommendations to Industry

- EPRI Guidelines do not have regulatory standing - if submittals are sent in just according to guidelines, it may lead to protracted review
- Quality of submittals also affects amount of staff review time
- Staff has pointed out areas, in the past, we believe should be treated more rigorously
  - Examples include differences between the draft guide we issued and the EPRI guidelines
  - IP2 restart review encountered these issues and are discussed in RIS-2000-22
  - These issues will be discussed in the technical sessions that follow

Industry Lessons Learned

David Goetcheus
Tennessee Valley Authority

NRC Workshop
February 27-28, 2001

Background

- EPRI SGMP and INPO supported IP2 with NDE and SG engineering expertise during investigation of tube failure
- Industry, through SGMP, issued Information Letters Concerning Lessons Learned from a Review of Recent SG Related Issues
  - Effort to supply the industry with timely information to consider when planning inspections, condition monitoring, and operational assessments
  - Information from IP2 tube failure, recent integrity assessments, and 1999 INPO review visit recommendations
  - Re-emphasized or further defined and explained specific requirements of NEI 97-06 and the supporting guidelines

Background

- Lessons learned letter addressed the following issues as reminders of good practices
  - Degradation assessments
  - Data quality
  - Site qualification of NDE techniques
  - Calibration standards and setup
  - In situ pressure testing
  - Steam generator program ownership
- Interim guidance on in situ testing changed technical requirements in an EPRI guideline
  - Pressurization ramp rate
  - Hold times

TVA's Implementation

- Requirement in NEI 97-06 and plant procedures to perform a degradation assessment prior to a SG inspection
  - This assessment shall consider industry experience
- The degradation assessment for Watts Bar and Sequoyah Unit 2 fall outages considered the lessons learned from recent industry events
- NRC's web site on IP-2
  - Review of industry's communications
  - Review of NEI Review Board decisions
- TVA Nuclear's Operating Experience Review Organization tracked TVA's implementation of the recent industry events

Application to TVA's Fall Outages

- Reviewed our current degradation assessments to ensure emphasized areas were being addressed
  - Validated that all input data was current
    - All potential initiators or accelerators had been considered
  - Placed emphasis on ensuring appropriate growth data was available
  - Validated that current ETSSs were being used
    - Appropriate setups and calibration standards
  - Evaluated the need for special inspection techniques

Application to TVA's Fall Outages

- Data quality was emphasized
  - ECT tester is energized by a dedicated conditioned power supply
  - Noise suppression kits are onsite to provide filtering if electromagnetic interference is encountered
  - Probes are receipt inspected with a test run of a calibration standard to identify defective probes
  - Six QA/QC personnel are assigned to monitor ECT process
  - Two data analysts were dedicated to identifying marginal or poor quality data prior to the analysis process

Application to TVA's Fall Outages

- Analyst training was enhanced
  - Each analysts is responsible for identifying conditions that inhibit the evaluation of data
  - Anomalous or "off-normal" signals are identified for Lead Analyst Review
    - These tubes are retested until good data is acquired or the tube is plugged
  - All analysts received training on the leaking tube from IP-2 as it appeared in the 1997 examination data
  - A circumferential filter was used to assist in flaw detection when bend geometry presented interfering signals

Application to TVA's Fall Outages

- Site validation of NDE Techniques
  - Exam techniques were selected to provide the best detection available for known and potential damage mechanisms
  - No signal interference associated with deposits
  - Tubing is not severely dented (small localized dents)
  - Apex is not ovalized due to hour glassing of flow slots
  - High frequency probe was considered for the U-Bend inspection
    - EPRI qualification data was reviewed and compared to site data
    - Proved that mid range magnetically biased probe had a clear advantage

Application to TVA's Fall Outages

- Calibration standards were validated
  - All were in compliance with Revision 5 of the EPRI PWR Examination Guidelines
  - Acquisition and analysis parameters were established in accordance with EPRI technique qualifications
  - Setups were verified by on-line QA surveillance

Application to TVA's Fall Outages

- In Situ Testing
  - Pressurization rate issue was entered into TVA Nuclear's Corrective Action Program
  - Validated all analysis input was appropriately conservative
  - In Situ pressure test screening and implementation utilized recent SGMP communications and NEI Review Board decisions
    - All indications above screening criteria tested
    - Two minute hold times at accident condition, then every 500 psig up to 3 times normal operating differential pressure
    - Pressurization rate did not exceed 200 psi/sec

Application to TVA's Fall Outages

- SG Program Ownership and Implementation
  - TVA's SG Program has expertise in the following areas:
    - Eddy current
    - Metallurgy
    - Steam generator design
    - Steam generator corrosion
    - Code requirements
    - Structural mechanics
    - Programmatic expertise
  - During inspections, the vendor works through the SG Technology Department
    - TVA prepares and oversees the training and testing of analysts
    - Reliance on vendors for tube integrity is minimal

Summary

- One utility's approach
- Fine tuned an existing extensive program
- Impacted all utilities
  - U-bend inspections
  - Evaluation of techniques
  - More conservative repair criteria
  - Other ameliorative measures