

COMMISSION MEETING EXHIBITS

BRIEFING ON STATUS OF  
STEAM GENERATOR ACTION PLAN

MONDAY, DECEMBER 3, 2001

# **Steam Generator Action Plan (SGAP)**



**Commission Meeting  
December 3, 2001  
Maitri Banerjee, NRR  
Louise Lund, NRR  
Joseph Muscara, RES**

# **Historical Overview**

- **2/15/00 – IP2 Tube Failure Event**
- **8/29/00 – OIG Report on IP2**
- **10/23/00 – IP2LLTG Report**
- **11/16/00 – SGAP revised**
- **2/01/01 – ACRS report on SGDPO**
- **5/11/01 – SGAP Revised (DPO issues)**

# **SG Action Plan - Scope**

- **Consolidated Action Plan**
- **NRC efforts result in an integrated regulatory framework**
- **Anticipated future revisions**

# **SG Action Plan- Purpose**

**Manage NRC efforts to ensure:**

- **Milestones are appropriately tracked and dispositioned**
- **Resolution coordinated with stakeholders**
- **Document completion of significant milestones**

# **SGAP Main Elements**

- **Modifications/Revisions to the Regulatory Process**
- **Revised Regulatory Framework -NEI 97-06**
- **Response to ACRS Recommendations on SG DPO**

# **SG Action Plan - Status**

## **Regulatory Process:**

- **20 of 23 milestones complete**
- **Open items scheduled for completion by 2/02**
- **Issues well understood and activities well underway**

# **NEI 97-06 Steam Generator Generic License Change Package**

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**Commission Meeting**

**December 3, 2001**

**Louise Lund**

**Division of Engineering**

**Office of Nuclear Reactor Regulation**

# **Current NRC SG Regulatory Framework**

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- **10 CFR Part 50, App. A and B**
- **10 CFR Part 100 Guidelines values**
- **ASME Code, Sections III and XI**
- **Plant Technical Specifications**
- **Reactor Oversight Process**

# **NRC SG Regulatory Framework**

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- **Rulemaking - 1994 to 1996**
- **Generic Letter - 1997 to 1998**
- **Consideration of industry's NEI 97-06 initiative - 1998 to present**
- **Review of NEI SG Generic License Change Package (GLCP) - 1/01 to present**

# **NEI 97-06**

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- **Generic license change package**
- **Formalizes revised framework through revised TSs**

# **NEI 97-06**

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- **Industry SG program initiative**
- **Currently implemented in conjunction with existing technical specifications (TSs)**
- **High level guidance for utility SG programs**
- **Detailed guidance in EPRI guidelines referenced in NEI 97-06**

# **NEI 97-06**

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- **Program incorporates a balance of:**
  - **prevention**
  - **inspection**
  - **evaluation**
  - **repair**
  - **maintenance**
  - **leakage monitoring**

# **NEI 97-06**

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- **Establishes performance criteria that define the basis for SG operability**

# **Revised Framework – NEI 97-06**

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- **Will rely on NEI SG Generic License Change Package (GLCP)**
- **Utilities to submit revised TSs based on NRC-approved GLCP**
- **GLCP to contain a commitment to follow NEI 97-06**
- **NEI 97-06 program guidelines translated into plant procedures**

# **Revised Framework – NEI 97-06**

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- **Revised TSs and bases**
  - **Revised Spec for operational leakage**
  - **New Spec: “Steam Generator Tube Integrity”**
  - **New Administrative TS: “Steam Generator Program”**

# **Revised Framework – NEI 97-06**

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- **Technical issues will still need to be resolved**
- **Issues exist under current framework, and will continue to be addressed under revised framework**

# **Review Status**

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- **Industry requests inspection intervals beyond current requirements**
- **Staff believes that approach must ensure that:**
  - **Tube integrity performance criteria will continue to be met**
  - **Tubing conditions not meeting the performance criteria will be promptly detected**

# **Review Status**

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- **Staff concluded that regulatory controls were needed**
- **Incorporate provision in Administrative TS regarding use of NRC-approved inspection intervals**

# **Review Status**

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- **Near Term Actions:**
  - **Staff to review anticipated package from industry defining generic inspection intervals**
  - **Recent meeting with NEI on final GLCP**
  - **Schedule for staff safety evaluation**

# **Review Status**

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- **Long Term Action:**
  - **Resolve outstanding issues with EPRI guideline documents to permit use of intended performance based approach and removal of prescriptive inspection interval requirements.**

# **Research on Steam Generator Action Plan DPO Issues**

**Commission Meeting  
December 3, 2001  
Dr. Joseph Muscara  
Office of Nuclear Regulatory  
Research**

# **Research Activities**

- **Current issues and anticipatory research**
- **Confirm effectiveness of current regulations or recommend improvements**

# **Research Activities**

- **Materials behavior and structural integrity**
- **Accident analysis - thermal hydraulics**
- **Improved risk methods**
- **80% of DPO milestones addressed by RES**

# **Crack Propagation Under Main Steam Line Break (MSLB) Loads**

- **Estimate loads, crack growth, and margins 12/31/02**
- **Conduct tests to validate the analytical results 06/30/03**

# **Jet Cutting**

- **Complete tests of jet impingement under MSLB and severe accident conditions, draft reports 12/31/01**
  - **Erosion rates are 2-5 mil/hr for severe accident conditions**
  - **5% to 25% wall loss after 2 hours under MSLB conditions**
- **Jet cutting not a concern**

# **Tube Conditions During Severe Accidents**

- **Computational Fluid Dynamics (CFD) analysis of the hot leg & steam generator to determine Tmax in tubes**
  - **Benchmarked against data 8/01**
  - **Full-scale CFD model under development 3/02**

# **Constant Probability of Detection (POD)**

- **Complete analysis and document results 12/31/01**
  - **POD curves developed as a function of flaw parameters**
  - **Topical report was peer reviewed and is in publication**

# **Stress Corrosion Cracking**

- **Long term understanding of mechanisms**
- **Evaluate crack initiation, evolution and growth 12/31/05**
  - **Realistic loads & environments**
  - **Alloys 600 and 690**
- **Develop models to predict cracking of tubes 12/31/06**

# **Conclusions**

- **Some research completed to resolve DPO issues-Jet Impingement, POD**
- **Research to address most DPO issues by 2003**

# **Conclusions (continued)**

- **Long-term research on degradation mechanisms will continue through 2006**
- **RES & NRR working closely to implement research in resolution of issues**

# **Acronyms**

- **ACRS – Advisory Committee on Reactor Safeguards**
- **DPO – Differing Professional Opinion**
- **IP2 – Indian Point 2**
- **LL – Lessons Learned**

# **Acronyms (Cont'd)**

- **LLTG – Lessons Learned Task Group**
- **NEI – Nuclear Energy Institute**
- **NRC – Nuclear Regulatory Commission**
- **NRR – Office of Nuclear Reactor Regulation**

## **Acronyms (Cont'd)**

- **OIG – Office of the Inspector General**
- **RES – Office of Research**
- **SG – Steam Generator**
- **SGAP – Steam Generator Action Plan**