REGULATORY GUIDE SUPPORTING SG RULE

- Provides a broad, performance-based framework for developing programs to ensure that the SG tubes are capable of performing their intended safety functions.

- This framework includes:

  ► performance criteria commenserate with adequate tube integrity

  ► programatic considerations for providing reasonable assurance that the performance criteria will be met during plant operation

  ► considerations for monitoring the condition of the tubing to confirm the performance criteria are in fact being met

REGULATORY GUIDE SUPPORTING SG RULE

- This framework can be broken down as follows:

  ▶ guidance for developing measures to mitigate active degradation and to minimize potential for new degradation

  ▶ guidance for developing inservice inspection programs

  ▶ guidance for developing tube repair criteria

  ▶ guidance for developing operational leakage limits/monitoring programs

  ▶ performance criteria commensurate with adequate tube structural and leakage integrity (these criteria are subject to NRC review and approval)

  ▶ guidance for performing a condition monitoring assessment to confirm that the performance criteria have been meet during the previous operating cycle; if negative, promptly report to NRC and implement corrective actions

REGULATORY GUIDE SUPPORTING SG RULE

- **Framework (Cont)**

  - ► guidance for performing operational assessment to demonstrate that performance criteria will continue to be met prior to the next scheduled inspection; implement corrective actions as neccessary to meet this objective.

  - ► guidance for taking corrective actions as neccessary; e.g., mitigation of active degradation mechanisms, enhanced ISI (in terms of sampling level, frequency, NDE techniques), reduced repair criteria, reduced operational leakage limits

  - ► guidance for evaluating radiological dose consequences of SG tube leakage during postulated accidents relative to the performance criteria for leakage integrity

REGULATORY GUIDE SUPPORTING SG RULE

- Discussion

  - ▶ Specific implementation details and methodologies for these program elements are to be developed by the utilities

  - ▶ The reg guide provides broad guidelines concerning the key considerations, parameters, and/or constraints which should be addressed as part of the development of these program elements to ensure their effectiveness

  - ▶ It is intended that licensees will have the flexibility to to adjust the specifics of their program elements within the constraints of these guidelines to reflect new information, new NDE technology, new degradation mechanisms, changes in flaw growth rate, etc, without NRC review and approval

  - ▶ The key to the exercise of this flexibility will be the development of SGDSM strategies to be documented in industry topical reports

    - ○ SGDSM strategies involve an integrated set of program elements, parallelling this reg guide, which address specific flaw mechanisms

REGULATORY GUIDE SUPPORTING SG RULE

- **Performance Criteria**

  ▶ **Structural Integrity Criteria**

  - ○ May be expressed deterministically or probabilistically

  - ○ Deterministic Criteria:

    - All tubes should maintain structural margins consistant with Reg Guide 1.121

  - ○ Probabilistic Criteria:

    - Condition probability of rupture during postulated accidentsshould not exceed:

      $5X10-2 \geq 1$ tube ruptures

      $2.5X10-2$ for ≥ 2 tube ruptures

      $10-3$ for ≥ 10 tube ruptures

    - Should not exceed 20% of these values for single degradation mechanism

REGULATORY GUIDE SUPPORTING SG RULE

- Performance Criteria (Cont)

  - ▶ Operational Leak Rate Criteria

    - ○ Operational leakage should not exceed the operational leak rate limit in the tech specs

  - ▶ Accident Leak Rate Criteria

    - ○ Leakage during postulated accidents should not exceed applicable limits

REGULATORY GUIDE SUPPORTING SG RULE

- **CONDITION MONITORING ASSESSMENT (BACKWARD LOOKING)**

    ▶ TO BE PERFORMED DURING EACH SG INSPECTION

    ▶ TO DEMONSTRATE THAT THE PERFORMANCE CRITERIA WERE IN FACT MET DURING PREVIOUS CYCLE

    ▶ INVOLVES EVALUATION OF THE OF THE "AS FOUND" CONDITION OF THE TUBING BASED ON EDDY CURRENT ISI RESULTS OR ALTERNATIVE METHODS

    ▶ IMPLEMENT CORRECTIVE ACTIONS AS NECCESSARY

REGULATORY GUIDE SUPPORTING SG RULE

- OPERATIONAL ASSESSMENT (FORWARD LOOKING)

  ▶ TO BE PERFORMED x DAYS FOLLOWING EACH RESTART FROM AN INSPECTION OUTAGE

  ▶ TO DEMONSTRATE THAT THE PERFORMANCE CRITERIA WILL CONTINUE TO BE MET PRIOR TO THE NEXT SG INSPECTION

  ▶ INVOLVES PROJECTING THE FUTURE CONDITION OF THE TUBING PRIOR TO THE NEXT SG INSPECTION BASED ON CONSIDERATION OF:

    ○ INSPECTION RESULTS FROM PREVIOUS OUTAGE

    ○ INDICATIONS ACCEPTED FOR CONTINUED SERVICE

    ○ FLAW GROWTH RATES

    ○ LEVEL OF SAMPLING PERFORMED

    ○ NDE DETECTION AND SIZING PERFORMANCE

  ▶ IMPLEM'T CORRECTIVE ACTIONS AS NECCESSARY

KEY OUTSTANDING ISSUES IN DRAFT RG

- What elements of the SG program should be subject to NRC review and approval?

  - ► Performance criteria

  - ► Methodology for condition monitoring?

  - ► SGDSM topical reports?

  - ► Repair method topical reports?

- What are appropriate deterministic margins to include in structural performance criteria?

  - ► Traditional margins per RG 1.121?

  - ► Industry proposal?

- How to deal with degradation mechanisms for which no NDE technique is qualified and/or detection and/or sizing performance is not adequately quantified

  - ► What alternative NDE techniques should be used for inspection?

  - ► How to perform condition monitoring?

  - ► How to perform operational assessment?

CONDITION MONITORING WHEN NDE SIZING PERFORMANCE IS POOR OR UNKNOWN

- Insitu pressure testing is a possible approach

- Issue: How to ensure most limiting tubes are tested?

- Possible approaches:

  - ▶ Demonstrate NDE capabilities to reliably sort out subset of tubes which is highly likely to contain most limiting tubes, or

  - ▶ Sort tubes on a best effort basis (considering indicated depth, length, and/or voltage), and

  - ▶ Test progressive samples of tubes until there is reasonable assurance, on the basis of the results, that the most limiting tubes have been tested

- Detailed guidelines regarding these possible approaches need to be developed

COMMENTS/DRAFT NEI GUIDELINES

Performance Criteria

- NEI makes distinction between performance "criteria" (subject to NRC approval) vs performance "measures" (not subject to NRC approval)

  ▶ This distinction is unneccessary

  ▶ The proposed performance measures (specifying structural margins, conditional probabilities of tube rupture, etc) should also be subject to NRC approval

- Proposed deterministic and probabilistic structural performance measures/treatment of uncertainties require justification.

- Probabilistic structural performance measures need to address the contribution of non-evaluated and unknown degradation mechanisms to the total conditional probabilty of rupture. Current guidance is too vague.

- Proposed default performance measure, which is an average depth-based limit, is vague and requires further justification. In addition, this limit is a tube repair limit and is inappropriate to use as a performance measure.

COMMENTS/DRAFT NEI GUIDELINES

Performance Criteria (Cont)

- Proposed operational leakage criteria is simply a restatement of the technical specification requirement. Instead, the criteria should be a leakage number that licensees should endeavor not to exceed. The draft Reg Guide proposes 150 gpd.

- Proposed 200 gpm accident leakage performance measure requires justification.

    - The makeup capacity for the primary system is frequently less than this value.

Condition Monitoring and Operational Assessments

- Expanded guidance is needed on how to conduct condition monitoring and operational assessments for degradation mechanisms for which there are no qualified NDE techniques and where flaw sizing performance is poor or not quantified on realistic/representative flaws.

- For condition monitoring, need to address selection of tubes for in-situ pressure testing such as to ensure most limiting tubes are included in the test sample.

COMMENTS/DRAFT NEI GUIDELINES

Condition Monitoring and Operational Assessments (Cont)

- NEI proposes that operational assessments need not be performed under certain conditions. The staff believes that operational assessments should be performed for each active degradation mechanism as defined in the draft Reg Guide.

- Determination of NDE flaw measurement uncertainty needs to be tied to performance demonstration results for techniques/personnel for realistic flaws.

  ▶ Credit taken for independant data analysis/resolution should be supported by performance demonstration.

Inservice Inspection

- NEI guidance should state clearly that inspections are to be performed in accordance with the EPRI Examination Guidelines, and specify additional guidance as necessary (see draft Reg Guide).

- Next revision of the EPRI guidelines need to be completed.

COMMENTS/DRAFT NEI GUIDELINES

Inservice Inspection (Cont)

- Preservice inspections should employ inspection techniques/personnel qualified for all degradation mechanisms which may potentially occur, based on industry-wide experience.

- Inspection frequency and tube sampling criteria need to be tied to the performance criteria.

- Supplemental performance demonstration on realistic flaws, as defined in the draft Reg Guide, is critical to quantifying NDE detection and sizing performance.

- NEI guidelines should state that plant procedures should include (either directly or by reference) a complete technique specification (addressing data acquisition and analysis) as defined in EPRI guidelines, Appendix G.

- NEI guidelines should state that plant procedures ensure that data analysts not perform duties beyond the limits of the applicability of their qualification and supplemental performance demonstration.

COMMENTS/DRAFT NEI GUIDELINES

Inservice Inspection (Cont)

- NEI guidelines should address the use of techniques/personnel which have not been qualified and undergone supplemental performance demonstration for specific applications.

Tube Repair Methods

- NEI proposal regarding the use of 50.59 is a potential issue. This matter is under review.

- NEI should reference industry guidelines concerning repair methods.

COMMENTS/EPRI SG EXAMINATION GUIDELINES
Revision 4 (Draft), Volume 1

- These comments do not address limitations in the EPRI guidelines already being addressed in the draft Reg Guide

- Guidelines need to clearly establish between guidelines that are essential versus those that are not.

  ▶ This is to ensure that where licensees have committed to the guidelines, there is no ambiguity about what actions they have committed to.

- Guidelines in Sections 4 and 5 dealing with data acquisition and analysis are very general (lacking in detail), and need to be substantually upgraded to address all key elements of an effective inspection. For example:

  ▶ The EPRI recommendations for dealing with circumferential cracks (presented to the staff on 3/13/95) should be fully discussed. This kind of detail is neccessary for all degradation mechanisms.

  ▶ Guidance for minimizing noise and noise acceptance/retest criteria should be presented.

COMMENTS/EPRI SG EXAMINATION GUIDELINES (CONT)

▶ Guidance should state that classification, diagnostics, and disposition of distorted and non-quantifiable indications are to be included in the plant written data analysis procedures. Enhanced guidance for each of these areas should be provided.

▶ Guidance should discuss need for validating applicability of generically qualified techniques for plant-specific situations.

▶ Draft guidelines state that plant specific analysis rules may include use of particular data channels or use of amplitude or phase angle criteria to assist in data management and disposition of indications.

  o This guideline needs to be reconciled with the guideline for using qualified procedures.

  o Use of particular data channels, voltage amplitude thresholds, and phase angle rotation vs frequency to disposition signals should be consistant with what has been shown to be adequate through qualification/performance demonstration.

COMMENTS/EPRI SG EXAMINATION GUIDELINES (CONT)

- ▶ Use of "pre-established voltage level" to screen data, either manually or by computer, is unacceptable for indications subject to a depth or length limit unless justified by performance demonstration to be consistant with such limits.

- ▶ Enhanced guidance is neccessary for ensuring the independance of independant analysis teams.

- ▶ Potential benefits of independant data analysis can only be demonstrated by performance demonstration.

- ▶ Guidelines addressing human factors which may potentually affect analyst performance (e.g., fatigue) need to be developed.

- ● Appendix G should address periodic requalification of personnel.

- ● Preservice inspections should be performed with qualified/performance demonstrated techniques/personnel for all potential future degradation mechanisms as indicated by experience (this agrees with NEI guidelines).

COMMENTS/EPRI SG EXAMINATION GUIDELINES(CONT)

- Section 3.5 of guidelines (SGs with adv materials/design) is inconsistant with Section 3.1 regarding the number of SGs to be inspected at 1st inspection.

- 20% initial inspection sample should be over full tube length.