SG Action Plan Items

SGTF / NRC

ATTACHMENT 8

Criteria for scheduling

- Affects generic license change package
- Requires interim guidance
- Existing guidance is adequate and:
  - Affects Rev 6 of SG Exam G/L
  - Affects ad hoc committee work on POD and sizing accuracy
  - Affects ad hoc committee work on In Situ Guidelines
- Need to improve guidance and affects ad hoc committees or rev 6
- Other items identified as "existing guidance is adequate"
- Other items identified as "need to improve guidance"

NEI

SG Action Matrix

- Surveillance requirement in SR 3.4.13.2
  - Develop appropriate TS.
    - Only the operational leakage performance criterion is applicable to the RCS Operational Leakage Tech Spec. Tube integrity can be verified by a surveillance in the proposed SG tube integrity TS.
    - Approve proposed TS

NEI

EPRI SGMP Response to NRC Comment on Operational Leakage Surveillance

Issue:

The existing standard technical specification for steam generators requires that steam generator tube integrity be verified in accordance with the tube surveillance program. In 1999 the industry and the NRC met numerous times to develop a Steam Generator Program Generic License Change Package that would revise the standard technical specification and provide the regulatory framework for SG Program requirements. As a result, in October of 1999 the SGTF and the NRC reached conceptual agreement on the Operational Leakage Technical Specification (TS). At that time, the Operational Leakage surveillance required that steam generator tube integrity be verified in accordance with all three Steam Generator Program performance criteria.

The SGTF removed the reference to the Structural Integrity and Accident Induced Leakage performance criteria as a result of the following industry comments on the proposed TSs:

- Technical Specifications should include only parameters that are monitored and controlled by the operators.
- The Structural Integrity and Accident Induced Leakage performance criteria are necessary for SG performance, but are not necessarily related to Operational Leakage. They are not appropriate surveillance requirements for the RCS Operational Leakage TS.

NEI submitted the resulting TS to the NRC on December 11, 2000.

The NRC does not agree with changing the RCS Operational Leakage surveillance requirement. The following comment was one of several received by e-mail on the SG Program Generic License Change Package Technical Specifications. This issue was not addressed in any of the NRC's action letters.

"Surveillance Requirement (SR) 3.4.13.2 is now, in the latest proposal, limited to verifying that primary to secondary leakage is within limits specified in the operational leakage performance criterion of the steam generator (SG) program, and no longer requires steam generator tube integrity be in accordance with the SG program. The purpose of this SR is to ensure SG operability, as described in the Standard Technical Specifications (STS) Bases and the prior submittal Bases. This SR should still ensure SG operability, it meets Criterion 2 of 10 CFR 50.36(c)(2)(ii) for inclusion in the Technical Specifications, and therefore this change is unacceptable; revert to prior submittal SR and associated Bases wording."

Industry Response: Develop appropriate technical specifications.

The industry agrees that steam generator tube integrity is a design feature that is an initial condition of design basis accidents that challenge the integrity of a fission product barrier and must be retained in the Technical Specifications per criterion 2 of 10CFR50.36. However, the RCS Operational Leakage Tech Spec LCO only addresses primary-to-secondary leakage.

EPRI SGMP Response to NRC Comment on Operational Leakage Surveillance

Requiring verification of the other two performance criteria (Structural Integrity and Accident Induced Leakage) is not consistent with the content of the Operational Leakage Tech Spec. There is no definite relationship between Operational Leakage and the other two criteria. For example, meeting structural integrity conditions does not mean that primary-to-secondary leakage will meet the operational leakage criterion (and vice versa). The limit of 150 gallons per day per steam generator is based on operating experience gained from SG tube degradation mechanisms that result in tube leakage. This leakage rate along with the other performance criteria in the Steam Generator Program provide reasonable assurance that a single flaw leaking this amount will not propagate to a SGTR under the stress conditions of a LOCA or a main steam line rupture prior to detection by leakage monitoring methods and commencement of plant shutdown.

Instead of changing the Operational Leakage TS surveillance requirement, industry proposes to create a Steam Generator Tube Integrity TS that will include a surveillance requirement addressing the Structural Integrity and Accident Induced Leakage performance criteria. The surveillance will require that steam generator tube integrity be verified in accordance with these two criteria at a frequency dictated by the Steam Generator Program. The RCS Operational Leakage technical specification that was submitted in the December 2000 version of the SG Program Generic License Change Package need not be changed.

The proposed resolution is a significant change to the Generic License Change Package reviewed by the industry. The industry commitment to adopt the Technical Specifications in the Generic Package assumed there would be no significant changes. The SGTF will distribute the revised technical specification to the industry for review.

Immediate Industry Actions:

- Obtain industry and NRC agreement on the appropriate technical specification changes by June 2001.
  - The proposed Technical Specification is attached to this response.

Future Actions to be Tracked by SGMP:

None

Resolution Status:

Proposed SG Tube Integrity Tech Spec

REACTOR COOLANT SYSTEM (RCS)

3.4.20 Steam Generator Tube Integrity

LCO 3.4.20 Steam Generator tube integrity shall be maintained.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of LCO not met.	A.1 Be in MODE 3. AND A.2. Be in MODE 5	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.20.1	Verify steam generator tube integrity satisfies the structural integrity and accident induced LEAKAGE performance criteria in accordance with the Steam Generator Program.	In accordance with the Steam Generator Program
SR 3.4.20.2	Verify that steam generator tubes that exceed the repair criteria in the Steam Generator Program are plugged or repaired in accordance with repair methods in the Steam Generator Program.	Prior to entering MODE 4

SG Action Matrix

- LL 3b - Adequacy of operational leakage limits
  - Existing industry guidance is adequate.
    - The operational leakage limit is not a surrogate for structural integrity.
    - Less than 1/3 of current standard TS.
    - The reduction in the leakage limit decreases the probability of a tube rupture.
    - Approve proposed TS

EPRI SGMP Response to NRC Comment LL 3b – Technical Specification

Issue:

"The industry should assess the adequacy of the Technical Specification regarding operational leakage limits."

Section 6.3.3.4, states further: "IP2 TS limit on primary-to-secondary leakage did not provide pro-active indication of upcoming tube failure. The experience from the IP2 event where the SG leakage did not exceed the TS limit before a tube failed indicates that IP2 TS leakage limits, by themselves, are not always sufficient to prevent such a failure or provide meaningful indication of an impending failure."

Industry Position: Existing industry guidance is adequate.

The current standard technical specification limit for primary-to-secondary leakage is 500 gpd per steam generator. The industry agrees that the 500 gpd limit is inadequate based on current knowledge. Consequently, the industry has developed detailed guidance that provides an ultimate primary-to-secondary leakage limit of 150 gpd, less than one third of the current standard limit. Lower leakage levels below 150 gpd could result in shutting down the plant; however, operation will never continue above 150 gpd except while the plant is shutting down.

The limit of 150 gallons per day per steam generator is based on operating experience gained from SG tube degradation mechanisms that result in tube leakage. The operational leakage limit is not a surrogate for structural integrity. SGTR is possible for some forms of degradation with no prior indication of leakage. The 150 gpd leakage rate along with the other performance criteria in the Steam Generator Program provide reasonable assurance that a single flaw leaking this amount will not propagate to an SGTR under the stress conditions of a LOCA or a main steam line rupture prior to detection by leakage monitoring methods and commencement of plant shutdown. The leakage limit of 150 gpd becomes more conservative for combined leakage from separate, smaller flaws. These flaws, because of their size, do not compromise structural integrity.

As indicated in (Draft) NUREG 1477, no limit, regardless how small, will guarantee that a tube rupture will not occur. However, the reduction in the leakage limit will increase the probability that a tube rupture can be averted.

The proposed reduction in the primary-to-secondary leakage limit was submitted to the NRC in NEI letter dated December 11, 2000 as part of the steam generator program generic license change package. The industry's voluntary initiative to implement NEI 97-06, Steam Generator Program Guidelines, incorporates the revised primary-to-secondary leakage guidance by reference.

No additional action by the industry is required. NRC Staff approval of the generic license change package is necessary to revise the technical specifications.

Immediate Industry Actions: None

Future Actions to be tracked by SGMP: None

Resolution Status:

SG Action Matrix

- LL 3a - Update to reflect current knowledge
  - Develop appropriate technical specifications.
    - The proposed TSs incorporate current knowledge by requiring adherence to the SG Program
    - Approve proposed TS

NEI

EPRI SGMP Response to NRC Comment LL 3a – Tech Spec Requirements

Issue:

NRC Comment LL 3a states:

"PWR TSs (or the regulatory framework currently being developed via the industry initiative) should ensure the technical requirements are strengthened to reflect the current knowledge of the SG degradation mechanisms, examination techniques, and methodology."

Section 6.3.3, recommendations, states further: "The IP2 TS on SG tube integrity does not reflect current knowledge regarding SG degradation and failure mechanisms (e.g., hour glassing), and provides insufficient guidance regarding the type of information and level of detail to be reported to the NRC. For example, the licensee report containing the result of its SG examination does not provide any details regarding the data quality."

Industry Response: Develop appropriate technical specifications.

NEI 97-06 is a top-level document that describes the basic structure of an acceptable SG Program. It references a number of EPRI Guidelines that provide the detailed requirements. The structure of the industry's SG program is introspective; the requirements are regularly evaluated against new knowledge and techniques and revised as necessary to accommodate improvements. This flexibility is one of the strengths of the industry's program.

The Technical Specifications developed as part of the industry's SG Generic License Change Package reference the SG Program for their surveillance requirements. This approach does not make specific test or assessment methods part of a utility's license, and in this way allows the surveillance requirements to change in response to the evolving guidance in the SG Program. It is not advisable to prescribe specific methods at the Tech Spec level or this flexibility will be lost as license amendments will be needed to update the requirements. By their nature, the Technical Specifications proposed by industry will reflect the current knowledge of steam generator degradation mechanisms, examination techniques, and methodologies.

The underlying Guidance documents that provide the Steam Generator Program details are constantly being strengthened as part of their biannual revision process. The revisions reflect current knowledge of the SG degradation mechanisms, examination techniques, and methodologies. The nature of the industry initiative on NEI 97-06 requires that each PWR adopt the changes included in approved SGMP Guidelines and in interim guidance unless a plant develops a justification for deviation from the requirement.

EPRI SGMP Response to NRC Comment LL 3a – Tech Spec Requirements

Immediate Industry Actions:

- Obtain NRC approval of the Steam Generator Program Generic License Change Package technical specification changes by June 2001.

Future Actions to be Tracked by SGMP: None

Resolution Status:

SG Action Matrix

- LL 21 - Tube integrity implications of new mechanisms
  - Enhance guidance.
    - Industry will issue interim guidance by August 31 to be in place before fall outages.
    - Issues to be addressed:
      - Definition of a new mechanism
      - Required actions

EPRI SGMP Response to NRC RIS 2000-22 and Lessons-Learned Report

Industry acknowledges the need to improve guidance in this area.

Issue LL 2L from NRC's Lessons-Learned Report

When a new type of steam generator tube degradation occurs for the first time, licensees should determine the implications on steam generator condition monitoring and operational assessments (e.g., potential for the tube to rupture before leaking such as at the apex of a small radius U-Bend).

During the NRC's review of the IP2 tube failure event, it was noted by the staff that the licensee did not take appropriate actions when they identified axial PWSCC at the apex of a low row U-Bend for the first time.

Industry position:

For newly active degradation modes that were not considered to be potential degradation mechanisms in the degradation assessment, the licensee should enter the issue into their corrective action program at a significance level that requires a root cause analysis to be performed, i.e., a Significant Condition Adverse to Quality as defined by 10CFR50 Appendix B. The degradation assessment and inspection plan should be reviewed and revised as necessary to ensure that the necessary data is available to allow the operational assessment to address potential effects of the new degradation mechanism. Corrective actions to bound the extent of condition, such as requiring additional inspections prior to unit restart, may be a result of this review. When developing corrective actions, consideration should be given to the effects of plant chemistry, individual plant operating experience, and other causal factors. Degradation that was expected but not previously active that was addressed in the plant-specific degradation assessment and inspection plan does not need to be entered into the plant corrective action program.

Immediate actions: None

Future actions to be tracked by SGMP: SGMP will issue an industry letter providing the above guidance by August 31, 2001.

Resolution status:

SG Action Matrix

- LL 2b - Data quality for new tubing
  - Existing industry guidance is adequate.
    - The tubing used for the data sets is appropriate. Tubing for the qualification of techniques should be representative of what is found in service. The higher noise level samples used in the EPRI qualification makes the technique uncertainty values conservative.
    - Quality standards apply to new and used tubing. An existing EPRI report recommends signal-to-noise and ovality criteria for new tubing.

NEI

EPRI SGMP RESPONSE TO THE NRC INDIAN POINT 2 LESSONS LEARNED (LL) MA 9163 AND REGULATORY ISSUE SUMMARY (RIS) 2000-22

Issue 2b of IP2LL MA9163 states:
The industry should consider the issue of noise in newer tubes in the revision to the EPRI SG Examination Guidelines.

Due to the high noise levels found on some samples in the U-bend ETSS, the NRC implies that noise can be present in the U bends of newer samples and that the industry should carefully assess the potential for conditions detrimental to detecting flaws at each plant.

Industry Position: Existing industry guidance is adequate.

Tubing for the qualification of techniques should be representative of what is found in service. The higher noise level samples used in the EPRI qualification makes the technique uncertainty values conservative.

The industry has developed manufacturing specifications as reported in "Guidelines for the PWR Steam Generator Tubing Specifications and Repair Volume 2, Revision 1: Guidelines for Procurement of Alloy 690 Steam Generator Tubing". TR-016743-V2R1. These guidelines set the signal to noise ratio for new steam generator tubes at 15:1. This specification has generally been adopted by utilities that have replaced their steam generators. Improvements in materials and manufacturing processes in recent years has typically produced SG tubes that exhibit average signal to noise ratios of 30:1 for pilgered tubes and 50:1 for drawn tubes.

The original version of these guidelines contained an 5 % ovality requirement The current version is 3 % due to improvements in bending techniques. In addition, stress relief is required for U-bends with a bend radius less than 10 times the OD of the tube.

Immediate industry actions: None

Future actions to be tracked by SGMP: None

Resolution status:

SG Action Matrix

- LL 2c - Use of noise minimization techniques
  - Existing industry guidance is adequate.
    - The SG Examination Guidelines consider filtering algorithms as essential variables which must be demonstrated through Appendix H qualification.

EPRI SGMP RESPONSE TO THE NRC INDIAN POINT 2 LESSONS LEARNED (LL) MA 9163 AND REGULATORY ISSUE SUMMARY (RIS) 2000-22

Issue 2c of IP2LL MA9163 states:
The EPRI Guidelines should address the use of noise minimization techniques such as filtering algorithms.

Industry Position: Existing guidance is adequate.

The PWR SG Examination guidelines currently consider filtering algorithms as essential variables which must be demonstrated through Appendix H technique qualification (H.2.1.1, H.4.2). The industry has filtering algorithms and other noise suppression techniques that can be applied to data. The essential variables of techniques must be controlled so consistent results are obtained.

Immediate industry actions: None

Future actions to be tracked by SGMP: None.

Resolution status:

SG Action Matrix

- RIS 4 - Use realistic flaws
  - Existing industry guidance is adequate.
    - Requirements for qualification samples are specified in Supplement 2, Appendix H of Revision 5 of the SG Examination Guidelines. Where actual field samples in the form of pulled tubes are not available, the Guideline allows test samples fabricated using mechanical or chemical methods. The Guideline, however, clearly states that such fabricated flaws should produce signals similar to those being observed in the field in terms of signal characteristics, signal amplitude, and signal to noise ratio.

NEI

SG Action Matrix

- RIS 4 - Use realistic flaws
  - For ETSS's related to cracking, there are currently a total of 39 techniques that utilize 149 signals from EDM notches, 511 signals from laboratory induced cracks, 201 signals from pulled tubes and it should be noted that all of the 149 EDM signals are in the U-bend qualifications. The U bend samples are being replaced with laboratory produced cracks.

NEI

EPRI SGMP RESPONSE TO THE NRC INDIAN POINT 2 LESSONS LEARNED (LL) MA 9163 AND REGULATORY ISSUE SUMMARY (RIS) 2000-22

Issue 4 from RIS 2000-22 states:
Non-destructive examination (NDE) qualification programs that include tube samples with flaws that truly represent flaws in the field.

Industry Position: Existing guidance is adequate in the area.

Requirements for qualification samples are specified in Supplement 2, Appendix H of Revision 5 of the SG Examination Guidelines. Section H2.2.1 requires that qualification data sets shall consist of flawed grading units and shall be established for each of the damage mechanism categories. It is further stipulated that flawed grading units shall consist of damage mechanisms/extraneous test variable combinations applicable to the scope of the examination procedure. Where actual field samples in the form of pulled tubes are not available, the Guideline allows test samples fabricated using mechanical or chemical methods. The Guideline, however, clearly states that such fabricated flaws should produce signals similar to those being observed in the field in terms of signal characteristics, signal amplitude, and signal to noise ratio.

Development of realistic flaw sets for testing and qualification of eddy current techniques has been a particularly challenging problem for the industry (including the NRC Research program aimed at assessing the industry practices). While the ideal flaw set continues to be a collection of defective tubes removed from service, the very limited number of available pulled tubes, and statistical requirements of qualification flaw sets forces the industry to resort to other alternatives such as laboratory produced machined flaws and chemically induced defects. Machining and other mechanical means can adequately simulate certain damage mechanisms such as wear and denting, but not stress corrosion cracks. EPRI SGMP has been aware of this problem and has had an aggressive program to develop the know-how and to produce realistic cracks in various steam generator tube locations. As realistic samples become available, the industry continuously updates technique qualification parameters (Examination Technique Specification Sheets, ETSS). Pulled tube data and laboratory produced crack samples replace machined defects in qualification flaw sets and modify qualification parameters as warranted.

Concerns have been expressed regarding the potential widespread use of EDM notches in Appendix H qualifications. Although not precluded, the use of EDM notches is limited to a very small subset of qualifications. For volumetric flaws such as thinning, wear and impingement, EDM simulated defects adequately resemble the type and size of degradations seen in the field. Their associated current ETSS's (as of February 14, 2001) reflect a total of 17 techniques where each technique represents a unique flaw/location/probe configuration. Based on a particular probe used, some flaw samples are often used in multiple technique

qualifications. For example, ETSS's for volumetric flaws contain 392 signals coming from machined flaws, 48 signals coming from EDM notches, 24 signals coming from pulled tubes, and 389 signals coming from chemically induced volumetric indications. For ETSS's related to cracking, there are currently a total of 39 techniques that utilize 149 signals from EDM notches, 511 signals from laboratory induced cracks, 201 signals from pulled tubes and it should be noted that all of the 149 EDM signals are in the U-bend qualifications. The U bend samples are being replaced with laboratory produced cracks. Five techniques are currently awaiting peer review and they contain 128 signals from laboratory cracks, 42 signals from pulled tubes, and 45 signals from EDM notches where all of the 45 EDM signals are located in sleeve samples.

Immediate industry actions: None

Future actions to be tracked by SGMP: None

Resolution status:

SG Action Matrix

- LL 2n - Computer data analysis
  - Existing guidance is adequate.
    - The industry currently recommends independent dual analysis teams. The results of each team are then resolved by a QDA. Currently one of those analysis methods may be automated. As additional experience is gained with analysis algorithms, and with improvements in technology, the use of computer data analysis will increase.

NEI

EPRI SGMP RESPONSE TO THE NRC INDIAN POINT 2 LESSONS LEARNED (LL) MA 9163 AND REGULATORY ISSUE SUMMARY (RIS) 2000-22

Issue 2n of IP2LL MA9163 states:
The data analyst's job is tedious and performed under severe time constraints, and thus prone to the possibility of missing indications. There are data screening computer programs that will enhance (not replace) the detection capability of the analysts in some situations.

Industry Position: Existing guidance is adequate.

The industry currently recommends independent dual analysis teams. The results of each team are then resolved by a QDA. Currently one of those analysis methods may be automated. Computer analysis guidance (SG Examination Guidelines, Rev. 5, Vol. 1, Sec. 6.3.3.3) already exists. To further enhance reliability of data analysis, there is also industry guidance for the use of an independent QDA (Sec. 6.3.3.4) and Field Analysis Feedback (Sec. 6.6) in the SG Examination Guidelines. As additional experience is gained with analysis algorithms, and with improvements in technology, the use of computer data analysis will increase. The industry guidance will in time be updated to take advantage of the gained experience and improvements in the technology.

Immediate industry actions: None

Future actions to be tracked by SGMP: None

Resolution status: