Steam Generator Integrity

NRC Information Meeting
June 25, 2009

Agenda

- Introduction
- Plant Specific Actions
- Planned EOTSG SG Integrity Assessment
- ANO-1 Plan for Radiological Source Term LAR
- Questions / Discussion
- Action Items

Purpose of SG Integrity Meeting

- Meeting is intended to respond to action items from the May 13 meeting
  - Current plant specific actions
  - Future plant specific actions
  - Steam generator Integrity Assessment program for the EOTSG Design

- ANO-1 Alternate Source Term Amendment Approach

Plant Specific Actions
In Response to SG Integrity Concerns following LOCA Loads

• Entergy	ANO-1 (EOTSG)	Dan Fouts
• Exelon	TMI-1 (EOTSG)	Howard Crawford
• FENOC	DB-1 (OTSG)	Dave Gerren
• Progress	CR-3 (ROTSG)	Scot Stewart
• Duke	Oconee (ROTSG)	Scott Thomas

ANO-1 Plant Specific Actions
Dan Fouts

- Actions completed
  - Condition Report filed
  - Procedure Changes/Training
  - Operability Assessment
  - OTSG Replaced by EOTSG (2005)
  - Two Inspections of 100% of EOTSG Tubes Completed

- Actions Planned
  - Perform Planned EOTSG Tube and T/TS Weld Integrity Assessment

TMI-1 Plant Specific Actions
Howard Crawford

- Actions Completed
  - Corrective Action filed
    - » Initiated CAP T2000-0223
    - » Initiated IR 934670
  - Procedure Changes/Training
    - » Steam Generator Tube Rupture EOP includes criteria on when to isolate steam generators and attachments to perform the secondary side isolation.
    - » In compliance with B&W EOP Technical Basis Document 74-1152414-10
    - » This EOP action is included in Operator training.

TMI-1 Plant Specific Actions
Howard Crawford

- Operability Assessment
  - » Engineering Evaluation 00184675 dated 6/14/2000
  - » BWOG 51-5008176-000 Input to LBLOCA Operability Evaluation
  - » Steam Generator Integrity Reports for each Refueling Outage
- OTSG Replaced by EOTSG (Fall 2009)

- Actions Planned
  - Perform Planned EOTSG tube and T/TS Weld Integrity Assessment

Davis Besse Plant Specific Actions
Dave Gerren

- Actions completed
  - Corrective Action filed
    - » Initiated CRs 1999-1022 and 2000-0300
    - » Issued Operational Experience Report OE10812 dated 03/20/00 on use of Leak Before Break (LBB)
  - Procedure Changes/Training
    - » Revised EOP. Steam Generator Tube Rupture Procedure includes an Attachment to control and track secondary side isolation. Action previously reported under B&W Owners Group Letter OG-1802 November 27, 2000.
    - » This EOP action continues to appropriate and is included in Operator training.

Davis Besse Plant Specific Actions
Dave Gerren

- Operability Assessment
  - » Completed OTSG Functional Evaluation dated 04/19/2000 as part of required corrective actions
    - Evaluated
      - Tube to Tubesheet Joint
      - Tube and Sleeve Repair Criteria
      - Repair Processes and Installed Repair Hardware
      - Evaluated against in-service tube indications (tube to tube support wear).
  - » Participated in BWOG Operability Evaluation dated 05/17/00.
  - » Evaluations continue to be valid with ongoing Condition Monitoring Assessments for LB LOCA conditions.

Davis Besse Plant Specific Actions
Dave Gerren

- Current operation with OTSG
  - » Revised the DBNPS License under Amendment 252 to add tubing circumferential defect assessment and reporting as a License Condition.
  - » Reported most recent results for License Condition 2.C(7) evaluation under FENOC Letter L-08-104 dated April 10, 2008.
  - » Current LB LOCA leakage estimate is 0.16 GPM which does not exceed 10CFR 100 limits.

- Actions Planned
  - Contracted with B&W Canada to have LBLOCA included in the ROTSG Analysis/Design including tubing repair criteria as part of their supplied work.
  - Replace OTSGs with ROTSG in Spring 2014.

CR-3 Plant Specific Actions
Scot Stewart

- **Actions Completed**
  - Non-Conformance Report (NCR) Generated In March 2000
    - » NCR is still "open" in the CR-3 Corrective Action Program
    - » Working with the Owners Group for resolution
  - Procedure Changes/Training
    - » EOP-8A (LOCA Cooldown) revised in 2006 to include steps for isolating downstream piping IF any MSIV is not fully closed and an OTSG was isolated for tube leakage concerns.
    - » The EOP steps are still current and are included in the Operator continuing training program.

CR-3 Plant Specific Actions
Scot Stewart

- Calculation Changes
  - » Revised calculation for RB flooding to include impact of inventory leaving thru MS lines
  - » Revised calculation for BS pump and DH pump NPSH A/R to show still acceptable

- Operability Assessment
  - » Completed an OTSG Tube Integrity and LBLOCA engineering evaluation in June 2000
    - Considered the impact of LBLOCA on tube to tubesheet joints and repair hardware
    - Concluded that OTSGs remain operable
  - » Participated in BWOG Operability Evaluation dated 05/17/00.
  - » Evaluations determined to be valid during ongoing CM Assessments for LB LOCA conditions

CR-3 Plant Specific Actions
Scot Stewart

- **Current OTSG Operation**
  - » CR3 granted License Amendment No. 198 on 9/10/01 for the application of reroll repairs.
    - Approval evaluated impact of LBLOCA, per BAW-2374 assumptions, on rerolls and concluded there was very low risk
    - CR3 committed to provide a Best-Estimate leakage calculation of the limiting LBLOCA based on as-found circumferential cracking in roll joints and adjacent to seal welds and demonstrate that leakage did not exceed 10 CFR Part 100 limits
    - CR3 submits results with each outage report. Most recent on May 30, 2008.

CR-3 Plant Specific Actions
Scot Stewart

- **Actions Planned**
  - ROTSG design included consideration of limiting LOCA in upper hot leg for the Tube stress.
  - Associated thermal stresses, including appropriate degradation, will not cause tube to break.
  - Tube to tube sheet joint/seal weld is sufficient to accommodate loads.
  - Tube flaw assessment process will maintain margin to tube failures for this load.

- Replace OTSGs in Fall 2009

Oconee Plant Specific Actions
Scott Thomas

- Actions completed
  - Operability performed for OTSGs in 2000 within the Corrective Action Program
  - All Oconee OTSGs have been replaced
    Unit 1 (2003), Unit 2 (2004), Unit 3 (2004)
  - ROTSGs have Inconel-690 tubes
  - ROTSGs were analyzed for the LBLOCA transient in the upper hot leg to ensure clear licensing strategy for ROTSG startup
  - Limiting thermal stress input to Reg Guide 1.121 analysis to determine allowable flaw size
  - Allowable flaw size from LBLOCA is used for condition monitoring (TS 5.5.10)
  - The analysis shows that ROTSG SG tubes will not fail, which precludes long-term cooling and dose considerations
- Actions Planned
  - None

EOTSG Integrity Assessment
Tim Wiger/Darrell Costa

- Planned Project to Assess Integrity of Steam Generator Tubes and Tube/Tubesheet Weld
- Structural Qualification of the EOTSG for the Loads associated with LOCA
- Assessment Considers Non-degraded tubes, Degraded tubes, and the tube/tubesheet weld by application of the appropriate load on the component consistent with the ASME code definition for “primary” or “secondary” stresses.
- Repair criteria to address these loads in degraded tubes will be defined in this effort
- Work is anticipated to be completed by the end of the year.

ANO-1 Alternate Source Term Amendment Approach Dan Fouts

- ANO-1 intends to submit a revised response to the previous RAI associated with the BAW-2374 issue
  - ANO-1 has replaced its steam generators with EOTSGs containing Inconel 690 tubes
  - ANO-1 has performed two 100% inspections of the EOTSG tubes with no cracking observed
  - ANO-1 intends to develop additional tube repair criteria based on the BAW-2374 event to ensure no tube failures occur

ANO-1 Alternate Source Term Amendment Approach Dan Fouts (Cont'd)

- Conclusions
  - ANO-1 will commit to update its Licensing Basis (including Tech Spec changes), as needed, to accommodate the Hot Leg U-bend LOCA event
  - The ANO-1 steam generators will remain intact following a Hot Leg U-bend LOCA
  - The ANO-1 AST submittal has appropriately identified the most limiting accidents
  - Approving or denying AST will not change the current plant exposure to the Hot Leg U-bend LOCA condition

10CFR50.46 Reportability

- The HL U-bend LOCA is not reportable under 10 CFR 50.46
  - not limiting for PCT,
  - not limiting for local oxidation,
  - not limiting for hydrogen generation,
  - not limiting for coolable core geometry,
  - not reportable for long-term core cooling (LTCC) because adequate pump NPSH is preserved and long-term core cooling is maintained with automatic and EOP directed follow up actions to isolate the secondary with indications of SGTR.