UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

June 21, 2000

LICENSEE: Tennessee Valley Authority

FACILITY: Sequoyah Nuclear Plant, Units 1 and 2

SUBJECT: SUMMARY - MAY 15, 2000, MEETING TO DISCUSS TVA'S INSPECTION OF SEQUOYAH UNIT 1 STEAM GENERATOR TUBES DURING THE CYCLE 10 REFUELING OUTAGE

On May 15, 2000, representatives of the Tennessee Valley Authority (TVA), the licensee for the Sequoyah Nuclear Plant (SQN), Units 1 and 2, met in a public meeting with members of the U.S. Nuclear Regulatory Commission (NRC) staff at NRC Headquarters in Rockville, Maryland. The NRC requested this meeting to discuss processes and results related to the recent steam generator tube inspections conducted at Sequoyah Unit 1. A list of attendees is given in Enclosure 1. The handout provided by TVA during the meeting is included as Enclosure 2.

Background

The NRC issued Amendment Nos. 252 and 243 to the Technical Specifications (TS) for SQN Units 1 and 2, respectively, on March 8, 2000. The purpose of the revisions to the TS was to incorporate an alternate repair criteria (ARC) for axial primary water stress corrosion cracking (PWSCC) at dented steam generator tube support plate intersections. The basis document for these revisions was Westinghouse Topical Report WCAP-15128, "Depth-Based SG Tube Repair Criteria for Axial PWSCC at Dented TSP Intersections," Revision 2, dated February 2000. The revised ARC was approved only for SQN operating Cycles 11 and 12, and the staff safety evaluation issued with the amendments listed additional information that needs to be supplied in any TVA request for a permanent license amendment for this ARC.

Summary of Meeting Discussions and Conclusions

TVA reviewed the history of their steam generator tube integrity program and plans to replace the Sequoyah Unit 1 steam generators in 2003. Unit 1 completed Cycle 10 of operation in February 2000 and has recently begun Cycle 11. Some tube denting occurred during initial operation of Unit 1. Mr. Valenti discussed TVA's steam generator management committee and involvement in industry groups on steam generator integrity, including the Electric Power Research Institute (EPRI), the Nuclear Energy Institute, and the Westinghouse Owners Group. TVA claims to be one of the first licensees to attempt to demonstrate steam generator tube integrity through degradation assessments, condition monitoring, and operational assessments and started sizing tube cracks in 1997.

During the month of March 2000, TVA conducted a total of 36,294 nondestructive examinations on the four SQN Unit 1 steam generator tubes. These exams included a 100% bobbin coil inspection of all tubes and 100% "plus point" inspections of hot leg dented intersections greater than or equal to 2 volts. The plus point probe was also used as a diagnostic tool for 1647 bobbin coil indications in less-than-2-volt dented intersections detected by bobbin coil inspections. Three circumferential stress corrosion cracks (two inner diameter, one outer diameter) were identified during these (less than 2-volt) inspections and the tubes were plugged

(removed from service). The NRC staff contends that more extensive plus point inspections should have been conducted in the less-than-2-volt dented intersections, and that TVA had committed to do so in a letter to the NRC dated March 12, 1997.

TVA presented a case to support their contention that the circumferential stress corrosion cracks at dented support plate intersections at SQN are not a significant safety problem (see pages 9-18 of Enclosure 2). They further reviewed the inspection plan used in terms of the SQN TS, as modified on February 29, 2000, to adopt Westinghouse Topical Report WCAP-15128, Revision 2. TVA stated that their adoption of the EPRI steam generator inspection guidelines has resulted in increased tube inspections (to 100%) of all dents greater than 2 volts up to the 7th hot leg support plate and that, like many other licensees, uses a dent threshold of 2 volts. TVA clarified what they meant in the March 12, 1997, letter with regard to their commitment to sample all dents less than 5 volts with a rotating pancake probe. TVA stated that this commitment was not intended to apply to dents that were less than 2 volts and cited a discussion in a special inspection report for the Unit 1, Cycle 8, outage dated August 8, 1997, that stated inspections for dents less than 2 volts were performed with a bobbin coil. This commitment will be restated and clarified in a future TVA submittal to the NRC staff.

A total of 200 steam generator tubes were plugged as a result of the SQN Unit 1, Cycle 10, inspections. The types of defects found and the number of tubes plugged for each type of defect are listed on page 24 of Enclosure 2. The cumulative number of Unit 1 tubes now plugged is 955, or 7% of the total number of tubes in the four steam generators. TVA discussed its operational assessment and condition monitoring results. All lowest predicted burst pressures at the end of Cycle 11 are above the required 3ΔP pressure, most by a considerable margin. The end-of-cycle maximum predicted leak rate is well below the limit of 1 gallon/minute.

At the conclusion of the meeting, the NRC staff expressed interest about how the mixed-mode cracking (i.e. axial and circumferential cracks) would be treated in the operational assessment and requested that TVA formally submit their operational assessment for Unit 1, Cycle 11 (the cycle that started in March 2000) to the NRC for staff review. This submittal may be separate from or part of the required 90-day special inspection report.

In the event that TVA would decide to request a permanent change to the SQN TS incorporating the PWSCC ARC, the NRC staff had requested (in the Safety Evaluation dated March 8, 2000) that TVA revise WCAP-15128, Revision 2, to incorporate the clarifications and commitments made in TVA's letter dated March 2, 2000. The staff also indicated at the meeting that the previous revisions of the WCAP report do not discuss treatment of mixed-mode cracking in operational assessments and that TVA/Westinghouse should consider adding this information to the WCAP.

The staff also expressed disagreement with TVA's strategy for inspecting (or not inspecting) circumferential cracks at less-than-2-volt dented tube support plate intersections and stated that a followup meeting may be requested. This meeting would be scheduled after the receipt of the operational assessment, when additional discussions on mixed-mode cracking would be held.

Based upon TVA's circumferential flaw inspection findings, the staff suggested that a strategy for inspection expansion consistent with the EPRI guidelines should be developed for less-than-2-volt dented intersections. Mr. Arhak, the representative from Pacific Gas & Electric (PG&E),

indicated that his company is interested in the same PWSCC ARC for their Diablo Canyon Nuclear Plant that was approved for SQN in March. PG&E is in the process of preparing to submit an update to WCAP-15128 (Revision 4) to support their ARC license amendment. The staff suggested that it would be advantageous for PG&E and TVA to cooperatively develop a consistent strategy for expansion of inspections of less-than-2-volt dented intersections that could be submitted by PG&E for their ARC request.

Ronald W. Hernan

Ronald W. Hernan, Senior Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-327 and 50-328

Enclosures: 1. Attendance List
2. TVA Handout

cc w/enclosures: See next page

NRC/TVA/WESTINGHOUSE MEETING TO DISCUSS TVA'S INSPECTION OF SEQUOYAH UNIT 1 STEAM GENERATOR TUBES DURING THE CYCLE 10 REFUELING OUTAGE

MAY 15, 2000,

ATTENDEES

Name	Affiliation
Ronald Hernan	NRC
Richard P. Correia	NRC
Bob Martin	NRC
Suzanne Black	NRC
Andrea Keim	NRC
John Tsao	NRC
Ted Sullivan	NRC
Emmett Murphy	NRC
Bill Bateman	NRC
Louise Lund	NRC
Pedro Salas	TVA
Joe Valenti	TVA
David Goetcheus	TVA
Helen Cothran	TVA
Bob Keaton	Westinghouse
Jim Begley	E-Mech
John Arhak	Pacific Gas & Electric
C. J. Conner	Public Service Electric and Gas
George Gaydos	Bechtel

ENCLOSURE 1

Sequoyah Nuclear Plant
U1C10 Steam Generator
Inspection Results

NRC Meeting

May 15, 2000

ENCLOSURE 2

Agenda

• Introduction	J. Valente
• TVA's Long-Term Commitment to SG Tube Integrity	D. Goetcheus
• TVA's Inspection Scope	D. Goetcheus
• Circ Cracks Observed U1C10 Outage	D. Goetcheus H. Cothron
• Condition Monitoring/Operational Assessment	H. Cothron
• Closing Remarks	J. Valente

TVA's Long-Term Commitment to SG Tube Integrity

David Goetcheus

TVA's Long-Term Commitment to S/G Tube Integrity

- Overview of Sequoyah Operation and History
  - Minor denting in the first 160 days of operations
  - Denting has been arrested since 1984 (0.740 probes pass)
- SG Program has always been high priority for management
  - Proactive approach to corrosion control
    - ⇨ U-Bend Heat Treatment
    - ⇨ Shot Peening of Expansion Transitions
    - ⇨ Chemical Cleaning
    - ⇨ Secondary System Chemistry
  - Active SG Management Committee
    - ⇨ Chemistry
    - ⇨ Outage Management
    - ⇨ Engineering
    - ⇨ Operations
    - ⇨ Maintenance
  - Aggressive Inspection Programs
- Plans for Unit 1 SG Replacement 2003 (U1C12)

TVA's Long-Term Commitment to S/G Tube Integrity

- Active Involvement in EPRI, NEI, and Users Group
  - Active members in the EPRI SGMP since late '70's
  - Active members of the NEI Task Force for NEI 97-06 since inception
  - Active members of the Westinghouse Owners Group

- TVA has always utilized state-of-the-art technology for SG inspections

- One of the first plants to begin demonstrating SG tube integrity through degradation assessments, condition monitoring, and operational assessments
  - First plant to qualify plus point for sizing axial PWSCC at dents
  - The most comprehensive industry database for Westinghouse Model 51 and Model D SGs
  - Began sizing cracks for assessments and growth rate studies in 1997

Sequoyah's U1C10 Inspection Scope/ Sampling Plan for All Degradation

David Goetcheus

U1C10 Outage S/G Tube Inspections
(SQN's Sampling Strategy for All Degradation)

- Scope of U1C10 SG Tube Inspections
  - 100% bobbin coil - 12,797 exams
  - 100% plus point at the top of tubesheet - 12,797 exams
  - 100% Rows 1 and 2 U-Bends with U-Bend plus point probe - 641 exams
  - 20% sample of freespan dents TTS-TSP2 using plus point - 52 exams
  - 100% plus point of hot leg ≥ 2 volt dented intersections
    - 3,509 ≥5 volt dent exams
    - 4,851 2-5 volt dent exams
  - Used the 100% bobbin coil inspection to identify flaws in <2 volt dented intersections
    - ⇨ Used the plus point probe as a diagnostic tool for bobbin indications - 1,647 exams
  - Total exams - 36,294 (bobbin coil and plus point and U-Bends)
- Sludge lancing and FOSAR in all four SGs

Circ Cracks Observed U1C10

David Goetcheus

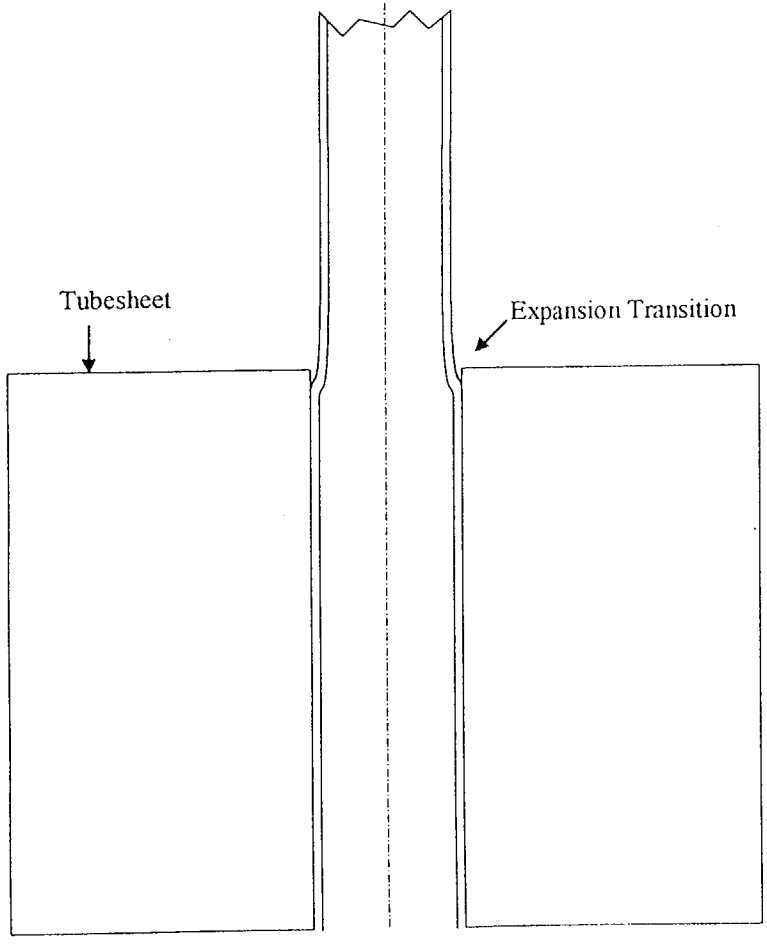
Industry Experience With Circumferential Stress Corrosion Cracking

- Tubesheet Expansion Transitions
  - 360° stress area allows large circumferential crack extents
  - Potential for tube rupture which affects neighboring tubes
  - This condition does not exist at SQN

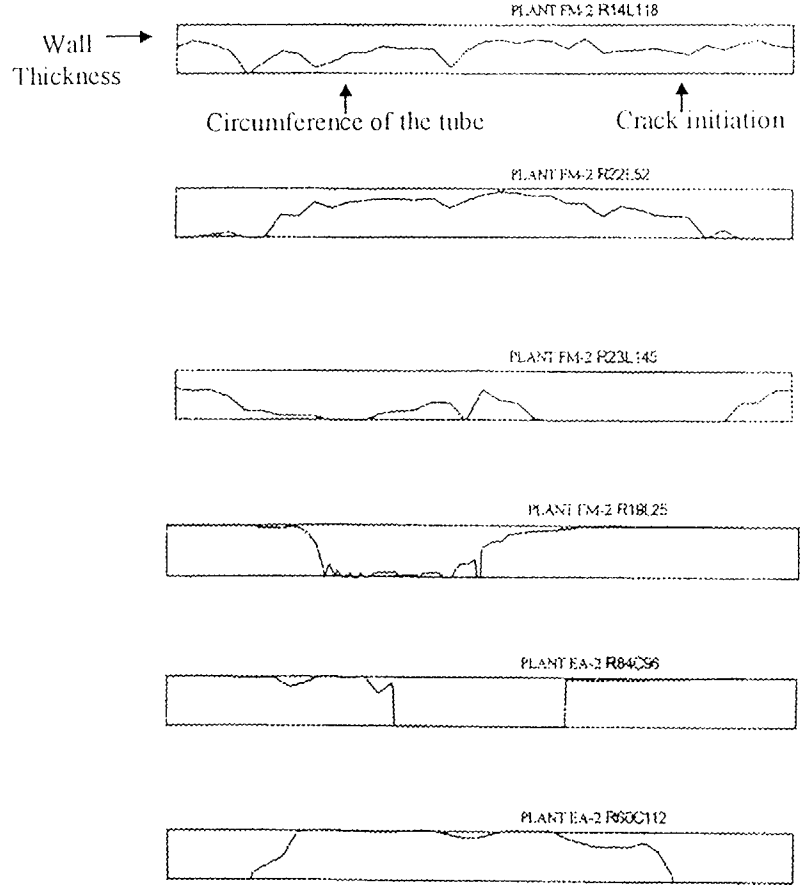
- Dented Tube Support Plate Intersections
  - Localized stress area limits crack extents
  - Very low probability of tube failure
  - No potential for tube rupture which affects neighboring tubes

Circumferential Stress Corrosion Cracks at Hard Rolled Expansion Transitions

- Located at tubesheet hard rolled expansion transitions
- 360° stress area allows large crack extents



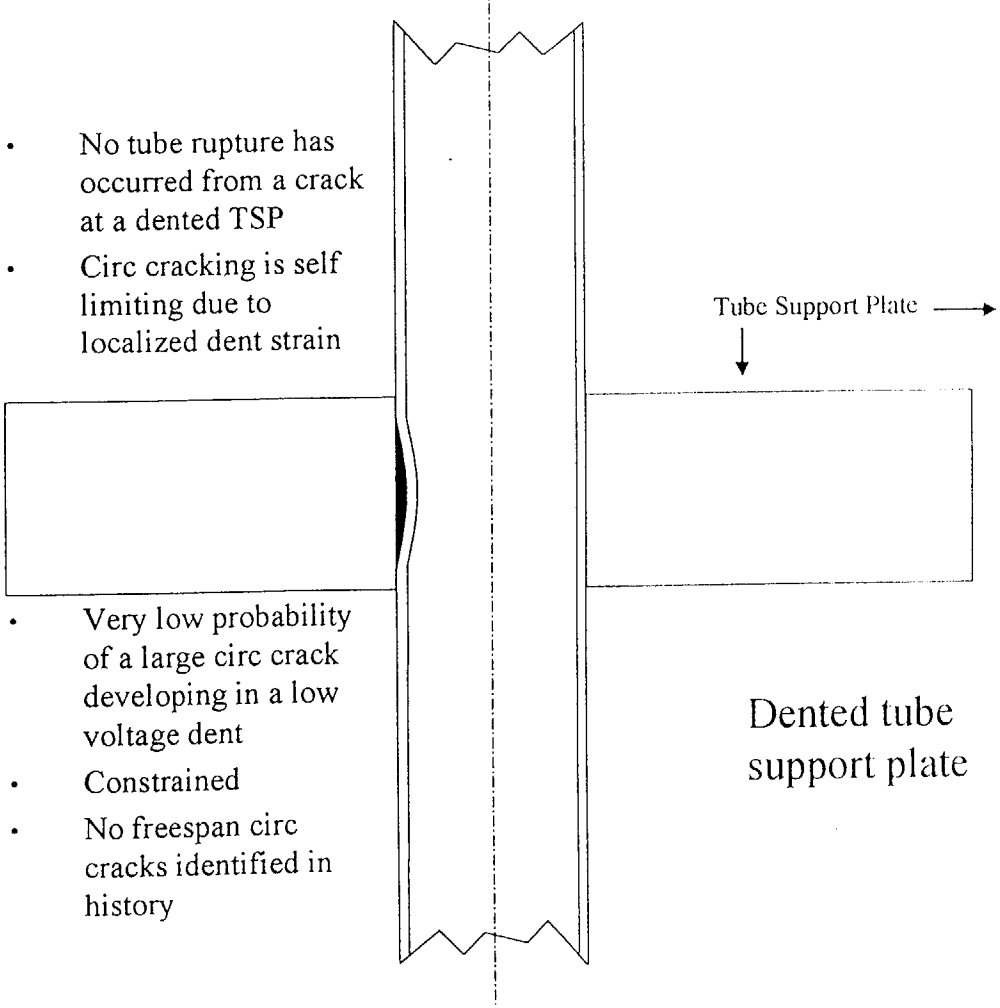
Industry Examples



Circumferential Stress Corrosion Cracks at Dented Support Plate Intersections at SQN

- Not a safety concern
- Localized dent strain limits crack extent

- No tube rupture has occurred from a crack at a dented TSP
- Circ cracking is self limiting due to localized dent strain

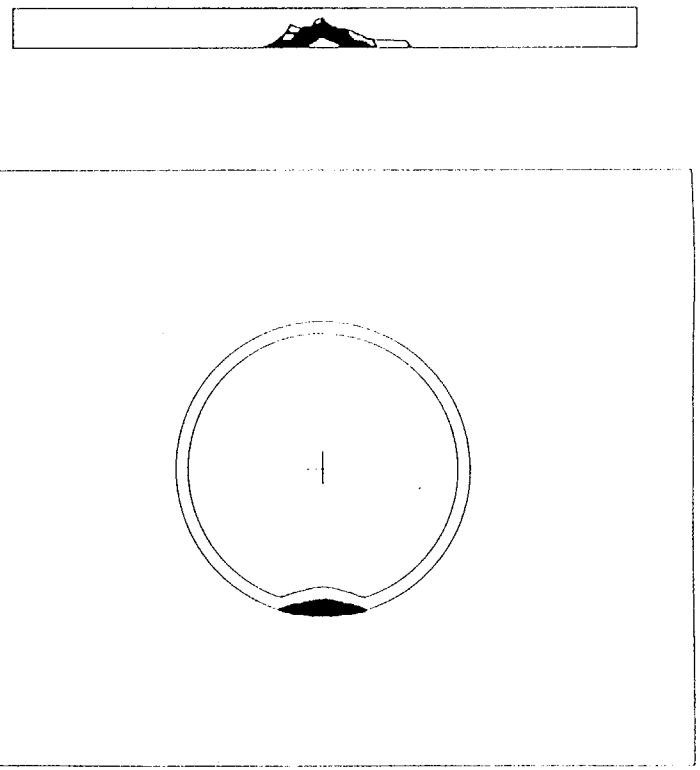


- Very low probability of a large circ crack developing in a low voltage dent
- Constrained
- No freespan circ cracks identified in history

Tube Support Plate

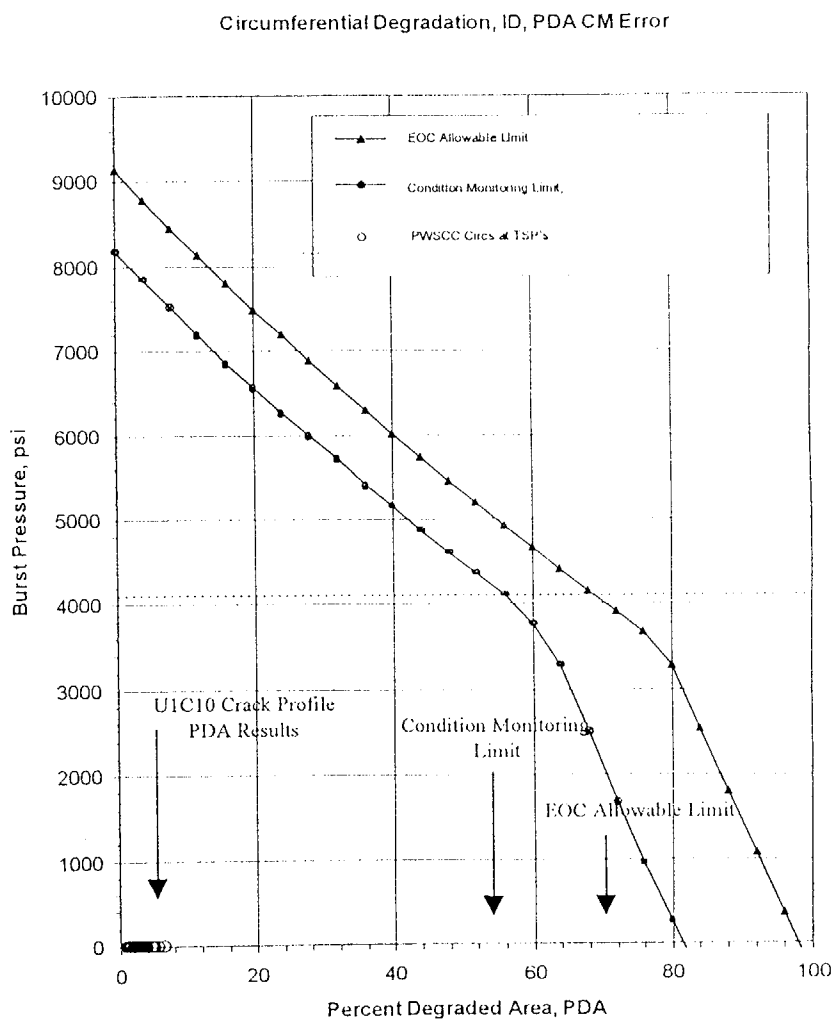
Dented tube support plate

U1C10 TSP circ profiles



Circ Cracks Observed U1C10

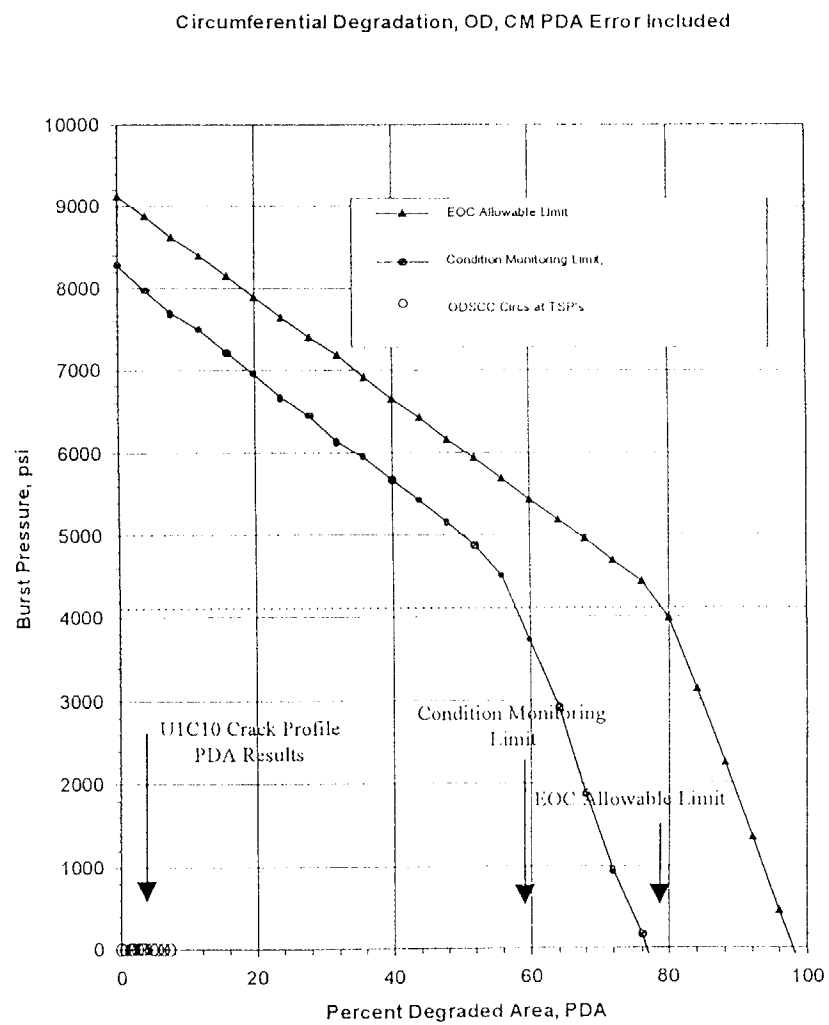
- 67 circumferential cracks identified
  - 45 ID (2 in < 2 volt dents)
  - Largest PDA 6.30%
  - Largest Length 73° (0.53")
  - Largest Max Depth - 76%
  - Largest Voltage - 1.09 volts
- Circ cracks are plugged on detection
- Condition Monitoring structural limit, including uncertainties=55.4% PDA
- EOC Limit - 69.3% PDA
- Using SQN-specific 95th percentile growth rate and 95th percentile uncertainties from ETSS 96702, a crack grown from Cycle 8 would be 31% PDA EOC-11



EPRI Report 107197

Circ Cracks Observed U1C10

- 67 circumferential cracks identified
  - 22 OD (1 in <2 volt dent)
  - Largest PDA 6.36%
  - Largest Length 70° (0.5")
  - Largest Max Depth - 77%
  - Largest Voltage -0.62 volts
- Circ cracks are plugged on detection
- Condition Monitoring structural limit, including uncertainties= 58.2% PDA
- EOC Limit - 78.0% PDA
- Using SQN-specific 95th percentile growth rate and 95th percentile uncertainties from EPRI Report 107197, a crack grown from cycle 8 would grow to 68% PDA EOC-11
  - This is a very conservative prediction since it highly unlikely in low voltage dents

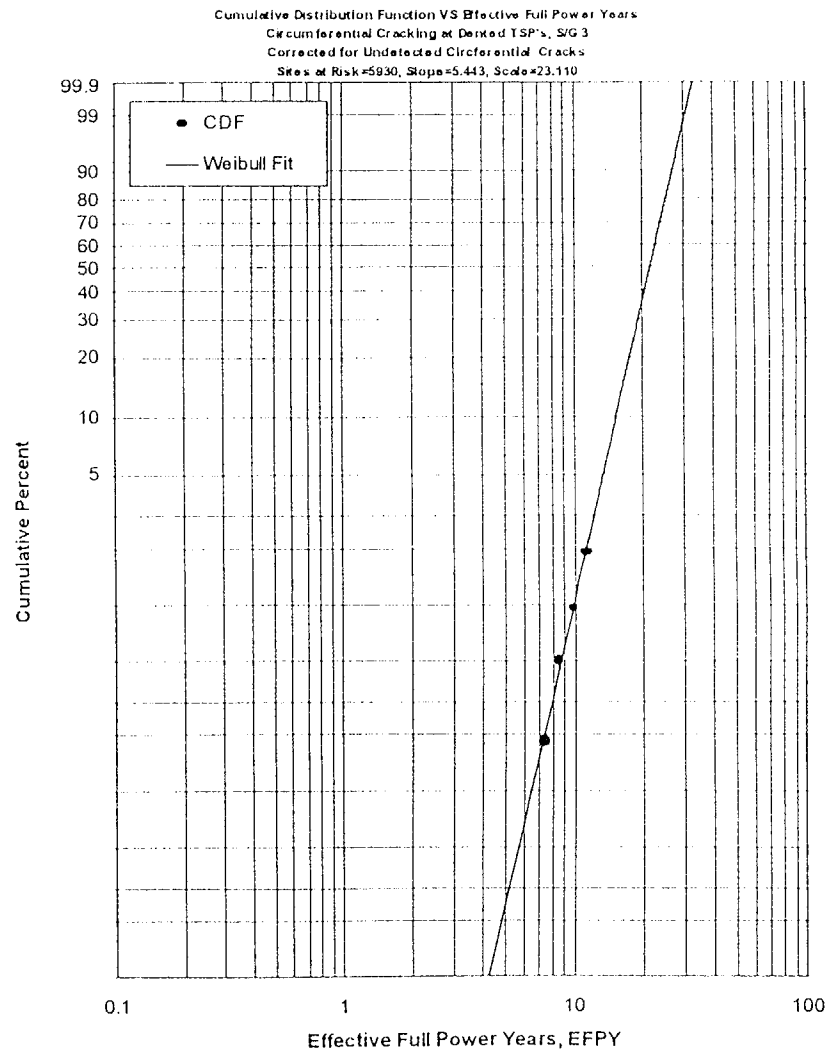


EPRI Report 107197

Conservative Projections of Circ Cracks at Dented TSP Intersections at EOC-11

- Predictions of a distribution of circ cracks for leakage analysis were made using SQN's experience with PWSCC axial cracks at dents
  - At least 70% of all axial indications since cycle 8 have been in ≥ 2 volt dents
  - Using this data, projections are made for a circ crack distribution including <2 volt dents

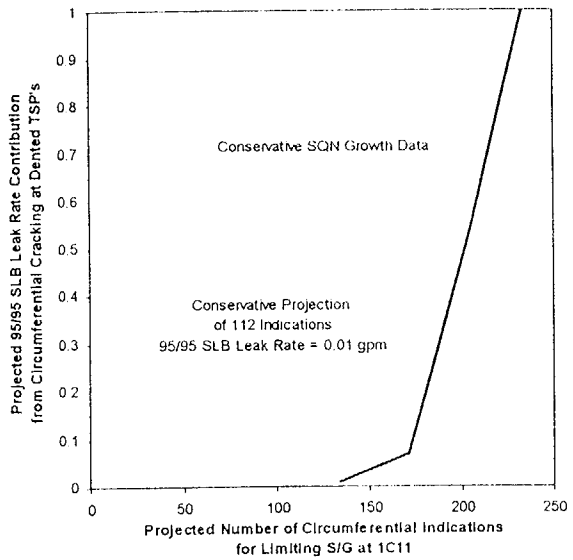
SG	EOC-10		EOC-11
	Observed	Potential	Projected
All	67	96	174
1	9	13	21
2	5	7	14
3	39	56	112
4	14	20	27



Potential for Undetected Circ Cracking in <2 Volt Dents

- The three circ cracks identified U1C10 in <2 volt dents were +Point examined because of a bobbin call (DSI)
  - Uninspected population taken into account during leakage analyses

Leakage Analysis of U1C10 Circ Cracks



  - Total leakage contribution to the limiting SG is calculated as 0.012 gpm

Potential for Mixed Mode Cracking in <2 Volt Dents

- OD and ID axial cracks in the same intersection are identified during 100% inspection and are taken out of service
  - These flaws are detected by bobbin and diagnostics are performed using +Point
  - POD of 0.6 conservative for predicting missed indications in both ARCs
- ID axial cracks and circ cracks in the same intersection are identified during 100% inspection and are taken out of service
  - All axial ID cracks are inspected with +Point
  - POD of 0.6 conservative for predicting missed indications in PWSCC ARC
- OD axial cracks and circ cracks in the same intersection are accounted for in tube integrity analyses
  - Westinghouse mixed mode cracking data proves that structural integrity is not an issue with SQN mixed mode cracks
    - Leakage rate could be affected (although low probability)
    - The calculated leakage prediction for the ODSCC ARC has been increased by 20%

Potential for Mixed Mode Cracking in <2 Volt Dents

- Test Data from Westinghouse (some of data EPRI NP6864 R2)
  - "L", "T", "U", "H" EDM slots plus laboratory stress corrosion cracks
  - Over 100 burst tests
  - Depths ranged from 50% through wall to 100% through wall
  - Lengths ranged from 0.12" to 0.60" for both circs and axials
- Conclusions
  - Both axial and circ cracks must be freespan, "L" or "U" shaped, at least 0.5", and 100% through wall before 3ΔP is challenged
  - None of SQN's circ cracks are freespan
  - None of SQN's identified mixed mode cracks had axial or circ that were 0.5" and 100% through wall
  - All ODSCC axial indications that measure 2 volts and greater are +Point examined
    - A 2 volt axial crack would have burst pressures higher than 4600 psi
    - With this burst pressure the indication would be very short or very shallow - never 0.5" long and 100% through wall
  - Mixed mode cracking is not a structural concern

Potential for Mixed Mode Cracking in <2 Volt Dents

- Even when the "L", "T", "U", and "H" crack formations are in freespan, "flap" does not occur at steam line break conditions - therefore large leak rates are not an issue
- Increased axial opening is addressed in leakage analysis
  - Axial crack will dominate in the mixed mode condition
  - If both cracks are 100% through wall in-plane crack opening will be increased
  - The effect is bounded by adding a 20% increase to the leakage calculated for the alternate repair criteria operational assessment

SQN's Dented Tube Support Plate Inspection

(Sampling Strategy With Respect to Tech Specs)

- WCAP 15128, Revision 2 approved for use by SQN's Tech Spec Change February 29, 2000 redefines the dent inspection plan for SQN on page 2-3
  - *100% bobbin coil inspection of all TSP intersections*
  - *+Point coil inspection of all bobbin coil indications at dented TSP intersections*
  - *+Point coil inspection of all prior PWSCC indications left in service*
  - *On a SG basis, +Point coil inspection all TSP intersections have > 2.0 volt dents up to the highest TSP for which PWSCC has been detected in the prior and current inspection and 20% of dents > 2.0 volts at the next highest TSP*
- The three circumferential cracks in <2 volt dents were identified while investigating and diagnosing 100% bobbin probe indications as required by WCAP-15128, Revision 2
  - No expansion was necessary

SQN's Dented Tube Support Plate Inspection

(Sampling Strategy With Respect to NEI/EPRI Guidelines)

- SQN's SG inspections are based on SQN experience as well as industry Model 51 experience
  - EPRI Guidelines
- SQN's dent sampling plan has been approved by the NRC Staff
  - Critical area/buffer zone concept adopted by the EPRI Guidelines has been utilized in the past and has caused SQN's dent inspection to expand to 100% of all dents >2 volts up to the 7th hot support plate
  - SQN utilizes a dent threshold of 2 volts
    - No discussion is included in the guidelines about dent thresholds
    - Possible inclusion in Rev. 6
    - Most plants have at least a 2 volt threshold for calling dents (only 1 known exception)
      - Generic Letter 95-05 only requires +Point examination of >5 volt dents
    - Lowering the 2-volt dent threshold is unnecessary because structurally significant flaws will be detected at intersections where the dent voltage is less than 2 volts
  - Uninspected areas are accounted for in tube integrity analyses

SQN's Dented Tube Support Plate Inspection

(Inspection Commitment in the Context of March 1997 RAI)

- The dent sampling plan outlined in the March 12, 1997 RAI response for dents less than 5 volts was not intended to apply to the range of 0 - 2.0 volts:
  - During an August 22, 1997 meeting between TVA and NRC, TVA reported the inspections were in the 2-5 volt range (pg. 10)
  - TVA's letter dated August 8,1997, "Special Report on Steam Generator Activities Completed During the U1C8 Refueling Outage" described TVA's dent inspection on page 4 of the attached Safety Evaluation Checklist

    The inspection of EOC-8, as well as for EOC-7, for dents <2 volts was based on bobbin coil inspection. . . . Since detection of flaws in dents <2 volts is based on bobbin coil inspection calls and detection of flaws in dents >2 volts is based on +Point detection, these two groups are evaluated separately below for the tube integrity operational assessment.
- This meeting serves to clarify TVA's commitment in the March 12, 1997 RAI response
- The commitment will be clarified with SQN's future submittal of the NEI Tech Spec Change Package

SQN's Dented Tube Support Plate Inspection

(Inspection Commitment in the Context of March 1997 RAI)

- The dent sampling plan and expansion criteria outlined in March 1997 RAI response to TS Change 96-05 has been followed since cycle 7 inspection
  - Cycle 7 original sample up to 2nd hot support with buffer zone at 3rd
  - Cycle 8 original sample up to 4th hot support with buffer zone at 5th
  - Cycle 9 original sample up to 5th hot support with buffer zone at 6th
  - Cycle 10 100% up to 7th hot support due to detection of axial PWSCC or circ cracking
- The only expansion would be into the cold leg if axial PWSCC or circ cracking was detected at the 7th hot support plate
- The three circ cracks in <2 volt dents were not identified during a sampling plan

Condition Monitoring for U1C10
and
Operational Assessment for U1C11

Helen Cothron

U1C10 Outage S/G Tube Inspection Results

- Results of Inspection - Total Tubes Plugged - 200

Active Degradation	Indications Plugged
AVB Wear	0 (62 indications)
Cold Leg Wastage	0 (27 indications)
ODSCC Axial TTS	13
ODSCC Circ TTS	4
ODSCC Axial TSP	36 (803 indications)
ODSCC Circ TSP	22
PWSCC Axial TTS	9
PWSCC Circ TTS	53
PWSCC Axial TSP	49 (160 indications)
PWSCC Circ TSP	45
PWSCC Axial R1 U-Bends	2
PWSCC Circ R1 U-Bends	9
Preventively plugged	36

- Cumulative Tubes Plugged - 955 tubes - 7.05%

U1C10 Condition Monitoring / U1C11 Operational Assessment

- Methodology for Structural Analysis
  - Condition Monitoring
    - Size the indication with qualified sizing technique or best available technique
    - Add NDE uncertainties using standard deviation * 1.645 from ETSS or industry data from EPRI Reports
    - Calculate burst pressure or compare to critical flaw size
  - Operational Assessment
    - Determine BOC limiting flaw and/or distribution of flaws
      - No NDE uncertainty is added -- projecting an actual flaw size, not an NDE measurement
    - Calculate growth from site data if sufficient number of data points are available - otherwise use industry data if applicable or data from similar degradation
      - Best axial growth data in the industry is SQN's axial PWSCC at dents
        - For the first time in the industry, indications were depth sized and left in service and sized again after a cycle of growth
      - Where axial growth data is insufficient, this growth is utilized
    - Calculate burst pressure or compare to critical flaw size

U1C10 Outage S/G Tube Inspection Overall Condition Monitoring/Operational Assessment

Mechanism	Repair Limit	Inspection	Structural Performance Criteria (psi)	Length at 95th Percentile (inches)	NDE Uncertainty	Source of Uncertainty	AD Growth (%) per EFPY	Limited Predicted BOC Flaw (%AD)	Limiting Predicted Flaw EOC (%AD)	Lowest Predicted Burst Pressure (psi)	U1C10 Limiting Flaw	Lowest Burst Pressure EOC-10 (psi)
AVB Wear	40% MD	100%	4110	0.38	5.62	96004	11.7	47.0	64.30	4738	37% MD	6380
C/L Wastage	40% MD	100%	3660	0.43	21.19	96001	8.8	51.1	64.11	4619	39% MD	6185
ODSCC Axial TTS	Plug on Detection	100%	4110	0.51	16.29	96703	19.9	32.5	61.93	4963	0.44"/31.57 %AD	5204
ODSCC Circ TTS	Plug on Detection	100%	4110	N/A	23.47	EPRI Report 107197	9.4	31.1	45.00	6361	3.56% PDA	8021
ODSCC Axial TSP	ODSCC ARC	100%	Probability of burst - $1x10^{2}$	N/A	probe - 7% sd analyst - 10.3 sd	WCAP 14277	Largest 95th 0.287V	N/A	3.1V	Probability of burst - $3.0x10^{1}$	2.63V	Probability of burst - $3.3x10^{4}$
ODSCC Circ TSP	Plug on Detection	Partial	4110	N/A	23.47	EPRI Report 107197	9.4	31.1	45.00	6361	6.36% PDA	7823
PWSCC Axial TTS	Plug on Detection	100%	4110	0.51	12.83	WCAP 15128	16.1	32.5	56.31	5123	62% AD/.51"	4228
PWSCC Circ TTS	Plug on Detection	100%	4110	N/A	16.52	96702	9.4	31.1	45.00	5667	6.35% PDA	7771
PWSCC Axial TSP	PWSCC ARC	100%	3660	0.47	7.8% sd	WCAP 15128	19	N/A	N/A	4791	47.5% AD	N/A
PWSCC Circ TSP	Plug on Detection	Partial	4110	N/A	16.52	96702	9.4	31.1	45.00	5667	6.3% PDA	7764
PWSCC Axial U-Bend	Plug on Detection	100%	4110	0.75	12.83	WCAP 15128	16.1	40	63.81	5925	46.56% AD/.25"	6899
PWSCC Circ U-Bend	Plug on Detection	100%	4110	N/A	16.52	96702	9.4	31.1	45.00	5667	6.79% PDA	8942

- Lowest predicted burst pressures for all degradation are above 3ΔP (4110)
- Structural performance criteria is met for EOC-10 and EOC-11

U1C10 Condition Monitoring / U1C11 Operational Assessment

- Methodology for Leakage Analysis
  - Condition Monitoring
    - Size the indication with qualified sizing technique or best available technique
    - Use voltage to screen indications to EPRI In Situ Guidelines/Westinghouse criteria
      - If the indications fail screening criteria, in situ testing would be performed
    - Determine if leakage occurs
    - Determine total leakage
  - Operational Assessment
    - Determine BOC limiting flaw and/or distribution of flaws
      - No NDE uncertainty is added -- projecting an actual flaw size, not an NDE measurement
    - Calculate growth from site data if sufficient number of data points are available - otherwise use industry data if applicable or data from similar degradation
    - Determine if leakage occurs
    - Calculate leakage

U1C10 Condition Monitoring / U1C11 Operational Assessment

Mechanism	Leakage Performance Criteria (gpm)	MD Growth per EFPY	Would Limiting U1C10 Flaw Exceed In Situ Screening	Potential for Leakage	gpm EOC Leak Rate
AVB Wear	1	11.7%	N/A	No	0
C/L Wastage	8.2	8.8%	N/A	No	0
ODSCC Axial TTS	1	25.60%	No	Yes	0
ODSCC Circ TTS	1	26.90%	No	Yes	0
ODSCC Axial TSP	8.2	N/A	No	Yes	0.61344
ODSCC Circ TSP	1	26.90%	No	Yes	0
PWSCC Axial TTS	1	20.60%	No	No	0
PWSCC Circ TTS	1	26.90%	No	Yes	0
PWSCC Axial TSP	8.2 / 1	19.20%	No	Yes	0
PWSCC Circ TSP	1	26.90%	No	Yes	0.012
Circ and Axial Mixed Mode	1		No	Yes	Add 20% factor to ODSCC TSP
PWSCC Axial U-Bend	1	20.60%	No	Yes	0
PWSCC Circ U-Bend	1	26.90%	No	Yes	0
Total Freespan Leakage	1				0.012
Total Constrained Leakage	8.2				0.61344 gpm

- Total predicted leakage from limiting SG is well below 1 gpm
- Leakage performance criteria is met for EOC-10 and EOC-11

Conclusions

- SQN's SG inspection met regulatory requirements and performance criteria
- Total projected leakage for full cycle 11 in limiting SG is below 1 gpm performance criteria
- Projected burst pressures for full cycle 11 are well above 3dP performance criteria
- This meeting serves to clarify TVA's intent of the March 12, 1997 RAI response that the range of dent voltages <5 volts inspected with plus point at SQN is 2-5 volts

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indicated that his company is interested in the same PWSCC ARC for their Diablo Canyon Nuclear Plant that was approved for SQN in March. PG&E is in the process of preparing to submit an update to WCAP-15128 (Revision 4) to support their ARC license amendment. The staff suggested that it would be advantageous for PG&E and TVA to cooperatively develop a consistent strategy for expansion of inspections of less-than-2-volt dented intersections that could be submitted by PG&E for their ARC request.

/RA/

Ronald W. Hernan, Senior Project Manager, Section 2
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Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-327 and 50-328

Enclosures: 1. Attendance List
2. TVA Handout

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