



UNITED STATES
NUCLEAR REGULATORY COMMISSION
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December 3, 2008

Mr. Ross T. Ridenoure
Senior Vice President and Chief Nuclear Officer
Southern California Edison Company
San Onofre Nuclear Generating Station
P.O. Box 128
San Clemente, CA 92674-0128

SUBJECT: SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 3 - SUMMARY OF
OCTOBER 31, 2008, DISCUSSIONS ON STEAM GENERATOR TUBE
INSPECTIONS (TAC NO. MD9640)

Dear Mr. Ridenoure:

On October 31, 2008, the U.S. Nuclear Regulatory Commission (NRC) staff participated in a conference call with Southern California Edison (SCE) representatives, R. Coe, A. Matheny, and A. Brough, regarding the 2008 steam generator tube inspections at San Onofre Nuclear Generating Station, Unit 3. A summary of the October 31, 2008, conference call is provided in the enclosure; the information supplied by SCE, in support of these discussions (handouts), is provided in an attachment to the enclosure. The NRC staff did not identify any issues that would warrant preventing the plant from starting up following its 15th refueling outage.

If you have any questions, please call me at (301) 415-1480.

Sincerely,

A handwritten signature in black ink, appearing to read "N. Kalyanam".

N. Kalyanam, Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-362

Enclosure: 1) Summary of conference call
2) Handouts

cc w/encl: Distribution via ListServ

SUMMARY OF OCTOBER 31, 2008, CONFERENCE CALL WITH
SOUTHERN CALIFORNIA EDISON REGARDING THE FALL 2008
STEAM GENERATOR TUBE INSPECTION AT
SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 3
DOCKET NO. 50-362

On October 31, 2008, the U.S. Nuclear Regulatory Commission (NRC) staff participated in a conference call with Southern California Edison (SCE, the licensee) representatives, R. Coe, A Matheny, and A. Brough, to discuss the ongoing steam generator (SG) tube inspections during their Cycle 15 refueling outage (3C15) at San Onofre Nuclear Generating Station, Unit 3 (SONGS 3).

SONGS 3 has two Combustion Engineering Model 3410 SGs, designated SG 88 and SG 89, each with 9,350 tubes made from mill annealed Alloy 600. The tubes have an outside diameter of 0.75 inches and a nominal wall thickness of 0.048 inches. The tubes are explosively expanded for the full depth of the tubesheet and are supported by carbon steel lattice grids (eggcrates). The tubes are also supported by carbon steel vertical and diagonal bars in the U-bend section. This was the last scheduled inspection of the Unit 3 SGs, which are scheduled to be replaced in the fall of 2010, after the upcoming Cycle 16 operating cycle.

Prior to the conference call, the licensee provided a written response to a set of discussion points from the NRC staff (Agencywide Documents Access and Management System (ADAMS) Accession No. ML082610458). The licensee's response, dated October 30, 2008, (ADAMS Accession No. ML083240834) is included as an enclosure. The abbreviations used by the licensee in the enclosure are:

ALARA	As Low As Reasonably Achievable
CA	Crack Angle
CIRC	Circumferential
COL	Column
ECT	Eddy Current Testing
EFPY	Effective Full Power Years
Elev	Elevation
EPRI	Electric Power Research Institute
FLDA	Flaw Length Degraded Area
ID	Inside Diameter
Ind	Indication
PDA	Percent Degraded Area
PP	Plus Point
SAI	Single Axial Indication
SCA	Single Circumferential Indication
TSC	tubesheet cold
TSH	tubesheet hot
TW	Through Wall

Additional clarifying information and information not included in the attached document is summarized below.

In discussing the scope of the inspections, the licensee clarified that a 100 percent inspection of the cold leg top of the tubesheet (TTS) locations was performed during 3C14 (November 2006). The rotating probe inspections conducted at the cold-leg TTS during this refueling outage included all the periphery tubes. The licensee also explained that dents are defined as tube diameter distortions located at a support plate, while dings are defined as tube diameter distortions located in a freespan.

The noise levels in the eddy current data in the 2008 outage are comparable to what has been observed in other Combustion Engineering model SGs that have tubing manufactured by Sawhill Tubular. Other plants that had (or still have) similar SGs are Arkansas Nuclear One, Unit 2, Saint Lucie Plant, Unit 2, and Waterford Steam Electric Station, Unit 3.

A visual exam was performed on the secondary side of the SGs using remote video camera equipment. The inspection stated the entire periphery and the blow down lane. The licensee indicated that the one loose part found in SG 89 near the stay cylinder, on the cold-leg at the TTS was not detected during the +Point™ exam, but was found visually during the foreign object search and retrieval (FOSAR). The neighboring tubes of this loose part were examined with the +Point™ probe. Since this loose part could not be removed from the SG, four tubes surrounding this loose part will be plugged. These tubes will not be stabilized since the part is firmly lodged in place, and the SGs will only be operated for one more cycle.

The licensee stated that potential loose parts (PLPs) found in the periphery are visually examined during FOSAR. Other PLPs that cannot be dispositioned by a visual exam are dispositioned by a historical eddy current review and by looking for trends and patterns in eddy current PLP signals. The licensee indicated that in SGs where the tubes are arranged in a triangular pattern, a true loose part would typically affect three tubes.

The licensee stated that there were no upper steam drum or upper bundle in bundle inspections performed this outage.

The licensee stated that flow accelerated corrosion was found in Unit 3 prior to a chemical cleaning performed in the 1990's during 3C9. The extent of corrosion was more severe in Unit 3 than Unit 2. The corrosion was a result of a change in flow patterns on the secondary side of the SG caused by the accumulation of deposits. Visual inspections in several outages following chemical cleaning indicated no further degradation or changes in the position of the supports.

At the end of the call, the licensee was requested to inform the NRC staff if during the remainder of the inspections there were any unexpected results such as new degradation mechanisms.

SONGS Unit 3

Steam Generator Inspections

3C15

Update with the NRC

October 30, 2008

SONGS Unit 3 Background

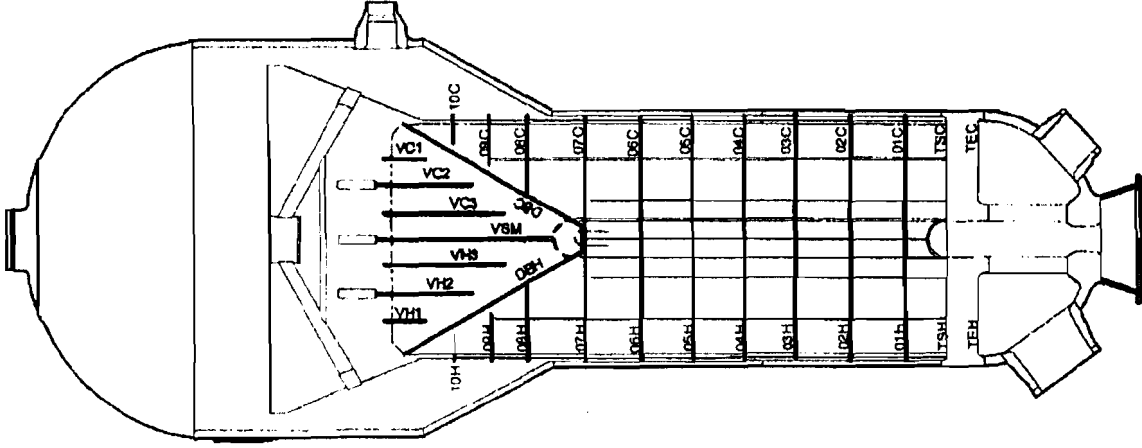
Two (2) Steam Generators

- Supplied by Combustion Engineering
- Designated SG 88 and 89
- SG88 – 8617 tubes in Service (7.9% Plugged)
- SG89 – 8688 tubes in Service (7.1% Plugged)
- No sleeves are installed in SONGS Unit 3

Recent Exam Outages

- Current Refueling Outage (3C15) ~19.6 EFPY
Last scheduled inspection prior to replacement

SONGS Steam Generator



Completion Status as of 10/30/2008

- Bobbin ECT Inspection – Complete
- +Point ECT Inspection – Complete
- Foreign Object Search (FOSAR)
 - Complete Both SGs
- In-Situ Testing – No candidate tubes identified
- Final Review of Inspection Data and Repair List Preparation In Progress
- Plugging – To begin 10/31/2008

Note: Since exams are still in progress, all data and numbers in this presentation should be considered preliminary and subject to change.

Discussion Points (DP)

DP-1) Discuss any trends in the amount of primary-to-secondary leakage observed during the recently completed cycle.

- SONGS Unit 3 has some reported extremely low-level primary-to-secondary leakage. Discovery was June 2, 2006, and it has remained stable at approximately 2×10^{-5} gallons per day. Similar leakage was noted for SONGS Unit 2 starting on July 25, 2007. This leakage is well below the threshold of detection of normal monitoring instrumentation (the condenser air ejector radiation monitor at approximately 0.1 gallons/day, a capability that is typical in the industry). This leakage was detected in the SONGS program for monitoring radioactive effluent paths of release to the environment which provides periodic monitoring (collection and measuring activity in a continuous charcoal filter sample on a weekly basis). This leakage detection is not typical in the industry because the SONGS condenser air ejector is a direct release path to the environment and is not diluted by other discharge streams. Monitoring will resume following SONGS Unit 3 restart.

Discussion Points (DP)

DP-2) Discuss whether any secondary side pressure tests were performed during the outage and the associated results.

- No secondary side pressure tests were performed.

DP-3) Discuss any exceptions taken to the industry guidelines.

- No exceptions to the industry guidelines were taken

Discussion Points (DP)

DP-4) Description of Inspections Performed

Bobbin Exam or Rotating Exams (+Point)

- Full Length Exam of In-Service Tubes (100%)

Rotating Exams (+Point)

- Hot Leg top-of-tubesheet locations (100%) (TSH-13.00”)
- Cold Leg top-of-tubesheet locations (28%) (TSC-13.00”)
- Rows 1-3 U-Bend Locations (100%)
- Rows 4-10 U-Bend Locations (20%)
- Special Interest Locations ~ 3600 locations
 - Non-quantifiable bobbin indications (I-Codes) ~ 139 locations
 - Dents ≥ 2 volts (100%) ~ 744 locations
 - Dings ≥ 4 volts (100%) ~ 937 locations
 - Tube wear at supports (100%) ~ 1770 locations

DP-5) Inspection Results

	<u>SG88</u>	<u>SG89</u>
TSH Circ, Axial	~10	~8
TSC Circ, Axial	~0	~0
Freespan Axial	~0	~0
Tube Support Axial	~0	~0
Tube Support Wear ($\geq 44\%$ TW)	~0	~0
Tube Support Wear (Preventative)	~10	~4
Foreign Object (Preventative)	~0	~4
Misc.	~0	~0
Total Repairable Tubes	~20	~16

DP-5) Inspection Results (Last Outage)

Previous Outage for Comparison	<u>SG88</u>	<u>SG89</u>
TSH Circ, Axial	5	2
TSC Circ, Axial	0	0
Freespan Axial	0	0
Tube Support Axial	0	0
Tube Support Wear ($\geq 44\%$ TW)	0	0
Tube Support Wear (Preventative)	23	8
Tubes with Data Quality/ ALARA Complications	1	1
Total Repairable Tubes	29	11

DP-5) Top Indications by Voltage

SG 88 Top 2 Indications by Voltage													
Row	Col	PP Volts	Ind	Origin	Elev	Inch	Length	Depth	PDA	FLDA	C A	Leak Test	Pressure Test
2	40	0.77	SAI	ID	TSH	-3.87	0.28	61		55.57		No	No
38	112	0.71	SAI	ID	TSH	-1.31	0.77	51		43.48		No	No
22	34	0.69	SCI	ID	TSH	-0.11		68	3.48		26	No	No
8	42	0.58	SCI	ID	TSH	-2.84		54	2.71		26	No	No
SG 89 Top 2 Indications by Voltage													
Row	Col	PP Volts	Ind	Origin	Elev	Inch	Length	Depth	PDA	FLDA	C A	Leak Test	Pressure Test
101	69	0.93	SCI	ID	TSH	-0.11		70	5.19		51	No	No
113	99	0.78	SAI	ID	TSH	-7.78	0.17	54		45.35		No	No
103	69	0.69	SCI	ID	TSH	-0.09		53	2.58		26	No	No
103	69	0.68	SCI	ID	TSH	-0.07		53	4.25		30	No	No

Discussion Points (DP)

DP-6) Repair/Plugging Plans

- **Repair**
 - All indications exceeding Technical Specification repair criteria ($\geq 44\%$ through wall)
 - All crack-like Indications
 - Quantified (Percent) Wear Indications
 - $\geq 25\%$ At tube support locations Diagonal Bar Hot and Diagonal Bar Cold
 - $\geq 30\%$ At all other support locations
 - Circumferentially oriented indications will be stabilized

Discussion Points (DP)

DP-7) In-situ Pressure Test and Tube Pull Plans

- Utilizing latest EPRI guidelines for candidate selection and testing
- All tubes meeting criteria will be tested
- No tubes have been selected to date this outage based on EPRI screening criteria
- No tube pulls are planned based on inspection results

Discussion Points (DP)

DP-8) Discuss Foreign Objects

- **What Inspections are performed to detect foreign objects?**
 - Secondary Side Visual Exam (FOSAR)
 - 100% By Bobbin Probe or rotating +Point
 - 100% TSH with rotating +Point
 - 100% TSC periphery with rotating +Point
 - 20% TSC of remaining tubes with rotating +Point
- **A description of any foreign objects detected and their location within the SG**
 - Found one foreign object on the top-of-tubesheet in the SG89 cold leg stay cylinder region. Appears to be approximately 1.25 inch diameter round washer between 2 tubes.

Discussion Points (DP)

DP-8) Discuss Foreign Objects

- **If the loose parts were removed from the SG**
 - No, removal efforts were unsuccessful. Part is firmly lodged. Neighboring tubes will be removed from service.
- **Indications of the tube damage associated with the foreign object**
 - None
- **Source or nature of the loose parts, if known**
 - Unknown

Discussion Points (DP)

DP-9) Secondary side inspection and maintenance activities

- Visual inspection for foreign objects (Both SGs)
- No sludge lancing this outage
- No other secondary side maintenance activities

Discussion Points (DP)

DP-10) New Inspection Findings

- During the 3C15 inspection, no damage mechanisms that were new to SONGS-3 were detected
- All mechanisms were previously detected and included in the degradation assessment and the operational assessment.
- A planned eddy current follow-up on industry experience (diagonal bar tube support degradation) was successfully complete in both Unit 3 SGs. The diagonal bars that cross the stay cylinder region have been verified in 3C14 (2006) and 3C15 (2008), by bobbin probe eddy current, to be in their normal locations.

Discussion Points (DP)

DP-11) Schedule for SG Related Activities during Remainder of Current Outage

- 10/30/08: Complete Eddy Current
- 10/31/08: Complete In-Situ Testing, If Any
- 11/02/08: Complete Repairs

December 3, 2008

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/RA/

N. Kalyanam, Project Manager
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DATE	12-2-08	12/2/08		12/2/08	10/3/08

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