

November 30, 2004

Mr. Harold B. Ray
Executive Vice President
Southern California Edison Company
San Onofre Nuclear Generating Station
P.O. Box 128
San Clemente, CA 92674-0128

SUBJECT: SAN ONOFRE NUCLEAR GENERATING STATION (SONGS) UNIT 2 -
EVALUATION OF STEAM GENERATOR TUBE INSPECTION REPORT FROM
2004 OUTAGE (TAC NO. MC2611)

Dear Mr. Ray:

By letter dated March 17, 2004, as supplemented by letter dated September 23, 2004, Southern California Edison submitted to the Nuclear Regulatory Commission (NRC) its special report summarizing the steam generator (SG) tube inspections for SONGS Unit 2, completed in March 2004.

Enclosed is the NRC staff's evaluation of the SG tube inspection report. The NRC staff did not identify any issues warranting additional plant-specific follow-up at this time.

Please contact me at (301) 415-8450 if you have any questions on this issue.

Sincerely,

/RA by MFields for/

Bo M. Pham, Project Manager, Section 2
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-361

Enclosure: Safety Evaluation

cc: See next page

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Division of Licensing Project Management
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ADAMS Accession No.: ML043350123

*** Memo from EMCBRR-106**

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SPECIAL REPORT: INSERVICE INSPECTION OF STEAM GENERATOR TUBES, CYCLE 13

SOUTHERN CALIFORNIA EDISON COMPANY

SAN ONOFRE NUCLEAR GENERATING STATION (SONGS) UNIT 2

DOCKET NO. 50-361

By letter dated March 17, 2004 (ADAMS Accession No. ML040850599), as supplemented by letter dated September 23, 2004 (ADAMS Accession No. ML042710277), Southern California Edison (SCE or the licensee) submitted reports summarizing the steam generator (SG) tube inspections performed at SONGS Unit 2 during the Cycle 13 refueling outage in February and March 2004. The September 23, 2004, letter contained the licensee's response to a NRC staff request for additional information. Additional information concerning the 2004 inspections was summarized by the NRC staff in a letter dated April 21, 2004 (ADAMS Accession No. ML041130214).

SONGS Unit 2 has two Combustion Engineering Model 3410 SGs, E-088 and E-089. Each SG has 9350 tubes fabricated from mill-annealed Alloy 600. Each tube has a nominal outside diameter of 0.75 inch and nominal wall thickness of 0.048 inch, and was explosively expanded into the full thickness of the tubesheet. The SGs were inspected during the Cycle 13 refueling outage (U2C13) in February and March 2004.

The plant Technical Specifications (TSs) allow tube repair using ABB/C-E TiG-welded sleeves. Prior to the outage, SONGS Unit 2 was operating with 255 sleeved tubes in SG E-088 and 146 sleeved tubes in SG E-089. In SG E-088, the licensee plugged 166 tubes and sleeved 113 tubes during the U2C13 outage. In SG E-089, the licensee plugged 143 tubes and sleeved 51 tubes. All of the sleeves were installed to repair defects within or just above the hot leg tubesheet.

Rotating probe inspections were performed in the tubesheet in every inservice tube on the hot leg from the expansion transition to a depth 17 inches below the top of the tubesheet in both SGs. In 93 tubes, inspection extended to a depth of 18 inches because of the location of the expansion transitions in these tubes. On the cold leg, rotating probe inspection was performed in 30 percent of the inservice tubes at the expansion transition. The hot-leg inspections resulted in 225 indications, of which 86 were in the top 8 inches and 139 were in the region between 8 and 17 inches below the top of the tubesheet. Some tubes had multiple indications.

The 2004 inspections also detected obstructions in 10 of the 118 sleeves installed within the tubesheet during the 2002 U2C12 refueling outage (7 sleeves in E-088, 3 sleeves in E-089). These obstructions were localized areas where plastic deformation of the sleeves reduced the

inside diameter. All of the sleeves installed in 2002 were inspected in 2004 (75 in SG E-088, 43 in SG E-089). In conference calls with the NRC staff the licensee stated that the deformation was most likely caused by a leak through the rolled joint into the annulus between the tube and sleeve. However, the licensee also stated that leakage through a flaw in the parent tube was possible (ADAMS Accession No. ML041130214).

A postulated cause for the development of these obstructions is called the "flow diode" effect and is discussed in an NRC letter dated December 2, 2003 (ADAMS Accession No. ML033290138). Several changes were made to the sleeving process during the 2004 outage, including (1) performing rotating probe exams in the region of the parent tube where the lower roll joint will be established to verify that no degradation is present prior to sleeve installation, (2) recording the visual examination of the weld region, and (3) performing visual examination of the rolled joint to evaluate parent tube cleaning.

In its September 23, 2004, letter, the licensee discussed its efforts to further understand (1) the ability to detect degradation in the parent tube behind the nickel and microlok bands of the sleeve, and (2) the implications of any flaws that may exist in these regions. These efforts include developing various test programs.

A chloride excursion with a maximum concentration of 1 ppm occurred following startup of the plant. The chloride level was reduced using the plant's normal procedures and guidance from the Electric Power Research Institute (EPRI). This excursion was subsequently determined to be a result of leaving a polyvinyl chloride hose in SG E-089. The hose residue was discovered and removed from the SG during the plant's return to Mode 5 for another reason.

Based on a review of the licensee's submittal, the NRC staff concludes that the licensee provided the information required by its TS. In addition, the NRC staff concludes that there are no technical issues that warrant follow-up action at this time since the inspections appear to be consistent with the objective of detecting potential tube degradation and the inspection results appear to be consistent with industry operating experience at similarly designed and operated units.