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SCHUYLER,J.O. Pacific Gas & Electric Co.
RECIP.NAME RECIPIENT AFFILIATION
KNIGHTON,G.W. Licensing Branch 3

SUBJECT: Forwards supplemental info to 840123 ltr re susceptibility of Westinghouse steam generator Row 1 tubes to early cracking & possible decision to require preventive plugging of tubes removed for evaluation, per SSER Open Item 9.

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J. O. SCHUYLER
VICE PRESIDENT
NUCLEAR POWER GENERATION

May 14, 1984

PGandE Letter No.: DCL-84-182

Mr. George W. Knighton, Chief
Licensing Branch No. 3
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Docket No. 50-275, OL-DPR-76
Docket No. 50-323
Diablo Canyon Units 1 and 2
SSER 9 Open Item, Row 1 Steam Generator Tubes

Dear Mr. Knighton:

Diablo Canyon Safety Evaluation Report, Supplement No. 9 (SSER 9), paragraph 5.2.7.3, raised a question about the susceptibility of Westinghouse steam generator row 1 tubes to early cracking and a possible decision to require preventive plugging of those tubes after similar tubes removed from the Trojan plant were evaluated. PGandE's rationale for not plugging row 1 tubes in the Diablo Canyon steam generators was presented in PGandE letter DCL-84-025, dated January 23, 1984.

The enclosure to this letter supplements PGandE's January 23, 1984 letter and presents the actions PGandE intends to take to detect cracks or leaks in steam generator short radius U-bend tubes. The intended actions also include provisions for minimizing the potential for tube cracking.

Kindly acknowledge receipt of this material on the enclosed copy of this letter and return it in the enclosed addressed envelope.

Sincerely,

J. O. Schuyler

Enclosure

cc: H. E. Schierling
Service List

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ENCLOSURE

STEAM GENERATOR SHORT RADIUS U-BEND TUBE LEAKAGE DETECTION AND MINIMIZATION

PGandE's intended actions to detect and minimize leakage in steam generator short radius U-bends consist of four programs: extensive nondestructive examination, leak monitoring, evaluation of stress corrosion cracking mitigation measures, and secondary water chemistry control (which will minimize the likelihood of tube stresses caused by denting on the secondary side in the steam generators).

A. NONDESTRUCTIVE EXAMINATION

PGandE intends to use the EPRI Steam Generator Owners Group (SGOG) guidelines for nondestructive examination (NDE) and the Diablo Canyon Technical Specifications as a basis for steam generator inspection. The SGOG guidelines for NDE contain recommendations for eddy current examination of steam generators and will be revised as the technology evolves. PGandE does not intend to follow the current edition of the guidelines for the life of the plant, but will re-evaluate the inspection program as new information and guidelines become available.

Current recommendations that relate to the examination of short radius U-bends and PGandE's specific intended actions are:

(1) Perform a baseline inspection of all steam generators

Preservice inspection (PSI) baseline examinations have been performed twice on the Diablo Canyon Power Plant steam generators. The first PSI was a single frequency examination in 1975 and 1976. A second PSI was performed late in 1982 to take advantage of advances in eddy current equipment and processes to provide additional baseline data. This PSI utilized Zetec multifrequency eddy current equipment and included all tubes in both units. Supplemental examination of most tubes in rows one and two of both units was performed using a probe designed by Zetec specifically for short radius U-bend examinations. This probe provided the best available examination at the time of the PSI. No defects were identified.

(2) Provide protected and permanent storage for tapes, stripcharts, and forms containing NDE data and analysis.

(3) Inspect all steam generators during each planned steam generator outage.

The Technical Specifications require that two steam generators be inspected during the first outage, the other two steam generators be

inspected in the second outage, and that one steam generator be inspected in each outage thereafter. At present, PGandE intends to inspect all four steam generators during each outage.

(4) Choose instrumentation and ISI vendors with established experience.

PGandE will select only ISI vendors with experienced and qualified analysts. PGandE nondestructive examination personnel will independently review all data from short radius U-bend examinations.

(5) Choose tube samples to inspect on the basis of operating history of the unit to be inspected and similar units.

PGandE intends to use the EPRI SGOG guidelines as a basis for selecting tubes for examination. The guidelines suggest examining all tubes in rows one and two during each ISI in addition to the examinations required by the Technical Specifications.

(6) Analyze all data collected and document all degradation and anomalous signals.

Data will be reviewed carefully by ISI contractors and qualified PGandE personnel. All degradation and anomalous signals will be documented.

(7) Choose probe designs, instrument settings, and signal interpretation methods that are appropriate for the steam generator design and suspected damage.

As probe design evolves, PGandE will continue to evaluate the new designs and will use the most appropriate probes during future examinations.

(8) Take corrective action to prevent damage progression.

If damage is detected, PGandE will evaluate it to determine causes and potential corrective actions. PGandE will carry out appropriate corrective action.

B. LEAK MONITORING

Primary-to-secondary leakage will be indicated in two ways at Diablo Canyon: (1) Radiation is detected at the air ejector discharge, main steamline, or steam generator blowdown. All radiation monitors have alarms. (2) A reactor coolant system water balance will be performed at least twice each day when conditions permit. When a steam generator leak is indicated, the leaking steam generator is determined by observing the radioactivity in the steam generator blowdown. The leak rate is determined utilizing flow rates and results from chemical or radiochemical analyses of the reactor coolant and steam generator blowdown. The minimum detectable leak rate is dependent on reactor coolant activity but will be below the 0.35 gpm limit of the Technical Specifications.

The Diablo Canyon Power Plant procedures that govern this process are EP OP-3B, STP R-10, CAP D-15, and CAP F-11.

C. EVALUATION OF MITIGATING ACTIONS

PGandE continues to monitor research in this field and is an active participant in the EPRI Steam Generator Owners' Group. Current potential mitigating actions include three methods of in-situ stress relieving, orificing row one tubes, and lowering reactor coolant temperatures. Other research that may lead to mitigating measures includes studies to measure reactor coolant corrosion potential and chemistry. Should the Diablo Canyon U-bend tubes prove to be susceptible to cracking, all available mitigating actions, including tube plugging, will be evaluated for applicability.

D. SECONDARY WATER CHEMISTRY CONTROL PROGRAM

PGandE has developed an extensive water chemistry control program designed to minimize corrosion of the secondary side of Diablo Canyon steam generators. Particular emphasis will be on controlling dissolved oxygen and chloride, which are primary contributors to denting. An inleakage reduction program, including the use of helium leak detection equipment, has been developed to minimize air and seawater inleakage. The removal of copper alloys from the secondary cycle is also being evaluated. Control of denting is important to prevent steam generator short radius tube U-bend apex leaks because the only domestic tube U-bend rupture observed was induced by deformation resulting from denting.