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RECIP.NAME RECIPIENT AFFILIATION
DENTON,H.R. Office of Nuclear Reactor Regulation, Director

SUBJECT: Provides results of 840910 shutdown due to steam generator primary to secondary leakage,Westinghouse safety evaluation check list encl.

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October 5, 1984

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Zion Generating Station Unit 1
Shutdown Due to Steam Generator
Primary to Secondary Leakage
NRC Docket No. 50-295

References (a): June 18, 1982 letter from D. Wigginton to L. O. DelGeorge.

(b): May 21, 1982 letter from F. G. Lentine to H. R. Denton.

Dear Mr. Denton:

In accordance with a request made by the Zion Project Manager, this letter is to inform you of the results of the September 10, 1984 Zion Unit 1 shutdown because of steam generator primary to secondary leakage.

The Unit 1 steam generator tube plugging level has increased from 528 to 567 during the recent outage. Thirty-five of the new pluggable tubes are from review of 1983 eddy current results using refined interpretation methods. Four of the tubes in B steam generator are new indications from the 1220 tubes checked during the outage. The remaining 10 indications in B S/G can be seen in 1983 tapes with the refined technology. All of the 25 indications in the C steam generator are within the first 1" to 2 1/4" of the tube, i.e. the rolled area. This increase in steam generator tube plugging brings the plugging level to 4.18%.

Reference (a) transmitted Technical Specification Amendment No. 74 to Facility Operating License No. DPR-39 for Zion Unit 1. Amendment No. 74 reduced the Unit 1 $F_Q$ limit from 2.17% to 2.13% to account for steam generator tube plugging which, at that time, had reached 3.7%. Reference (b) included a sensitivity analysis in support of Amendment No. 74. A review of all FSAR accidents showed that only the LOCA analysis is affected by low steam generator plugging levels; other analyses can accommodate greater levels of tube plugging. The following sensitivities were used in support of the 1982 amendment:



A001
1/1

(1) For low levels of plugging, the Peak Clad Temperature (PCT) is linearly proportional to the percentage of plugged tubes.

(2) For 3-loop plants, a 1% increase in tube plugging results in a 12.4°F increase in PCT.

(3) The increase in PCT due to tube plugging for 4-loop plants is less than for 3-loop plants.

(4) A 10°F increase in PCT can be offset by a reduction of 0.01 in $F_Q$.

Although Reference (b) specifically identified 4% plugged steam generator tubes as the basis for the Technical Specification amendment, using the above sensitivities it can be shown that the $F_Q$ limit reduction of 0.04 allows a 40°F increase in PCT. Thus:

$$\frac{40^{\circ}F}{12.4^{\circ}F} = 3.2\%$$

Since the base case LOCA allows for 1% tube plugging, the existing 2.13 $F_Q$ limit allows a 4.2% uniform steam generator tube plugging. This additional margin is supported by Westinghouse in the attached September 27, 1984 Nuclear Safety Evaluation Checklist.

Furthermore, the 1984 LOCA reanalysis, now ready for submittal to the NRC, supports up to 10% steam generator tube plugging and establishes a 2.32% $F_Q$ limit using models which are more accurate than those used for the current LOCA analysis.

Based on the above, station On-Site and Off-Site reviews have been performed and Unit 1 return to service authorized.

If there are any further questions regarding this matter, please contact this office.

Sincerely,

Robert N. Cascarano

R. N. Cascarano
Nuclear Licensing Administrator

lm

cc: J. Norris - NRR

9273N

Customer Reference No(s).

Westinghouse Reference No(s).
(Change Control or RFQ as Applicable)

WESTINGHOUSE
NUCLEAR SAFETY EVALUATION CHECK LIST
PAGE 1 OF 3

(1) NUCLEAR PLANT(S) Zion Units 1 & 2 (CWE/COM)

(2) CHECK LIST APPLICABLE TO: (Subject of Change) ECCS LOCA Analysis with 4.2% Steam Generator TUBE PLUGGING

(3) The written safety evaluation of the revised procedure, design change or modification required by 10CFR50.59 has been prepared to the extent required and is attached. If a safety evaluation is not required or is incomplete for any reason, explain on Page 3.

Parts A and B of this Safety Evaluation Check List are to be completed only on the basis of the safety evaluation performed.

CHECK LIST - PART A

(3.1) Yes Y No ___ A change to the plant as described in the FSAR?

(3.2) Yes ___ No X A change to procedures as described in the FSAR?

(3.3) Yes ___ No X A test or experiment not described in the FSAR?

(3.4) Yes ___ No X A change to the plant technical specifications (Appendix A to the Operating License)?

(4) CHECK LIST - PART B (Justification for Part B answers must be included on Page 3.)

(4.1) Yes ___ No X Will the probability of an accident previously evaluated in the FSAR be increased?

(4.2) Yes ___ No X Will the consequences of an accident previously evaluated in the FSAR be increased?

(4.3) Yes ___ No X May the possibility of an accident which is different than any already evaluated in the FSAR be created?

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WESTINGHOUSE
NUCLEAR SAFETY EVALUATION CHECK LIST
PAGE 2 OF 3

(4.4) Yes ____ No X. Will the probability of a malfunction of equipment important to safety previously evaluated in the FSAR be increased?

(4.5) Yes ____ No X Will the consequences of a malfunction of equipment important to safety previously evaluated in the FSAR be increased?

(4.6) Yes ____ No X May the possibility of a malfunction of equipment important to safety different than any already evaluated in the FSAR be created?

(4.7) Yes ____ No X Will the margin of safety as defined in the bases to any technical specification be reduced?

If the answers to any of the above questions are unknown, indicate under (5) REMARKS and explain on Page 3.

If the answer to any of the above questions in (4) cannot be answered in the negative, based on written safety evaluation, the change cannot be approved without an application for license amendment submitted to NRC pursuant to 10CFR50.90.

(5) REMARKS:

(6) APPROVAL LADDER (Signatures):

(6.1) Prepared by (Nuclear Safety): Robert M Lenger Date: 9/27/84

(6.2) Coordinated with (Engineer(s): _____ Date: ____

(6.3) Coordinating Group Manager(s): _____ Date: ____

(6.4) Nuclear Safety Group Manager: [illegible] Date: 9/27/84

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NUCLEAR SAFETY EVALUATION CHECK LIST
PAGE 3 OF 3

The following summarizes the justification, based upon the written safety evaluation[1], for answers given in Part 8 of the Safety Evaluation Check List:

Results of sensitivity studies reported in WCAP-8986 show that the relationship between percentage tubes plugged and increase in peak clad temperature (PCT) is linear for low levels of uniform steam generator tube plugging. These studies also show that a 4-loop plant has less increase in PCT for percentage tube plugging than a 3-loop plant. A sensitivity study to tube plugging performed for a 3-loop plant predicts an increase of 12.4°F in PCT for one percent tube plugging. Using this result and the relationship that a rise of 10°F in PCT is worth about - 0.01 in Fq, hand calculations were performed for the Zion units to predict an estimated PCT and Fq for a steam generator tube plugging level of 4.2%.

| For CWE/COR | PCT(°F) | Fq |
|---|---|---|
| At 1% tube plugging | 2048.3 | 2.17* |
| For 4.2% tube plugging | 2048.0 (estimated) | 2.13 |
| → 4.0% | 2045.5 ( " ) | 2.13 |

from May 6, 1982 W letter.

The tube plugging level of 4.2% requires no change in the current Tech Spec Fq value of 2.13.

2045.5
$+ .2\% \left(\frac{12.4°F}{1\%}\right)$
2047.98

*This represents the currently docketed ECCS performance analysis result adjusted to include the burst and blockage (NUREG-0630) Fq penalty. A subsequent, soon to be docketed ECCS analysis for Zion using the BART Evaluation Model demonstrates acceptable performance at an Fq of 2.32 with a 10% steam generator tube plugging level.

[1] Reference to document(s) containing written safety evaluation:

PREPARED BY: Robert M Langer DATE: 9/27/84