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SUBJECT: LTR 1 ENCL 0
FURNISHING RESPONSE TO SECOND AND THIRD QUESTIONS AS CONTAINED IN NRC LTR DTD 03/30/78 RE APPLICANT"S REQUEST FOR A 50 PERCENT WASTAGE STEAM GENERATOR TUBE PLUGGING LIMIT.

PLANT NAME: H B ROBINSON - UNIT 2 REVIEWER INITIAL: XJM
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REGULATORY DOCKET FILE COPY

August 9, 1978

NG 3514(R)

SERIAL: GD-78-2206

Office of Nuclear Reactor Regulation
Division of Operating Reactors
ATTENTION: Mr. A. Schwencer, Chief
Operating Reactors Branch No. 1
United States Nuclear Regulatory Commission
Washington, D. C. 20555

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US NRC
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H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261
LICENSE NO. DPR-23
STEAM GENERATOR TUBE PLUGGING LIMIT

Dear Mr. Schwencer:

Your letter of March 30, 1978, requested additional information in support of our request for a 50 percent wastage steam generator tube plugging limit. Carolina Power & Light Company responded to the first question on June 9, 1978, and requested additional time to respond to your second and third questions. Responses to your remaining questions are given below and are based on generic Westinghouse comments on Regulatory Guide 1.121 and recent discussions with the NRC staff.

Question 2: The minimum required tube wall thickness of 0.021" calculated to accommodate a LOCA + SSE condition must be maintained. Induced tube thinning under laboratory conditions cannot model actual conditions found in operating steam generators and does not preclude the possibility of uniform tube wall thinning for two diameters along the axis of a tube. Therefore, the stated structural requirement of 0.020" tube wall is not adequate. In addition, the proposed factor of safety of 2 against tube burst under the full range of normal operating conditions is not acceptable. The bases for this reduction in the factor of safety are only qualitative at best. Therefore, either provide a quantitative technical justification or state that a factor of safety of 3 during the full range of normal operating conditions will be maintained. If you choose the latter, the structural requirement for minimum tube wall thickness must be changed from 0.020" to 0.023".

Response: Question 2 contends that induced tube thinning under laboratory conditions cannot model actual conditions

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found in operating steam generators. In tests performed to justify the CP&L tube plugging criteria, Westinghouse has utilized conservative test specimens and assumptions so that the results are believed to be conservative when applied to actual operating conditions.

The following position is a result of the July 24, 1978, meeting between Westinghouse and NRC. This information will be included in Amendment 16 of RESAR 4.14. Westinghouse has documented its opinions on Regulatory Guide 1.121 by corporate letter, NS-CE-1282, dated November 22, 1976, and has identified as the major exception the margin of 3 against tube failure for normal operation. Westinghouse defines tube failure as plastic deformation of a crack to the extent that the sides of the crack open to a non-parallel, elliptical configuration. The tubing is capable of sustaining added internal pressure beyond those values before reaching a condition of gross failure. Westinghouse has interpreted this to apply as an operating limit for the plant and consider that it introduces a conflict to the established conditions for plant operation as identified in the plant technical specifications. A factor of 3 is quite often used in ASME Code Design guidelines. These Code practices apply to the design of hardware and to the analyses done on these designs. Conditions which occur during operation of the equipment and which may affect the equipment so that design values no longer apply, are not directly addressed by the initial Code requirements. This is one reason why plant technical specifications have been generated to establish safe limits of operation for power station equipment. The ASME Code is not applicable to the operational criteria of steam generator tubing. Our tubing design and tubing in the design condition has margins in excess of 3. In summary, we satisfy the margin of 3 if it were used in a Code sense as new equipment design. Moreover, we do not believe that this margin should be utilized as a limiting condition for normal operation.

Question 3: The calculations shown on Page 203 of Attachment II to the July 29, 1977, submittal for the minimum tube wall thickness required to maintain a factor of safety of 3 against burst under normal conditions is based on test data for unflawed tubes. However, Regulatory Position C.2.a.(2) of Regulatory Guide 1.121 states that a combination of wastage and cracks must be considered. In conformance with this position, indicate whether a tube thickness of 0.023" with a superimposed crack up to the size associated with the technical specification leakage limit will ensure a factor of safety of 3 during the full range of normal operating conditions.

Response: Present day eddy current testing (ECT) techniques are incapable of distinguishing between thinning and cracking and, therefore, the NRC Regulatory Guide 1.121 position and criteria related to the plugging of tubes with part or thru-wall cracks in combination with wastage (or thinning) are believed to be impracticable. When a crack exists in combination with thinning, the ECT signal is higher than that corresponding to thinning alone and, therefore, the tube is assigned a higher thinning than it actually has. The ECT signal amplification is directly dependent on the size and number of cracks; a large signal can, therefore, be interpreted as severe thinning or significant cracking or any combination of thinning and cracking. In any case, the tube weakening due to any existing cracking is reflected in the measured ECT signal. Analytically, it is possible to correlate the effects due to cracking in terms of the reduced burst strength with the resultant tube wall penetrations indicated by the ECT.

Using leak rate and burst pressure data obtained by testing and/or analyses, Westinghouse will establish that for a given thinning around the entire tube circumference, a superimposed thru-wall crack associated with technical specification allowable leakage will not lead to tube rupture during the maximum postulated accident condition pressure loading.

If a crack begins to propagate and exceeds the technical specification limit, it will be detected through radiation monitoring so that an orderly and safe shut-down is ascertained. On this basis, we do not believe that criteria involving specific factor of safety against tube rupture and fatigue failure during normal operation are necessary or warranted.

Yours very truly,

E. E. Utley
Senior Vice President
Power Supply

CSB/mf