OCT 4 1977

Docket Nos. 50-269
50-270
and 50-287

Duke Power Company
ATTN: Mr. William O. Parker, Jr.
Vice President
Steam Production
Post Office Box 2178
422 South Church Street
Charlotte, North Carolina 28242

Gentlemen:

RE: FRACTURE TOUGHNESS AND POTENTIAL FOR LAMELLAR TEARING OF STEAM GENERATOR AND REACTOR COOLANT PUMP SUPPORT MATERIALS

During the course of the licensing action for North Anna Power Station Unit Nos. 1 and 2, a number of questions were raised as to the potential for lamellar tearing 1/ and low fracture toughness of the steam generator and reactor coolant pump support materials for that plant. Two different steel specifications (ASTM A36-70a and ASTM A572-70a) covered most of the material used for these supports. Toughness tests, not originally specified and not in the relevant ASTM specifications, were made on those heats for which excess material was available. The toughness of the A36 steel was found to be adequate, but the toughness of the A572 steel was relatively poor at an operating temperature of 80 F. In this case, the applicant has agreed to raise the temperature of the ASTM A572 beams in the steam generator supports to a minimum temperature of 225 F prior to reactor coolant system pressurization to levels above 1000 psig. Auxiliary electrical heat will be employed to supplement the heat derived from the reactor coolant loop as necessary to obtain the required operating temperature of the structures.

1/ Lamellar tearing is a cracking phenomenon which occurs beneath welds and is principally found in rolled steel plate fabrications. The tearing always lies within the parent plate, often outside the transformed (visible) heat-affected zone (HAZ) and is generally parallel to the weld fusion boundary. Lamellar tearing occurs at certain critical joints usually within large welded structures involving a high degree of stiffness and restraint. Restraint may be defined as a restriction of the movement of the various joint components that would normally occur as a result of expansion and contraction of weld metal and adjacent regions during welding. ("Lamellar Tearing in Welded Steel Fabrication", The Welding Institute).

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Since similar materials and designs have been used on other nuclear plants, the concerns raised on the supports for the North Anna plant may be applicable for other operating PWR plants. It is therefore necessary to reassess the fracture toughness and potential for lamellar tearing of the steam generator and reactor coolant pump support materials for all operating PWR plants.

We will require certain information to make the necessary reassessment of the steam generator and reactor coolant pump support materials for your plant; therefore, please provide the following information within sixty (60) days after receipt of this letter:

1. Provide engineering drawings of the steam generator and reactor coolant pump supports sufficient to show the geometry of all principal elements. Provide a listing of materials of construction.

2. Specify the detailed design loads used in the analysis and design of the supports. For each loading condition (normal, upset, emergency and faulted), provide the calculated maximum stress in each principal element of the support system and the corresponding allowable stresses.

3. Describe how all heavy section intersecting member weldments were designed to minimize restraint and lamellar tearing. Specify the actual section thicknesses in the structure and provide details of typical joint designs. State the maximum design stress used for the through-thickness direction of plates and elements of rolled shapes.

4. Specify the minimum operating temperature for the supports and describe the extent to which material temperatures have been measured at various points on the supports during the operation of the plant.

5. Specify all the materials used in the supports and the extent to which mill certificate data are available. Describe any supplemental requirements such as melting practice, toughness tests and through-thickness tests specified. Provide the results of all tests that may better define the properties of the materials used.

6. Describe the welding procedures and any special welding process requirements that were specified to minimize residual stress, weld and heat affected zone cracking and lamellar tearing of the base metal.

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7. Describe all inspections and non-destructive tests that were performed on the supports during their fabrication and installation, as well as any additional inspections that were performed during the life of the facility.

In addition to the information requested above, please provide your own evaluation of the fracture toughness of the steam generator and reactor coolant pump support materials for your plant. Please inform us within thirty (30) days after receipt of this letter of your schedule for providing us with your evaluation. This generic request was approved by GAO, B-180225 (R0072), clearance expires July 31, 1980. Approval was given under a blanket clearance specifically for identified generic problems.

Sincerely,

/s/
A. Schwencer, Chief
Operating Reactors Branch #1
Division of Operating Reactors

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NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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A. Schwencer, Chief
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