Central Files

AUG 31 1977

MEMORANDUM FOR: K. R. Goller, Assistant Director for Operating Reactors

FROM: D. G. Eisenhut, Assistant Director for Operational Technology

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION RE: TURBINE BUILDING FLOODING, OCONEE UNITS 1, 2, AND 3 (TAC 6318)

Plant Name: Oconee Nuclear Power Station Units 1, 2 and 3
Docket Number: 50-269/270/287
Responsible Branch: ORB #1
Reviewing Branch: Plant Systems Branch
Project Manager: J. D. Neighbors
Status: Awaiting additional information

In response to Technical Assistance Request, TAC 6318, we have reviewed certain submittals made by the Duke Power Company regarding the turbine building flooding event of October 9, 1976, and the licensee's proposed corrective measures. These submittals include:

(a) Reportable Occurrence Report RO-287/17-18, dated October 25, 1976;
(b) FSAR Supplement 13, dated January 29, 1973;
(c) Duke Power Company letter, dated April 21, 1976; and
(d) Duke Power Company letter, dated June 27, 1977.

We find that additional information is required in order to complete our review. We point out that the staff does not ordinarily review the consequences of condenser failures caused by postulated turbine missiles. An exception is made in this review because we need to assess the potential for flooding of redundant engineered safety features.

Our request for additional information is enclosed.

D. G. Eisenhut, Assistant Director
for Operational Technology
Division of Operating Reactors

cc: See page 2.

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Enclosure:
Request for Additional Information

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D. Neighbors

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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REQUEST FOR ADDITIONAL INFORMATION
TURBINE GENERATOR BUILDING FLOODING
OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3

1. In Section 3.0, Design Basis Turbine Building Flood, of the conceptual design presented with your April 21, 1977 letter, you state that "the flood does not occur... subsequent to any other accident condition". This appears inconsistent with the single failure criterion presented in 10 CFR 50, Appendix A, "General Design Criteria for Nuclear Power Plants". We request that you reevaluate the maximum turbine building flooding rates, considering the single failure criterion.

2. Describe and discuss the postulated breaches of the condenser cooling water (CCW) system barrier that were examined and which served as the basis in establishing the turbine building flooding rate of 1,000 cfs as presented in your April 21, 1977 submittal for the design basis flood.

3. Assuming that the failure of one low pressure stage of a turbine serves as the triggering event, provide the following:

   (a) a demonstration that the resulting damage, created by turbine missiles, to the condenser cooling water barriers will not result in a flooding rate in excess of the assumed rate of 1000 cfs. Alternatively, provide an appropriate modification of the design basis flooding rate and the calculated maximum flood level. Your presentation should consider the following:

   (i) that there are twelve 6'-6" diameter, condenser cooling water inlet and outlet lines in the turbine generator building directly below the condensers of each of the three turbine-generator assemblies; (ii) the failure of one low pressure stage turbine wheel would result in multiple missiles; and

(iii) the failure of one low pressure stage wheel could possibly trigger the failure of other low pressure stage wheels due to the resulting dynamic loads imposed on the rotor.

(b) a description and discussion of the peak CCW water pressure that would be created if a turbine missile impacts the CCW pipes directly below the condenser and relate it to the rubber expansion joint maximum working pressures of 45 psig and 50 psig. Indicate what would be the total area of the breach and the associated flooding rate, should such a transient peak pressure be experienced.

4. In your June 27, 1977 response, you indicate that five of the six personnel passage ways located in the basement of the turbine building will be permanently plugged and waterproofed. The remaining access opening will be provided with a watertight door. In regard to these barriers, provide the details of their design and demonstrate that they are equivalent to the wall in withstanding the impact of a turbine generator missile and in maintaining their waterproof integrity. Alternatively, provide modifications to your April 21, 1977 and June 27, 1977 responses to accomplish the above.

5. The arrangement drawing of the turbine building, auxiliary building and reactor building (plan view: Elevation 771 and 775) shows that the steam turbine driven emergency feedwater pumps for Units 1, 2, and 3 are located in a plane perpendicular to the axis of rotation for the turbine-generator low pressure cylinders. Demonstrate that the emergency feedwater system (including all associated essential control, power and piping) will remain functional following the impact of a turbine missile. Alternatively, provide modifications to your April 21, 1977 and June 27, 1977 responses such that a emergency feedwater system failure will not result from turbine missiles.

6. In the April 21, 1977 response, you indicate that you propose in the conceptual design to install waterproof walls around three of the five low pressure service water pumps. Further, you state that only two pumps are required to supply low pressure service water to Units 1, 2, and 3. In regard to the above responses, provide the following information:

   (a) a clear indication on a plan view of the turbine building basement, as to which of the five pumps will be protected and the boundary of these waterproof barriers;

   (b) construction details for these waterproof barriers;

   (c) a line diagram, or a reference to the appropriate section in the FSAR, which shows all essential lines to and from all five LPSW pumps. Describe the waterproof barriers surrounding the three LPSW pumps in the turbine building and how the interconnections between the five systems will permit any two of the three protected pumps to supply low pressure service water to the essential heat loads in Units 1, 2, and 3; and

   (d) a description and discussion with the aid of drawings, of the adequacy of the measures taken to protect the LPSW pumps and all associated piping, control and power lines housed within the turbine generator building from turbine generated missiles.

7. In your June 27, 1977 response to the concern expressed over the adequacy of the water source for the five LPSW pumps, you indicate that your calculations show there was no deficiency in available NPSH with respect to the pumps required NPSH, considering any single failure. Assuming the most adverse potential damaging sequence of events to the CCW system following a turbine low pressure stage wheel failure, calculate and provide the minimum available NPSH to the LPSW

pumps. Further, provide the LPSW pump's required NPSH characteristics, as a function of flow rate. By discussion, demonstrate that the above results support the conclusion that the available NPSH will always be equal to or exceed the required NPSH.

8. In reference to the June 27, 1977 submittal, indicate when you intend to submit the response to Item number 5, regarding the peak pressures that would be experienced in the CCW system by the sudden closure of one of the CCW valves. By discussion, relate these calculated peak pressures to the maximum working pressures of 45 and 50 psig of the rubber expansion joints and to the resulting total area of the breach should the rubber expansion joints fail.

9. Figure 9-8 of the FSAR, HP and LP Service Water Systems, shows that the water discharged from the three LPSW pumps, for Units 1 and 2 passes through a single 42-inch line before it branches into the two supply headers for Units 1 and 2. Provide a description and discussion of the location, length and design features of this 42-inch line which demonstrates it is not appropriate to assume the failure of this line and the resulting subsequent loss of all three LPSW pumps for Units 1 and 2.

10. Considering the essential equipment in the turbine building, describe, discuss, and demonstrate that the assumed design basis flooding rate of 1000 cfs is a conservative assumption with respect to the potential flooding rate following a design basis earthquake when considering that there are a total of 30-six feet, six inch diameter condenser cooling water lines entering and leaving the turbine building, each having a non-seismic butterfly valve and rubber expansion joint.

11. Provide a discussion which supports the contention that the low pressure service water systems and the emergency feedwater systems meet seismic Category I requirements when they are located in the non-seismic turbine-generator building.

12. In your April 21, 1977 submittal, you indicate that Lake Keowee would be lowered, following a turbine building flooding event, to an elevation of 791 within about 18.3 hours be utilizing the spillway, hydrounits and by discharging through the Turbine Building. In regard to the above, provide the following:

    (a) the initial assumed lake level and its relation to the maximum allowed level;

    (b) the relative amounts of water handled by the spillway, the hydrounits and flow through the turbine building; and

    (c) explain why it is not possible for water to enter the turbine building when the lake level is 791 or less considering that the turbine building basement is at elevation 775 and the CCW system is designed to take advantage of the siphon effect.

13. In your June 27, 1977 response you indicate that the essential Emergency Feedwater Pump Turbine Oil Cooler Pumps will not be protected from a turbine building flooding event but rather a line will be added from the LPSW pump to the turbine oil coolers. In regard to the above provide the following:

    (a) a P&I diagram of the revised system;
    (b) a demonstration that, for the existing system and the added line from the LPSW, both the LPSW and Emergency Feedwater Pump Turbine Oil Cooling System will not be lost in the event of turbine generated missiles or the occurrence of a seismic event.
    (c) a description and discussion of the NPSH requirements of the Emergency Feedwater Pump and Turbine Oil Cooling System, with respect to the most adverse available NPSH.