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MEMORANDUM FOR: Karl R. Goller, Assistant Director for Operating Reactors, Division of Operating Reactors

FROM: Brian K. Grimes, Chief, Environmental Evalution Branch, DOR

SUBJECT: REVIEW OF "SAFETY ASSESSMENT OF STEAM GENERATOR TUBE LEAKAGE EXPERIENCED AT THE OCONEE NUCLEAR STATION," AUGUST, 1977

We have reviewed the draft report (marked proprietary) submitted by Duke Power in response to some of the staff's questions regarding the consequences of steam generator tube failures concurrent with the LOCA or the main steam line failure accidents.

A major portion of the report deals with the systems' response to the events (pressure and temperature histories, etc). The correctness of these calculations would have to be ascertained by the Plant Systems and Reactor Safety Branches. Most of the licensee's calculations agree with the assumptions that we have previously made for the case of the steam line failure accident. Major differences are that they assume operator action after 10 minutes (i.e., operator switches off the Safety injection system and starts controlled cooldown at 100 F/hr), but the primary to secondary leak is not stopped within 2 hours. However, the primary system temperature reaches 212 F after 63 minutes and 93 minutes for the cases of 10 tube failures and 1 or 3 tube failures, respectively. They do not estimate any additional fuel clad failure as a result of the accident, even for the case of 10 tube failures.

The report uses a new iodine spiking model for calculating the iodine releases, but it is barely explained. The model appears to be based on four spikes observed at the Oconee plants, but they are not compared to spikes observed at other plants nor is the probability of occurrence of a larger spike at the Oconee units discussed. The expression given on page 12 for the reactor coolant activity as a function of time is erroneous. It is our recommendation that they present their proposed iodine spiking model in a separate report which could be reviewed as an independent effort.

Finally, the results given on page 14 are based on the unjustified assumption that only 10% of the activity in the primary to secondary leakage is released to the environment. Everything else the same, but assuming that 100% of the activity is released to the environment, the results are 2110 Ci, 2172 Ci, and 1094 Ci for the cases of a steam line failure and 1, 3 and 10 tube failures, respectively. Such releases could lead to offsite exposures on the order of 250 rem thyroid for the Oconee site. A larger fractional release over a two hour period would not be unlikely for the system described.

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The licensee was asked to provide analyses of the probability of tube failures following a LOCA and steam line failure accidents and of these accidents occurring following shutdown because of identified tube leaks. They have not performed the former on the basis that the consequences (considered bounded by their analysis) are sufficiently low not to warrant any additional effort. The report does include an estimate of the probabilities of a steam line failure or LOCA during the shutdown period following detection of a leak. A cursory review of their calculations show the probability of these sequences of events to be reasonably low.

Enclosed is a list of questions which I suggest be addressed to the licensee.

Original Signed by
Brian K. Grimes

Brian K. Grimes, Chief
Environmental Evalution Branch
Division of Operating Reactors

Enclosure:
As stated

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QUESTIONS ON DRAFT REPORT

SAFETY ASSESSMENT OF STEAM GENERATOR TUBE LEAKAGE

EXPERIENCED AT THE OCONEE NUCLEAR STATION, AUGUST, 1977

1. It is stated that switching off the safety injection is conservative because it results in minimum dilution. Explain the effect of delaying this action. The concern is that continuation of the safety injection will keep the system pressure at a higher level and would result in higher releases, in spite of the increased dilution.

   This appears to be particularly important for the cases of 1 and 3 tube failures for which the leak rate is calculated to be increasing at a high rate at the time that the safety injection is switched off.

   The time for operator action should be considered as a variable over a range of values.

2. The iodine spiking model presented in Appendix A needs to be discussed in more detail, preferably as a separate report. Explain why the model proposed is considered to be conservative. In particular, estimate the probability of a spike exceeding the model occurring at the Oconee plants. Compare these spikes with those observed at other plants and explain differences in the phenomena causing the spike which allow other data to be disregarded. Present an analysis using a correlation derived from all spiking data available.

3. The expression given on page 12 to calculate the reactor coolant activity as a function of time appears to be incorrect. Indicate how it was derived and assumptions made.

4. The assumption is made that only 10% of the iodine contained in the primary to secondary leak is released to the environment. Explain where the remainder of the iodine is expected to be as a function of time, in view of the fact that the steam generator is assumed dry.