BEFORE THE
UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

In the Matter of)
CONSOLIDATED EDISON COMPANY) Docket No. 50-247
OF NEW YORK (Indian Point,)
Unit No. 2))

FURTHER ECCS INQUIRIES BY THE CITIZENS COMMITTEE FOR THE PROTECTION OF THE ENVIRONMENT

1. Discuss the Staff assumption that only 10% of the iodine released after a LOCA will be organic in light of the results reported in ORNL-4635 (pp. 59-61) indicating higher than expected amounts of the organic iodide CH_3I. Also explain how the use of 5% organic iodine rather than 10% organic iodine as discussed in the Staff October 4 letter to Richard Cruger produces higher radioactive releases to the public if the 10% figure is assumed to be more conservative than the 5% figure. Finally generally explain how the results of radioactive releases discussed in ORNL-4635 affect the assumptions used in your evaluations of this plant.

2. What are the assumptions and figures used and the basis for their usage with respect to both transient pressures and the amount of water remaining in the vessel after blowdown as a function of time?

3. What affect does the failure of RELAP 3 to predict pressures within 100 psia of those actually measured (see IN-1444, p. 13) have on the reliability of the ECCS predictions for this plant? How has this problem been corrected in the Staff and Applicant analysis?

4. Discuss the assumptions used and the basis for them with respect to the critical flow phenomenon and its effect on the rate at which coolant is expelled from the core in a LOCA.

5. Explain the use of a conical approach for determining the critical discharge of steam water mixture from a broken pipe. What other approach can be used and how will this affect blow-down and ECCS performance?

6. To what extent has the Fauske theory been used in determining critical flow and in what manner have the Fauske theory inadequacies in predicting secondary choking been corrected? See HW-80535 (p. 14)

7. In light of recent semi-scale tests and the level of steam pressures produced, explain the manner in which the ECCS analysis takes account of the higher metal water reaction. When high steam pressures and high water temperatures exist. See ANL-6548, p. 10, 16.

8. In light of the fact that small particles of metal have higher metal-water reactions (ANL-6548, pp. 10, 12, 14) how does the computation of the metal water reaction take into account clod fragments and rough edges as a result of clod bursting. Use ORNL-4635 statistics for the quantity of clod bursting which will occur in a LOCA but indicate the additional number of burst rods which reach temperatures of 1800°F-2300°F.

9. Does the 1% of metal-water reaction mean 1% of the total volume of zirconium or only 1% of the total surface area of zirconium exposed to water? Justify the former definition if it is used.

10. Discuss the manner in which the heat generated by the metal-water reaction is taken into account in computing pear clod temperatures. For instance, where in the core is the reaction assumed to occur and how is the higher heat created at that spot added into calculated rod temperatures. Also, how is the higher fuel rod temperature caused by the metal-water reaction taken into account in predicting the rate of further metal-water reactions. Refer to ANL-6548, p. 58.

11. How is the metal-water reaction affected by the presence of irradiated fuel rods, how have these effects been included in the analysis and upon what experiments are the computations made? Describe the experiments and the conditions under which they were performed.

12. What percentage of metal water reactions has been predicted for each temperature level in the reactor? What percentage of fuel rods and how much of the rods will reach each of those temperatures? Describe the method by which it has been determined that a metal-water reaction will be less than 1%. Answer this question in light of the experimental results from the ORNL-4635 showing 0.2% metal-water reaction for rods at or below 1800°F with only one irradiated rod and that rod irradiated for only 30 days. See ORNL-TM-3188, pp. 17, 20. Also consider the effect of the movement of the steam-water mixture on the reaction. See ANL-6548, p. 50.

13. How is the temperature level for each rod computed? What simplifying assumptions are used?

14. Upon what basis was 2300°F set as the maximum permissible rod temperature level in a LOCA? What will occur at 2301°F which will not occur at 2300°F?

15. Discuss the use of the parabolic rate law in computing the amount of metal water reaction.

16. To what extent and in what manner have other chemical reactions been considered in computing the core heat? For instance, discuss the metal water reaction associated with the maximum-zirconium alloy discussed in ANL-6548, pp. 61-62, the reaction with uranium dioxide and water and the reaction between the eutectic formed by iconel (in the spacers) and zircalloy and water discussed in IN-1453.

17. To what extent does the pressure of rod spaces tend to concentrate metal water reactions and rod swelling and bursting at or near the spaces? To what extent has this factor been included in the FLECHT tests and other rod performance tests relied upon in the analysis of this reactor? See ORNL-TM-3188, p. 14.

18. Discuss the assumption that core geometry will remain intact and not interfere with ECCS performance in light of the statement in ORNL-TM-2742, p. 1-2.

19. Does the analysis of post-LOCA rod swelling include possible 60% of expansion of the rod? See ORNL-TM-2742, p. 5. In this answer, fully discuss the interaction between creating rate, internal pressure, ductile behavior and the affect of these factors on whether a rod will burst after only a little swelling or burst only after substantial swelling. See ORNL-TM-3188, p. 11-13. Explain how these variables are taken into account in the analysis of rod performance after an ECCS. Explain how the tests used to verify rod performance have included the important factors which will influence the extent of rod swelling before bursting. See ORNL-TM-2742, pp. 6-7, 10, 14-15 on the latter pages. Please answer the questions shown there.

20. In the Staff analysis of rod burst tests by suppliers, what inadequacies were found that warranted the conduct of additional tests by ORNL?

21. On p. 22 of ORNL-TM-2742, several factors present in the ORNL rod experiments are listed. Compare and contrast these to the factors present in the rod tests relied upon by applicant.

22. Discuss the extent to which rod tests have included the effect of irradiated rods on tests results particularly the higher burning levels associated with this reactor. See ORNL-TM-2742, p. 39.

23. Explain how the concerns expressed in ORNL-TM-3188, p. 2, are resolved for this plant.

24. Discuss the adequacy of quenching tests designed to predict rod embrittlement for this reactor in light of ORNL-TM-3188, pp. 15-16 and explain in what manner embrittlement has been considered in the ECCS analysis for this reactor.

25. Explain how the effect of flow blockage has been considered in calculating peak temperatures. Discuss the experimental data relied upon for the calculations. See ORNL-TM-3188, p. 22.

26. Discuss the criticism of the PWR and/or BWR - FLECHT tests contained in ORNL-TM-3188, pp. 24-25 and what corrective steps if any have been taken in the present analysis?

27. How have the unanswered problems contained in ORNL-TM-3188, p. 30 been resolved in the analysis for this plant?

28. In the Westinghouse ECC Performance of 6/1/71, explain in more detail the basis for altering the assumptions which it is alleged were overly conservative. What tests and experiments are the changes based upon and what is the similitude of those test to the LOCA?

29. What are the differences between the Staff calculations and assumptions and those contained on p. 6 of the 6/1/71 Report? Also the differences in the transition boiling correlation (p. 24 of the same Report), reflooding heat transfer (p. 33) and discharge coefficient (p. 35).

30. How will the water level in the downcomer increase during the flow resistence time (see p. 58 of the 6/1/71 Report) if the flow resistance also in the loops carrying accumulation water to the downcomer? Discuss this in light of the discussion of the water plug preventing steam venting discussed on p. 64 of the Report.

31. Compare the quality of similitude to a LOCA of the tests relied upon by Applicant with the rod tests discussed in ORNL-4635. See pp. 3, 75 of that report.

32. Does the Applicants analyses of rod failure compute the failure at approximately 25-30 seconds and if not, why not? See ORNL-4635, p. 13.

33. Discuss the Applicants assumption that rod swelling and bursting is random in light of the ORNL-4365 results. See pp. 28, 32, 46, 47, 66-67, 68 and 75.

34. To what extent does the Applicant's analysis consider propogation of the failures caused by fragments from burst rods, fuel pellets or other causes? See ORNL-4635, pp. 32, 69.

35. To what extent does the ECCS performance analysis consider bowing of the rods? See ORNL-4635, p. 33.

36. To what extent do the predicted levels of radioactivity and their composition in a LOCA in the analysis of this plant correspond with the results of the tests reported in ORNL-4635, pp. 55, 61, 69-70, 75. Also discuss the experimentally proven quantity of unreactive iodine and its effect on plateant and spray performance.

37. Discuss the reasonable projections for rod performance at the temperature levels expected for this reactor compared to the levels in the ORNL-4635 tests. See pp. 65-66.

38. Explain why at least some of the channel blockage factors are not supplementary rather than mutually exclusive and has this been considered in the Applicants analysis. See WCAP-7015, Rev. 1, p. 3.

39. To what extent are the codes THINCI and II used in the analysis of this reactor and what assumptions have been verified by experimental results. Discuss the experiments and their similitude to a LOCA.