

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 41 TO FACILITY OPERATING LICENSE NO. DPR-58

INDIANA AND MICHIGAN ELECTRIC COMPANY -

DONALD C. COOK NUCLEAR PLANT UNIT NO. 1

DOCKET NO. 50-315

Discussion

10 CFR Part 50, Appendix G "Fracture Toughness Requirements," requires that pressure-temperature limits be established for reactor coolant system heatup and cooldown operations, inservice leak and hydrostatic tests, and reactor operation. These limits are required to ensure that the stresses in the reactor vessel remain within acceptable limits. They are intended to provide adequate margins of safety during any condition of normal operation, including anticipated operational occurrences.

The pressure-temperature limits depend upon the metallurgical properties of the reactor vessel materials. The properties of materials in the vessel beltline region vary over the lifetime of the vessel because of the effects of neutron irradiation. One principal effect of the neutron irradiation is that it causes the vessel material nil-ductility temperature (^{RT}NDT) to increase with time. The pressure-temperature operating limits must be modified periodically to account for this radiation induced increase in ^{RT}NDT by increasing the temperature required for a given pressure. The operating limits for a particular operating period are based on the material properties at the end of the operating period. By periodically revising the pressure-temperature limits to account for radiation damage, the stresses and stress intensities in the reactor vessel are maintained within acceptable limits.

The magnitude of the shift in ^{RT}NDT is proportional to the neutron fluence that the materials are subjected to. The shift in ^{RT}NDT can be predicted from Regulatory Guide 1.99. To check the validity of the predicted shift in ^{RT}NDT, a reactor vessel material surveillance program is required. Surveillance specimens are periodically removed from the vessel and tested. The results of these tests are compared to the predicted shifts in ^{RT}NDT, and the pressure-temperature operating limits are revised accordingly.

Evaluation

By letter dated February 22, 1980, Indiana and Michigan Electric Company requested a change to the Technical Specifications of Cook 1 regarding the pressure-temperature operating limits for the reactor vessel. The proposed operating limits are applicable for 12 EFPY and are based on the test results from material surveillance capsule T. The fluence on this capsule is 1.8×10^{18} m/cm². This fluence caused the RTNDT of plate



material to increase by 75°F and the ^{RT}NDT of weld material to increase by 130°F. The initial, or unirradiated ^{RT}NDT of the limiting plate and weld materials were assumed to be 55 and -70°F.

We have performed independent calculations to verify the validity of the proposed limits. We conclude that the limiting material is weld metal in the intermediate to lower shell circumferential seam. In accordance with Indiana and Michigan Power Company letter dated November 7, 1977, the initial RTNDT of this material is 0°E. The proposed operating limits are calculated for a radiated value of RTNDT of 155°F. Our calculations show that the limiting weld metal will reach this value at 9 EFPY. Our calculations agree with the remainder of the calculations submitted. Therefore, the proposed operating limits are acceptable for operation through 9 EFPY and are in accordance with Appendix G to 10.CFR For this operating period. Conformance with Appendix G to 10.CFR Part 50 in establishing safe operating limitations will ensure adequate safety margins during operation, testing, maintenance and postulated accident conditions and constitutes an acceptable basis for satisfying the requirements to NRC General Design Criterion 31, Appendix A, 10 CFR Part 50.

Environmental Consideration

We have determined that the amendment does not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendment involves an action which is insignificant from the standpoint of environmental impact and, pursuant to 10 CFR \$51.5 (d)(4), that an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of this amendment.

Conclusion

We have concluded, based on the considerations discussed above, that: (1) because the amendment does ont involve a significant increase in the probability or consequences of accidents previously considered and does not involve a significant decrease in a safety margin, the amendment does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Date: September 11, 1980