



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
SUPPORTING AMENDMENT NO. 50 TO FACILITY OPERATING LICENSE NO. DPR-39
AND AMENDMENT NO. 47 TO FACILITY OPERATING LICENSE NO. DPR-48

COMMONWEALTH EDISON COMPANY

ZION STATION UNITS 1 AND 2

DOCKET NOS. 50-295 AND 50-304

Introduction

In response to our letter of August 28, 1978 Commonwealth Edison Company (the licensee) by letter dated February 26 and as supplemented May 11, 1979 requested changes to the Technical Specifications appended to Facility Operating Licenses DPR-39 and DPR-48 for Zion Station Unit Nos. 1 and 2, respectively. The proposed amendments would revise the pressure-temperature operating limits to meet the requirements of Appendix G to 10 CFR 50.

Discussion

10 CFR 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 core 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 or 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 principle 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.

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The magnitude of the shift in RT_{NDT} is proportional to the neutron fluence to which the materials are subjected. 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.

The present Zion Station Technical Specifications contain pressure-temperature operating limits that were intended to be applicable through eight EFPY. However, we have determined that these limits will not be in compliance with Appendix G, 10 CFR 50 for this length of operational time. We have concluded that they would be acceptable for only about 3-1/2 EFPY. We, therefore, requested that the licensee submit an updated set of pressure-temperature operating limits. The proposed amendment would modify the Zion Units 1 and 2 operating limits to meet the requirements of Appendix G, 10 CFR 50 for an operating period of eight EFPY.

Evaluation

One material surveillance capsule has been removed from each Zion Station vessel and tested. Both capsules received a neutron fluence of about 2×10^{18} n/cm². The limiting material for both of the Zion reactor vessels is weld metal. The weld metal in the Unit 1 surveillance showed an increase in RT_{NDT} of 125°F at this fluence level and the Unit 2 weld metal showed an increase in RT_{NDT} of 155°F. Since the licensee desired to use the same operating limits for both units, the proposed limits are based on the Unit 2 weld metal properties. The calculation procedures contained in Appendix G to ASME Code, Section III and Appendix G, 10 CFR 50 were used. The revised operating limits are proposed for operation through eight EFPY.

We have reviewed the proposed changes to the operating limits of Units 1 and 2 and have performed independent calculations to verify compliance with Appendix G, 10 CFR 50. At eight EFPY we calculate that the neutron fluence at the 1/4T* location in the reactor vessel wall will be 3.1×10^{18} n/cm². This value of fluence causes an increase in RT_{NDT} of the limiting material (Unit 2 weld metal) of 185°F. This radiation damage was calculated from the results of tests on the surveillance material and using the damage estimate procedures

*1/4 T is one-fourth the thickness of the vessel wall, measured from the inside.

in Regulatory Guide 1.99, Revision 1. Using this increase in RT^{NDT} a set of pressure-temperature operating limits were calculated for the Units 1 and 2 reactor vessels. These limits were found to be consistent with those calculated by the licensee. Therefore, we conclude that the proposed operating limits are in accordance with Appendix G, 10 CFR 50. Conformance with Appendix G to 10 CFR 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 50.

It has been determined that both the Unit 1 and 2 reactor vessels may contain an atypical (out of specification) weld metal. The staff is currently investigating this subject. Until this investigation is completed and the issue resolve, both the Unit 1 and 2 reactor vessels are operating under administrative pressure-temperature limitations based on the assumption that both vessels contain the atypical weld metal. The proposed Technical Specification operating limitations are based on typical weld metal properties. Therefore, if we conclude that either the Unit 1 or 2 reactor vessel contains the atypical weld metal we will review Zion pressure-temperature operating limits to determine if a further Technical Specification revision is necessary. Such a revision would only involve reducing the time period for which the limitations are applicable.

Environmental Considerations

We have determined that these amendments do not authorize a change in effluent types or total amounts or an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that these amendments involve an action which is insignificant from the standpoint of environmental impact and, pursuant to 10 CFR §51.5(d)(4), that an environmental statement, or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of these amendments.

Conclusion

We have concluded, based on the considerations discussed above, that: (1) because the amendments do not involve a significant increase in the probability or consequences of accidents previously considered and do 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 these amendments will not be inimical to the common defense and security or to the health and safety of the public.

Date: June 18, 1979

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