



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 60 TO FACILITY OPERATING LICENSE NO. DPR-50

AND EXEMPTION TO APPENDIX H OF 10 CFR PART 50

METROPOLITAN EDISON COMPANY

THREE MILE ISLAND NUCLEAR STATION

UNIT NO. 1

DOCKET NO. 50-289

Introduction

By letter dated July 9, 1980 (TLL 301), Metropolitan Edison Company (Met Ed) requested that an exemption to Appendix H of 10 CFR 50 Paragraph II.C. 4 be granted allowing the indefinite operation of the Three Mile Island Nuclear Station, Unit No. 1 (TMI-1) with one of the remaining reactor vessel surveillance capsules being irradiated in Crystal River, Unit No. 3 (CR-3) rather than in TMI-2. Met Ed, by letter dated April 11, 1980 (TLL 165), also requested approval of a proposed change to the Technical Specifications (TSs) consistent with the requested exemption.

The basis for this request is to provide an alternative to the capsule that is in TMI-2 reactor, which is inoperable and is not expected to restart in time to conduct an adequately integrated surveillance program. In lieu of putting a backup surveillance capsule currently in storage in the TMI-1 pressure vessel, it will be placed in a host reactor, CR-3, for irradiation. In addition, data from capsules from other irradiation programs will provide input to the TMI irradiation program. This overall program is an integrated surveillance program, in which all presently operating facilities with B&W 177 fuel reactor assemblies are participating. TMI-1 contains the B&W 177 fuel reactor assemblies and is considered a participating member.

Background

Neutron irradiation causes the vessel material reference nil ductility temperature, RT<sub>NDT</sub>, to increase with time and the material fracture toughness properties to decrease with time. These irradiated properties are used to establish pressure-temperature operating limits in accordance with Appendix G, 10 CFR Part 50.

10 CFR Part 50, Appendix H, "Reactor Vessel Material Surveillance Program Requirements", requires a material surveillance program for reactor vessels to monitor changes in the fracture toughness properties of ferritic materials in the vessel beltline region resulting from their exposure to neutron irradiation and thermal environment. Under this program, fracture toughness test data are obtained from material specimens periodically withdrawn from the reactor vessel. Paragraph II.C.4 of Appendix H provides guidance for integrated surveillance programs for multiple reactors located at a single site. However, Paragraph II.C.4 of Appendix H does not permit

the sample of one reactor vessel material to be irradiated at another site. The intent of this provision is to assure that reactor vessel sample material will be exposed to neutron energy spectra and the environmental conditions similar to that to which the reactor vessel is exposed during its service life.

#### Discussion & Evaluation

The original TMI-1 design included three reactor vessel surveillance specimen holder tubes (SSHTS) located near the reactor inside vessel wall. The integrated program for TMI-1 was approved as part of Amendment 29 issued April 22, 1977. Furthermore, similar integrated programs for other facilities with B&W 177 fuel assemblies were approved by the Commission, and exemptions were granted for those facilities with the host reactors at other sites.

To date, the status of the TMI-1 surveillance program is that one surveillance capsule has been removed from the TMI-1 reactor vessel and tested (removed prior to the initiation of the integrated program). This capsule received a fluence of  $1.1 \times 10^{18}$  n/cm<sup>2</sup>. Test results showed that weld metal (designated WF-25) is the limiting vessel material. One TMI-1 capsule was installed and still exists in the TMI-2 reactor vessel. The remaining four TMI-1 capsules are in storage.

Due to the TMI-2 incident, it is anticipated that TMI-2 will not be operational for at least several years. Therefore, the licensee, by letter dated April 11, 1980, requested an amendment to the TSs of TMI-1 that would permit one of the TMI-1 capsules currently in storage to be irradiated in the CR-3 reactor vessel. Because this request resulted in having the host reactor offsite for the TMI-1 integrated surveillance program, Met Ed, by letter dated July 9, 1980, requested an exemption from 10 CFR Appendix H.

The licensee proposed that a capsule now in storage be placed in the CR-3 vessel at the end of the second cycle and withdrawn at the end of the fifth cycle. During this period, the capsule is expected to receive a fluence of  $8.2 \times 10^{18}$  n/cm<sup>2</sup>. This fluence is approximately equal to the fluence at the 1/4T location in the TMI-1 reactor vessel wall at 22 effective full power years (EFPY). The TMI-1 surveillance weld metal, WF-25, is also contained in a B&W research capsule being irradiated in CR-3. This capsule contains not only tensile and Charpy specimens but also several sizes of compact fracture toughness specimens. The test results on this capsule should be available by the end of 1982. Finally, irradiated data on WF-25 will be obtained from a Naval Research Laboratory (NRL) program sponsored by NRC. This data should be available in the early 1980s.

In regard to installing the capsule in TMI-1, part of Amendment 29 included studies of methods to install the redesigned SSHTS in TMI-1. These studies indicated that substantial difficulties would be experienced primarily because precision machinery alignment and inspection must be performed remotely and under water. Although such problems do not in themselves justify relief from a requirement to reinstall the SSHTS in TMI-1, they would cause significant radiation to personnel. Based on experience in removing the SSHTS at TMI-1 and other reactors, B&W estimated that installing SSHTS in irradiated reactors would result in personnel exposure of about 100 man rem/reactor. The licensee reviewed this matter based on the existing conditions of TMI-1 (i.e., shutdown for an extended period) and concluded an exposure of about 100 man rem would be applicable to the present conditions at TMI-1. This is due to the increased fluence that the reactor internals have been exposed to since the initial study has been

made, which on the other hand would be offset by the decay of the short half life isotopes due to the long shutdown period. This matter was discussed with the licensee and the staff agrees with this assessment.

The B&W integrated surveillance program was initiated in 1977. Since then one capsule originally belonging to Oconee 1, 2 and 3, Arkansas 1 and CR-3 reactor vessels has been removed from the host vessel and tested. A second capsule for Oconee 1, 2 and 3 and Arkansas 1 is currently being evaluated. Data generated from these capsules are satisfactory. The integrated surveillance program is considered to be working as planned in monitoring radiation effects of the pressure vessel materials. Therefore, there is no need at this time to consider a limiting period to the exemption.

From our review, we conclude that the TMI-1 surveillance program supplemented by data from NRL and B&W research programs, will provide sufficient data to monitor radiation damage on the TMI-1 reactor vessel weld metal throughout service life. Data on the TMI-1 vessel base metal will be generated only from the TMI-1 surveillance capsules. Since base metal is not the limiting material, we conclude that the data from the surveillance program will be sufficient to monitor radiation damage on base metal. Furthermore, we have determined that the dimensional design, the thermal environment and the neutron flux distribution and the energy spectrum of the CR-3 and TMI-1 reactor vessels are so similar that changes in mechanical properties due to irradiation effects will not be affected whether capsules are irradiated in CR-3 or in TMI-1. We find that irradiating a TMI-1 surveillance capsule in CR-3 does not reduce the effectiveness of the surveillance program and the intent of the provisions of Paragraph II.C.4 of Appendix H are being met.

Based on the above, we conclude that the proposed program to irradiate a TMI-1 surveillance capsule in the CR-3 reactor vessel is acceptable. We find that an exemption to the provisions of Paragraph II.C.4 of Appendix H of 10 CFR Part 50 is authorized by law and will not endanger life or property or the common defense and security. Moreover, since the exemption allowing irradiation of the TMI-1 surveillance capsule in CR-3 will avoid approximately 100 man-rems of occupational exposure that would result if the exemption were not granted and the surveillance capsule had to be inserted into the TMI-1 vessel and since the exemption will allow the completion of the pressure vessel material surveillance program for TMI-1 without such an occupational dose, we find that the exemption is in the public interest. Accordingly, we find that the exemption should be granted.

The existing TSs permit the reactor surveillance program for TMI-1 to be irradiated only in TMI-2. We agree with Met Ed that the surveillance program cannot be continued in TMI-2 due to its present inoperable condition which is expected to exist for several years. The proposed TS change will permit a backup surveillance capsule currently in storage to be irradiated in the CR-3 reactor vessel. We find this change acceptable because this capsule containing reactor vessel sample material of TMI-1, when irradiated in CR-3, will be exposed to the neutron energy spectra and environmental conditions similar to that to which the TMI-1 reactor vessel is exposed during its service life.

### Environmental Consideration

We have determined that these amendments do 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 these amendments involve an action which is insignificant from the standpoint of environmental impact and pursuant to 10 CFR §1.5(d)(4) that an environmental impact statement, negative declaration or 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 decrease in a safety margin, the amendments 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.

Moreover, based on the considerations discussed above, we conclude that an exemption from Paragraph II.C.4 of Appendix H of 10 CFR Part 50, permitting irradiation of a TMI-1 surveillance capsule in CR-3, is in accordance with law, will not endanger life or property or the common defense and security and is otherwise in the public interest.

Dated: January 22, 1981