TOLEDO EDISON COMPANY
DAVIS-BESSE NUCLEAR POWER STATION
UNIT NUMBER 1
DOCKET NUMBER 50-346
SAFETY EVALUATION REPORT SUPPLEMENT

MATERIALS ENGINEERING BRANCH
MATERIALS INTEGRITY SECTION

5.3 Reactor Vessel Integrity

We have reviewed all factors contributing to the structural integrity of the reactor vessel and conclude that there are "no special considerations" (Commission Memorandum and Order in the Matter of Consolidated Edison Company of New York, Indian Point Unit No. 2, Docket No. 50-247, October 26, 1972) that make it necessary to consider potential vessel failure for Davis-Besse Unit No. 1.

The design, material, fabrication, inspection, and quality assurance requirements conform to the rules of the ASME Code, Section III, 1968 Edition, all Addenda through Summer 1968, and all applicable Code Cases. [The toughness properties of the reactor vessel beltline material will be monitored throughout the service life by a material surveillance program which conforms to Appendix H, 10 CFR Part 50 and American Society for Testing and Materials (ASTM) Standard E 185-73 to the maximum extent practical for a vessel ordered prior to the publication of Appendix H. The technical basis and general description of the program is contained in Topical Report BAW-10100A, "Reactor Vessel Material Surveillance Program," which we have reviewed and found acceptable.

The applicant has redesigned and installed the surveillance specimen holder tubes described in Supplement 1 to BAW-10051, "Structural Analysis of 177-FA Redesigned Surveillance Specimen Holder Tube." In addition, the calculated fluence values for exposure time have been updated using a different analytical model combined with analytical predictions of the effect of refueled core configurations on relative power distribution. This analytical model has been verified and refined by comparison with surveillance capsule specimen analyses recently removed from several 177-FA B & W reactors. As a result of the redesign of the holder tubes and the updated analytical model, the predicted neutron flux received by the specimens is more than three times as high as that received by the vessel inner surface. Therefore, the applicant has proposed a surveillance specimen withdrawal schedule different from Appendix H, Section II.C.3.c. We have requested a technical justification to demonstrate that the rate of irradiation does not effect the measured fracture toughness properties of the weld metal, base metal and heat affected zone (HAZ).

However, our evaluation of the available information concludes that the Davis-Besse Unit No. 1 reactor vessel material surveillance program with the surveillance specimen holder tube locations is acceptable at least through the first fuel cycle when the first capsule is scheduled to be withdrawn and evaluated. The technical basis for this conclusion is that the results during this period of operation will be conservative since the irradiation effects on the surveillance specimens will lead

the reactor vessel. Our investigation of the influence of irradiation rate on Appendix H requirements is continuing on a generic basis. If the results from the applicant's material surveillance program or from NRC sponsored programs indicate that the rate of irradiation has a significant effect on measured fracture toughness properties, we will require that the applicant submit for approval a modification to his surveillance capsule withdrawal schedule after the first fuel cycle.]

If data from the surveillance program indicate that the toughness properties are marginal, we will require that the vessel be annealed to restore the toughness properties to acceptable values.

Operating limitations on temperature and pressure will be established for this plant in accordance with Appendix G, "Protection Against Nonductile Failure," of the 1972 Summer Addenda of the ASME Code, Section III, and Appendix G, 10 CFR Part 50.

The integrity of the reactor vessel is assured because the vessel:

1. Was designed, analyzed, and fabricated to the high standards of quality required by the ASME Code Section III and pertinent Code Cases.

2. Was made from materials of demonstrated high quality.

3. Was extensively inspected and tested to provide substantial assurance that the vessel will not fail because of material or fabrication deficiencies.

4. Will be operated under conditions and procedures and with protective devices that provide assurance that the reactor vessel design conditions will not be exceeded during normal reactor operation or during most upsets in operation, and that the vessel will not fail under the conditions of any of the postulated accidents.

5. Will be subjected to monitoring and periodic inspection to demonstrate that the high initial quality of the reactor vessel has not deteriorated significantly under the service conditions.

6. May be annealed to restore the material toughness properties if this becomes necessary.

The applicant has redesigned the surveillance capsule specimen holder tube and has installed accelerometer and strain gauge instrumentation to obtain design verification data during the hot functional test for Davis-Besse Unit No. 1. We find the design of the holder tube to be acceptable pending review of the vibration and strain data. We will review and evaluate this data to confirm that the redesigned holder tube is capable of withstanding the dynamic environment to which it will be subjected and will report our findings in a supplement to this report.