

Detroit  
Edison

William S. Orser  
Senior Vice President

Fermi 2  
6400 North Dixie Highway  
Newport, Michigan 48196  
(313) 586-5201



Nuclear  
Operations

February 7, 1991  
NRC-91-0011

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D. C. 20555

- References:
- 1) Fermi 2  
NRC Docket No. 50-341  
NRC License No. NPF-43
  - 2) Detroit Edison letter, EF2-53,823  
dated June 22, 1981
  - 3) Fermi 2 Safety Evaluation Report Section 10.2.2,  
NUREG-0798, July 1981
  - 4) Detroit Edison letter, NRC-90-0135,  
dated August 17, 1990

Subject: Inspection of Low Pressure Turbine Discs (License  
Condition 2.C.11, TAC 59614)

License Condition 2.C.11 of the Fermi 2 Operating License requires that Detroit Edison perform an inspection of the low pressure turbine discs during the second refueling outage, including volumetric examination of the disc base using ultrasonic techniques. It also states that the frequency of subsequent inspections shall be in accordance with the turbine manufacturer's recommendations. The purpose of this letter is to inform the Nuclear Regulatory Commission that the inspection of the number three low pressure turbine (No. 3 LP) rotor disc was performed during the recent turbine outage, thus meeting the license condition for this turbine. This letter also addresses the damage to the turbine blades on the 4th stage of the No. 3 LP turbine. The blade damage is not associated with the potential concern for which the license condition was established. Mr. John Stang, NRC Project Manager, requested that the latter topic be addressed.

The purpose of the license condition is to monitor any crack growth at the disc base area. Low pressure turbine discs are subjected to relatively high stresses. In some turbines, stress corrosion problems have occurred, with cracks initiating at the inner bore area, especially in keyways and other openings, and then propagating outward. To prevent disc failure, the turbine discs are forged by processes that minimize flaws and provide adequate fracture toughness

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to ensure their integrity. Additionally, conservative inspection intervals are established to detect and monitor any crack growth to permit repair or replacement of discs well in advance of a postulated failure.

In Reference 2, Detroit Edison committed to perform a volumetric examination of the low pressure turbines' disc bore area using ultrasonic techniques during the second refueling outage. In the Fermi 2 Safety Evaluation Report (Reference 3), the NRC indicated they had performed their own crack growth calculations to determine when the turbine should be inspected and concluded that the discs should be inspected during the second refueling outage. The SER also noted that Detroit Edison had committed to perform an inspection during the second refueling outage and that the NRC would include this inspection as a license condition. This section concludes that the materials, processes, design, and planned volumetric inspection provide reasonable assurance that the probability of disc failure with missile generation is low during normal operation, which includes transients up to design overspeed.

Since the purpose of the inspection is to detect any cracks and monitor their growth so that corrective action be taken before failure, inspecting at intervals shorter than originally specified or calculated, as needed, is conservative. Therefore, the ultrasonic examination performed on the No. 3 LP turbine disc bore area during the recent outage fulfills the license condition. No indications of stress corrosion cracking were found on or adjacent to the disc bores or the dowel holes. The same favorable results were obtained during the inspection of the No. 2 LP turbine disc bore area, as discussed in Reference 4. The No. 1 LP turbine disc remains to be inspected during the second refueling outage, scheduled for spring 1991. Subsequent inspections for all three low pressure turbines will be performed at a frequency recommended by the turbine manufacturer to ensure any future cracking will be detected.

During the recent turbine outage, damage was observed to the shroud, blades and blade support area of the 4th stages of the No. 3 LP turbine. A total of 5 blades were broken off and there were 9 indications on the disc in the blade support area. The indications are repairable by existing conventional means. As a temporary measure, until new blades can be obtained and installed, the 4th stage blades were removed. A pressure reducing plate was installed in both flow paths for the No. 3 LP turbine in place of the 4th stage. The indications in the blade support area will be repaired when the blades are replaced.

The cause of the blade failures was fatigue, not stress corrosion cracking. The cracks initiated in the roots of the individual blades. Therefore, the integrity and strength of the disc is not reduced. The primary concern of disc failure is the generation of

USNRC  
February 7, 1991  
NRC-91-0011  
Page 3

large missiles able to penetrate the turbine casing. The blades that failed did not penetrate the turbine casing. Individual blades are not able to penetrate turbine casings. Therefore, the observed blade failures do not provide a penetrating missile generation risk and have no association with the basis for the license condition. Actions are being taken in response to the blade failure as were discussed in the December 17, 1990 management meeting.

If there are any questions or additional information needed on the results of the No. 3 LP turbine ultrasonic examination of the rotor bore area, please contact Lynne S. Goodman at (313) 586-4211.

Sincerely,



cc: A. B. Davis  
R. W. DeFayette  
W. G. Rogers  
J. F. Stang