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July 9, 1984  
EF2-69271

Mr. James G. Keppler  
Regional Administrator  
Region III  
U. S. Nuclear Regulatory Commission  
799 Roosevelt Road  
Glen Ellyn, Illinois 60137

Dear Mr. Keppler:

Reference: (1) Fermi 2  
NRC Docket No. 50-341

(2) Letter D. A. Wells to J. G. Keppler,  
December 22, 1983, EF2-66490

Subject: Final Report of 10CFR50.55(e) Item 107  
"Mechanical Problems with RHR Pumps"

This is Detroit Edison's final report concerning mechanical problems with the RHR pumps. Item 107 was originally reported as a potential deficiency on November 21, 1983, and subsequently documented in Reference (2).

Description of the Deficiency

An examination of the RHR pump B internals was conducted to determine if the pump was the source of debris (set screws) found in a check valve downstream of the pump. This examination revealed problems with the pump, and the pump internals were sent to the manufacturer for evaluation. The manufacturer, Byron-Jackson, informed Detroit Edison that the amount of wear on the pump hydrostatic bearings was excessive considering the amount of time the pumps had operated. Subsequent investigation by Detroit Edison revealed that RHR pumps "B" and "D" had the following mechanical problems:

1. Liquid penetrant tests revealed impellers with linear indications (cracks);
2. Missing set screws from the wear rings in the pump bowls;
3. Excessive wear on the wear rings and the hydrostatic bearings.

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### Analysis of Safety Implications

The RHR pumps could experience reduced longevity and premature failure. A common mode failure could occur resulting in all four pumps becoming simultaneously unavailable, thereby, negating accident and long-term cooling capability. However, such a simultaneous pump failure without some prior surveillance indication or with a total loss of performance capability is highly unlikely for all RHR pumps. Specific consequences are as follows:

1. The extension of the crack to the point of impeller failure could cause pump failure.
2. Loose set screws could pass through the impeller and lodge in valve seat areas or jam in a check valve hinge and cause a valve not to close. (A loose parts analysis performed by General Electric determined that there are no safety implications for set screws entering into the vessel.)
3. The loosened wear ring could cause a pump to jam.

### Corrective Action

The following corrective actions were initiated as a result of a joint evaluation conducted by General Electric and Byron-Jackson, and concurred with by Detroit Edison:

1. Metallurgical examination revealed that the cracks were original casting flaws which did not propagate as a result of pump operation. The cracks were subsequently weld repaired.
2. Vibration of the pump assembly loosened the set screws. Replacement set screws have been installed and tack welded.
3. Ineffective hydrostatic bearing design, coupled with pump assembly vibration, caused the damage to the bearings. Grooves behind the bearing surfaces have been removed to improve performance. A harder material than the original has been used in the wear rings to improve wearability and stability.
4. The following corrective actions were taken to reduce the pump assembly vibration:

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- a. The pump nozzle to piping interface has been braced;
- b. Multiple breakdown orifices have been installed to reduce flow induced vibration.

A ten day test run, including vibration analysis, was conducted and verified the adequacy of the corrective actions.

This is Detroit Edison's final report on this item. If you have questions concerning this matter, please contact Mr. Lewis P. Bregni, (313) 586-5083.

Sincerely,

A handwritten signature in cursive script, appearing to read "Raynet H. Jess".

cc: Mr. P. M. Byron  
Mr. R. C. DeYoung  
Mr. R. C. Knop