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February 10, 1978
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Mr J. G. Keppler, Regional Director
Office of Inspection and Enforcement
Region III
US Nuclear Regulatory Commission
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MIDLAND NUCLEAR PLANT -
UNIT NO. 1, DOCKET NO. 50-329
UNIT NO. 2, DOCKET NO. 50-330
REACTOR COOLANT PUMP MOTOR FLANGES

In accordance with the requirements of 10 CFR 50.55(e), this letter constitutes an interim report on the eight reactor coolant pump motors which have a design deficiency in their motor mounting flanges. Attached is a report prepared by the Babcock and Wilcox Company (B&W) which provides a description of the deficiency and the proposed corrective action. Additional information has been requested from B&W to better enable Consumers Power to review the adequacy of their proposed repair. Either a final or another interim report will be sent on or before March 31, 1978.

Attachment: Report on Reactor Coolant Pump Motor Flange Deficiency

CC: Dr Ernst Volgenau, USNRC (15)

Director, Office of Management
Information and Program Control, USNRC (1)

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REPORT ON REACTOR COOLANT PUMP MOTOR FLANGE DEFICIENCY

This report documents the evaluation of the deficiency in the design and construction of reactor coolant pump motor flanges. The subject motors were designed for installation at the Consumers Power Company Midland Units 1 and 2. The purpose of this report is to determine whether the deficiency constitutes a significant deficiency as defined by 10 CFR 50.55(e).

Identification of Problem

During a routine dimensional inspection of a RC pump motor at the vendor's (GE) shop prior to shipment in February 1977, it was determined that the as-built rabbet height dimension on the motor mounting flange was less than that specified on the motor drawing. The rabbet is a cylindrical extension of the motor flange that fits into a counterbore in the motor support stand flange with a very close clearance; its purpose is to assure axial alignment of the motor with the pump and to bear the horizontal shear loads resulting from LOCA and seismic forces. Upon further investigation, it was determined that the rabbet had also been incorrectly designed and was not adequate to withstand the design loads; this inadequate design exists in all eight of the RC pump motors for Midland Units 1 and 2.

Safety Implications

Specification 08-101600007-01, Drive Motor for Reactor Coolant Pump is the procurement specification for these motors. Section 3.1 of this specification

states: "The motor shall be capable of withstanding the Seismic and LOCA Loads specified in Appendix C insuring that the criteria and stress limits specified are met. The criteria for upset, emergency and faulted conditions is that no damage is caused to other plant components. This shall be satisfied by showing that the major motor structures do not become missiles." Appendix C of that specification lists the design loads and defines the major motor structures as the flywheel and the motor frame. The incorrect design of the rabbet violated the design requirements as specified in Section 3.1 and Appendix C of this specification.

The deficiency in the design of the motor flange rabbet, were it to have remained uncorrected, could have permitted the motor structure to become detached from its mounting as a result of LOCA or seismic forces, thus creating the potential for damaging other systems and components in the vicinity of the motors that are vital to plant safety. An analysis of (1) the extent to which the motors would have been hurled, would have fallen, or would have otherwise been displaced as the result of a LOCA or a seismic event, (2) the extent of damage to other components, and (3) the effect on plant safety resulting from such damage, has not been made, however. While the motor procurement specification characterizes the motor frame as having the potential for becoming a "missile", the Midland Units 1 and 2 FSAR, Section 3.5.1 does not include the motor frame as a component that has been analyzed or has been examined with respect to its potential for becoming a missile. The motor, nevertheless, could have been displaced from its mountings under LOCA or seismic forces, and has the potential for acting in a manner analogous to a "missile" in that it could damage other components vital to safety. The design deficiency in the motor flange rabbet is therefore concluded to represent a possible significant deficiency within the meaning of 10CFR 50.55(e) in that, "were it to have remained uncorrected, it could have affected adversely the safety of operations of the nuclear power plant at any time throughout the expected lifetime of the plant."

The deficiency also satisfies the definition of 10 CFR 50.55(e) in that it is a "deficiency in final design as approved and released for construction such that the design does not conform to the criteria and bases stated in the safety analysis report or construction permit." The specific criteria in the Midland FSAR that would be violated is General Design Criterion No. 4, Environmental and missile design bases, Appendix A to 10 CFR 50. This criterion states that "structures, systems and components important to safety shall be appropriately protected against dynamic effects, including the affects of missiles, pipe whipping and discharging fluids, that may result from equipment failures." The potential loosening and falling of the motor during a LOCA or seismic event and the potential for damaging surrounding components that are vital to safety would be a violation of GDC No. 4.

The reported deficiency therefore satisfies the necessary requirements for reportability as a significant deficiency under 10 CFR 50.55(e).

Corrective Action

The load carrying capability of the motor flange rabbet will be augmented by increasing the friction load between the surfaces of the motor flange and the motor support flange of the reactor coolant pump. This will be accomplished by replacing the 16 cap screws with studs and nuts and by specifying the required stud preloading. The replacement of the screws with studs was necessary since the cap screws could not be tightened to the preload required to achieve the flange friction force due to the fact that the limited available access to the screws precluded the use of the necessary torque tools. The available access, however, was adequate to permit the use of stud tensioners and hence the use of studs, which can be tightened with tensioners, was adopted. The instruction manuals

describing the method of attaching the motor to the motor support stand will be revised to provide for the use of studs and stud tensioners and to speciy the required preloading of the studs.

This corrective action has been approved and is being implemented for all 8 pump and motor units for Midland 1 and 2. The motor vendor stress report has been revised accordingly and the report has been approved.

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