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June 15, 1989

Director of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Mail Station P1-137
Washington, D. C. 20555

REFERENCE: Docket 50-186
University of Missouri Research Reactor
License R-103

SUBJECT: Report as required by Technical Specification 6.1.h(2)
concerning reactor operation with one of two regulating
blade position rod run-in functions inoperable.

DESCRIPTION:

At 0250 on June 3, 1989 with the reactor operating at 10 MW in the automatic control mode, a reactor operator on routine patrol found that the drive chain had fallen off the drive gear for the regulating blade rotary limit switch assembly. This rotary limit switch assembly provides alarm annunciation for regulating blade positions of 60% withdrawn and 20% withdrawn, as well as providing a rod run-in function at the 10% withdrawn position. Reactor operation with the regulating blade less than 10% withdrawn rod run-in function inoperable is a deviation from Technical Specification 3.4.c.

ANALYSIS:

The regulating blade automatically controls power at a desired level set by the duty operator. The blade is constructed of stainless steel and is driven at 40 inches per minute by the regulating blade drive mechanism. The regulating blade position indication transmitter and the rotary limit switch assembly are each driven by separate chains from a slave gear arrangement connected to the lead screw in the regulating blade drive mechanism.

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The position indication transmitter supplies the regulating blade position indication on the control room operating panel. The rotary limit switch assembly provides two regulating blade position alarms (20% withdrawn and 60% withdrawn) and one rod run-in (10% withdrawn). A second rod run-in associated with regulating blade position comes from a limit switch directly actuated by the regulating blade mechanism lead screw, a rod bottomed rod run-in.

At 0250 on June 3, 1989 during a routine patrol, a reactor operator found that the chain that drives the regulating blade rotary limit switch assembly had fallen off. He immediately informed the shift supervisor who initiated a reactor shutdown.

Since the previous routine patrol, which started at 2230 on June 2, 1989, did not reveal any problems with the regulating blade drive mechanism, the regulating blade rotary limit switch assembly and its associated rod run-in are assumed to have been inoperable for at most 4 hours and 20 minutes. This deviates from Technical Specification 3.4.c which states "the reactor shall not be operated unless the following rod run-in functions are operable... regulating blade position less than 10% withdrawn and bottomed."

The regulating blade and its associated rod run-in features are not part of the reactor safety system as defined in Technical Specification 1.18. When a reactor scram or rod run-in occurs, the regulating blade is automatically shifted to manual control to prevent it from trying to maintain power by shimming.

The basis for the rod run-ins associated with the regulating blade is to assure termination of a transient which, in automatic operation, is causing a rapid insertion of the regulating blade. The regulating blade less than 10% withdrawn rod run-in is not required to avoid reaching a limiting safety system setting. Additionally, there is a redundant rod run-in which is actuated by the regulating blade drive mechanism being full in (rod bottomed) that is independent of the rotary limit switch assembly. This redundant rod run-in was operable during the time the 10% withdrawn rod run-in was inoperable.

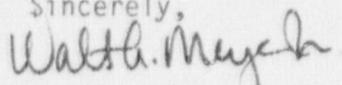
CORRECTIVE ACTION:

The reactor was immediately shutdown when the rotary limit switch assembly and its associated rod run-in were determined to be inoperable.

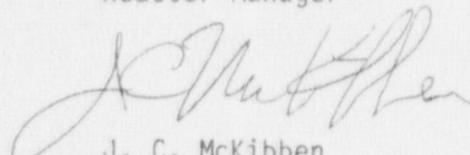
The chain for the rotary limit switch assembly was returned to its drive gear and its tension was adjusted. The limit switches in the assembly were adjusted for proper position actuation. The regulating blade rod run-in portion of surveillance check CP-14 was performed to verify the operation of the less than 10% withdrawn rod run-in, as well as the independent rod bottomed rod run-in.

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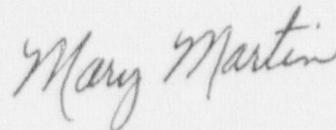
On the next scheduled maintenance day, June 5, 1989, the electronics technicians completed scheduled semiannual preventive maintenance on the regulating blade drive mechanism. This preventive maintenance includes checking and adjusting the drive chain tension and inspecting the condition of all drive chains and gears. Additionally, the Electronics Shop will add a quarterly visual inspection of the drive chains for the position indication transmitter and rotary limit switch assembly on the regulating blade drive mechanism.

Sincerely,

W. A. Meyer, Jr.
Reactor Manager

ENDORSEMENT:
Reviewed and Approved


J. C. McKibben
Associate Director

xc: Region III, Regional Administrator
Reactor Advisory Committee
Reactor Safety Subcommittee



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