



UNIVERSITY OF MISSOURI

Research Reactor Facility

Research Park
Columbia, Missouri 65201
Telephone (314) 882-4211

June 29, 1979

Director of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Reference: Doclet 50-186
University of Missouri
License R-103

Subject: Failure of Nuclear Instrumentation Channel 4

Description

On May 31, 1979, while operating at a steady state power of 10 MW, channel 4, one of three Nuclear Instrumentation (N.I.) Power Range Channels, indication failed downscale. Both channels 5 and 6 were indicating no change in reactor power. Each power range channel is required to provide a rod run-in at 115% of full power and a reactor scram at 125% of full power. The failure of channel 4 indication caused its associated rod run-in and scram trips to be inoperable while the reactor was operating, which is a deviation from Technical Specifications 3.3.a and 3.4.c.

Analysis

At 1641 on May 31, 1979, with the reactor operating in manual control at a power level of 10 MW; N.I. channel 4 indication failed downscale; while electronic technicians were seating a circuit board during work on the regulating blade automatic control circuit. The reactor operator with the control room console watch promptly manually scrammed the reactor to comply with Technical Specifications. With the reactor shutdown, N.I. channel 4 was investigated and revealed the picoammeter module had failed. The picoammeter is the output module of channel 4 and its output signal is sent to the regulating blade automatic control circuit, safety trip circuits, and power indication meters.

In attempting to seat the circuit board, the output of the picoammeter had been shorted to ground which overloaded the last stage transistor in the picoammeter causing the failure. The spare picoammeter module was installed

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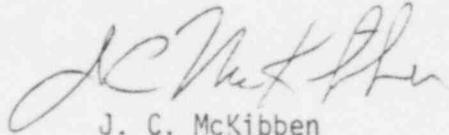
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and start-up checks of N.I. channel 4 were completed with no additional problems. There was no failure of the safety system, since N.I. Power Range Channels 5 and 6 were operational and would have provided the required rod run-in or scram protection.

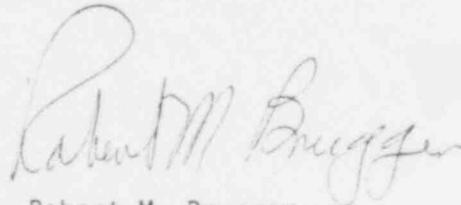
Corrective Actions

The reactor was shut down immediately when N.I. channel 4 failed downscale and the problem was corrected by installing the spare picoammeter module. To prevent reoccurrence of this problem, the input resistor (10 megohm) for the N.I. Channel 4 output to the automatic control circuit was moved from the circuit board to the picoammeter side of the circuit board connector pin. The 10 megohm resistor now protects the picoammeter from being overloaded by a short at either the connector pin or in the circuit board. Additionally, insulating material was added around the automatic control circuit board connectors to prevent grounding.

Sincerely,



J. C. McKibben
Reactor Manager



Robert M. Brugger
Director

JCMK:vs

cc: Directorate of Regulatory
Operations, Region III

Reactor Advisory Committee
Reactor Safety Subcommittee

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