



UNIVERSITY OF MISSOURI

September 15, 1988

Research Reactor Facility

Research Park
Columbia, Missouri 65211
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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 the Emergency
Generator operable but in a degraded state.

DESCRIPTION:

At 1315 on August 18, 1988 with the reactor secured for regularly scheduled maintenance, the Emergency Generator (EG) cranking limit indication was found tripped and the "plant failed to start" lamp energized, by a licensed operator performing a full power startup checksheet.

After the reactor was shutdown for the scheduled maintenance day on August 18 the EG had automatically started and run as part of its normal 30 minute unloaded weekly exercise. The EG hour meter indicated the EG had run approximately 6 to 12 minutes (.1 to .2 hours on the meter). Operations' personnel were able to inspect and run the EG within 15 minutes after finding the EG tripped. A subsequent EG load test, Compliance Check (CP-17), was completed satisfactorily. However, since the EG was not able to run its intended 30 minutes during its weekly exercise, it may be concluded that the EG was operable but in a degraded state from August 11, 1988, the date of its last full unloaded run, through August 18, 1988. Technical Specification 3.10(a) states "the reactor shall not be operated unless the emergency electrical generator is operable."

ANALYSIS:

The EG is a 45 KVA generator powered by a Ford 292 cubic inch gasoline engine with a one barrel carburetor fuel system and a 12 volt electric choke.

The reactor was shutdown and secured at 0600, August 18, 1988, in preparation for a regularly scheduled Thursday maintenance day. At 0757 the EG running light was energized and noted in the console log book as the EG started its unloaded run on the weekly exerciser. At 1315 the same day, a licensed operator, while performing a full power reactor startup checksheet, discovered the EG cranking limiter tripped and the

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"plant failed to start" lamp energized. The EG hour-meter showed that the EG had run only 6 to 12 minutes (.1 to .2 hours) that day, instead of its full 30 minutes. This indicates that the EG had stalled and when trying to restart, exceeded the cranking limiter trip time, tripping the cranking limiter relay and energizing the "plant failed to start" lamp.

Operations' personnel inspected the EG fuel, electrical and ignition systems and found no cause for the EG to stall or to not restart. The EG was started manually and it ran, but at low RPM (approximately 1200 RPM instead of the desired 1800 RPM). The linkage between the carburetor and governor was found to be binding. Once the linkage was freed and lubricated the EG resumed proper speed control. A full load test (CP-17) was performed. The EG started, accepted the emergency loads and ran without incident during the 30 minute load test.

The EG was last operated on August 11, 1988 when the automatic exerciser started it and ran it for 30 minutes. The previous load test (CP-17) of the EG was conducted on July 28, 1988. The last LER (dated January 11, 1985) associated with the EG occurred on December 13, 1984. Since that time the EG has been called upon to provide emergency electrical power on nine different occasions, with electrical outage times ranging from 39 minutes to 4 hours 26 minutes. Each time the EG started and assumed the load successfully.

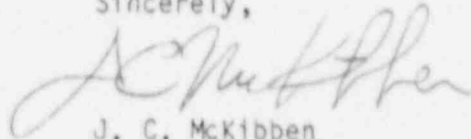
The analysis for loss of electrical power with the reactor operating at 10MW and the emergency generator failing to start is covered in Hazards Summary Report (HSR), Addendum 5, Section 2.4.1, 2.4.2, and 2.5. In this dual failure mode, the reactor will shut down if not already shut down and decay heat removal will be performed indefinitely by the in-pool heat exchanger. The control blades are released on loss of electrical current to their electromagnets and drop to the full inserted position by gravity. All process systems are placed in the shutdown condition due to the failsafe design of these systems; i.e. the redundant (only one is required) primary in-pool heat exchanger valves 546 A and B open by spring actuation, placing the convection cooling in-pool heat exchanger in service. This failsafe design of the system permits shutdown decay heat removal with no electrical power (Appendix D of Addendum 4 to HSR). The containment building integrity could not be indefinitely guaranteed if facility electrical power and emergency generator were not available, but the reactor would be shut down and containment would not be required.

CORRECTIVE ACTION:

The EG was inspected and the linkage lubrication problem was identified and corrected. The EG was subsequently load tested successfully. To prevent this problem from reoccurring, a preventive maintenance (PM) procedure to periodically lubricate the EG throttle linkage has been added to the PM schedule. Since August 18, 1988, the EG has operated properly when started by the weekly exerciser and when manually started by an operator each week as part of performing the full power reactor startup checksheet. The EG properly handled the emergency electrical loads on September 1, 1988 when CP-17 load test was performed.

The University of Missouri is currently selecting a general contractor to procure a new diesel EG and construct a building to house it as part of a long term facility upgrade. This construction and procurement project is scheduled to start in October 1988, and be completed by April 1989. If there are any additional questions concerning the EG, please call either Walt Meyer (314-882-5203) or me (314)-882-5204.

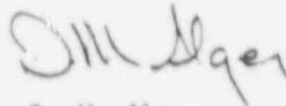
Sincerely,



J. C. McKibben
Reactor Manager

Endorsement:

Reviewed and Approved



D. M. Alger
Assist Director,
Nuclear Technology and Operations

xc: Reactor Advisory Committee
Reactor Safety Subcommittee

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