

PRIORITY ROUTING

First		Second	
RA		RC	
DRA		EIC	
DRP		SGA	
DHC		OI	
✓ DPCS		PRD	
DRMA			

FILE _____

UNIVERSITY OF MISSOURI RESEARCH REACTOR

OPERATIONS MONTHLY SUMMARY

April 1995

Prepared by:
Operations Staff

April 1995

The reactor operated continuously in April with the following exceptions: four shutdowns for scheduled maintenance and refueling; one unscheduled shutdown.

On April 13, a manual rod run-in was initiated after receiving a fire main low pressure alarm and indication. A break was discovered in the water supply main from the nearby pumping station. This water main supplies the emergency pool fill system 1,000 gpm capacity required by Technical Specification 3.10(c). The break was quickly isolated and sufficient water pressure was returned via alternate University wells. The reactor was refueled, and prior to commencing operation, an emergency pool fill compliance test procedure was completed satisfactorily. The broken main was repaired and water service was returned to its original configuration later in the week.

Major maintenance items for the month included: replacing the stack monitor motor, pulley, and belt; installing a new Gamma-Metrics wide range monitor detector in the reactor pool (separate from required nuclear instruments for preliminary testing); completing the biennial change-out of control blade offset mechanism "A".

UNSCHEDULED SHUTDOWNS

<u>Date</u>	<u>Number</u>	<u>Type</u>	<u>Cause</u>
4/13/95	1034	Manual Rod Run-In	Fire main low pressure

OPERATION SUMMARY

HOURS OPERATED THIS PERIOD	647
TOTAL HOURS OPERATED	185,710
HOURS AT FULL POWER THIS PERIOD	644
TOTAL HOURS AT FULL POWER	184,739
INTEGRATED POWER THIS PERIOD	269 MWD
TOTAL INTEGRATED POWER	71,122 MWD

MAINTENANCE ACTIVITY

4/2/95 Replaced stack monitor motor.

4/3/95 Refueled - removed core 95-13, loaded core 95-14.

4/10/95 Refueled - removed core 95-14, loaded core 94-15.

4/13/95 Refueled - removed core 95-15, loaded core 95-16.

4/14/95 Replaced stack monitor motor pulley and belt.

4/17/95 Refueled - removed core 95-16, loaded core 95-17; installed Gamma-Metrics WRM detector for testing.

4/24/95 Refueled - removed core 95-17, loaded core 95-18; completed biennial change-out of control blade offset mechanism "A".



UNIVERSITY OF MISSOURI-COLUMBIA

Environmental Health & Safety

Research Park Development Bldg.
Columbia, Missouri 65211
Telephone (314) 882-7018
FAX (314) 882-7940

Hazardous Waste Management 882-7018
Industrial Hygiene Services 882-7018
Radiation Safety Office 882-7221
Workers' Compensation 882-7018

April 14, 1995

John B. Martin, Regional Administrator
U.S. Nuclear Regulatory Commission
Region III
801 Warrenville Road
Lisle, IL 60632-4351

RE: License No. 24-00513-32
Docket No. 030-02278
Response to Notice of Violation

Subject: Monthly Progress Report of Safety Performance Improvement Program -- Action Plan for the University of Missouri-Columbia Radiation Safety Program

Dear Sir:

In accordance with commitments made by the University of Missouri-Columbia and with the NRC Order dated July 13, 1994, this report is being submitted to you. The purpose of this report is to provide you with monthly progress on the completion status of the action items identified in the Safety Performance Improvement Program (dated June 20, 1994). I have been providing you these monthly progress reports by the 15th of each month.

Enclosure 1 provides you with the completion status of the specific action items identified in the June 20, 1994 Safety Performance Improvement Program (University's Action Plan) that were completed in March 1995. The University is committed to completing the specific action items within the time limitations, as stated in the University's Action Plan. It is our understanding that, by virtue of the NRC Order, we may make a written request of you to allow additional time to meet a step and provide the reason for the request and the new time frame for completion. The University has submitted a written request (dated February 15, 1995) to change the frequency of submitting these progress reports to you. We understand that no change may be made without your written approval.

Sincerely,

Susan M. Langhorst
Susan M. Langhorst, Ph.D., CHP
Radiation Safety Officer

cc: C.A. Kiesler, Chancellor
B.J. Deaton, Chief of Staff
K.W. Groshong, Vice Chancellor
J.K. Jones, Associate Vice Chancellor
E. P. Sheridan, Provost
J.P. McCormick, Vice Provost
W.H. Miller, RSC Chair
J.L. Beckett, Director

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APR 27 1995

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APR 24 1995

Progress Report of the
Safety Performance Improvement Program --
Action Plan for the University of Missouri-Columbia Radiation Safety Program
Action Items Completed as of March 31, 1995

PHASE THREE:

- Staffing needs will be specifically re-evaluated to assure that the program needs are being met. [Due date -- March 31, 1995]
- The annual review of the radiation safety program content and implementation will consist of two audits:
 - a. The RSO will develop a comprehensive audit form to assure that all of the radiation safety records are reviewed each year and that discrepancies are identified; that corrective actions are being initiated; that trends of noncompliance are noted; and program level corrective action prescribed. [Due date -- March 31, 1995]

{Completion -- Comprehensive audit form was developed by March 31, 1995. As part of the development of this form, the Radiation Safety staffing needs were specifically re-evaluated and found to be meeting current program needs}



UNIVERSITY OF MISSOURI-COLUMBIA

Research Reactor Center

Research Park
Columbia, Missouri 65211
Telephone (314) 882-4211
FAX (314) 882-3443

April 19, 1995

Director of Nuclear Reactor Regulation
ATTN: Document Control Desk
Mail Station P1-37
U.S. Nuclear Regulatory Commission
Washington, DC 20555

REFERENCE: Docket No. 50-186
University of Missouri Research Reactor
License R-103

SUBJECT: Report as required by Technical Specification 6.1.h.(2) regarding reactor startup with the source range monitor in a degraded condition

INTRODUCTION

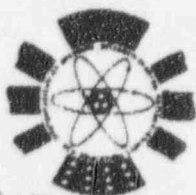
On March 20, 1995, a reactor startup was commenced following a normally scheduled maintenance day. The prerequisite Full Power Reactor Startup Checksheet had been completed, which includes a response test of the fission chamber detector for the source range channel to verify it is operable as required by Technical Specification 3.4.a.

The startup commenced at 2025, after taking the initial set of Nuclear Data and recording source range count rate to be used in the 1/M determination of critical rod height. Initial count rate was 900 cps and Estimated Critical Position (ECP) was 16.9 inches. The startup procedure (SOP II.1.1) requires stopping rod bank withdrawal in 5 inch increments until the rod bank is 2 inches below ECP to take Nuclear Data. At 2 inches below ECP rods are pulled individually to establish criticality.

The startup had proceeded to the point where the rods were withdrawn 10 inches. At this point, the startup was discontinued because the senior operator in charge of the startup saw no significant change in source range counts from those measured initially at zero inches. A review of reactor startups for the past year indicates that, at 10 inches, source range count rate has typically increased 30 to 50%. The reactor was shutdown by manual rod run-in at 2112 to investigate the lack of expected response.

Technical Specification 3.4.a. requires the source range nuclear instrument to be operable only during reactor startup. The inadequate response of the source range channel, noted by the reactor operator before terminating the startup, indicates that the operability of the source range channel was questionable for the 47 minutes the startup had progressed, even though it was response tested prior to startup as required by the Full Power Startup Checksheet and met the conditions of T.S. 3.4.e. which states:

"The reactor shall not be started up unless the Source Range is indicating a neutron count rate of at least 1 cps and the Wide Range monitor is indicating a power level above 1 watt or the Source Range monitor is indicating a neutron test source of at least 2 cps and is verified just prior to startup by a neutron test source or movement of the monitor that the channel is responding to neutrons."



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DESCRIPTION

The source range nuclear instrument detector is a one inch diameter fission chamber with eight inches of sensitive length. The fission chamber is mounted in a water tight container and is located in the pool outside the reflector region. It is connected to a mechanical drive system with 6 feet of stroke which allows vertical positioning of the detector prior to startup. When not in use, the fission chamber is withdrawn into a boral thermal neutron shield to prevent excessive burnout of the chamber when the reactor is at power.

Technical Specification 3.4.a. requires the source range nuclear instrument to be operable only during reactor startup. When the reactor startup was commenced on March 20, 1995, the source range monitor had been response checked as specified in T.S. 3.4.e. and by Step 11 of the Full Power Startup Checksheet by driving the detector in towards the core and verifying increased count rate, and set to indicate greater than 1 count per second. The source range indicated 900 cps and the wide range monitor was reading 750 watts, so the initial conditions of T.S. 3.4.e. were met.

The source range channel appeared to be operable before reactor startup, but was determined not to be responding adequately 47 minutes into the startup. The reactor was shutdown and the startup channel was again response tested by driving the movable fission chamber over the length of its travel to verify an increased response when closer to the source (beryllium reflector). The source range counts increased as the fission chamber was driven in, but did not decrease as expected when it was withdrawn. The count rate, compared to data from several previous startups, was considerably higher than normal at various fission chamber heights.

Electronics technicians were called in to troubleshoot the difference in response. The source range drawer and preamplifier were checked and were determined to be operating normally. The fission chamber detector and cables were removed for inspection and the cabling near the detector was brittle. The cabling from the fission chamber to the preamplifier was replaced and source range counts returned to the range logged for several previous startups.

A short form precritical checksheet was performed, the source range monitor was response checked, and the reactor was started up without further incident.

ANALYSIS

The discontinued startup had followed Standard Operating Procedure and, when commenced, met Technical Specifications 3.4.a. and 3.4.e., within the limits of the historical method used to verify operability. This method had simply been to verify count rate increase on the source range channel as the fission chamber is inserted.

In retrospect, this method (which had served us well for 27 years) will detect if the source range channel is not responding, but provides no guidance for determining whether the source range is over responding. The main concern with over response is that gamma or noise background could obscure the neutron contribution to the count rate such that subcritical multiplication would not be observed.

Review of previous startup records indicate that for normal startups after maintenance day (12 to 16 hours after shutdown), source range count rate is 100 cps or less for fission chamber height higher than 20 inches from full inserted. The source range detector is usually placed in the 20 to 25 inch range for startups after maintenance day. The count rate indicated for the March 20 startup was 900 cps, which exceeded typical count rates and may have been caused by high noise background due to detector cable insulation breakdown. Electronics technicians checked the source range discriminator circuits and eliminated them as a cause of the higher than normal response.

The source range channel is required by Technical Specification to be operable only during reactor startup. It is not part of the reactor safety system, but provides improved monitoring of low neutron flux levels at startup to ensure that subcritical multiplication and criticality can be observed during a startup. Safety System Protection from a Startup or Continuous Rod Withdrawal Accident (Hazards Summary Report, Addendum 5, pp. 25-29) is provided by the period scrams associated with the two intermediate range instruments, which were operable.

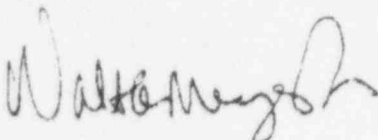
During the March 20 startup, the wide range monitor, which also monitors reactor power level down to source range level, was operable and indicating 750 watts. This indication is well above the 1 watt threshold stated in T.S. 3.4.e. and was capable of indicating criticality if the startup had proceeded further than 10 inches of rod withdrawal (6.9 inches below ECP).

CORRECTIVE ACTION

The immediate corrective action was a reactor shutdown taken by the console operator when source range count rate did not change as expected with the rods withdrawn to 10 inches.

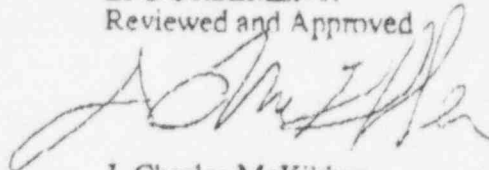
Review of the technique for response checking the source range channel indicated that no limit had ever been established for considering the source range operability degraded when higher than normal response is indicated. This has been corrected by a Standing Order to Reactor Operations staff providing a range of expected values for source range counts based on time after shutdown. Count rates higher or lower than the expected range require investigation by electronics technicians before startup can commence. This evaluation will be in addition to the current response check of the source range channel and will be added to the Full Power Startup Checklist at the next revision of Standard Operating Procedures.

Sincerely,



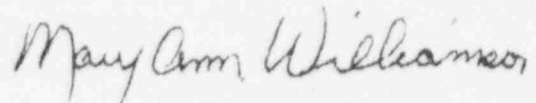
Walt A. Meyer Jr.
Reactor Manager

ENDORSEMENT:
Reviewed and Approved



J. Charles McKibben
Associate Director

cc: Mr. Alexander Adams, Jr., USNRC
Regional Administrator, NRC, Region III
Dr. John P. McCormick, Interim Vice Provost for Research
and Graduate School Dean, UMC
Reactor Advisory Committee
Reactor Safety Subcommittee



Maryann Williamson
Notary Public State of MO
Boone County
Commission Exp. May 18, 1997