UNIVERSITY OF MISSOURI RESEARCH REACTOR

OPERATIONS MONTHLY SUMMARY

November 1995

Prepared by:
Operations Staff

November 1995

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

On November 4, a spurious pool loop low flow scram occurred (coincidentally) while a reactor operator was measuring pool water temperature (T_c) millivolt output with a multimeter. The pool water temperature module and the pool loop flow square root converter modules and alarm trip units are located in the same process instrument rack. The scram source isolation monitor indicated a yellow leg pool loop low flow scram, however, no actual low flow condition was indicated on pool flow charts or indications. Electronics technicians replaced the dual scram trip unit which serves the primary and pool loop yellow leg flows (FT's and 912A and 912F). This unit generated spurious scrams whenever the pool loop flow scram setpoint potentiometer knob was touched. Primary and pool flow compliance checks were performed satisfactorily. The reactor was refueled and no further problems of this type have occurred.

During the subsequent startup, on November 5, a manual rod run-in was initiated from 5 MW to investigate small (0.5°F) fluctuations in primary temperature (T_c) indication. Electronics technicians recalibrated the millivolt transmitter for reactor water T_c (RTD 901A). A satisfactory compliance check was performed and the reactor was returned to normal operation.

On November 14, a manual rod run-in was initiated when the reactor operator discovered a malfunction in the position indication mechanical-electrical transducer for control blade "D". When control blade "D" was shimmed out at 22.00 inches its position indication stopped incrementing. The shift supervisor physically verified that rod "D" position did not exceed one inch difference from the other three rods as required by Technical Specification 3.2.b. Electronics technicians replaced the transducer and tested the indication satisfactorily. The reactor was then refueled and returned to normal operation.

Major maintenance items for the month included: replacing the dual scram trip unit for flow transmitters 912A and 912F; installing, testing, and later removing a pneumatic tube terminal end into the south side of the graphite reflector; replacing the position indication mechanical-electrical transducer for control blade "D"; dumping a depleted pool deionization bed and loading a new one.

UNSCHEDULED SHUTDOWNS

Date	Number	Type	Cause
11/4/95	1039	Scram	Spurious pool low flow
11/5/95	1040	Manual Rod Run-In	Erratic reactor T_c indication
11/14/95	1041	Manual Rod Run-In	Control blade "D" position indication gear assembly failure

OPERATION SUMMARY

HOURS OPERATED THIS PERIOD	621
TOTAL HOURS OPERATED	192,249
HOURS AT FULL POWER THIS PERIOD	616
TOTAL HOURS AT FULL POWER	189,254
INTEGRATED POWER THIS PERIOD	256 MWD
TOTAL INTEGRATED POWER	73,003 MWD

MAINTENANCE ACTIVITY

11/4/95 Replaced the dual scram trip unit for flow transmitters 912A and 912F.

11/5/95 Refueled - removed core 95-46, loaded core 95-47.

11/6/95 Refueled - removed core 95-47, loaded core 95-48.

11/13/95 Refueled - removed core 95-48, loaded core 95-49. Installed south side pneumatic tube terminal end.

11/14/95 Refueled - removed core 95-49, loaded core 95-50. Replaced control blade "D" position indication gear assembly.

11/20/95 Refueled - removed core 95-50, loaded core 95-51. Removed south side pneumatic tube terminal end.

11/22/95 Dumped depleted pool deionization bed, loaded new bed.

11/27/95 Refueled - removed core 95-51, loaded core 95-52.

UNIVERSITY OF MISSOURI-COLUMBIA

INTRA-DEPARTMENT CORRESPONDENCE

TO: MURR Staff

FROM: J. Ernst & W. Meyer

DATE: October 11, 1995

SUBJECT: NRC Inspection, Operations/Health Physics, October 2-6, 1995

The inspector announced an expected shift of the inspection function from Region III to Washington in about six months.

Three violations related to shipping, dating back to 1992, should be closed out by this inspection. One Licensee Event Report regarding the source range monitor was closed out.

The inspector noted continued poor laboratory procedure in the fume hoods. He entered a lab during pneumatic tube runs and found the hood sash above the marked location. This was considered a deficiency during last year's inspection also.

General housekeeping has slipped from good to adequate. The walk through of the center revealed several areas with trash, loose electrical wires, and a defective wall socket that was taped over with a make shift warning sign. This particular discrepancy should have been reported to Reaction Operations control room for tag-out and tracking in the discrepancy log.

The ALARA and Radiation Protection Program audits were considered good. The inspector noted they could use more performance based aspects. Andrea Shipp and Scott Keithley were observed performing H.P. tasks and the inspector thought they performed well.

The inspector commented that procedures are "living documents" and should be critically reviewed on a continuing basis for improvement.

The inspector raised a question regarding some subcommittees of the Reactor Advisory Committee (RAC). Some subcommittee charters explicitly state that they are authorized to act in behalf of the RAC, while others do not. He reviewed committee and subcommittee minutes, and commented that there were good records of the meetings.

Emergency Preparedness was satisfactory. The inspector recommended several changes to the way we document training for outside groups prior to the biennial drill.

Operator logs and records appeared to be well maintained. One individual's requal record had a misleading title for the performance of an emergency scenario. Several entries in surveillance records exceeded the specified checksheet limit, but were in the conservative direction. It appears that the supervisory reviews of surveillances can be improved. Operational surveillances were completed in accordance with Tech Specs.

MPOC has scheduled training for discrimination issues for November with the Personnel Office.

One potential violation was identified regarding the release of lead pigs to a storage area on the loading dock. The inspector, while observing an H.P. Tech survey the lead pigs and then performing a confirmatory measurement, determined that four pigs' contamination level exceeded regulatory limits for free release.

The inspector also found that a beamstop on the CT storage pad had lost its label. This was put into the non-cited violation category.

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The inspector also commented about a hand dose received by a visiting researcher.

The bottom line was the inspector thought we were slipping in several areas. These areas are what the NRC consider precursors of sloppiness and lack of attention to detail. We have several follow-up corrective actions to implement. We will be discussing these actions with the affected groups in the coming groups.

UNIVERSITY OF MISSOURI-COLUMBIA

Research Reactor Facility

Research Park
Columbia Missouri 652[illegible]
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FAX (314) 882-6360

UNIVERSITY OF MISSOURI RESEARCH REACTOR (MURR)

Date: 12/12/95

Number of pages including cover sheet: 2

TO: Mark Mitchell

FROM: Steve Morris

Fax Number: 314 882-6360

If trouble in receiving, call: 314 882-5265

Contact person:

NOTES: As per your request

UNIVERSITY OF MISSOURI-COLUMBIA

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FAX (314) 882-3[illegible]

UNIVERSITY OF MISSOURI RESEARCH REACTOR (MURR)

Date: 10-12-95

Number of pages including cover sheet: 4

TO: Tim Reidinger

FROM: John Ernst

Fax Number: 314 882-6360

If trouble in receiving, call: 314 882-_____

Contact person: _____

NOTES: Tim, let me know if you need anything. John

Stack Effluent
1 January 1994 through 31 December 1994

Ordered by % Technical Specification (TS) Limit

Isotope	Average Concentration (µCi/ml)	Total Release 1/94 - 12/94 (Ci)	TS Limit Multiplier	% TS*
Ar-41	7.44E-07	3.7E+02	350	21.2578
Cd-109	2.14E-13	1.1E-04	1	0.3062
I-131	6.09E-13	3.0E-04	1	0.3045
H-3	3.10E-08	1.5E+01	350	0.0686
Pd-103	2.59E-12	1.3E-03	1	0.0519
Co-60	1.73E-14	8.6E-06	1	0.0346
Se-75	1.35E-13	6.7E-05	1	0.0169
Ce-144	2.33E-15	1.2E-06	1	0.0116
Te-125M	8.31E-14	4.1E-05	1	0.0083
K-40	4.46E-14	2.2E-05	1	0.0074
W-188	1.30E-13	6.4E-05	1	0.0065
Hg-203	2.90E-14	1.4E-05	1	0.0029
Cs-137	5.32E-15	2.6E-06	1	0.0027
Eu-155	5.24E-15	2.6E-06	1	0.0026
Zn-65	6.23E-15	3.1E-06	1	0.0016
I-133	5.18E-12	2.6E-03	350	0.0015
Rb-86	1.27E-14	6.3E-06	1	0.0013
Tm-170	3.35E-15	1.7E-06	1	0.0011
Sn-113	7.01E-15	3.5E-06	1	0.0009
Pa-233	5.52E-15	2.7E-06	1	0.0007
Ce-139	5.32E-15	2.6E-06	1	0.0006
I-135	1.18E-11	5.8E-03	350	0.0006
Sc-46	1.30E-15	6.4E-07	1	0.0004
As-77	9.51E-12	4.7E-03	350	0.0004
Os-191	7.62E-15	3.8E-06	1	0.0004
Ir-192	1.14E-15	5.7E-07	1	0.0004
I-134	4.05E-11	2.0E-02	350	0.0002
Co-57	1.52E-15	7.5E-07	1	0.0002
I-132	1.10E-11	5.5E-03	350	0.0002
Re-188	1.63E-12	8.1E-04	350	0.0001
Ce-141	7.74E-16	3.8E-07	1	0.0001
Xe-135M	1.19E-11	5.9E-03	350	0.0001
Pd-109	1.63E-12	8.1E-04	350	0.0001
Cd-115	1.35E-15	6.7E-07	1	0.0001
Ba-140	1.21E-15	6.0E-07	1	0.0001
Mn-54	5.60E-16	2.8E-07	1	0.0001
Total				22.1134

* Isotopes observed at <0.0001% TS limit are not listed.

Stack flow rate 33,500 cfm.

SECTION VIII

SUMMARY OF RADIOACTIVE EFFLUENT RELEASED TO THE ENVIRONMENT

Sanitary Sewer Effluent
1 January 1994 through 31 December 1994

Descending Order of Activity Released for Isotope Totals > 1.00E-5 Ci:

Nuclide	Amount (Ci)
H-3	1.089E-01
S-35	1.117E-02
Ca-45	3.794E-03
Co-60	1.496E-03
As-77	1.411E-03
Re-186	3.193E-04
Zn-65	1.118E-04
Se-75	6.626E-05
Cr-51	4.781E-05
Eu-152	2.533E-05
Gd-159	1.686E-05
Sb-124	1.632E-05
Ta-183	1.555E-05
Total H-3	1.089E-01 Ci
Total Other	1.849E-02 Ci

01849

February 10, 1995

TO: File

FROM: John Ernst
Health Physics Manager

SUBJECT: NESHAPs Compliance Analysis of MURR Air Effluent for 1994

The attached COMPLY code report was generated by John Rong on February 2, 1995 from MURR effluent releases for the reporting period January 1, 1994 - December 31, 1994. The results of this compliance analysis indicate that MURR is in compliance with the standards set in 40 CFR 61.102. The results also demonstrate that MURR is exempt from the reporting requirements of 40 CFR 61.104.

02/02/95 02:40

40 CFR Part 61
National Emission Standards
for Hazardous Air Pollutants

REPORT ON COMPLIANCE WITH

THE CLEAN AIR ACT LIMITS FOR RADIONUCLIDE EMISSIONS

FROM THE COMPLY CODE, VERSION 1.2, SEPT. 1989

Prepared by:

UMC
MURR
MURR, COLUMBIA, MO 65211

JOHN
93140 882-4211

Prepared for:

U.S. Environmental Protection Agency
Office of Radiation Programs
Washington, D.C. 20460

02/02/95 02:40

1994 MURF COMPLIANCE CHECK (CALLAWAY WIND DATA)

SCREENING LEVEL 4

DATA ENTERED:

Nuclide		Release Rate (curies/YEAR)
AR-41		3.700E+02
CD-109	D	1.100E-04
I-131	D	3.000E-04
H-3	V	1.500E+01
PD-103	Y	1.300E-03
CO-60	Y	8.600E-06
SE-75	W	6.700E-05
CE-144	Y	1.200E-06
TE-125M	W	4.100E-05
K-40	D	2.200E-05
W-188	D	6.400E-05
HG-203	D	1.400E-05
CS-137	D	2.600E-06
SU-155	W	2.600E-06
MN-65	Y	3.100E-06
I-133	D	2.600E-03
RB-86	D	6.300E-06
TM-170	W	1.700E-06
SN-113	W	3.500E-06
PA-233	Y	2.700E-06
CE-139	Y	2.600E-06
I-135	D	5.800E-03
SC-46	Y	6.400E-07
AS-77	W	4.700E-03
OS-191	Y	3.800E-06
IR-192	Y	5.700E-07
I-134	D	2.000E-02
CO-57	Y	7.500E-07
I-132	D	5.500E-03
RE-188	W	8.100E-04
CE-144	Y	3.800E-07
XE-135M		5.900E-03
PD-109	Y	8.100E-04
CD-115	Y	6.700E-07
BA-140	D	8.000E-07
MN-54	W	2.800E-07

Release height 21 meters.

Building height 16 meters.

The source and receptor are not on the same building.

Building width 48 meters.

Building length 77 meters.

STACK DISTANCES, FILE: DISTJE.DAT

DIR FROM	Distance (meters)
N	550.000
NNE	150.000
NE	150.000
ENE	250.000
E	250.000
ESE	850.000
SE	800.000
SSE	800.000
S	130.000
SSW	600.000
SW	900.000
WSW	1250.000
W	1600.000
WNW	1100.000
NW	950.000
NNW	600.000

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WINDROSE DATA, FILE: CW85-90.DAT

Source of wind rose data: CALLAWAY NUCLEAR PLANT (10 M HEIGHT)
Dates of coverage: 1985-1990
Wind rose location: CALLAWAY NUCLEAR PLANT
Distance to facility: 33 MILES

Percent calm: 0.00

Wind FROM	Frequency	Speed (meters/s)
N	0.030	3.58
NNE	0.040	2.78
NE	0.040	2.41
ENE	0.036	2.57
E	0.046	2.86
ESE	0.051	2.80
SE	0.095	2.97
SSE	0.104	3.16
S	0.110	3.48
SSW	0.072	3.52
SW	0.066	3.36
WSW	0.044	3.23
W	0.062	3.39
WNW	0.073	3.55
NW	0.068	3.51
NNW	0.063	3.39

Distance from the SOURCE to the FARM producing VEGETABLES is 2000 meters.

Distance from the SOURCE to the FARM producing MILK is 2000 meters.

Distance from the SOURCE to the FARM producing MEAT is 2000 meters.

NOTES:

The receptor exposed to the highest concentration is located 130. meters to the N.

He gets his VEGETABLES from a farm located 2000. meters to the NNW.

He gets his MEAT from a farm located 2000. meters to the NNW.

He gets his MILK from a farm located 2000. meters to the NNW.

Input parameters outside the "normal" range:

02/02/95 02:40

Distance from stack to receptor is unusually FAR.

RESULTS:

WHOLE BODY dose: 2.2 (mrem/year).

WHOLE BODY dose: 1.6E-03 (mrem/year) due to Iodine.

*** COMPLY at level 4.

This facility is in COMPLIANCE.

It may or may not be EXEMPT from reporting to the EPA.

You may contact your regional EPA office for more information.

********** END OF COMPLIANCE REPORT **********

The receptor exposed to the higheet dose is located in a building 130 meters to the North of MURR. The building is on land owned by the University of Missouri and houses a laboratory. It is considered to be on site.

The lab is occupied 8 hrs/day, 5 days/week for an occupancy factor of 0.24.

(2.2 mrem/year) (0.24) = 0.5 mrem/year

The results of this analysis indicate that MURR is in compliance and is exempt from reporting to the EPA.

John Ernst, CHP
Health Physics Manager

UNIVERSITY OF MISSOURI-COLUMBIA

Research Reactor Center

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Columbia, Missouri 65211
Telephone (314) 882-4211
FAX [314] 882-3443

November 17, 1995

Cynthia D. Pederson, Director
Division of Nuclear Materials Safety
U.S. Nuclear Regulatory Commission, Region III
801 Warrenville Road
Lisle, Illinois 60532-4351

Subject: Reply to Confirmatory Action Letter CAL No. RIII-95-04 and Concerns Raised During Exit Interview November 3, 1995

Dear Ms. Pederson:

This letter is our notification to you that we have completed the actions addressed in your Confirmatory Action Letter CAL-RIII-95-004. Specifically:

(1) On September 20, 1995, the inner door of Room 267 (Dark Room) was padlocked and the two keys were placed under the control of Mr. John Ernst or his designee and Mr. Matt Sanford or his designee.

(2) Since September 20, 1995, a University of Missouri Research Reactor (MURR) employee has been present in a supervisory role when any work is performed in Room 267.

(3) Conducted on the evening of September 20, 1995, an audit of the byproduct material contained in Room 267 was conducted under the direction of Mr. Jim Schuh.

(4) The inventory was reconciled under the oversight of Mr. Clarence Jett of the University of Missouri Internal Auditing Department on September 21, 1995. No material was transferred into or out of Room 267 until September 22, 1995.

(5) A University of Missouri Research Reactor employee has supervised all byproduct material transfers into and out of Room 267. The first transfer of byproduct material was a transfer into Room 267 on September 22, 1995. The first transfer out was a shipment on September 25, 1995.

During the investigation conducted on September 20-21, 1995, we understood Mr. Robert Marsh had major concerns about how we were handling the byproduct material in Room 267. We do not believe that the University violated any regulations regarding the possession and use of the byproduct material in Room 267. When we asked Mr. Marsh what NRC regulation he felt we were not in compliance with concerning Room 267, no specific answer was given. Therefore in an attempt to

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continue to meet appropriate program needs while alleviating nonspecific concerns, Mr. Steve Gunn committed to take the actions in his September 20, 1995 letter (amended September 21, 1995). MURR is in compliance with CAL-RIII-95-004.

Next, we wish to address the issues raised in the November 3, 1995 exit interview of the CAL compliance inspection. We understand that you are concerned that our supervision of non-University employees working with byproduct material is insufficient to preclude the possibility of unauthorized release in the United States. Specifically, that allowing non-University employees unescorted access to byproduct topaz material in Room 267 and being involved jointly with MU employees in delivering the material to the carrier in St. Louis does not provide a sufficient barrier to prevent this topaz from being switched with nonbyproduct topaz. You suggest that this provides an opportunity for byproduct topaz to be released in the U.S. without going through the appropriate controls of an exempt gemstone license.

We have implemented the following controls to provide the barrier and documentation for inspection to validate that the byproduct topaz is only released in compliance with 10CFR regulations:

(1) We have restricted . . activities in Room 267 to storage, cleaning, heat treating and sorting of MURR irradiated byproduct material that has been approved by the Gemstone QA program for non-U.S. release. No nonbyproduct topaz will be allowed in Room 267.

(2) All transfers into and out of the Room 267 are documented by MURR employees who log the date, type of transfer and mass of the transfer.

(3) MURR employees will package all shipments of byproduct topaz leaving the Center after weighing and documenting the weights. The packages will be sealed and marked to clearly differentiate them from any other packages and make unauthorized opening easily detectable.

(4) MURR employees will keep packages in their custody during the transfer to the air carrier and will obtain documentation of this transfer. Only MURR irradiated byproduct material will be allowed in these shipments.

It is our position that properly trained radiation workers can be relied on to follow procedures and obey regulations. The gemstone material being handled in Room 267 has all been analyzed by an extnesive QA program to ensure that each individual stone does not exceed a concentration of 74 Bq/g (2 nCi/g). In practice the concentrations are significantly below the 74 Bq/g limit. Small batches of gemstones having these very low radioactive concentrations can be surveyed with a typical GM survey instrument with no increase in count rate detected. We believe that the hazard level of byproduct material that has been certified to have a specific activity of less than 74 Bq/g including beta activity does not justify constant surveillance or physical search of trained personnel.

We propose implementing the following controls governing the activities in Room 267 to address the issues raised during the inspection November 1-3, 1995. These controls will be in place December 18, 1995 and will replace the controls given in the CAL-RIII-95-004.:

(1) Limit by procedure the activities in Room 267 to the storage, cleaning, heat treating, sorting and handling of byproduct material that has been certified for nondomestic release by the MURR Gemstone QA program.

(2) By procedure, require that all transfers of byproduct material into and out of Room 267 will be supervised by a MURR employee.

(3) By procedure, require that the date, type of transfer and mass of all transfers of byproduct material into and out of Room 267 be logged by a MURR employee.

(4) By procedure, require that MURR employees perform or supervise the packaging of all topaz byproduct topaz leaving the center.

(5) By procedure, require that shipments of byproduct material from Room 267 will be restricted to byproduct material only, and that MURR employees will keep the packages in their custody during transfer to the air carrier and will obtain documentation of this transfer.

(6) Compliance with the control procedures will be documented by conducting an annual audit of the physical inventory and records of the material balance in Room 267.

These steps will enhance the level of control over byproduct material located in Room 267 of MURR. We believe that this enhanced level of control will address the issues you raised and more than adequately protect the public from any potential hazards associated with this byproduct material. No shipments of byproduct topaz have been made since the November 3, 1995 exit. We will make shipments as needed meeting the above policies, but do not anticipate shipping until after November 26, 1995. If there are any additional questions, please call John Ernst (314-882-5226) or Charles McKibben (314-882-5204).

Sincerely,

J. Charles McKibben
Associate Director

James J. Rhyne
Director, MU Research Reactor
and Professor of Physics

xc: J. McCormick
S. Weiss, NRC/NRR/ONDB
J. Ernst