THE OHIO STATE UNIVERSITY

Engineering Experiment Station

142 Hitchcock Hall
2070 Neil Avenue
Columbus, OH 43210-1275

Phone 614-292-4903
FAX# 614-292-9021

September 10, 1992

Document Control Desk
Nuclear Regulatory Commission
Washington DC 20555

Dear Sir:

Please find enclosed the annual report for The Ohio State University Research Reactor, Docket No. 50-150. This report is being submitted as required by our Technical Specification, Section 6.6.1. If you have questions on the content of this report, please contact Mr. Richard Myser, Associate Director of the Nuclear Reactor Laboratory.

Sincerely,

Stacy Weisel
Acting Director

SW/lv

enclosure

c: Nuclear Regulatory Commission Region III (w/enc.)
Theodore S. Michaels (w/enc.)

IE47

Introduction

As stated in The Ohio State University Research Reactor Technical Specifications, Section 6.6.1 Operating Reports, an annual report shall be made to the NRC by September 30 of each year. This report is to include the following seven sections.

(1) A narrative summary of operating experience (including experiments performed) and of changes in facility design, performance characteristics, and operating procedures related to reactor safety occurring during the reporting period.

(2) A tabulation showing the energy generated by the reactor (in kilowatt hours) and the number of hours the reactor was in use.

(3) The results of safety-related maintenance and inspections. The reasons for corrective maintenance of safety related items shall be included.

(4) A table of unscheduled shutdowns and inadvertent scrams, including their reasons and the corrective actions taken.

(5) A summary of changes to the facility or procedures, which affect reactor safety, and performance of tests or experiments carried out under the conditions of Section 50.59 of 10CRF50.

(6) A summary of the nature and amount of radioactive gaseous, liquid, and solid effluents released or discharged to the environs beyond the effective control of the licensee as measured or calculated at or prior to the point of such release or discharge.

(7) A summary of radiation exposures received by facility personnel and visitors, including the dates and times of significant exposures.

These seven sections are discussed below. These are all for the period July 1, 1991 through June 30, 1992 except as noted for exposure records.

(1) A. Experiments Performed

The staff of The OSU Research Reactor are generally involved in four types of experiments at the Nuclear Reactor Laboratory. Included are introductions to nuclear research, neutron activation analysis, material irradiations, and classes that measure various reactor parameters. Additionally, this year we began 500 KW operation.

Typically when we introduce students, faculty, or other experimenters to nuclear research we do the following:

a. Discuss nuclear reactions and radiological safety.
b. Operate the reactor at 10KW - 100 KW.
c. Have the individuals observe control room operations and
d. Complete a tour and demonstration of irradiation techniques.

Neutron activation analysis experiments are routinely completed for students ranging from high school to graduate school. The facilities normally utilized are the "rabbit" (pneumatic tube) and the "CIF" (Central Irradiation Facility). The majority of the NAA work is biological samples. Irradiations are typically no longer than eight hours.

Material irradiations, other than for NAA, are in four basic areas: isotope production, detector, electronic component, and fiber optic testing; boron neutron capture therapy (BNCT); and irradiation of biological samples.Isotope production is extremely limited. Only two irradiations (specifically for isotope production) were completed in the last year. Detector and electronic component testing is done more routinely. This testing is usually completed in the thermal column, or one of the beam ports,while fission chamber testing is in the Central Irradiation Facility. The reactor thermal column is also utilized for other BNCT studies. Typically it is the location for blood samples to determine their boron content and for the evaluation of Cr-39 plastic plates. We also completed a few other biological sample irradiations for research projects but currently are not approved to do any animal irradiations.

Various nuclear engineering or physics classes throughout Ohio utilize the reactor for the following basic experiments:

a. Approach to critical (using banked control rods rather than fuel loading)
b. Control rod calibration by rod drop, positive period, and subcritical multiplication
c. Measurement of the Reactor Transfer function
d. Void coefficient measurements and
e. Radiological surveys.

On November 14, 1990 the OSURR License was amended to allow 500 KW operation. Installation of the in-pool portion of the heat removal system was completed in June, 1991. The core loading was increased to 3821.65 g on July 16, 1991 with a measured excess reactivity of 2.34%.

Operations at greater than 10 KW began on September 18, 1991 and full power operation at 500 KW first took place on December 19, 1991.

The reactor utilization for July 1, 1991 through June 30, 1992 is summarized in the following quarterly reports.

Utilization Report

July 1 - September 30, 1991

Description	Hours
Power Increase Activities including core load to increase excess reactivity to 2.0-2.6, control rod calibration, and power calibration	32.0
NE744 Laboratory sessions including control rod calibrations, void measurements, transfer function, power calibration, and temperature feedback	75.0
Reuter Stokes Fission Chamber Testing	28.0
Fiber Optics Research	10.0
BNCT (Boron Neutron Capture Therapy)	9.0
Ar-41 Production for Instrument Calibration for Victoreen and NRL	3.0
Reactor Tours and Workshops	13.0
Seed Irradiation for OSU Biotechnology	2.0
Power Increase Monitoring at 10 KW and 50KW	8.0
Total	180.0

October 1 - December 31, 1991

Description	Hours
Power Increase Activities including radiation monitoring, power calibration, and detector repositioning	30.75

Description	Hours
Reuter Stokes Fission Chamber Testing	45.00
Class Laboratory and Demonstrations including NE641, Pharmacy 800, and irradiations for classes from outside OSU	8.50
Tours	9.25
Transistor Testing for NASA including transistor holder testing	40.25
Irradiation of Biological Material for Kent State University	6.00
Fiber Optics Research	5.50
Isotope Production for Victoreen and NRL Calibrations	2.25
Total	145.50

January 1 - March 31, 1992

Description	Hours
Reactor Power Increase Activities	8.5
Reuter Stokes Fission Camber Testing	27.0
Iso-Tex I-125 Production Evaluation	16.0
Reactor Sharing - Kent State University NAA of Zooplankton for Na	10.0
OSU Nuclear Engineering, BNCT in Thermal Column	25.0
NE793 Power Calibration	16.0
NE845 Noise Analysis	17.0
Reactor Sharing, Approach to Critical Experiments	25.0
Tours and Demonstrations	4.0
Total	149.0

April 1 - June 30, 1992

Description	Hours
Requalification Exam Operations	4.0
Reuter Stokes Fission Chamber Testing	51.0
Terra Technical College Experiments	15.0
BNCT Experiments	12.0
NAA for Kent State University	3.0
NAA for Oberlin College	7.0
Youngstown State University approach to critical	2.0
NE720 Dynamic Reactor Behavior	2.0
Tours and Demonstrations	12.0
Total	108.0

(1)B. Changes in Facility Design

There were no facility design changes that required changes to the SAR or Technical Specifications. 10CFR50.59 changes are described in Section 5.A. The changes to the SAR and Technical Specifications necessary for the power increase to 500 KW were approved by the NRC on November 14, 1990.

(1)C. Changes in Performance Characteristics

There have been no changes in performance characteristics related to reactor safety in the last year. However, the Reactor Staff had completed Technical Specification modifications to allow a power increase from 10 KW to 500 KW. These Specifications were approved by the Reactor Operations Committee and submitted to the NRC on June 12, 1990. They were approved by the NRC on November 14, 1990. Operations at 500 KW began December 19, 1991.

(1)D. Changes in Operating Procedures

There was one change in operating procedure related to reactor safety in the last year. (10CFR50.59 changes are described in Section (5)B.) This change was made to IM-03, OSURR Pre-Start Checkout, in response to the reportable occurrence of January 9, 1992 discussed in (3) below. The change required the operator to check detector HV as a part of pre-start surveillance.

(2) A. Kilowatt Hours of Operation - 21,424

B. Hours of Utilization - 584.5

(3) Safety Related Maintenance

Routine preventive maintenance and inspections by the reactor staff did reveal one reportable safety related item. It was reported to the NRC as required by Technical Specification 6.5.2(3). This item described the failure on January 9, 1992 of one of the Level Safety Systems to perform its intended function. Appropriate corrective action was taken. This was reviewed by the OSU Reactor Operations Committee on January 24, 1992. During a subsequent NRC inspection of May 26 - 28, 1992 this item was closed out.

(4) Unscheduled Shutdowns

From July 1, 1991 to June 30, 1992 there were a total of twenty unplanned scrams. One was from operator error, the remainder were instrument related. These are summarized below:

Reason	Corrective Action
A. Operator Error (1)	None Required
B. Fission Chamber (15) Switch caused spurious signal	Replaced switch on Fission Chamber Drive with surge suppressor circuit
C. Instrumentation (4) cables accidentally bumped or Instrumentation turned on during operation	New conduit installed

(5) Changes in Facility Procedures, and Performance of Tests or Experiments in Accordance with 10CFR50.59

A. During the period July 1, 1991 to June 30, 1992 one OSUNR Modification Request was completed by the Reactor Staff and approved by the Reactor Operations Committee, and one new experiment was approved by the ROC. These did not require license or technical specification changes or result in an unreviewed safety question per 10CFR50.59. These are described below.

1. Replaced the Log Count Rate Module with a comparable Lin-Log Ratemeter.

2. Approved a feasibility study on the Production of I-125.

B. The following is a list of Procedure changes made under 10CFR50.59 from July 1 1991 to June 30, 1992 in accordance with Administrative Procedure AP-05 Format for Writing, Revising, and Approving Procedures.

Procedure Number	Procedure Title	Revision Number	Revision Date
OM-01	Reactor Power Changes	4	4/23/92
OM-07	Fuel Element Inspections	2	2/13/91
RS-09	Area Radiation Surveys	3	5/14/92
IM-03	OSURR Pre-Start Checkout	8	2/25/92
IM-04	Post Shutdown Checkout	6	4/09/92
EP-01	Emergency Procedures	6	5/14/92

(6) Radioactive Effluents

A. Gaseous Effluent - The only effluent we measure is the release of Ar-41. A new procedure to directly measure Ar-41 releases was implemented starting October 1, 1989. The measured value for the period July 1, 1991 to June 30, 1992 was 0.032% of MPC released to the unrestricted area.

B. Liquid Releases - The reactor pool was not drained during this reporting period. There were no releases through the "hot" sink.

C. Solid Releases - No releases of solid radioactive material were made to the uncontrolled environment.

(7) A. Radiation Exposures

Since the firm that maintains records for The Ohio State University keeps a year to date record it is easier to report this by the nearest completed calendar year. Therefore film badge exposures in this report are for the period January 1 to December 31, 1991. Six individuals were monitored as radiation workers for the entire year. These are tabulated below. They are consistent with the ALARA policy for The Ohio State University and represent a small fraction of the allowed limits.

Individual	Whole Body (Waist)		Right Finger	Left Finger
	Deep	Shallow		
I.	160	160	M	M
II.	130	130	100	80
III.	180	180	460	550
IV.	40	40	-	-
V.	400	400	650	480
VI.	170	170	760	970

All doses in millirem, M denotes less that minimum detectable level for monitoring device, - denotes no monitoring.

B. In addition to the above individuals, all visitors and experimenters are monitored. These individuals are normally issued visitor or spare film badges. Results of these exposures are tabulated below.

Visitors (10 badges)
All less than 50 millirem for the year

Spares (13 badges)
All less than 60 millirem for the year