

REED REACTOR FACILITY



ANNUAL REPORT

September 1, 1995 -- August 31, 1996

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EXECUTIVE SUMMARY

This report covers the period from September 1, 1995 to August 31, 1996. This report is intended to fulfill several purposes including the reporting requirements of the U.S. Nuclear Regulatory Commission, the U.S. Department of Energy, and the Oregon Department of Energy.

Highlights of the last year include:

- Student participation in the program is very high. The number of licensed student operators exceeds one percent of the student body. Forty percent of the licensed operators are women; sixty percent are men.
- The facility continues its success in obtaining donated equipment from the Portland General Electric, U.S. Department of Energy, and other sources. Pacific Northwest National Laboratory has been generous in lending valuable equipment to the college.
- The facility is developing more paid work. Income this year was much greater than previous years. The U.S. Department of Energy's Reactor-Use Sharing grant remained constant this year in spite of a general reduction in their pool of money.
- Progress is being made in a collaborative project with Pacific Northwest National Laboratory on isotope production for medical purposes. This could be an exciting long term relationship which is very promising for the facility.

There were over 1500 individual visits to the Reactor Facility during the year. Most were students in classes at Reed College or area universities, colleges, and high schools. Including tours and research conducted at the facility, the Reed Reactor Facility contributed to the educational programs of six colleges and universities in addition to eighteen pre-college groups. Most of the reactor use by non-Reed personnel was conducted under the auspices of the Nuclear Science Consortium of the Willamette Valley, supported by a grant from the U.S. Department of Energy through the Reactor-Use Sharing Program.

During the year, the reactor was operated almost three hundred separate times. The total energy production was over 23 MW-hours. The reactor staff consists of a Director, an Associate Director, a contract Health Physicist, and approximately twenty Reed College undergraduate students as hourly employees.

All radiation exposures to individuals during this year were well below five percent of the federal limits. There were no releases of liquid radioactive material from the facility and airborne releases (primarily ^{41}Ar) were well within regulatory limits. No radioactive waste was shipped from the facility during this period.

INTRODUCTION

The Reed College Reactor Facility has been a resource for research and educational projects in the Portland area since its establishment in 1968. Cooperative programs between Reed and several public and private high schools, colleges, and universities in northwestern Oregon were established in 1970. These programs, fostered by the reactor staff, are an important part of the educational picture of the region. Partial funding from the U.S. Department of Energy's Reactor Use Sharing Program through the Nuclear Science Consortium of the Willamette Valley enables use of the reactor by educational institutions other than Reed.

The Reed College reactor is a TRIGA Mark I reactor with zirconium hydride / uranium hydride fuel elements in a circular grid array. The uranium fuel is enriched to 19.9% in uranium-235. The reactor is at the bottom of a 25-foot-deep tank of water and is surrounded by a graphite reflector.

The Reed Reactor operates at various steady power levels. The reactor is brought up to a desired power level (up to the license ceiling of 250 kW-thermal) and is kept at that power until the experiment or irradiation is completed. This power level is usually maintained for periods ranging from a few minutes to several hours. Repeated operation over several days are possible for long-term irradiations.

The main uses of the Reed Reactor Facility are instruction and research, especially trace-element analysis. In addition to providing student research opportunities, the reactor staff has worked to educate the surrounding community on the principles of nuclear energy and radiation safety.

PERSONNEL

Facility Staff

During the period from September 1995 through the present, the facility staff consisted of:

<i>Director:</i>	Stephen Frantz (4/94 – Present)
<i>Associate Director:</i>	Josh Filner (6/94 – Present)
<i>Reactor Supervisor:</i>	Chris Ghormley (9/96 – Present) Chris Melhus (7/96 – 8/96) Chris Ghormley (6/96 – 7/96) Kathy Reeves (6/95 – 6/96)
<i>Training Supervisor:</i>	Chris Ghormley (6/95 – Present)
<i>Radiation Safety Officer:</i>	Cindy Savage (4/93 – Present)
<i>Contract Health Physicist:</i>	Marshall Parrott (8/91 - Present)
<i>Assistant Health Physicist:</i>	Traci Hilton (10/94 – Present)
<i>Senior Reactor Operators:</i>	<i>Reactor Operators:</i> Joshua Filner Stephen Frantz Chris Ghormley Traci Hilton Chris Melhus Michael Pollock Kathy Reeves Aubin Whitley
	Patricia Bennett Juliet Brosing Nate Carstens Si Cook Brian Halbert Jimmy Huang Claire Jouseau Chris Meecham Eric Saunders Matt Shaw Zoe VanHoover Greta Vanderbeek

Operators who held licenses during the period but who no longer have licenses:

Wendy Evans
Noah Iliinsky

All staff members were Reed College undergraduates during the report period with the following exceptions. Mr. Frantz and Mr. Filner are the Director and Associate Director, respectively. Ms. Savage is the Reed Campus Safety Officer. Dr. Parrott works on contract to Reed College as Reactor Health Physicist. Dr. Brosing is Professor of Physics and Mathematics at Pacific University. Mr. Pollock was the previous director of the reactor. Nate Carstens is a student at Rex Putnam High School. Kathy Reeves graduated in 1996 and is continuing her research at Reed. The Reed Reactor Facility has two oversight committees: the Radiation Safety Committee and the Reactor Operations Committee. The Radiation Safety Committee is concerned with emergency preparedness, health physics, radiation safety, physical security, environmental impact, and the interface between the Reed Reactor Facility and the Reed College Campus and the surrounding Community. The Reactor Operations Committee deals with the day-to-day operations of the

reactor, reactor maintenance, reactor safety, and operator training, and requalification. The membership of the committees during the reporting period is shown below:

Radiation Safety Committee

Voting Members:

Curt Keedy (Chair) (*Chemistry Faculty, Lewis and Clark College*)
Virginia Hancock (*Music Faculty, Reed College*)
Wayne Lei (*Environmental Director, Portland General Electric*)
Jack Mahoney (*Neighborhood Resident*)
Cindy Savage (*Radiation Safety Officer, Reed College*)
George Toombs (*Radiation Control Section, Oregon State Health Division - retired*)

Ex Officio:

Linda Mantel (*Dean of the Faculty, Reed College*)
Stephen Frantz (*Director, Reed Reactor Facility*)
Josh Filner (*Associate Director, Reed Reactor Facility*)
Marshall Parrott (*Contract Health Physicist*)
Kathy Reeves (*Reactor Supervisor*)

Reactor Operations Committee

Voting Members:

John Essick (Chair) (*Physics Faculty, Reed College*)
Juliet Brosing (*Physics Faculty, Pacific University*)
Dan Gerrity (*Chemistry Faculty, Reed College*)
Johnny Powell (*Physics Faculty, Reed College*)
Bill Nicholson (*Portland General Electric*)
Michael Pollock (*Geology Faculty, Portland State University*)

Ex Officio:

Linda Mantel (*Dean of the Faculty, Reed College*)
Stephen Frantz (*Director, Reed Reactor Facility*)
Josh Filner (*Associate Director, Reed Reactor Facility*)
Marshall Parrott (*Contract Health Physicist*)
Kathy Reeves (*Reactor Supervisor*)

FACILITIES

Reactor Facility Floor Plan

In addition to the reactor, the Reed Reactor Facility has associated space for a nuclear science lab. A floor plan appears as Figure 1.

The equipment available at the reactor facility includes four gamma spectrometers (with High Purity Germanium and Sodium Iodide detectors), surface barrier detectors, alpha spectrometers, Silicon Lithium X-ray detectors, a whole body counter, gas flow proportional counters, ion chambers, beta counters, Geiger-Müller tubes, and thermoluminescent dosimeter readers. The instruments are used for experiments in basic nuclear science and radiation detection. Hand and shoe monitors are used in the reactor bay and the lab. A liquid scintillation detector is available in the chemistry department and serves the campus radioisotope committee.

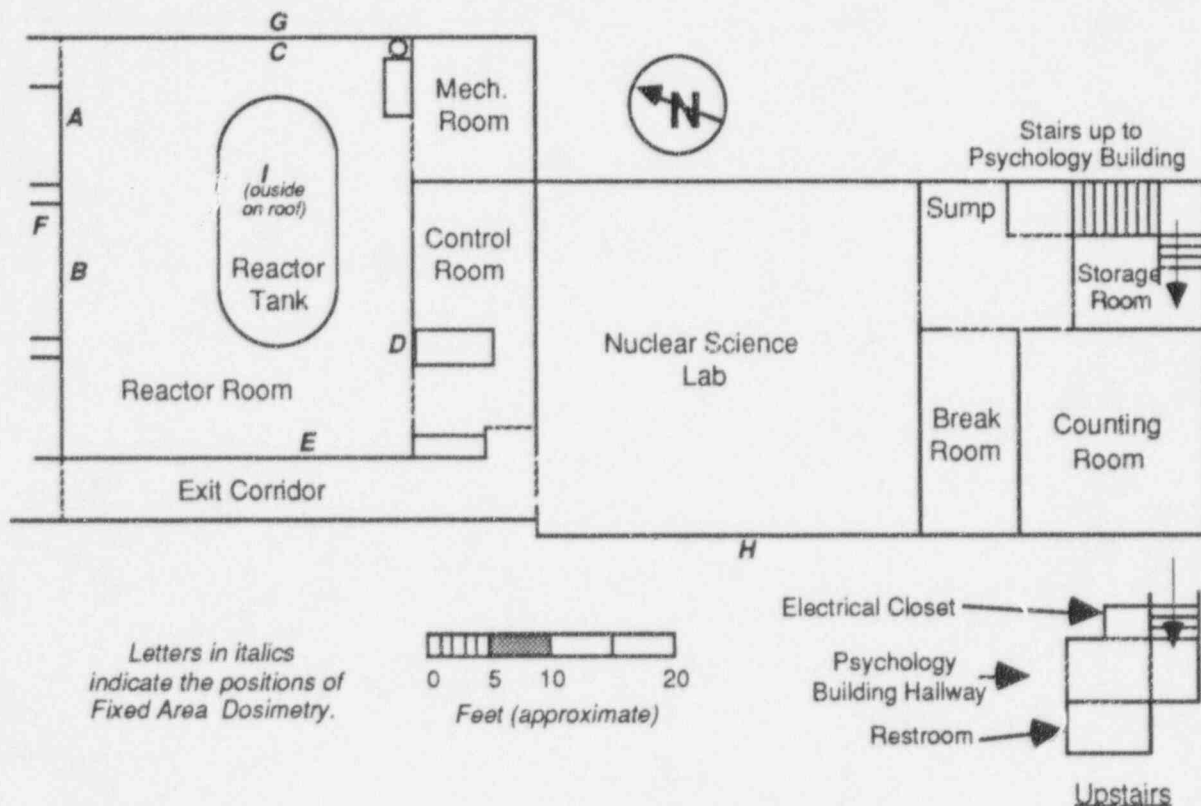


Figure 1 - Reed Reactor Facility Floor Plan

The reactor facility has several special for performing irradiations, described below.

Rotating Specimen Rack Facility

The rotating specimen rack ("lazy susan") is located in a well on top of the graphite reflector which surrounds the core. The rack consists of a circular array of 40 tubular receptacles. Each receptacle can accommodate two TRIGA-type irradiation tubes, so that up to 80 separate samples may be irradiated at any one time. Vials holding up to 17 ml (four drams) are routinely used in this system. Depending upon its geometry, a sample up to about 40 ml could be irradiated by joining two vials. Samples are loaded in the specimen rack prior to the start-up of the reactor. The rack automatically rotates during irradiation to ensure each sample receives the same neutron flux. Typically, the rotating rack is used by researchers when longer irradiation times (generally greater than five

minutes) are required. The average thermal neutron flux in the rotating rack position is approximately 1.7×10^{12} n/cm²s with a cadmium ratio of 6.0 at full power.

The specimen rack can also be used for gamma irradiations when the reactor is shutdown. The shutdown dose rate in the specimen rack is approximately 3 R/min.

Pneumatic Transfer System

The pneumatic transfer system ("rabbit") consists of an irradiation chamber in the outer ring of the core with its associated pump and piping. This allows samples to be transferred in and out of the reactor core very rapidly, while the reactor is at power. It is not currently in use.

Routine use of the pneumatic transfer system involves placing samples into vials, which in turn are placed in special capsules known as "rabbits." The capsule is loaded into the system in the laboratory next to the reactor and is then transferred pneumatically into the core-irradiation position. At the end of a predetermined time the sample is transferred back to the receiving terminal, where it is removed for measurement. The transfer time from the core to the terminal is about seven seconds, making this method of irradiating samples particularly useful for experiments involving radioisotopes with short half-lives. The flux in the core terminal is approximately 5×10^{12} n/cm²s when the reactor is at full power.

In-Core Facilities

The central thimble, which is a water-filled irradiation chamber about 3 cm in diameter, provides the highest available neutron flux, about 1×10^{13} n/cm²s. Special sample holders can be designed for the central thimble to provide maximum flexibility in experiment design.

A source holder assembly can also be used. The chamber fits into a fuel-element position within the core itself. However, it holds only one specially positioned irradiation container, containing a cavity 7.5 cm in length and 2.5 cm in diameter. Use of the chamber as an irradiation facility necessitates special arrangements.

Foil-insertion holes, 0.8 cm in diameter, are drilled at various positions through the grid plates. These holes allow inserting special holders containing flux wires into the core, to obtain neutron flux maps of the core.

In-Pool Facilities

Near core, in-pool irradiation facilities can be arranged for larger samples. Neutron fluxes will be lower than in the lazy susan and will depend on the sample location.

Beam Facilities

The central thimble can be evacuated with gas, producing a vertical neutron beam. This beam can be used to generate directional neutron flux, or for limited irradiations above the tank. Neutron radiography is also possible. The flux above the beam exit is approximately 1×10^3 n/cm²s when the reactor is at full power.

REACTOR USERS

Reactor Visitors

A total of 1564 individuals visited the Reed Reactor Facility during the year, as derived from the visitors log - Entry List B. Individuals who visited more than once are counted for each visit. A display of visitors by month is shown in Figure 2. Visitors include all individuals who are not listed as facility staff. A large percentage of these were students in classes at area universities, colleges, and high schools as discussed below.

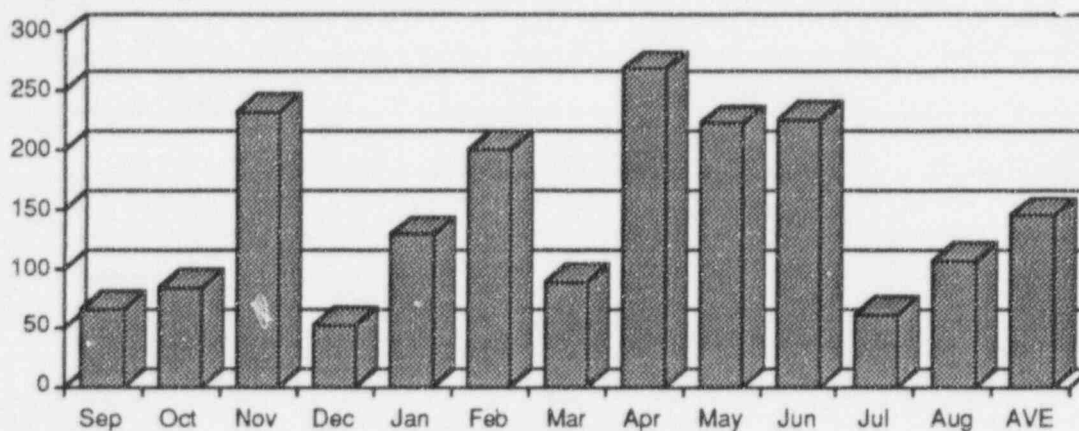


Figure 2 - Visitors

Reactor Operations Seminar

The Reed Reactor Facility conducts a annual seminar series for students and faculty from Reed and other area educational institutions. This non-credit course serves as an introduction to nuclear reactor theory, health physics, and reactor operation. Some of the students continue with in-depth reactor operator training and subsequently apply for a reactor operator license. If successful, the individual may be hired to operate the reactor. In addition, existing reactor operators may take the NRC senior reactor operator exam to upgrade their licenses. For those NRC exams administered during this reporting period, all eight reactor operator candidates passed and three of four senior reactor operator candidates passed.

Nuclear Science Consortium

In order to better use the resources of the Reed Reactor Facility, Dr. Scott and representatives of several area colleges and universities established the Nuclear Science Consortium of the Willamette Valley in 1970. Funding for the Consortium has been derived from Reactor Use Sharing Grants of the U.S. Department of Energy. This made the facility available without charge to classroom groups and unfunded research projects for consortium members.

The following institutions have participated in facility tours, experiments, and research projects in the reporting period. A chronological listing is attached.

COLLEGE TOURS

Concordia University

Clackamas Community College

Oregon Health Sciences University

Pacific University

Portland Community College

Portland State University

HIGH SCHOOL & MIDDLE SCHOOL TOURS

SE Montessori

Edmonds High School

Elmira High School

Forest Grove High School

Gladstone High School

Hood River Valley High School

Lincoln High School

Oregon Episcopal School

Rex Putnam High School

Rogue River High School

Rogers High School

Wilson High School

SPECIAL PRE-COLLEGE GROUPS

Bring Your Child to Work

Cub Scout Packs

Boy Scout Troops

Pacific University's Science and Technology Camp for Girls

Project Plus

Saturday Academy

Most of the reactor tours include actual hands-on use of facility equipment to conduct experiments in basic radiation science, health physics, and nuclear physics. The most popular experiments for middle school students are a demonstration of the inverse square law and the absorption of radiation by different types of material. For high school classes, a typical lab experience would involve determining the background of a Geiger-Müller scalar system and then determining the half-life of a radioactive material.

College classes are generally more closely tailored to the individual interests and needs of the Consortium faculty member involved. Experiments include more direct use of the reactor itself by the students, more detailed analysis of materials, and emphasize the incorporation of other classroom activities as much as possible.

Several special programs for gifted children used the reactor. These are designed to enrich their educational program and prepare them for college. Many of the groups who use the reactor target minority and disadvantaged youth who are historically under-represented in science professions.

High School Student Projects

The Reed Reactor Facility continued to be used in independent science projects initiated by students from several Oregon high schools. Students from Oregon Episcopal School, Elmira High School, and Gold Beach High School performed special science research projects at the reactor this year. Kim Boatman from Gold Beach went on to win first place in her category at international competition. According to the judges, her process for zirconium extraction is the first economically feasible method. She has applied for a patent.

Lincoln High School physics class spent three afternoons at the reactor performing experiments. A student from Lincoln High School and two students from Wilson High School spent most of the summer working at the facility on various projects. Nathan Carstens, a student at Rex Putnam High School, spent most of his summer and much of the school year working at the facility. He passed an NRC reactor operators exam this year.

Pacific University Science and Technology Camp for Girls

The Pacific University Science and Technology Camp for Girls holds a summer camp for 7th and 8th grade girls. This camp is funded by the U.S. Department of Energy. The overall goal is to encourage the participants to continue in math and science.

Pacific University Modern Physics Lab

Each year the Modern Physics Lab at Pacific University spends two lab sessions (4-5 hours each) at the reactor. The students do several labs including basic health physics, subcritical multiplication, and neutron activation analysis.

Concordia University

Two or three times each year the Environmental Remediation & Hazardous Material Management Program (ERHMM) at Concordia University visits the facility. The reactor provides training and experiments involving radiation and radioactive material.

Reed Classes, Theses, and Faculty Research

The Reed College Reactor Facility was used in three Reed College Classes and three senior theses.

- The Chemistry 110 class conducted a lab using neutron activation analysis to analyze for potassium in a compound synthesized earlier in the course.
- Chemistry 315 students evaluated the presence of impurities in aluminum foil.
- Natural Science 100 students studied the effects of acid rain on sediment taken from the Reed Canyon.
- Three Reed students used the reactor this year for their thesis work. We performed activation analysis for Luke Kanies who was working with Dave Dalton, and for John Notis who was working with Ron McClard. We produced P-32 for Dhawal Goradia who was also working with Ron McClard.
- Three other Reed students did work with the reactor. Chris Ghormley performed yttrium measurement in solid state compounds for Chemistry 212. Traci Hilton investigated metal uptake in plants for Biology 332. Chris Melhus checked for arsenic content in vitamins as class projects in Physics Junior lab.

Industrial and Commercial Applications

The Reed Reactor Facility is available for use by industrial or commercial concerns whenever it does not conflict with our educational goals. As in past years, the primary operations involve neutron activation analysis of materials or environmental samples. Arrangements may be made either on a time lease basis or the industry may contract for sample analysis.

This year work included attempts to find trace elements in soil samples and renting analytical equipment. The facility is expanding its commercial activities by providing radiation protection training to interested parties and schools in the area.

The facility has begun providing health physics courses. This year we offered two 1-day training sessions and one 40-hour Radiation Safety Officer training course.

REACTOR OPERATIONS

Operations

During the year, 153 reactor start-up checklists were completed with a total of 295 times critical. A reactor start-up is conducted on each day of reactor operation; each time critical represents one reactor operation. The total energy production amounted to 23.05 MWh. Operations by month appear in Figures 3-5.

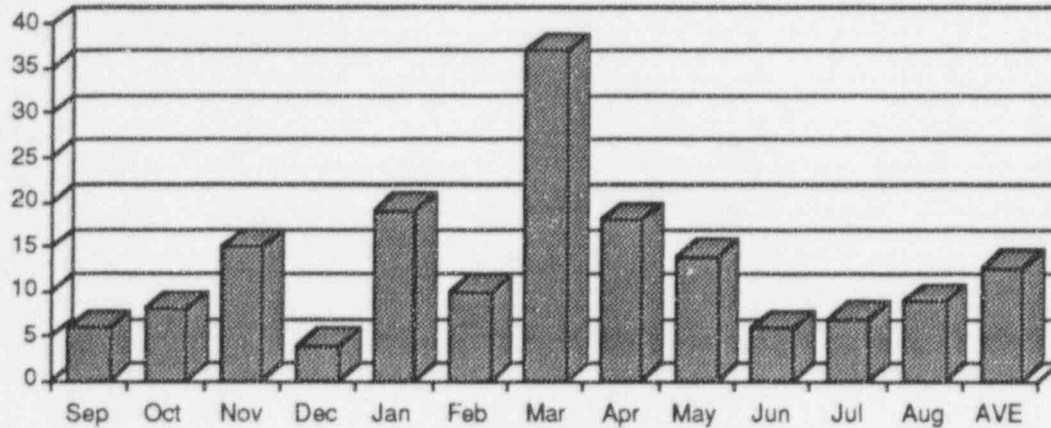


Figure 3 - Days of Operation

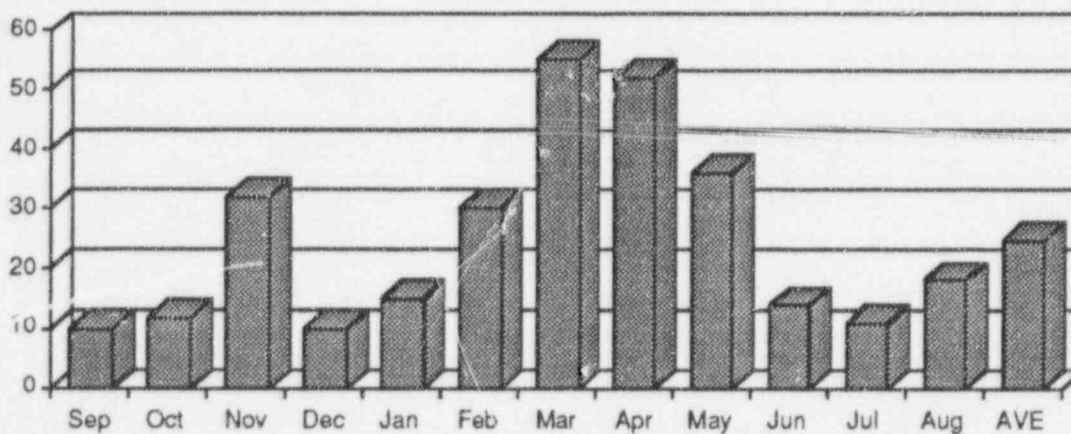


Figure 4 - Times Critical

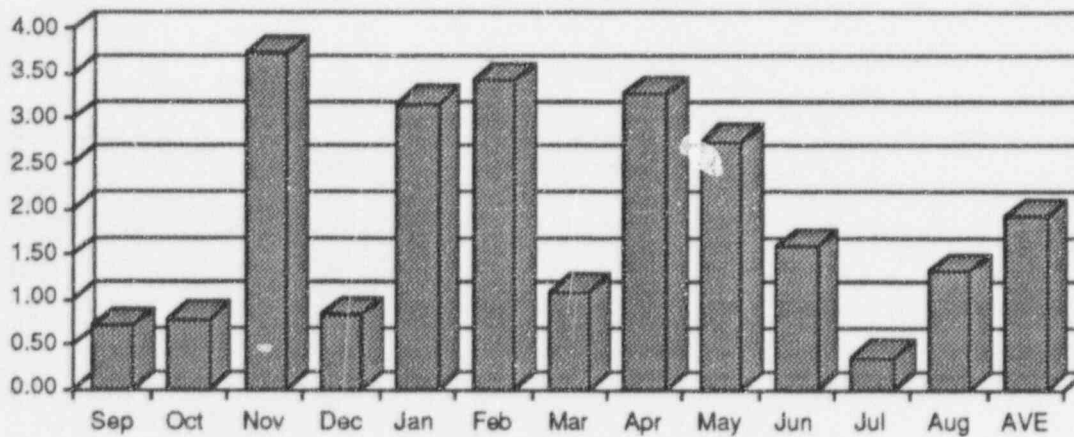


Figure 5 - Energy Production (MWh)

Unplanned Reactor Shutdowns

There were 19 unplanned reactor shutdowns (scrams) during the period, as shown in Table A. All were classified as inadvertent. On 5/20/96 the licensed operator manually scrambled the reactor when he noticed that the trainee had allowed power to reach 100% (we normally limit power to 96%). One scram was due to instrument noise. The remainder resulted from operator or trainee error. The number of unplanned reactor shutdowns is consistent with previous years.

Table A - Unplanned Reactor Shutdowns

<u>Date</u>	<u>Type</u>	<u>Cause Of Shutdown</u>
9/8/95	Linear Power	Operator error
9/28/95	Percent Power	Operator error
10/2/95	Linear Power	Operator error
10/2/95	Reactor Period	Operator error
11/4/95	Percent Power	Operator error
11/15/95	Percent Power	Trainee error
11/28/95	Reactor Period	Trainee error
3/2/96	Linear Power	Operator error
3/7/96	Linear Power	Operator error
3/18/96	Reactor Period	Trainee error
3/29/96	Linear Power	Trainee error
4/5/96	Linear Power	Trainee error
5/7/96	Reactor Period	Operator error
5/9/96	Reactor Period	Operator error
5/20/96	Manual	Power above 96%
6/22/96	Reactor Period	Instrument noise
6/26/96	Reactor Period	Operator error
7/8/96	Linear Power	Trainee error
7/19/96	Linear Power	Operator error

REACTOR MAINTENANCE

Significant Maintenance

Routine equipment checks are conducted by reactor staff members on a daily, weekly, bimonthly, semiannual (January and July) and annual (January) basis as required by facility procedures. Reed College maintenance personnel assist with routine preventative maintenance to auxiliary equipment. Significant maintenance operations which were not part of a regular schedule are listed in Table B.

Table B - Significant Maintenance Operations

<u>Date</u>	<u>Maintenance</u>
9/27/95	Soldered center arm on Linear Channel switch.
4/5/96	Soldered Regulating Rod motor wire.

Safety Reviews

There were no changes performed during the reporting period under the provisions of 10CFR50.59.

RADIATION PROTECTION

Personnel Dosimetry

During the period from July 1, 1995 to June 30, 1996, personnel dosimeters were issued to 34 Reed students and staff and 1 contractor working at the reactor. Since dosimeters are changed on a calendar quarter schedule, this period is the closest to the reporting period. In almost all cases, individuals were issued both a ring badge for estimating hand exposure and a whole-body badge.

Seven individuals met or exceeded the detection limit, as indicated on Table D. No exposures exceeded five percent of the federal limit.

Table D - Personnel Dosimetry
(doses in mR per calendar quarter)

	<u>Ring</u>	<u>Whole-body</u>
Total dosimeters issued	111	111
Reports below detection limit	104	104

Details of dosimeters exceeding detection limit:

Reed staff:	45 mR to whole body and finger ring.
Reed staff:	50 mR to whole body and finger ring.
Contractor:	55 mR to whole body and finger ring.
Reed staff:	65 mR to whole body and finger ring.
Reed student:	20 mR to whole body and finger ring.
Reed student:	15 mR to whole body and finger ring.
Reed student:	15 mR to whole body and finger ring.

Gaseous Releases

The only routine release of gaseous radioactivity is from ^{41}Ar (1.8 hour half-life) and ^{16}N (7 second half-life). These come from activation of pool water and air dissolved in the pool water. The average annual gaseous activity released is approximately 5.3×10^{-9} mCi/ml; well below regulatory guidelines.

Liquid Waste Releases

No liquid radioactive waste was released from the Reed Reactor Facility during this report period.

Solid Waste Disposal

No solid radioactive waste was shipped from the Reed Reactor Facility during this report period.

Environmental Sampling

Soil and water samples taken from the area surrounding the facility showed no activity above background.

Fixed Area Dosimetry

Radiation levels are continually monitored to provide an indication of the average radiation levels in the reactor bay and dose outside the facility. The locations of these dosimeters are shown on Figure 1. All are thermoluminescent dosimeters (TLDs) designed to monitor beta and gamma radiation. In addition, locations C and E have TLDs that measure neutron dose.

The radiation doses measured during the period beginning July 1, 1995 and ending June 30, 1996 are shown in Table E. Since dosimeters are changed on a calendar quarter schedule, this period is the closest to the reporting period. There are radioactive material sample storage locations along the north wall: a radioactive source storage safe and a lead enclosed sample box where samples are placed immediately upon removal from the reactor.

Table E - Area Radiation Dosimeters
(doses in mR per calendar quarter)

<u>Location</u>	<u>height</u> (m)		<u>7/1-9/30</u>	<u>10/1-12/31</u>	<u>1/1-3/31</u>	<u>4/1-6/30</u>	<u>Total</u>
A North wall	1.5	β, γ	140	110	160	0	410
B North wall	2.5	β, γ	220	0	25	10	255
C East wall	1.7	β, γ	0	0	0	0	0
C East wall	1.7	neutron	0	0	0	0	0
D South wall	1.7	β, γ	10	0	15	0	25
E West wall	1.0	β, γ	45	0	0	0	45
E West wall	1.0	neutron	0	0	0	0	0
F North outside	3.0	β, γ	10	0	10	0	20
G East outside	1.5	β, γ	0	0	0	0	0
H South outside	0.2	β, γ	0	0	0	0	0
I Roof outside	0.0	β, γ	0	0	0	0	0

APPENDIX A
Reed Reactor Visitors 1995-96

<u>Date</u>	<u>Institution</u>	<u># in Group</u>	<u>Comments</u>
9/12/95	Reed Student	1	Tour
9/12/95	Cub Scouts	7	Tour
9/14/95	Reed Student	17	Training Seminar
9/14/95	Rex Putnam High School	1	Training Seminar
9/14/95	Neighborhood Citizens	2	Tour
9/15/95	Rex Putnam High School	1	Training
9/19/95	Rex Putnam High School	1	Training
9/19/95	Pacific University	1	Research Project
9/19/95	Water Metric West	1	Maintenance
9/19/95	Reed Physical Plant	1	Maintenance
9/21/95	SE Montessori Center	7	Tour
9/27/95	Rex Putnam High School	1	Training
9/27/95	Reed Student	1	Training
9/28/95	Oregon Episcopal School	9	Tour
9/29/95	Reed Student	2	Training
9/29/95	Rex Putnam High School	1	Training
9/30/95	Reed Student Family	6	Tour
10/1/95	Hood River Valley High School	25	Tour
10/2/95	Hood River Valley High School	14	Tour
10/3/95	Rex Putnam High School	1	Training
10/4/95	Reed Student	1	Training
10/4/95	Rex Putnam High School	1	Training
10/5/95	Pacific University	5	Class
10/5/95	Rex Putnam High School	1	Training
10/12/95	Reed Student	1	Training
10/12/95	Pacific University	4	Class
10/12/95	Reed Student	1	Training
10/12/95	Rex Putnam High School	1	Training
10/17/95	Pacific University	1	Research Project
10/18/95	Portland Community College	1	Tour
10/18/95	Reed Student	1	Training
10/19/95	Reed Student	1	Tour
10/19/95	University of California, Berkeley	1	Tour
10/19/95	Reed Student	1	Tour
10/20/95	Reed Student	1	Tour
10/23/95	Rex Putnam High School	1	Training
10/26/95	Rex Putnam High School	1	Training
10/26/95	Rose City Astronomers	4	Tour
10/28/95	Putnam High School	1	Training
10/28/95	Reed Student	3	Training
10/30/95	Elmira High School	2	Tour
10/31/95	Reed Student	3	Chem Lab
11/1/95	Reed Student	2	Training
11/1/95	EDUCOM	10	Tour
11/1/95	Reed Student	7	Training Seminar
11/1/95	OHSU	1	Tour
11/1/95	Wright Health Physics	1	Tour
11/4/95	Rex Putnam High School	1	Training
11/4/95	Citizen	1	Tour
11/4/95	Reed Student	5	Training
11/7/95	Reed Student	7	Training Seminar

11/8/95	Wright Health Physics	1	Training Seminar
11/8/95	Reed Student	3	Chem Lab
11/8/95	Rex Putnam High School	1	Training
11/8/95	Gladstone High School	1	Tour
11/10/95	Citizens	2	Tour
11/11/95	Reed Students	11	Training Seminar
11/13/95	Reed Students	3	Training
11/13/95	Reed Students	14	Nat Sci Tour
11/14/95	Reed Students	15	Nat Sci Tour
11/14/95	Portland General Electric	2	Tour
11/14/95	Rex Putnam High School	1	Training
11/14/95	Reed Students	2	Training
11/14/95	Reed Students	2	Tour
11/15/95	Reed Students	4	Training
11/15/95	Reed Students	14	Nat Sci Tour
11/16/95	Reed Students	3	Training
11/16/95	Reed Students	21	Nat Sci Tour
11/17/95	Reed Students	15	Nat Sci Tour
11/18/95	Reed Students	4	Training
11/18/95	Rex Putnam High School	1	Training
11/20/95	Boy Scout Troop	18	Tour
11/21/95	Reed Students	4	Chem Lab
11/22/95	Reed Community Safety	5	Training
11/24/95	Reed Students	3	Training
11/28/95	Reed Students	2	Training
11/28/95	Portland Community College	19	Tour
11/28/95	Rex Putnam High School	2	Tour
11/29/95	Portland General Electric	2	Tour
11/30/95	Reed Students	11	Chem Lab
12/1/95	Portland Community College	14	Tour
12/1/95	Reed Students	11	Chem Lab
12/2/95	Concordia University	16	Tour
12/5/95	Reed Student	1	Operator
12/8/95	Reed MALS	10	MALS Tour
12/27/95	Connecticut College	1	Tour
1/5/96	Pacific University	1	Tour
1/6/96	Pacific University	4	Tour
1/7/96	Amherst College	1	Tour
1/8/96	Reed Students	7	Training
1/9/96	Rex Putnam High School	1	Training
1/9/96	Reed Students	8	Training
1/10/96	Reed Students	10	Training
1/10/96	Rex Putnam High School	1	Training
1/11/96	Reed Students	7	Training
1/11/96	Rex Putnam High School	1	Training
1/11/96	Wright Health Physics	1	Tour
1/12/96	Reed Students	9	Training
1/12/96	Wright Health	1	Tour
1/13/96	Reed Students	7	Training
1/14/96	Reed Students	6	Training
1/14/96	Rex Putnam High School	1	Training
1/15/96	Reed Students	5	Training
1/15/96	Oregon Episcopal School	5	Tour
1/15/96	Rex Putnam High School	1	Training
1/16/96	Reed Students	9	Training

1/17/96	Reed Students	7	Training
1/18/96	Reed Students	7	Training
1/19/96	Reed Students	5	Training
1/20/96	Rex Putnam High School	1	Training
1/22/96	Rex Putnam High School	1	Training
1/23/96	Rex Putnam High School	1	Training
1/23/96	NRC Examiner	1	Exam
1/24/96	Reed Community Safety	3	Tour
1/25/96	Reed Reactor	2	Tour
1/25/96	Pacific University	2	Tour
1/26/96	Rex Putnam High School	1	Training
1/26/96	Reed Student	1	Training
1/27/96	Reed Students	3	Training
1/31/96	Reed Student	1	Training
2/1/96	Reed Student	1	Training
2/1/96	Pacific University	1	Tour
2/1/96	Reed Students	2	Tour
2/2/96	Reed Students	6	Training
2/3/96	Reed Students	6	Training
2/3/96	Elmira High School	2	Tour
2/3/96	Scott Family	8	Tour
2/6/96	Reed Student	1	Research
2/6/96	Reed Maintenance	2	Maintenance
2/6/96	Wilson High School	1	Tour
2/7/96	Reed Students	2	Research
2/8/96	Reed Students	3	Training
2/9/96	Reed Students	7	Training
2/10/96	Reed Students	3	Tour
2/13/96	Edmonds High School	4	Tour
2/14/96	Mt. Hood Chemical Co.	1	Tour
2/15/96	Reed Maintenance	2	Maintenance
2/16/96	Reed Students	2	Tour
2/18/96	Reed Student	1	Tour
2/19/96	Rex Putnam High School	2	Tour
2/19/96	Prospective Students	5	Tour
2/20/96	Reed Students	19	Chem 110 Lab
2/21/96	Reed Students	42	Chem 110 Lab
2/21/96	Reed Students	2	Training
2/22/96	Reed Students	25	Chem 110 Lab
2/23/96	Oregon State University	1	Tour
2/23/96	Reed Students	24	Chem 110 Lab
2/26/96	Reed Maintenance	1	Maintenance
2/27/96	Reed Maintenance	1	Maintenance
2/28/96	Reed Reactor	1	Tour
2/29/96	Pacific University	11	Tour
2/29/96	Reed Students	3	Training
3/1/96	Reed Students	3	Training
3/2/96	Reed Student	1	Research
3/3/96	Reed Reactor	1	Tour
3/5/96	Physical Plant	2	Maintenance
3/5/96	Saturday Academy	17	Tour
3/6/96	Physical Plant	2	Maintenance
3/6/96	Stericycle	1	Maintenance
3/6/96	Reed Reactor	3	Tour
3/8/96	Wilson High School	1	Tour

3/12/96	Wilson High School	1	Tour
3/12/96	Panther Systems	7	Tour
3/13/96	Panther Systems	3	Tour
3/14/96	Reed Students	2	Research
3/14/96	Pacific University	1	Research
3/15/96	Reed Student	1	Research
3/18/96	Reed Student	1	Research
3/19/96	Project Plus	12	Tour
3/19/96	Reed Student	1	Training
3/20/96	Oregon Episcopal School	2	Tour
3/20/96	Reed Students	5	Training
3/21/96	Reed Students	2	Training
3/22/96	Reed Student	1	Tour
3/23/96	Reed Student	1	Research
3/24/96	Reed Student	1	Research
3/25/96	Oregon Health Science University	2	Tour
3/27/96	Portland General Electric	2	Tour
3/28/96	Reed Student	1	Research
3/28/96	Harvard University	2	Tour
3/29/96	Wilson High School	1	Tour
3/29/96	Reed Student	1	Research
3/30/96	Reed Student	1	Research
3/31/96	Reed Students	2	Research
4/1/96	Reed Students	2	Training
4/2/96	Reed Students	2	Research
4/3/96	Portland Fire Bureau	4	Tour
4/3/96	Reed Students	2	Research
4/3/96	Portland Police Bureau	5	Tour
4/4/96	Reed Student	1	Research
4/5/96	Photographer	1	Photos
4/5/96	Reed Economics Students	8	Tour
4/6/96	Reed Students	5	Training
4/9/96	Reed Student	1	Research
4/10/96	Reed Student	1	Research
4/10/96	Lincoln High School	30	Tour
4/10/96	Oregon Episcopal School	4	Tour
4/11/96	Reed Student	1	Tour
4/11/96	Lincoln High School	19	Tour
4/12/96	Prospective Students	16	Tour
4/12/96	Rogue River High School	13	Tour
4/12/96	Cub Scouts	10	Tour
4/13/96	Reed Students	8	Research
4/15/96	Prospective Students	11	Tour
4/17/96	Reed Students	2	Research
4/18/96	Pacific University	1	Tour
4/18/96	Reed Students	8	Research
4/19/96	Prospective Students	8	Tour
4/19/96	Reed Students	2	Research
4/20/96	Reed Students	4	Research
4/22/96	Prospective Students	10	Tour
4/22/96	Reed Students	2	Research
4/23/96	Reed Students	2	Research
4/23/96	Prospective Parent	1	Tour
4/23/96	Wilson High School	1	Tour
4/23/96	Saturday Academy	8	Tour

4/24/96	Reed Students	2	Research
4/25/96	Bring Child to Work	55	Tours
4/29/96	Reed Students	6	Training
4/29/96	NRC Examiner	1	Testing
4/30/96	NRC Examiner	1	Testing
4/30/96	Reed Students	2	Training
5/1/96	NRC Examiner	1	Testing
5/1/96	Reed Students	3	Training
5/3/96	Reed Student	1	Training
5/6/96	Honeywell	1	Maintenance
5/6/96	Reed Student	1	Training
5/7/96	Reed Students	3	Research
5/7/96	Portland Community College	10	Tour
5/7/96	Saturday Academy	20	Tour
5/9/96	Reed Reactor	1	Tour
5/9/96	Portland Community College	8	Tour
5/10/96	Portland State University	6	Tour
5/10/96	Reed Students	2	Research
5/10/96	Reed Reactor	2	Tour
5/14/96	Reed Student	1	Training
5/14/96	Physical Plant	2	Maintenance
5/16/96	Reed Student	1	Training
5/16/96	Murdock Trust	3	Tour
5/17/96	Reed Students	4	Training
5/17/96	Visitor	1	Tour
5/19/96	Reed Student	1	Research
5/19/96	Visitors	8	Tour
5/20/96	Portland Community College	16	Tour
5/21/96	Visitors	7	Tour
5/21/96	Wilson High School	1	Research
5/22/96	Rogers Middle School	4	Tour
5/23/96	Rogers Middle School	10	Tour
5/23/96	AWSEM	17	Tour
5/23/96	Portland Community College	7	Tour
5/24/96	Wilson High School	2	Tour
5/24/96	Portland Community College	10	Tour
5/24/96	Rogers Middle School	7	Tour
5/25/96	Reed Student	1	Research
5/29/96	Portland Community College	23	Tour
5/30/96	Clackamas Community College	13	Tour
5/31/96	Reed Student	1	Training
5/31/96	Wilson High School	1	Research
5/31/96	Wilson High School	17	Tour
6/4/96	Forest Grove High School	10	Tour
6/5/96	Forest Grove High School	1	Tour
6/11/96	Visitors	2	Tour
6/12/96	Reed Reactor	3	Testing
6/14/96	Alumnus	6	Tour
6/14/96	Reed Students	2	Training
6/18/96	Reed Student	1	Training
6/19/96	Reed Student	1	Training
6/19/96	Howard Hughes Medical Institute	15	Tour
6/20/96	Wilson High School	2	Tour
6/20/96	Physical Plant	1	Maintenance
6/21/96	Reed Student	1	Training

6/21/96	Wilson High School	2	Tour
6/21/96	Pacific University	28	Tour
6/22/96	Concordia University	15	Tour
6/26/96	Howard Hughes Medical Institute	15	Tour
6/28/96	Penn State University	1	Research
6/28/96	Wilson High School	1	Research
6/28/96	Dean Mantel	1	Tour
6/29/96	Visitors	5	Tour
6/29/96	Dan Gerrity	1	Audit
6/29/96	Wilson High School	1	Research
7/2/96	Wilson High School	2	Research
7/2/96	Concordia University	1	Research
7/3/96	Wilson High School	1	Research
7/8/96	Wilson High School	1	Research
7/8/96	Saturday Academy	12	Tour
7/10/96	Wilson High School	2	Research
7/10/96	Saturday Academy	8	Tour
7/11/96	Saturday Academy	8	Tour
7/12/96	Wilson High School	2	Research
7/13/96	Wilson High School	2	Research
7/15/96	Wilson High School	1	Research
7/16/96	Oregon Health Science University	2	Tour
7/16/96	Wilson High School	1	Research
7/17/96	Wilson High School	2	Research
7/19/96	Wilson High School	2	Research
7/20/96	Wilson High School	1	Research
7/22/96	Wilson High School	3	Research
7/26/96	Physical Plant	2	Maintenance
7/26/96	Wilson High School	1	Research
7/30/96	Physical Plant	2	Maintenance
7/31/96	Wilson High School	1	Research
8/1/96	Physical Plant	1	Maintenance
8/6/96	Physical Plant	2	Maintenance
8/6/96	Radiation Safety Officer Course	8	Training
8/14/96	Health Physics Northwest	1	Training
8/1/96	Wilson High School	1	Research
8/1/96	Radiation Safety Officer Course	3	Training
8/1/96	Wilson High School	1	Research
8/18/96	Wilson High School	1	Research
8/8/96	Clackamas Community College	13	Tour
8/8/96	Radiation Safety Officer Course	5	Training
8/19/96	Prospective Students	2	Tour
8/20/96	Wilson High School	1	Research
8/22/96	Physical Plant	1	Maintenance
8/22/96	Citizen	1	Tour
8/22/96	Water Metric	2	Maintenance
8/23/96	Physical Plant	1	Maintenance
8/24/96	Wilson High School	1	Research
8/24/96	Concordia University	17	Training
8/26/96	J. Powell	1	Audit
8/26/96	Wilson High School	1	Research
8/27/96	Wilson High School	2	Research
8/28/96	Wilson High School	1	Research
8/28/96	Reed Parents/Students	23	Tour
8/29/96	Reed Parents/Students	16	Tour