



*Center for Excellence in
Nuclear Technology, Engineering, and Research*

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U.S. Nuclear Regulatory Commission
Document Control Desk
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To whom it may concern:

Enclosed is the annual operating Report for the University of Utah TRIGA Nuclear Reactor, License No. R-126, Docket number 50-407, for the period of 1 July 2000 through 30 June 2001. This report fulfills the requirements of the TRIGA technical specifications (TTS) 6.10(5).

If there are any further questions or concerns regarding this report, please contact me at (801) 581-8499

Respectfully,

David M. Slaughter
Reactor Administrator

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**The University of Utah TRIGA Reactor
Annual Operating Report
for the period
1 July 2000 through 30 June 2001**

A. NARRATIVE.

1. Operating Experience.

The University of Utah Center for Excellence in Nuclear Technology, Engineering, and Research (CENTER) TRIGA Reactor, License No. R-126, Docket No. 50-407, was critical 53.652 hours and generated 3597.179 kilowatt-hours of thermal energy during this reporting year. The reactor was used for educational demonstrations, laboratory experiments, systems tests, power measurements and sample irradiations.

2. Changes in Facility Design.

The documents supporting a forthcoming application to upgrade licensed power from 100 kW to 1.1 MW, are being internally reviewed before submission to the NRC. No facilities changes have occurred.

3. Surveillance Tests.

Documentation of all surveillance activities is retained and stored by the facility.

a. Control Rod Worths

Table 1. Summary of control rod worth, SDM, and ER

Core Configuration	8/09/00	9/27/00	2/21/01
	#24	#24	#24
	Dollars	Dollars	Dollars
	(\$)	(\$)	(\$)
Safety Rod	2.31	2.37	2.32
Shim-Safety Rod	1.59	1.60	1.65
Regulating Rod	0.25	0.24	0.24
Excess Reactivity	1.037	1.015	1.029
Shutdown Margin	0.803	0.825	0.861

b. Control Rod Inspection.

Rod drop times were measured on 8/09/00, 9/27/00, and 2/21/01. All rod drop times were less than 1.0 seconds.

c. Reactor Power Level Instrumentation.

Calorimetric power calibrations were performed on 8/23/00, and 2/16/01 with the following results:

Date	Measured % Power	Calculated Power Level
8/23/00	91.7 kW	88.46 kW
2/16/01	90.6 kW	87.39 kW

d. Fuel Temperature Calibration.

Fuel temperature circuits were calibrated on 8/08/00 and 2/20/01. The circuits were calibrated to less than a 2°C error over the range 20°C to 400°C.

e. Reactor Safety Committee Audits.

Rian B. Smith audited the maintenance and operational activities of the facility and radiation safety for the period 1 Jul. 2000 through 31 Dec. 2000.

James M. Byrne audited the maintenance and operational activities of the facility for the period 1 Jan. 2001 through 30 Jun. 2001.

Rian B. Smith audited radiation safety and ALARA practices at the facility for the period 1 Jul. 2000 through 31 Dec. 2000.

Rian B. Smith audited radiation safety and ALARA practices at the facility for the period 1 Jan. 2001 through 30 Jun. 2001.

No significant deviations from normal operating practices were identified by these audits.

B. ENERGY OUTPUT.

The reactor was critical for 53.652 hours and produced 0.150 megawatt·days (3597.179 kilowatt·hours) of energy during this reporting period. Since initial criticality, the reactor has been operated for a total of 3056.982 hours with an accumulated total energy output of 8.039 megawatt·days (192939.479 kilowatt·hours).

C. EMERGENCY SHUTDOWNS AND INADVERTENT SCRAMS: none

D. MAJOR MAINTENNANCE.

Pool water level float detector: circuit wire was soldered to restore the connection.

Ventilation motor system: ventilation motor and fan bearing were replaced by campus HVAC.

Test signal line for linear power on console: the signal line was re-soldered to connection point.

Fission counter- source interlock did not remaining activated after removal of the source: BNC post and RG-59 line from post to P505 were replaced.
Fission/gamma discriminator and interlock set point were adjusted.

Reactor console- source interlock light was not functional: light bulb was replaced.

Scram indicator lights-some indicator lights burned out: Bulbs ordered and replaced.

Outside air pressure-measuring system- the gauge was not functioning for measuring reactor room pressure: Reconnect the Tygon tube

Tank water alarm- corrosion on micro-switch: the micro-switch was cleaned.

Rustrack recorder- impact needle (pointer) were broken off: the impact needle was replaced.

E. CHANGES, TESTS AND EXPERIMENTS PURSUANT TO 10 CFR 50.59.

As of the end of the reporting period, the current membership of the Reactor Safety Committee (RSC) as designated by the Licensee is as follows:

JoAnn Lighty, Chair
Gary M. Sandquist, Secretary
David M. Slaughter, Reactor Administrator
James Thompson, RSO of University of Utah
Melinda P. Krahenbuhl, reactor supervisor
James M. Byrne
Karen Langely
Rian B. Smith

The RSC has reviewed and approved several CENTER procedures that were modified to update and correct perceived deficiencies. The CENTER staff continues to review and update facility documentation to assure compliance with all applicable regulations.

F. RADIOACTIVE EFFLUENTS.

- 1. Liquid Waste - Total Activity Released: none
- 2. Gaseous Waste - Total Estimated Activity Released: 44.784 μ Ci.

The TRIGA Reactor was operated for 41.653 hours at power levels up to approximately 90 kW. At this power level argon-41 production is substantially below MPC values for unrestricted areas. The minimum detectable concentration of Ar-41 for the stack monitor has been found to be one-third of 10 CFR 20 appendix B limits for release to unrestricted areas. The average annual calculated concentration of Ar-41 generated during operations is estimated at 1.993×10^{-10} μ Ci/ml which is less than 2 % of the MPC for this radionuclide. The total amount of Ar-41 released was estimated at 44.784 μ Ci. No phosphorus-32 was released from CENTER during this period. The total amount of all gaseous radioactivity released was estimated at 44.784 μ Ci. A monthly summary of gaseous releases is given in Table I.

Table I.

Summary of Monthly Gaseous Radioactive Effluent
1 July 2000 through 30 June 2001

Month	Ar-41 (μ Ci)	Estimated Release P-32 and all others	Total (μ Ci)
July	2.133	0	2.133
August	7.913	0	7.913
September	0.007	0	0.007
October	0.312	0	0.312
November	1.360	0	1.360
December	0	0	0
January	0	0	0
February	8.480	0	8.480
March	7.800	0	7.800
April	9.529	0	9.529
May	2.817	0	2.817
June	4.433	0	4.433
Total Activity of gaseous effluent (μ Ci):		44.784 μ Ci	

3. Solid Waste - Total Activity: 2.0848 μ Ci

2.0848 μ Ci of low-level materials were generated by the University of Utah facility. The types of materials generated include the following: debris removed from the reactor tank during cleaning/maintenance, materials from handling irradiated samples and irradiated samples disposed of through Radiological Health Department.

Table 3-1. Solid waste shipped between 7-1-00 and 6-30-01

Isotopes	Amount (μ Ci)
Eu-152	0.4338
Cs-134	0.5396
Mo-99	0.0017
Co-60	0.0265
Mn-54	0.0040
Sb-124	0.6288
Nd-147	0.4406
Sc-46	0.0098

G. RADIATION EXPOSURES.

Personnel with duties in the reactor laboratory on either a regular or occasional basis have been issued a OSL (since Nov. 1999, collected bimonthly) dosimeter by the University of Utah Radiological Health Department. The duty category and monitoring period of personnel are summarized below:

Name	Monitoring Period	Duty Category
David M. Slaughter	7/1/99-6/30/00	regular
Gary M. Sandquist	7/1/99-6/30/00	regular
Ross Schmidtlein	7/1/00-6/30/01	Regular/terminated
Melinda Krahenbuhl	7/1/00-6/30/01	regular
Dong-ok Choe	7/1/00-6/30/01	regular
Justin Wilde	7/1/00-6/30/01	regular
Brenda Shelkey	7/1/00-6/30/01	regular
Aja Marcheson	7/1/00-6/30/01	regular
Heidi Walk	7/1/00-6/30/01	regular
Michael LeBaron	7/1/00-6/30/01	regular
David Lignell	7/1/00-6/30/01	Regular/terminated
Assenov Dimitre	7/1/00-6/30/01	regular
Ashley J. Pingree	7/1/00-6/30/01	regular
Youngshik Kim	11/1/00-6/30/01	Regular/terminated

John Bess	7/1/00-6/30/01	regular
Jennifer L. Killpack	7/1/00-6/30/01	regular
Justin Wilkins	10/1/00-6/30/01	Regular/terminated

Measured Doses

7/1/00-4/30/01 Doses: <10 mrem average; 10 mrem highest measured*.
 *The dosimetry report for 30 Apr 2001 ~ 30 Jun. 2001 has not been received and is not included in this report. The data for the period will be included in the next year's annual report.

Dose Equivalent Limit

Maximum Permissible Dose Equivalent = 5000 mrem/year (1250/quarter).
 Minimum Detectable Dose per Monthly Badge = 10 mrem.

Of the 664 visitors to the facility under the DOE Reactor Sharing Program for the reporting year, no visitor received a measurable dose. Therefore, the average maximum dose is all within NRC guidelines. A summary of whole body exposures is presented in Table II.

Table II

Summary of Whole Body Exposures
 1 July 2000 through 30 June 2001

Estimated whole body exposure range (rem):	Number of individuals in each range:
No Measurable Dose	
Less than 0.10	17
0.10 to 0.25	0
0.25 to 0.50	0
0.50 to 0.75	0
0.75 to 1.00	0
1.00 to 2.00	0
2.00 to 3.00	0
3.00 to 4.00	0
4.00 to 5.00	0
Greater than 5 rem	0

H. LABORATORY SURVEYS

Monthly surveys of the facility were conducted by the University of Utah Radiological Health Department during the reporting period. The surveys have not indicated any unusual radiation levels over previous years. Records of surveys are retained by the facility.

I. ENVIRONMENTAL STUDIES

Environmental monitoring conducted by the University of Utah Radiological Health Department indicated no unusual dose rates in the areas surrounding the Merrill Engineering Building, which houses the reactor facility.

The maximum total exposure of 45 millirem per quarter to environmental dosimeters located at various positions surrounding CENTER for the period 1 July 2000 through 15 Apr. 2001*.

The average quarterly exposure for the six environmental monitoring stations was 27.17 millirem.

*The dosimetry report for 16 Apr. ~ 30 Jun. 2001 has not been received and is not included in this report. The data for the period will be included in the next year's annual report.

Prepared by: *C. Haerens* Date: *Jul 31, 2001*

Submitted by: *[Signature]* Date: *July 31, 2001*
Reactor Supervisor

Approved by: *[Signature]* Date: *7/31/2001*
Reactor Administrator