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To whom it may concern:

Enclosed please find 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 2014 through 30 June 2015. This report fulfills the requirements of the TRIGA Technical Specifications 6.7.1.

If there are any further questions or concerns regarding this report, please contact me at (801) 587-9696.

Respectfully,



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# **The University of Utah TRIGA Reactor (UUTR)**

## **Annual Operating Report**

**for the period  
1 July 2014 through 30 June 2015**

**Ryan C. Schow, UUTR Supervisor  
Dr. Tatjana Jevremovic, UNEP & UUTR Director**

## A. NARRATIVE

### 1. Operating Experience

The University of Utah TRIGA Reactor (UUTR), License No. R-126, Docket No. 50-407, was critical for 82.584 hours and generated 2589.667 kilowatt-hours of thermal energy during this reporting year. The reactor was used for educational demonstrations and training, laboratory experiments, reactor systems tests, reactor power measurements and sample irradiations.

### 2. Changes in Facility Design

No major changes to the facility occurred during this reporting period.

### 3. Surveillance Tests

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

#### a. Control Rod Worth

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

Core Configuration Date	#24-B 7/1/14	#24-B 10/28/14	#24-B 4/22/15
	Worth (\$)	Worth (\$)	Worth (\$)
Safety Rod	2.323	2.300	2.270
Shim Rod	1.473	1.487	1.467
Regulating Rod	0.263	0.277	0.273
Excess Reactivity	0.640	0.655	0.629
Shutdown Margin	1.096	1.109	1.112

#### b. Control Rod Inspection

The biennial control rod inspection was performed during May of 2014 and was not required to be performed from July 1, 2014 to June 30, 2015.

#### c. Reactor Power Level Instrumentation

Calorimetric power calibrations were performed on 8/21/14 and 2/25/15 with the results shown in Table 2.

*Table 2. Summary of calorimetric power calibration*

Date	Measured % Power	Calculated Power Level
8/21/14	89.2	83.86
2/25/15	89.5	91.25

The adjustment of power monitoring channels procedure was performed on 8/26/14 following the calorimetric results received on 8/21/14.

d. Fuel Inspection

The biennial fuel inspection was performed during May of 2014 and was not required to be performed from July 1, 2014 to June 30, 2015.

e. Fuel Temperature Calibration

Fuel temperature circuits were calibrated on 9/8/14 and 2/27/15. The circuits were calibrated to less than or equal a 2°C error over the range from 20 °C to 400 °C.

f. Reactor Safety Committee (RSC) Audits

Three RSC audits were completed during this reporting period. The data are shown in Table 3. No significant deviations from normal operating practices were identified by these audits.

*Table 3. Audit summary*

Audit	Period	Auditor
Operation and Maintenance	1 Jan. 2014 to 30 Jun. 2014	James M. Byrne
Radiation Safety and ALARA	1 Jul. 2013 to 30 Jul. 2014	Fred Monette Karen Langley
Operation and Maintenance	1 Jul. 2014 to 31 Dec. 2014	James M. Byrne

g. Environmental Surveys

Nine environmental monitors are located in the areas surrounding the UUTR. A maximum exposure of 44 mrem in a quarter to an environmental dosimeter located in the Building 80 was measured. Table 4 shows the average dose recorded in last five years.

*Table 4. Summary of environmental monitoring around the UUTR*

Year	Average quarterly readings for the 8 environmental monitors (mrem)
2014	33.81
2013	33.88
2012	35.56
2011	35.13
2010	36.00
2009	34.56

**B. ENERGY OUTPUT**

The UUTR reactor was critical for 82.584 hours and produced 0.1079 megawatt·days (2589.667 kilowatt·hours) of energy during this reporting period. Since initial criticality, the reactor has been operated for a total of 3869.461 hours with an accumulated total energy output of 9.334 megawatt·days (224027.195 kilowatt·hours).

**C. EMERGENCY SHUTDOWNS AND INADVERTENT SCRAMS:**

There were five inadvertent SCRAMs that occurred during this period: 9/30/14, 12/16/14, 3/11/15, 3/25/15, and 3/27/15, because of erratic indication when operating the linear power selector switch. Summary of the inadvertent scrams and unplanned shutdowns is given in Table 5.

*Table 5. Summary of Inadvertent SCRAMS and Unplanned Shutdowns*

Date	Run Number	Type	Cause	Action
09/30/14	1873	Linear Power	Linear power indication oscillated when operating the reactor power selector switch	Reactor power selector switch examined
12/16/14	1879	Linear Power	Linear power indication oscillated when operator inadvertently operated the linear power selector switch	Operator coached and all operators trained on operation of the linear power selector switch
03/11/15	1886	Linear Power	Linear power indication oscillated when operating the reactor power selector switch	Reactor power selector switch examined

03/25/15	1887	Linear Power	Linear power indication oscillated when operating the reactor power selector switch	Reactor power selector switch examined
03/27/15	1888	Linear Power	Linear power indication oscillated when operating the reactor power selector switch	Reactor power selector switch examined

#### D. MAJOR MAINTENANCE

- The source range fission counter began being replaced in June 2015 and is still under maintenance and replacement as of July 1, 2015.
- During fission counter replacement the reactor control console wiring and connections are being cleaned and organized.

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

None.

#### F. REACTOR SAFETY COMMITTEE

As of the end of the reporting period, the current members of the RSC as designated by the Licensee are as follows:

James M. Byrne, Chair  
 Tatjana Jevremovic, Director UNEP and UUTR  
 Karen Langley, RSO of University of Utah  
 Ryan Schow, Reactor Supervisor  
 Donald Wall  
 Rian Smith  
 Benjamin Huffman

The UNEP staff continues to review and update facility documentation to assure compliance with all applicable regulations.

#### G. RADIOACTIVE EFFLUENTS

##### 1. Liquid Waste

Total activity released: none

##### 2. Gaseous Waste

Total estimated activity released: 32.241  $\mu$ Ci.

The UUTR was operated for 82,584 hours at power levels up to approximately 90 kW. At this power level Ar-41 production is substantially below MPC values for unrestricted areas. The minimum detectable concentration of Ar-41 from the CAM system for the stack monitor has been found to be less than two-third of 10 CFR 20 appendix B limits for release to unrestricted areas. The average annual calculated concentration of Ar-41 generated during operation is estimated to be  $1.434 \times 10^{-10}$   $\mu\text{Ci/ml}$  that is approximately 0.005 % of the DAC. The total amount of Ar-41 released was estimated to be 32.241  $\mu\text{Ci}$ . No phosphorus-32 was released from the UUTR and associated facilities during this period. The total amount of all gaseous radioactivity released was estimated to be 32.241  $\mu\text{Ci}$ . A monthly summary of gaseous releases is given in Table 6. Total activity of gaseous effluent was therefore 32.241  $\mu\text{Ci}$ .

*Table 6. Summary of Monthly Gaseous Radioactive Effluent*

Month	Power (kWh)	Ar-41 ( $\mu\text{Ci}$ )	Ar-41 ( $\mu\text{Ci/ml}$ )	Estimated Release P-32 and all others	% of DAC
Jul 14	655.584	8.162	3.63021E-11	0	0.001%
Aug 14	663.796	8.264	3.67568E-11	0	0.001%
Sep 14	577.637	7.192	3.19859E-11	0	0.001%
Oct 14	105.191	1.310	5.82481E-12	0	0.000%
Nov 14	48.328	0.602	2.6761E-12	0	0.000%
Dec 14	74.796	0.931	4.14173E-12	0	0.000%
Jan 15	0	0.000	0	0	0.000%
Feb 15	296.352	3.690	1.64101E-11	0	0.001%
Mar 15	50.582	0.630	2.80091E-12	0	0.000%
Apr 15	117.401	1.462	6.50092E-12	0	0.000%
May 15	0	0.000	0	0	0.000%
Jun 15	0	0.000	0	0	0.000%
<b>Total</b>	<b>2589.667</b>	<b>32.241</b>	<b>1.43399E-10</b>	<b>0</b>	<b>0.005%</b>

### 3. Solid Waste - Total activity: None

No solid waste material was sent to the Radiological Health Department for disposal during the period of 1 July 2014 through 30 June 2015.

## H. PERSONNEL RADIATION EXPOSURES

### UNEP Personnel

The University of Utah Radiological Health Department has issued to all personnel with duties in the reactor laboratory on either a regular or

occasional basis an OSL dosimeter. The duty category and monitoring period of personnel are summarized in Table 7. A summary of the whole body exposures to the UNEP personnel is presented in Table 8.

#### Measured Doses

7/1/14-6/30/15 Doses: <1 mrem average; 1 mrem highest measured

#### Dose Equivalent Limit

Maximum Permissible Dose Equivalent = 5000 mrem/year  
(1250/quarter).

Minimum Detectable Dose per Monthly Badge = 1 mrem.

#### Visitors

Six hundred and thirty-seven (637) individuals visited the reactor facility during the period 1 July 2014 to 30 June 2015. None of the visitors received a measurable dose.

*Table 7. Summary of Monitored Personnel*

Name	Monitoring Period	Duty Category
Adjei, Christian	07/01/14-6/30/15	Regular
Alroumi, Fawaz	07/01/14-6/30/15	Regular
Anderson, Jacqui	10/01/14-6/30/15	Regular
Bahamonde Castro, Christina	07/01/14-6/30/15	Regular
Burak, Adam	10/01/14-6/30/15	Regular
Burnham, Steven	07/01/14-6/30/15	Regular
Chidester, Joshua	07/01/14-6/30/15	Regular
Cutic, Avdo	07/01/14-6/30/15	Regular
Doane, Samuel	10/01/14-6/30/15	Regular
Duffin, Taylor	02/01/15-6/30/15	Regular

Eklund, Mathew	07/01/14- 6/30/15	Regular
Fairbanks, Thomas	07/01/14- 6/30/15	Regular
Flygare, Joshua	10/01/14- 6/30/15	Regular
Foley, Amanda	10/01/14- 6/30/15	Regular
Gee, Wimonphan	11/01/14- 6/30/15	Regular
Han, Dahee	04/01/15- 6/30/15	Regular
Hans, Zachary	10/01/14- 6/30/15	Regular
Hinrichs, Benny	10/01/14- 6/30/15	Regular
Jevremovic, Tatjana	07/01/14- 6/30/15	Regular
Kanno, Nicholas	10/01/14- 6/30/15	Regular
Kavouras, John	07/01/14- 6/30/15	Regular
Kim, Donghoon	04/01/15- 6/30/15	Regular
King, Travis	02/01/15- 6/30/15	Regular
Lee, Sangkyu	07/01/14- 6/30/15	Regular
Levinthal, Joseph	07/01/14- 6/30/15	Regular
Lintereur, Azaree	11/01/14- 6/30/15	Regular
Lund, Matthew	07/01/14- 6/30/15	Regular
McDonald, Luther	07/01/14- 6/30/15	Regular
Minko, Aliaksei	07/01/14- 6/30/15	Regular
Morgan, David	07/01/14- 6/30/15	Regular

Novy, Rebecca	02/01/15- 6/30/15	Regular
Porter, JoCee	02/01/15- 6/30/15	Regular
Rapich, Jason	07/01/14- 4/30/15	Regular
Schow, Ryan C	07/01/14- 6/30/15	Regular
Schwerdt, Ian	02/01/15- 6/30/15	Regular
Sisson, Richard	07/01/14- 6/30/15	Regular
Tamplin, Michelle	11/01/14- 6/30/15	Regular
Walton, Mary	07/01/14- 6/30/15	Regular
Wagh, Robert	04/01/15- 6/30/15	Regular
Weimer, Jonathan	08/01/14- 6/30/15	Regular
Wilson, Dylan	10/01/14- 6/30/15	Regular
Winkle, Samantha	07/01/14- 6/30/15	Regular
Bautista, Victor	07/01/14- 7/31/14	Regular/Terminated
Bindra, Hitesh	07/01/14- 7/31/14	Regular/Terminated
Boyd, Dallan	07/01/14- 7/31/14	Regular/Terminated
Jasaraj, Elton	07/01/14- 7/31/14	Regular/Terminated
McCoy, Kaylyn	07/01/14- 7/31/14	Regular/Terminated
Painter, Daniel	07/01/14- 7/31/14	Regular/Terminated
Varun, Vijay	07/01/14- 7/31/14	Regular/Terminated
Williams, Tristalee	07/01/14- 7/31/14	Regular/Terminated

Noble, Brooklyn	07/01/14- 8/31/14	Regular/Terminated
Sandstrom, Yumiko	07/01/14- 8/31/14	Regular/Terminated
Alamaniotis, Miltiadis	07/01/14- 10/31/14	Regular/Terminated
Derber, Robert	07/01/14- 10/31/14	Regular/Terminated
Quach, Quang	07/01/14- 12/31/14	Regular/Terminated
Santora, Joseph	07/01/14- 12/31/14	Regular/Terminated
Hernandez, Hermilo	07/01/14- 2/28/15	Regular/Terminated
Moffitt, Gregory	07/01/14- 2/28/15	Regular/Terminated
Kennington, Connor	10/01/14- 4/30/15	Regular/Terminated
Bean, Amy	10/01/14- 5/31/15	Regular/Terminated
Johnson, Seth	10/01/14- 5/31/15	Regular/Terminated
Martinez, Brian	10/01/14- 5/31/15	Regular/Terminated
Obadina, Sarah	07/01/14- 5/31/15	Regular/Terminated
Robinson, Robbie	09/01/14- 5/31/15	Regular/Terminated
Simmons, Mindy	10/01/14- 5/31/15	Regular/Terminated
Stilson, Kameron	10/01/14- 5/31/15	Regular/Terminated

*Table 8. Summary of whole body exposures to the UNEP personnel*

Estimated whole body exposure range (rem)	Number of individuals in each range
Less than 0.1	66
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


## I. 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.

## J. 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 UUTR reactor facility.

Prepared by:

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Reactor Supervisor

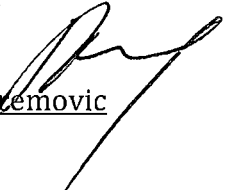
Date: 7/27/2015

Submitted by:

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Date: 7/27/2015

Approved by:

Tatjana Jevremovic   
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Date: 7/28/2015