THE UNIVERSITY OF UTAH

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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 2010 through 30 June 2011. This report fulfills the requirements of the TRIGA Technical Specifications 6.10(5).

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

Respectfully,

Tatjana Jevremovic, Ph.D.
Director

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NRR

The University of Utah TRIGA Reactor (UUTR)

Annual Operating Report

for the period
1 July 2010 through 30 June 2011

Dr. Dong-OK Choe, 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 115.947 hours and generated 4619.573 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 samples irradiations.

2. Changes in Facility Design

No changes in facility design took place. However, the facility and associated laboratories were upgraded. The upgrade included cleaning of the space, painting and modernizing the space of the control room and the students' prep-room by replacing the old and used furniture.

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 8/13/10	#24-B 2/18/11
	Worth ($)	Worth ($)
Safety Rod	2.293	2.232
Shim Rod	1.543	1.543
Regulating Rod	0.290	0.283
Excess Reactivity	0.884	0.845
Shutdown Margin	0.949	0.781

b. Control Rod Inspection

The biennial control rod inspection was performed during December of 2009. In this reporting year, the control rods were sequentially removed from the reactor core for visual inspection. Each control rod was found to

be in a good condition with no noticeable deterioration or corrosion. Rod drop times were measured on 8/13/10, and 2/18/11. All rod drop times were less than 1.0 second.

c. Reactor Power Level Instrumentation

Calorimetric power calibrations were performed on 8/20/10, and 2/25/11 with the results shown in Table 2.

Table 2. Summary of calorimetric power calibration

Date	Measured % Power	Calculated Power Level
8/20/10	90.9	87.32
2/25/11	90.6	92.53

d. Fuel Inspection

The biennial fuel inspection was performed during December of 2009. In this reporting year, each fuel element was visually inspected while keeping it submerged for shielding. No deterioration or excessive corrosion of in-core fuel elements was observed. Pool water is sampled and analyzed periodically for evidence of fission product activity indicative of defective or deteriorating fuel. Analyses of pool water following full-power reactor operations lasting several hours have not shown any indication of fission product leakage. B-1 stainless steel fuel element was replaced with R6-6 stainless steel element because B-1 element developed a bent end-pin. B-1 element was moved to R6-1 location.

e. Fuel Temperature Calibration

Fuel temperature circuits were calibrated on 8/18/10 and 2/18/11. The circuits were calibrated to less than a 2°C error over the range from 20°C to 400°C. The replacement of B-1 did not affect the fuel temperature in the UUTR core.

f. Reactor Safety Committee (RSC) Audits

Four 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. 2011 to 30 Jun. 2011	James R. Parry/INL
Radiation Safety and ALARA	1 Jan. 2011 to 30 Jun. 2011	James R. Parry/INL
Operation and Maintenance	1 Jul. 2010 to 31 Dec. 2010	James R. Parry/INL
Radiation Safety and ALARA	1 Jul. 2010 to 31 Dec. 2010	James R. Parry/INL

g. Environmental Surveys

Six environmental monitors are located in the areas surrounding the UUTR. James R. Parry of Idaho National Laboratory (INL) reported to the RSC a maximum exposure of 50 mrem per quarter to an environmental dosimeter located in the building #80. 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 6 environmental monitors (mrem)
2010	36.00
2009	34.56
2008	39.26
2007	37.94
2006	36.74

B. ENERGY OUTPUT

The UUTR reactor was critical for 115.947 hours and produced 0.192 megawatt·days (4,619.573 kilowatt·hours) of energy during this reporting period. Since initial criticality, the reactor has been operated for a total of 3,563.059 hours with an accumulated total energy output of 8.827 megawatt·days (211,840.225 kilowatt·hours).

C. EMERGENCY SHUTDOWNS AND INADVERTENT SCRAMS:

There were seven inadvertent SCRAMs occurred during this period: 7/07/2010, 9/10/2010, 12/17/2010, 3/04/2011 (2), and 3/18/2011 (2) because of feedback from the reactor power select switch and mechanical

errors from the pool water scram switch. There were no emergency shutdowns. Summary of the inadvertent scrams is given in Table 5.

Table 5. Summary of Inadvertent SCRAMS

Date	Run Number	Type	Cause	Action
7/07/10	1687	Pool water	Pool water scram switch-Feedback from the pool water scram switch	Reset pool water scram
9/10/10	1695	Pool water	Pool water scram switch-Feedback from the pool water scram switch	Reset pool water scram
12/17/10	1699	Linear power	Static from power indicator switch	N/A
3/04/11	1723	Pool water	Pool water scram switch-Feedback from the pool water scram switch	Reset pool water scram
3/04/11	1723	Linear power	High voltage pass through the linear channel	N/A
3/18/11	1726	Pool water	Pool water scram switch-Feedback from the pool water scram switch	Reset pool water scram
3/18/11	1727	Pool water	Pool water scram switch-Feedback from the pool water scram switch	Reset pool water scram

D. MAJOR MAINTENANCE

None.

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 Langely, RSO of University of Utah

Dongok Choe, Reactor Supervisor
Gary M. Sandquist
Robert J. Huber
James Thompson
James R. Parry
Paul Tikalsky
Alireza Haghighat
Rian B. Smith

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: 57.513 μCi.

The UUTR was operated for 115.947 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 2.559×10^{-10} μCi/ml that is approximately 0.008 % of the DAC. The total amount of Ar-41 released was estimated to be 57.513 μCi. 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 57.513μCi. A monthly summary of gaseous releases is given in Table 6. Total activity of gaseous effluent was therefore 57.513 μCi.

Table 6. Summary of Monthly Gaseous Radioactive Effluent

Month	Ar-41 (μCi)	Ar-41 (μCi/ml)	Estimated Release P-32 and all others	% of DAC
Jul. 10	1.750	7.789×10^{-12}	0	0.000
Aug. 10	6.705	2.983×10^{-11}	0	0.001
Sept. 10	5.081	2.261×10^{-11}	0	0.001
Oct. 10	0.027	1.212×10^{-13}	0	0.000

Nov. 10	0.448	1.991×10^{-12}	0	0.000
Dec. 10	1.548	6.889×10^{-12}	0	0.000
Jan. 11	7.366	3.278×10^{-11}	0	0.001
Feb. 11	4.846	2.156×10^{-11}	0	0.001
Mar. 11	6.015	2.677×10^{-11}	0	0.001
Apr. 11	2.321	1.033×10^{-11}	0	0.000
May, 11	11.637	5.178×10^{-11}	0	0.002
Jun. 11	9.769	4.347×10^{-11}	0	0.001
Total	**57.513**	**2.559×10^{-10}**	**0**	**0.008**

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 2010 through 30 June 2011.

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

7/1/10-6/30/11 Doses: <5 mrem average; 5 mrem highest measured

Dose Equivalent Limit

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

Visitors

Five hundred and thirty (530) individuals visited the reactor facility during the period 1 July 2010 to 30 June 2011. None of the visitors received a measurable dose.

Table 7. Summary of Monitored Personnel

Name	Monitoring Period	Duty Category
Dong-ok Choe	07/01/10-6/30/11	Regular
Douglas Crawford	07/01/10-6/30/11	Regular
Jorge Navarro	07/01/10-6/30/11	Regular
Kingston J. Micha	07/01/09-12/31/11	Regular/Terminated
Benjamin Marble	07/01/10-12/31/11	Regular/Terminated
Jesse Reeves	07/01/10-6/30/11	Regular
Jensen Mathew	07/01/10-6/30/11	Regular
Troy Bowden	07/01/10-6/30/11	Regular
Tatjana Jevremovic	07/01/10-6/30/11	Regular
Nader Satvat	06/01/10-1/31/11	Regular/Terminated
Todd Sherman	07/01/10-6/30/11	Regular
Voyles Andrew	10/01/10-6/30/11	Regular
Haori Yang	02/01/11-6/30/11	Regular
Levinthal Joseph	03/01/11-6/30/11	Regular
Schwerdt Ian	03/01/11-6/30/11	Regular
Dances Christopher	11/01/10-6/30/11	Regular
Kriss Eric	10/01/10-6/30/11	Regular/Terminated
Ortiz R. Luis	04/01/11-6/30/11	Regular
Rapich Jason	11/01/10-6/30/11	Regular
Burnham Steven	03/01/11-6/30/11	Regular
Telenko Daniel	03/01/11-6/30/11	Regular
Babitz Philip	10/01/10-6/30/11	Regular
Avdo Cutic	02/01/11-6/30/11	Regular
Jennifer Gibson	03/01/11-6/30/11	Regular

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

Estimated whole body exposure range (rem)	Number of individuals in each range
No Measurable Dose (Less than 0.10)	24
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:	Dongok Choe Reactor Supervisor	Date: 7/26/2011
Submitted by:	Dongok Choe Reactor Supervisor	Date: 7/26/2011
Approved by:	Tatjana Jevremovic Director	Date: 7/26/2011