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03/03/2020

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Washington, DC 20555-0001

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NRR/DLP/PRLB
3WFN MS 8 C28

SUBJECT: Docket No. 50-602 R-126, 2019 ANNUAL REPORT FOR THE UNIVERSITY
OF TEXAS TRIGA II NUCLEAR RESEARCH REACTOR

Sir:

Attached is the 2019 Annual Report for the University of Texas TRIGA II Nuclear
Reactor. If there are any questions, please feel free to contact P. M. Whaley at
whaley@mail.utexas.edu or 512 232 5374.

Sincerely,

A handwritten signature in dark ink, appearing to read "P. M. Whaley".

P. M. Whaley

ADZD
NRR

2019 ANNUAL REPORT FOR THE UNIVERSITY OF TEXAS TRIGA II NUCLEAR RESEARCH REACTOR (DOCKET 50-602)

INTRODUCTION

The University of Texas System (UTS) was established by the Texas Constitution in 1876, with the University of Texas at Austin the flagship institution. The Nuclear Engineering Teaching Laboratory was established at the J. J. Pickle Research Campus with a TRIGA II Nuclear Research Reactor, critical in 1992. The reactor is licensed to the University of Texas under USNRC License R-129, a class 104 research reactor. A second USNRC license for special nuclear materials, SNM-180, authorizes possession of a subcritical assembly, neutron sources, and various equipment at NETL. Other activities at the NETL using radioisotopes fall under a broad scope, State of Texas license (L00485).

The NETL TRIGA II Reactor Technical Specifications (section 6.6.1) requires an annual report to the Nuclear Regulatory Commission. This Annual Report covers the period from January through December 2019. The report is organized to summarize the status of current organization during the reporting period (line management organization, oversight committees, and independent oversight activities) followed by the information as detailed in Technical Specifications.

ANNUAL REPORT

Personnel status for the organization during the 2018-2019 reporting year for management, oversight, and operating staff is provided. The Technical Specifications requires "Routine annual reports covering the activities of the reactor facility during the previous calendar year" three months following the end of each prescribed year. The information required in the annual report is addressed as indicated in Table 1.

Table 1: Required Annual Report Information		
Information		Addressed as
a.	A narrative summary of reactor operating experience including the energy produced by the reactor or the hours the reactor was critical, or both.	Narrative Summary
		Energy produced: 36 MWD
		Hours critical: 1236 h
b.	The unscheduled shutdowns including, where applicable, corrective action taken to preclude recurrence.	Tabulation of Unscheduled Shutdowns
		Analysis and Corrective Action
c.	Tabulation of major preventive and corrective maintenance operations having safety significance.	Statement of Surveillance Activities
		Description of Significant Corrective Maintenance
d.	Tabulation of major changes in the reactor facility and procedures, and tabulation of new tests or experiments, or both, that are significantly different from those performed previously, including conclusions that no new or unanalyzed safety questions were identified.	Description of Facility Modifications
		Description of Procedure Changes
		Description of New Tests/Experiments
		50.59 Summary

e.	A summary of the nature and amount of radioactive effluents released or discharged to the environs beyond the effective control of the owner-operator as determined at or before the point of such release or discharge. The summary shall include, to the extent practicable, an estimate of individual radionuclides present in the effluent. If the estimated average release after dilution or diffusion is less than 25% of the concentration allowed or recommended, a statement to this effect is sufficient.	There were no liquid effluents in 2019 Argon 41 Effluent
f.	A summarized result of environmental surveys performed outside the facility.	Environmental Surveys
g.	A summary of exposures received by facility personnel and visitors where such exposures are greater than 25% of that allowed or recommended.	Exposures

ORGANIZATION

Line Management

Figure 1 presents the four levels of management identified in Technical Specifications.

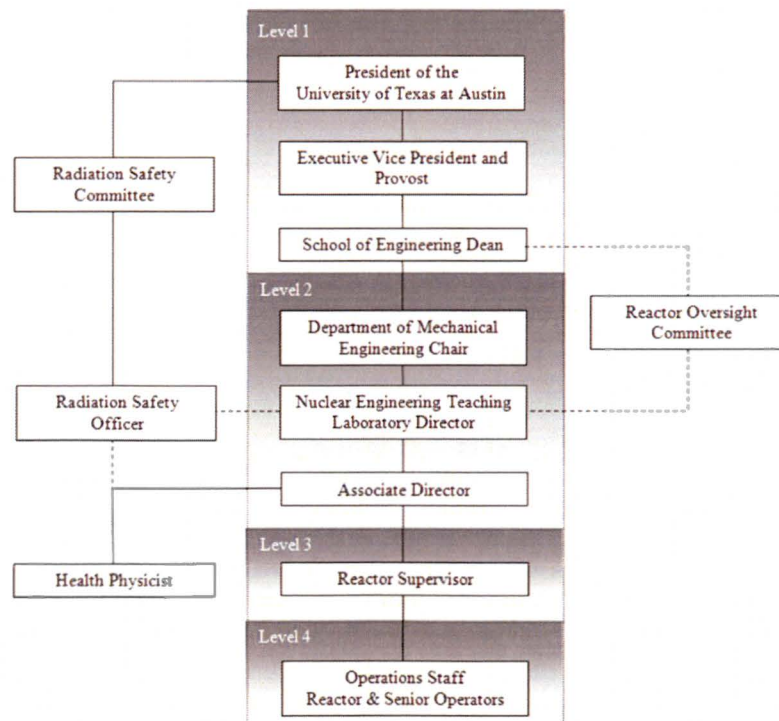


Figure 1: Line Management Organization

Table 2: Level 1

The University of Texas at Austin Administration
Greg L. Fenves, PhD, President
Maurie McInnis, PhD, Executive Vice President and Provost
Sharon Wood, PhD, Dean, Cockrell School of Engineering
There were no changes in Level 1 personnel during 2019.

Table 3: Level 2

Mechanical Engineering and NETL Administration
Dr. Richard Neptune, Chair, Mechanical Engineering Department
Dr. W. Charlton, Director
P. M. Whaley, Associate Director
There were no changes in Level 2 personnel during 2019.

Table 4: Level 3

NETL Reactor Supervisor
Larry Hall, Reactor Manager
There was no change in the reactor manager during 2019.

Table 5: Level 4

NETL Reactor Operators/Senior Reactor Operators
<i>P. M. Whaley: Senior Operator</i>
<i>Larry Hall: Senior Operator</i>
<i>Jim Terry (Electronic Technician) Senior Operator – Upgraded 10/2019</i>
Tracy Tipping (Health Physicist) Reactor Operator
Walker Payne (Research Assistant) Reactor Operator
Isaac Kravitz (UT graduate student) Reactor Operator
Briana Barth (UT undergraduate student) Reactor Operator
Kevin McKay -- <i>License issued 10/2019</i>
Anthony Sandoval -- <i>License issued 10/2019</i>
Mark Andrews (Research Associate) – <i>License issued 10/2019</i>
Three reactor operator and one senior operator licenses issued, three terminated in 2019.

Oversight Committees

Table 6: 2018-2019 University Radiation Safety Committee

Kevin N. Dalby, Ph.D., Chair, Professor, College of Pharmacy
Dan Jaffe, Ph.D., Vice Chair, Vice President for Research
R. DeWayne Holcomb, ex-officio, Radiation Safety Officer, Environmental Health and Safety
Jack L. Ritchie, Ph.D., Department Chair, Professor, Department of Physics
John Salsman, Director, Environmental Health and Safety (& acting Radiation Safety Officer)
Christopher S. Sullivan, Ph.D., Associate Professor, Department of Molecular Biosciences
J. Steven Swinnea, Ph.D., Texas Materials Institute X-Ray Facility Manager
Tracy N. Tipping, NETL Health Physicist and Laboratory Manager
Karen M. Vasquez, Ph.D., Professor, College of Pharmacy

Table 7: 2018-2019 Reactor Oversight Committee

Derek Haas (ME), Chair
Kevin Clarno (ME), Chair
Dale Klein (ME)
Rick Neptune, ex-officio (ME)
John G. Ekerdt, ex-officio
Lawrence R. Jacobi (External Representative)
Larry Hall, ex-officio (NETL)
Tracy Tipping, ex-officio (NETL)
Mike Whaley, ex-officio (NETL)
DeWayne Holcomb (Radiation Safety Officer)
John Salsman, Director, Environmental Health and Safety (acting Radiation Safety Officer)

Independent Oversight Activities

Table 8: Inspections and Reviews

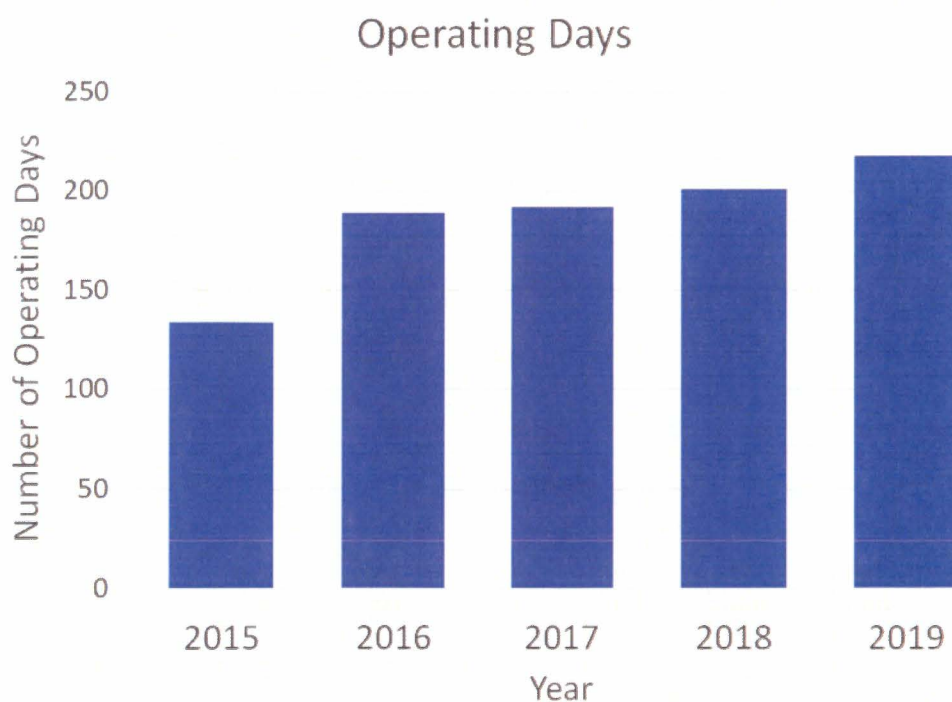
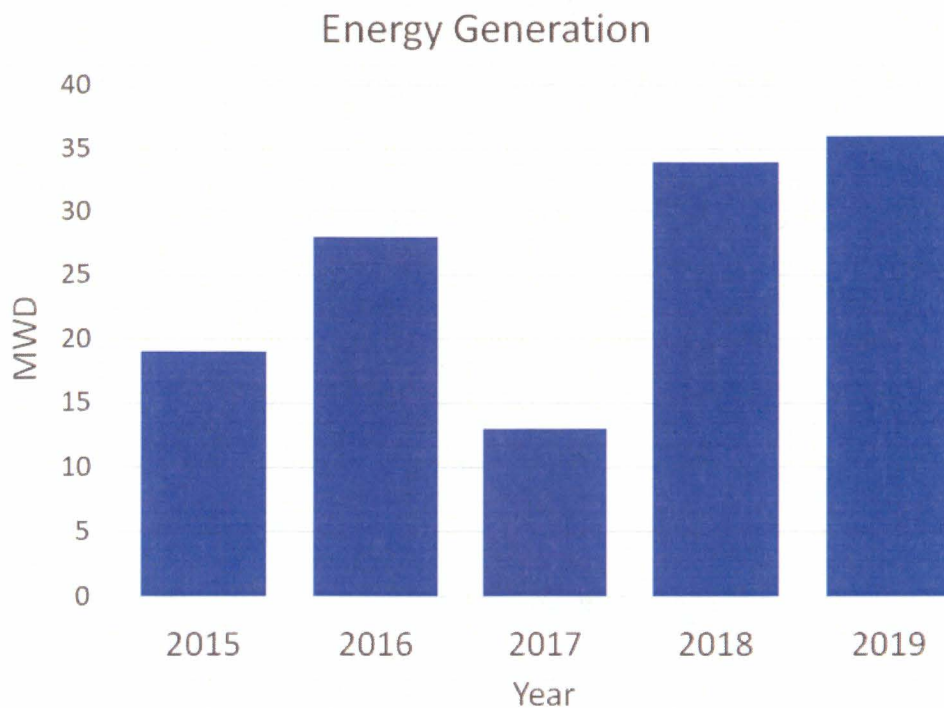
USNRC License(s) Inspection	
R-129	18-29 November 2019
SNM-180 ¹	None
State of Texas License Inspection	
L00485 (89)	None
Reactor Oversight Committee Review	
Semi Annual Review	15 Apr 2019
Semi Annual Review	1 Nov 2019
Other	
UT Fire Marshal Fire Safety	13 Feb 2019
UT Fire Safety Systems	None due to installation of new fire alarm and sprinkler system

FACILITY OPERATIONS SUMMARY REPORT

Narrative Summary

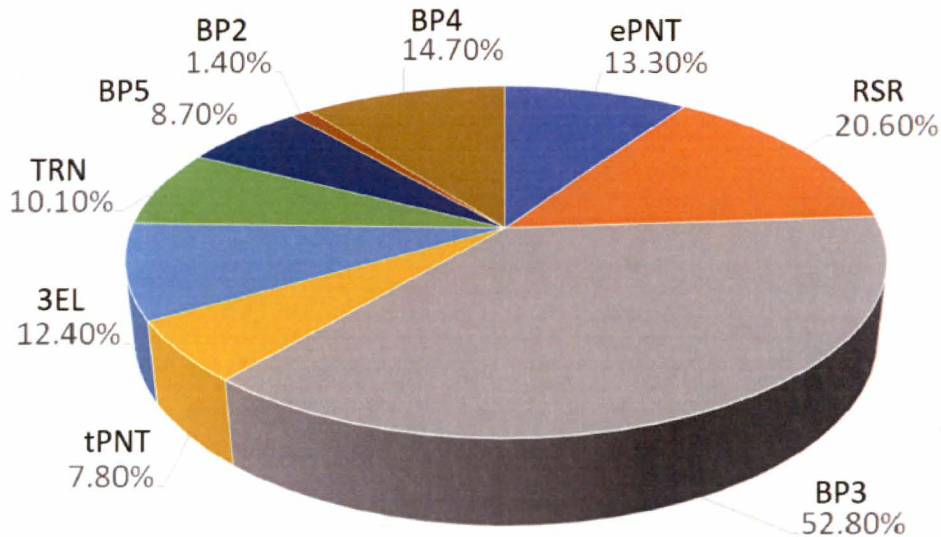
The UT-TRIGA reactor operated on 218 days in 2019, producing a total energy output of 867 MWh. There were routine maintenance outages in July, and December; the maintenance outage scheduled for January 2020 was completed prior to Christmas break (The University is secured over Christmas break, typically from the Friday before Christmas through January 1) to support an experiment schedule. There were week-long outages in 28 Oct- 1 Nov to resize MCZPR and subcritical core fuel and 11-15 Nov for Y-12 packaging and shipping of MCZPR and subcritical fuel. There was a weeklong outage in August to inspect stored spent fuel in preparation for transport (schedule to be determined). Even with the special operations that limited reactor operations, the trend of operating hours and energy generation is increasing.

¹ SNM 180 termination in progress



There were 22 days of operations for training and education, including preparation for NRC examination and reactor-based laboratory classes. There were 808 samples irradiated during 196 days of experiment operations (56 experiments run: 21 for research, 27 for service work and 8 for internal experiments. The distribution of utilization across experiment facilities is provided below.

Experiment Facility Utilization



Other Significant Operations and Events

Prior to installation of the original UT TRIGA reactor (at Taylor Hall on main campus) a Lockheed Aircraft Corporation Subcritical Assembly was purchased to support UT nuclear education under a Special Nuclear Materials license (SNM-180). The subcritical assembly was moved to NETL when facility construction was complete. SNM-180 was amended to allow Manhattan College Zero Power Reactor fuel to be transferred from interim storage to NETL, supporting accelerator driven reactor research. The MCZPR fuel was not used in the experiment and has remained as a possession only status with no anticipated utilization. In 2019 the subcritical assembly and MCZPR Fuel were transferred to the Uranium Scrap Recovery program at the Y-12 National Security Complex. Authorization for possession of plutonium beryllium sources used in detector calibration supporting the reactor program were transferred from a Special Nuclear Materials license (SNM 180) to the reactor facility license (R-129). A request for termination of SNM-180 was transmitted to NRC.

The original inventory of TRIGA fuel at NETL was principally fuel with prior power history at one or more other research reactors. Some of the previously irradiated fuel was received with significant burnup, and there are no plans to use this fuel at NETL. There are two fuel elements that had fission product leakage during operation, encapsulated as failed fuel. These elements contribute significantly to the amount of Special Nuclear Materials at NETL with no intent for utilization. However, the interim disposal site for TRIGA fuel cannot accept fuel until unrelated milestones are met by the Department of Energy. There is potential for resolving the issues within the next few years, and key personnel at the interim storage facility are nearing retirement. To ensure a campaign to ship spent fuel from NETL can be initiated as soon as the opportunity occurs, an on-site inspection of fuel designated for disposal was conducted in 2019.

Tabulation of Unscheduled Shutdowns

TABLE 9: UNSCHEDULED SHUTDOWNS			
1/09/2019	NP%PWR	Approach 950kW NP spiked high	Operator Error
4/01/2019	NP%PWR	Playback indicated 95% prior to trip	Spurious NP
4/08/2019	NP%PWR	Playback indicated 95% prior to trip	Spurious NP
5/16/2019	NPP%PWR	Playback indicated 95% prior to trip	Spurious NPP
5/16/2019	NPP%PWR	Playback indicated 98% prior to trip	Spurious NPP
6/12/2019	NP%PWR	Flux tilt Spurious trip	Operator Error
9/12/2019	NPP%PWR	Playback indicated 95% prior to trip	Spurious NPP

Analysis and Corrective Actions

Temperature Trips

There were no temperature trips in 2019, a significant change from previous years.

Operator Errors

There were two reactor scrams that occurred because of errors by operators. One occurred while a less experienced operator was approaching power and they did not notice the power difference between NP and NPP due to rod positioning; signal instability at high power is compensated by operating at a lower steady state power level, and the operator did not recognize the potential for a spurious scram as the signal varied. The second occurred during power operations with 3el installed; operator did not remember the flux tilt caused by the 3-EL being installed in core causing different power values between NP and NPP.

Spurious NM 1000 Power Level Trips

The NP and NPP accounted for a large fraction of spurious trips. Playback allows the operator to witness the highest level of power reached. In all cases, the scram occurred well below the scram limit. This has been a recurring event throughout the history of UT NETL. During the July 2019 maintenance period, an adjustment was performed on the detectors and seems to have reduced the incidents of spurious scrams. During the July 2018 maintenance outage, the fission chamber and integral cable were replaced and re-terminated. This corrective maintenance was very effective based on no spurious scrams caused by the NM 1000 through 2019.

Statement of Surveillance Activities

The facility conducts two major maintenance outages each year, one in January (before the start of the spring semester) and one mid-summer. In 2019, the maintenance scheduled for the January 2020 outage was completed in December 2019 to support an experiment operation schedule. All surveillances and scheduled maintenance activities were completed during the

reporting year at the required frequencies. All results met or exceeded the requirements of the Technical Specifications.

Description of Significant Corrective Maintenance

None

Description of Facility Modifications

Fire Sprinkler

The fire sprinkler system throughout the facility was upgraded and some areas added. There were no sprinklers placed above the reactor pool or electronics due to possible contamination of reactor water if sprinklers were set off. The alarms and indicators were upgraded throughout the facility to include the reactor bay to allow better indication of an incident within the facility.

Description of Procedure Changes

Operation Procedures 2 (Reactor Startup and Shutdown) and 3 (Reactor Operation Modes) were rewritten to be included into a single procedure to assist in ease of operations.

Operation Procedure 1 (Reactor Startup and Shutdown Checks) checklist was revised to ensure it reflected all Technical Specifications requirement completions were annotated more effectively.

New Tests or Experiments

A pneumatic facility located in a 3-EL canister was approved. Facility design is in progress.

Minor changes were made to the gamma imaging and fast neutron facilities experiment.
(ongoing)

50.59 Summary

Modifications for which no Technical Specifications change is required and the criteria for NRC approval prior to implementation was not met.

23 May 2019: Replaced Argon CAM vacuum pump with exact manufacture make and model pump due to an internal bearing failure.

The pneumatic facility in a 3-EL canister is in the design phase; a 10CFR50.59 review will be completed following review of final design and prior to installation (ongoing)

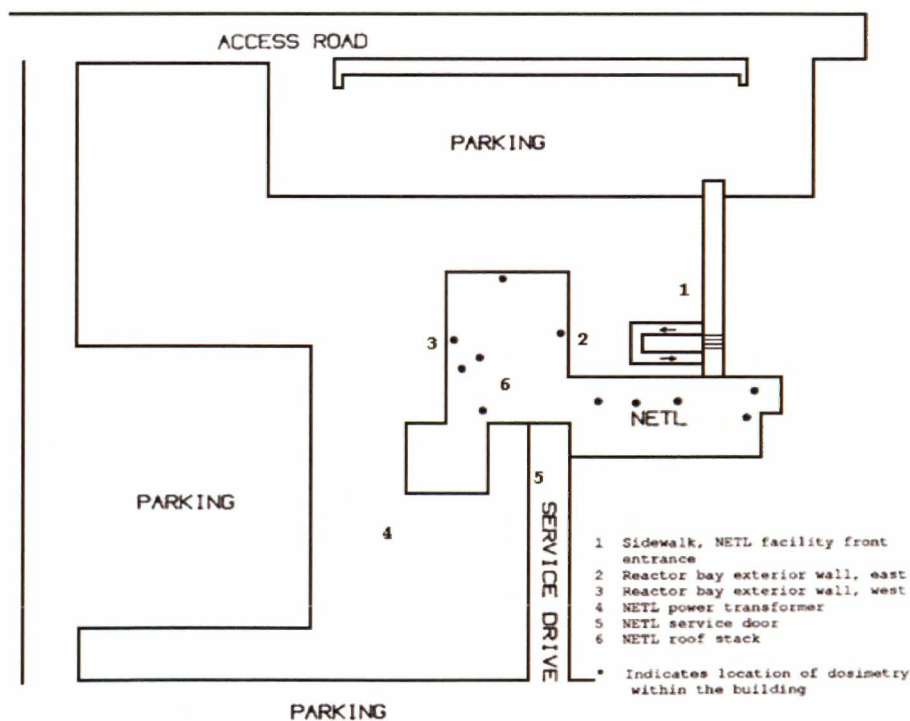
RADIOLOGICAL SUMMARY REPORT

Argon 41 Effluent

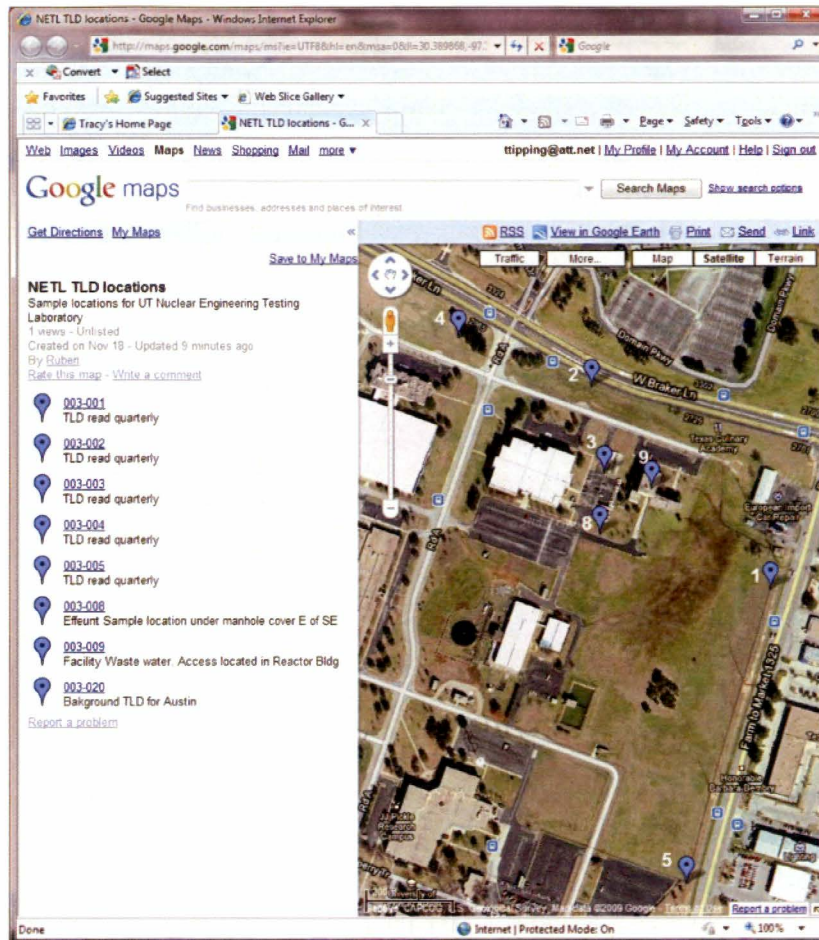
The principal radioactive effluent for the UT reactor is Argon 41. There were 4.3×10^6 μCi of argon-41 discharged during calendar year 2019, approximately 4% of the value permitted by Technical Specifications.

Environmental Surveys

NETL monitors exterior locations indicated as positions 1 through 6 on the exterior dosimeter map. For 2019, "minimal" doses (< 1 mrem) were reported for positions 1, 4, 5, and 6. A dose of four mrem was reported for positions 2 and a dose of 1 mrem was reported for position 3 for 2019. These doses are well below the 100 mrem annual limit for dose to the general public.



NETL Environmental Monitor Locations (External Dosimeter Map)



The Texas Department of State Health Services monitors exterior locations near NETL indicated as positions 1 through 5 on the TDSHS TLD map. For 2019, <1 mrem dose was reported for positions 1, 2, 3, and 5. During the same period, a dose of 9 mrem was reported for position 4. These doses are well below the 100 mrem annual limit for dose to the general public.

Exposures

One worker received an extremity exposure of approximately 15 rem in 2019. Almost all of this dose was received during the packaging phase of a special high-activity isotope production run. The dose received is 30% of the 10 CFR 20 dose limit.