



**TEXAS A&M ENGINEERING
EXPERIMENT STATION**

NUCLEAR SCIENCE CENTER

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Enclosed please find the TAMUS/TEES Nuclear Science Center 2014 annual report. If you have any questions, please contact Mr. Jerry Newhouse at 979-845-7551.

Sincerely,

Jerry Newhouse
Assistant Director
Nuclear Science Center
Texas A&M Engineering Experiment Station

Xc: 2.11/Central File

A02D
NRR

TEL. 979.845.7551 | FAX 979.862.2667
nsc.tamu.edu

1095 Nuclear Science Rd. | 3575 TAMU | College Station, TX 77843-3575

**Texas A&M University System
Texas Engineering Experiment Station**

2014 Annual Report

Facility Operating License R-83

**Nuclear Science Center
1095 Nuclear Science Road
College Station, Texas 77843-3575**

Prepared By: Ashley Booth, NSC RSO

Reviewed By: S. McDeavitt, NSC Director

August 2015

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1. Introduction

The Texas A&M University (TAMU) Nuclear Science Center (NSC) is a multi-disciplinary research and education center supporting basic and applied research in nuclear related fields of science and technology as well as providing educational opportunities for students in these fields as a service to the Texas A&M University System and the state of Texas. The NSC also provides services to commercial ventures requiring radiation or isotope production services.

The NSC reactor is a 1 MW TRIGA research reactor in a large (108,000-gal.) pool. The size of the NSC reactor pool provides great flexibility in the experiments that may be conducted near the reactor. The NSC reactor facility includes two neutron beam ports, a neutron/gamma irradiation cell, a film neutron radiography system, hot cells with manipulator arms, and other supporting facilities. Moreover, NSC has Cs-137 calibrator for use in instrument calibration.

Laboratory facilities include counting laboratories with gas flow proportional detectors and High Purity Germanium detectors, a two-station pneumatics sample transfer system, and a fast neutron irradiation system.

The NSC reactor design allows for easy loading/unloading of various types of samples. The NSC actively produces a variety of radioisotopes for academic and industry users. The NSC provides nationally recognized neutron activation analysis (NAA) services to many research and academic institutions in the United States. The Nuclear Engineering Department on campus is a major user of the NSC reactor. The NSC is also one of the major attractions on campus. Last year, the NSC hosted approximately 1700 local and international visitors including: elementary, middle school, high school and college students as well as faculty members, national laboratory scientists and industrial clients. Through these tours, the NSC taught people with widely varying backgrounds about nuclear science.

With the DOE reactor upgrade funding from 2014, the NSC has acquired new continuous air monitors, a second sample handling cell, a replacement/upgrade to our heat exchanger, and we are negotiating a replacement pool demineralizer system. These purchases will enhance and help extend the safe operation of the NSC for many years to come.

The NSC has submitted the license amendment request as well as the revised Tech Specs, SAR, and other supporting documents for the renewal process with Nuclear Regulatory Commission (NRC). They are under review and are still pending with the NRC.

This annual report has been prepared to satisfy the reporting requirements of Technical Specification 6.6.1 of the facility operating license R-83 and of the Department of Energy University Reactor Fuel Assistance Program subcontract No. C87-101594 (DE-AC07-76ER02426).

1.1 Nuclear Science Center Staff

The staff at the Nuclear Science Center consists of four major groups: Reactor Operations, Radiation Safety, Engineering, and Administrative Services. Personnel directly involved with the operation and maintenance of the reactor are NRC-licensed operators. The NSC is committed to its educational responsibilities and many members of the staff are part or full-time students at Texas A&M University. Appendix A shows the Nuclear Science Center Organization Chart.

The Texas A&M Engineering Experiment Station (TEES) of the Texas A&M University System operates the NSC. The Director of the NSC is responsible to the Deputy Director of the TEES for the administration and the proper and safe operation of the facility. The NSC Radiation Safety Office is responsible to the Director of the NSC for matters relating to safety and for maintaining a proper radiation safety program. In addition to the internal structure, the Reactor Safety Board (RSB) advises the Deputy Director of the TEES and the Director of the NSC on issues or policy pertaining to reactor safety. The Texas A&M University Environmental Health and Safety Department (EHSD) provides assistance when required for emergencies and for special operations as agreed. The Texas A&M University Police Department provides security support on a daily basis and is a key support group in the event of a security incident. The College Station Fire Department and Scott & White Medical Center provide offsite emergency support when required as per agreement.

2. Reactor Utilization for 2014

The Nuclear Science Center (NSC) reactor has been in operation since 1961. The reactor is a 1 MW MTR-converted TRIGA reactor. Core IX is the current core configuration and has been in use since September 2006. The NSC reactor is pulse operational and was pulsed up to \$1.75 for nuclear engineering laboratories, staff training, and public tours.

The NSC reactor operated for 2011.7 hours in 2014 with a total integrated power of 82.8 MW-days. There were 479 "Requests for Irradiation" processed at the NSC during the reporting period. The NSC provided services to TAMU departments, other universities, research centers, and secondary schools in and outside the state of Texas. The cumulative total energy output since initial criticality of the LEU fuel is 621.3 MW-days. Table 2 shows the reactor utilization summary in 2014 and Figure 2 shows the annual reactor utilization in MW-hrs of operation.

Table 2: Reactor Utilization Summary in 2014

Days of Reactor Operation	238
Integrated Power (MW-days)	82.8
Number of Hours at Steady-State	2011.7
Number of Pulses	64
Number of Reactor Irradiations (RFS)	479
Number of Visitors	1779
Unscheduled Shutdowns	24

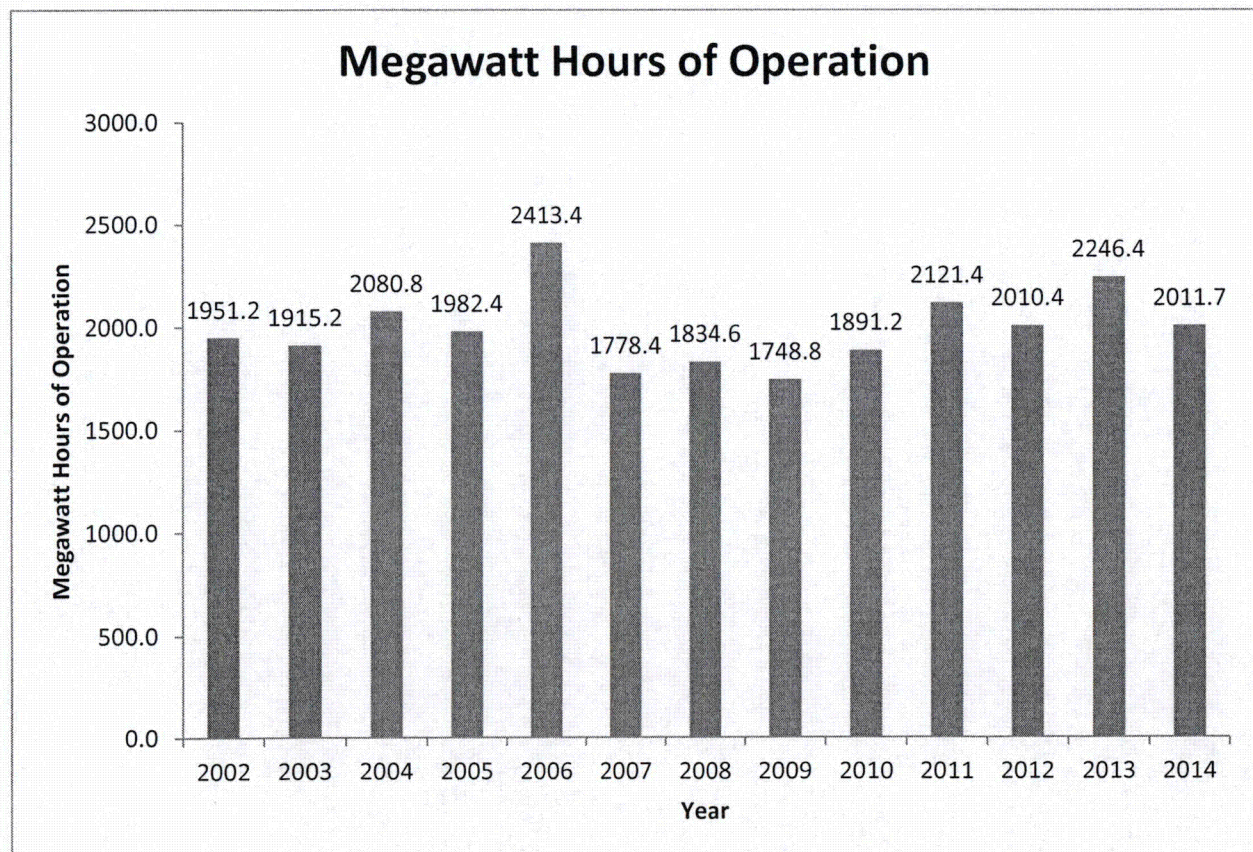


Figure 2. Annual Reactor Utilization in MW-hrs of Operation

2.1 TAMU Academic Support Program

Texas A&M University provides funding for the reactor for such academic activities as nuclear engineering laboratories, neutron activation analysis demonstrations and laboratories, graduate student thesis and dissertation research, and undergraduate research projects. The program has been very successful and is crucial for many graduate students who use the NSC reactor for research and have not received research grants. The wide range of academic users from the university reflects in the NSC's reputation as a multi-disciplinary institution.

2.2 Commercial Activity and External Research

The NSC provides services to a variety of users that provide their own funding. The majority of commercial activities focus on production of radioactive tracers for the petroleum and chemical industries. Outside research grants fund a significant amount of the NSC's research. The NSC is involved with neutron activation analysis and radioassays for a wide variety of samples for outside customers. The NSC has many years of experience producing radioisotopes and has developed several customer-specific methods for radioactive sample production and handling. The production of radioisotopes generally involves handling radioactive material with high activities. The NSC staff takes precautions to minimize the exposures during the transfer of radioactive materials to shipping shields.

3. Facility and Procedure Changes

3.1 Facility Modifications

- 3.1 Continuous air monitors
- 3.2 Sample handling cell
- 3.3 Primary coolant heat exchanger

3.2 Experiment Authorization and Modification Authorization

There were no new Experiment Authorizations (EA) and one Modification Authorization (MA) covered in 2014. Modification Authorization 61 was approved for the Primary Heat Exchanger replacement.

4. Reactor Maintenance and Surveillance

4.1 Scheduled Maintenance

NSC personnel performed regular maintenance on the Fuel Element Temperature Channel, Area Radiation Monitors and the Linear, Log, and Safety Power Channels as required by the Technical Specifications. They also performed all surveillance required by the reactor license. Control rod worth and scram time measurements performed in June 2014 gave the following results. The total rod worth was \$15.928. The most reactive control rod was Shim Safety #4 with a worth of \$4.19. The shutdown margin was \$6.024 and core excess was \$4.967.

Scram times on all rods were less than 1.2 seconds. In addition, operators performed calorimetric calibration following each maintenance period, and fuel inspections with no abnormalities noted (as required by the Technical Specification). The cold critical reactivity worth, performed for each reactor experiment, shows that the most reactive fixed experiment is the Thermal Column Coupler (-\$1.146).

4.2 Unscheduled Shutdowns

There were twenty-four unscheduled reactor shutdowns during 2014. The cause is detailed below in Table 4-2.

Table 4-2: Unscheduled Shutdowns

01/13/2014	Reactor scrammed due to Shim Safety 1 drop. Cause determined to be vibrations incurred during sample loading.
01/15/2014	Reactor scrammed due to electronic malfunction on Safety Amplifier Channels 1 and 2.
01/23/2014	Reactor scrammed due to experiment scram safety interlock activation. Faulty switch was found on interlock.
02/13/2014	Reactor scrammed manually by operator. Rod drive was not responding to operator control during shutdown.
03/27/2014	Reactor scrammed due to high power on Safety Amplifier Channel 2. Scram caused by accidental activation of test current simulating 130% power.
03/31/2014	Reactor scrammed due to accidental manual scram button pressed poolside.
04/02/2014	Reactor scrammed due to short in the scram circuit. Cable was shorted to ground while wire tray maintenance was being performed.
04/09/2014	Reactor scrammed due to Shim Safety Rod #2 drop. Fluctuating magnet power caused rod to drop.

04/23/2014	Reactor scrammed due to Shim Safety Rod #2 drop. Loss of magnet power caused rod to drop.
05/01/2014	Reactor scrammed manually by operator. FAM computer reset resulting in central exhaust shutdown and lack of FAM display.
05/07/2014	Reactor scrammed due to Shim Safety Rod #1 drop. Cause determined to be vibrations incurred during sample loading.
05/13/2014	Reactor scrammed due to experiment scram. Cave door and Bridge interlock scram wiring shorted.
05/21/2014	Reactor scrammed due to experiment scram. Scram circuit wiring connected improperly.
05/27/2014	Reactor scrammed due to potentiometer fail on Shim Safety 1.
06/24/2014	Reactor scrammed due to Safety Amplifier scram. Scram happened during power increase for log channel calibration.
06/24/2014	Reactor scrammed due to Safety Amplifier scram. Operator error of increasing power too rapidly.
06/25/2014	Reactor scrammed due to brief facility power loss.
07/07/2014	Reactor scrammed due to Safety Amplifier scram. Operator error – excessive shim safety withdrawal at the point of criticality.
07/25/2014	Reactor scrammed due to manual scram. Operator trainee scrammed reactor due to breach of staffing requirements.
09/03/2014	Reactor scrammed due to facility power loss.
11/07/2014	Reactor scrammed due to Safety Amplifier scram. Operator error of increasing power too rapidly.
12/03/2014	Reactor scrammed due to Safety Amplifier #2. Non-power electrical noise caused a signal spike above the scram limit.

12/09/2014	Reactor scrammed due to Safety Amplifier #2. Non-power electrical noise caused a signal spike above the scram limit.
12/10/2014	Reactor scrammed due to Safety Amplifier #2. Non-power electrical noise caused a signal spike above the scram limit.

4.3 Emergency Plan and Review

The members of Reactor Safety Board (RSB) reviewed the NSC Security and Emergency Plans.

4.4 Reactor Safety Board

The Reactor Safety Board is responsible for providing an independent review and audit of the safety aspects of the NSC reactor. The Reactor Safety Board met as required in the year 2014.

4.5 Inspections and Audits

The Reactor Safety Board performed the required audits and inspections as per the Technical Specifications requirement. The results of the audit were shared with the RSB members. A facility inspection was performed by Nuclear Regulatory Commission in September 2014 for the Class II research and test reactor safety programs; 2 deficiencies were identified.

4.6 NRC Inspection Results

The NRC conducted an inspection of the NSC in September of 2014. This inspection resulted in 2 findings or violations: Failure to maintain proper staffing while reactor operating, and failure to properly inspect facility checklists.

5. Health Physics Surveillance

The purpose of Health Physics surveillance is to ensure safe use of radioactive materials in the Nuclear Science Center's research and service activities and to fulfill the regulatory requirements of U.S. Nuclear Regulatory Commission and State agencies. The NSC maintains a Health Physics group as an integral part of the organization. They are responsible for radiological as well as chemical and physical safety concerns. The radiation safety team at the TAMU Environmental Health and Safety Department provides additional support to the NSC Health Physics group upon request.

5.1 Radioactive Shipments

The Health Physics monitoring and technical support that was provided in 2014 assured minimal exposure during sample handling, shipment of radioactive material, and normal reactor operation. The radiation exposures were maintained ALARA. During 2014, about 328 radioactive samples were handled and released to various facilities including Texas A&M University campus. A total of 525 curies were handled in 2014.

5.2 Personnel Monitoring

Personnel Monitoring was provided on a monthly basis to approximately 64 personnel. All measured doses to personnel were below the limits set forth in 10 CFR 20. Three individuals received whole body dose greater than 10% of the annual limit in 10 CFR 20. Their deep dose equivalent (DDE) recorded were 0.81R, 0.50R, and 0.75R for the year. Airborne monitoring during sample handling continued to show no significant airborne activity, therefore, total effective dose equivalent will equal deep dose equivalent for 2014. A total of 5.9 manrem was recorded for the year 2014. When total manrem/curie was determined for 2014, the dose per curie equaled 0.011 (manrem/Ci).

During 2014, 1779 visitors toured the Nuclear Science Center. Minimal exposures were measured with pocket ion chambers worn by these visitors and the pocket ion chamber readings of their respective tour guides.

NSC employees who were likely to exceed 10% of their total annual dose wore whole body badges (Luxel dosimeter) and extremity badges (TLD dosimeters) that were provided by Landauer, a NVLAP accredited supplier. Landauer also provides the reports of the doses received. Employees who potentially handle more radioactive materials on a regular basis were provided two extremity badges and were changed out on a monthly basis.

5.3 Facility Monitoring

Surveys of the Nuclear Science Center facilities were performed to assess radiological hazards to NSC workers. Radiation levels and sources of radioactive contamination were routinely monitored. All areas accessible to the general public at the NSC were surveyed for radiation and contamination levels with an ion chamber and evaluation of smear samples. Areas where contamination is expected are access/egress controlled and are evaluated on shorter intervals as needed. Building monitors and area monitors are located strategically throughout the reactor facility, providing dose equivalent (mrem) on a monthly basis. Table 5-3 summarizes the annual accumulated dose equivalent (mrem) recorded on the area monitors for the year 2014.

Table 5-3: Total Dose Equivalent (mrem) Recorded on Area Monitors

Monitor ID	Location	Accumulated Dose Equivalent (mrem)
BLDG MNTR 1	Upper Research Level Mezzanine	1228
BLDG MNTR 2	Lower Research Level Mezzanine	1380 ^a
BLDG MNTR 3	Lower Research Level	660 ^a
AREA	Control Room	55
AREA	Upper Research Level	3610
AREA	Room next to MHA	753 ^b

^aRadioactive shipments were stored in the LRL area pending transport

^bRadioactive materials were stored in the temporary locations in MHA.

5.4 Particulate Effluent Monitoring

Radioactive particulates were monitored at the base of the central exhaust stack and summarized on a monthly basis. The average release concentration for 2014 was 5.25×10^{-18} $\mu\text{Ci/cc}$. The total radioactivity released for 2014 was 0.04 μCi . Table 5-4 summarizes monthly particulate effluent releases during 2014. The most common isotopes noted during particulate effluent releases were Sc-46, Sb-124, and Ir-192.

Table 5-4: Particulate Effluent Releases

Quarter	Month	Activity from channel 1 (uCi)	Additional releases (uCi)	Exhaust Volume (cc)	Dilution Concentration at boundary (uCi/cc)	Total activity released (Ci)
I	January	<BG		9.96E+12	<BG	<BG
	February	5.03E-03		8.99E+12	2.80E-18	5.03E-09
	March	8.68E-03		9.96E+12	4.36E-18	8.68E-09
	Sum:	1.37E-02		2.89E+13	7.16E-18	1.37E-08
II	April	3.41E-03		9.64E+12	1.77E-18	3.41E-09
	May	<BG		9.96E+12	<BG	<BG
	June	7.94E-03		9.64E+12	4.12E-18	7.94E-09
	Sum:	1.14E-02		2.92E+13	5.89E-18	1.14E-08
III	July	4.00E-03		9.96E+12	2.01E-18	4.00E-09
	August	<BG		9.96E+12	<BG	<BG
	September	<BG		9.64E+12	<BG	<BG
	Sum:	4.00E-03		2.96E+13	2.01E-18	4.00E-09
IV	October	3.50E-03		9.96E+12	<BG	<BG
	November	<BG		9.64E+12	<BG	<BG
	December	1.19E-02		9.96E+12	5.95E-18	1.19E-08
	Sum:	1.54E-02		2.96E+13	5.95E-18	1.19E-08
Summary YTD		4.44E-02		1.17E+14	Average: 5.25E-18	4.09E-08

notes:

1. Activity released from the stack: Activity sampled from Ch 1 of air going through the stack
2. Diluted Concentration equal to: Total Release Concentration multiplied by 0.005 (Technical Specification 3.5.2, dilution value for release concentration at exclusion boundary)
3. Exhaust Volume equal to: (# days/month)*(24hrs/day)*(60min/hr)*(7875 cfm)/ 3.53E-5cc)
4. Additional Release equal to: (Individual releases calculated from facility air monitoring data)
5. Total Release equal to: (Sum Released Activity + Additional Releases)* Conversion Factor

5.5 Gaseous Effluent Monitoring

Argon-41 is the major gaseous effluent produced and released at the Nuclear Science Center. This effluent is monitored at the central exhaust stack. Total Argon-41 released during 2014 was approximately 1.85 Ci with an annual average release concentration of 2.32×10^{-10} $\mu\text{Ci/cc}$. Table 5-5 summarizes monthly gaseous effluent (Ar-41) releases during 2014.

Table 5-5: Gaseous Effluent (Ar-41) Releases

Quarter	Month	Activity from channel 3 (μCi)	Additional releases (μCi)	Exhaust Volume (cc)	Dilution Concentration at boundary ($\mu\text{Ci/cc}$)	Total activity released (Ci)
I	January	2.58E+02		9.96E+12	1.30E-13	2.58E-04
	February	<BG		8.99E+12	<BG	<BG
	March	4.93E+02		9.96E+12	2.47E-13	4.93E-04
	Sum:	7.51E+02		2.89E+13	3.77E-13	7.51E-04
II	April	1.29E+02		9.64E+12	6.68E-14	1.29E-04
	May	<BG		9.96E+12	<BG	<BG
	June	1.84E+02		9.64E+12	9.56E-14	1.84E-04
	Sum:	3.13E+02		2.92E+13	1.62E-13	3.13E-04
III	July	2.62E+02		9.96E+12	1.32E-13	2.62E-04
	August	2.19E+01	1.07E+05	9.96E+12	5.37E-11	1.07E-01
	September	<BG		9.64E+12	<BG	<BG
	Sum:	2.84E+02	1.07E+05	2.96E+13	5.39E-11	1.07E-01
IV	October	2.58E+02		9.96E+12	1.30E-13	2.58E-04
	November	2.57E+01		9.64E+12	1.33E-14	2.57E-05
	December	1.91E+03	1.74E+06	9.96E+12	8.75E-10	1.74E+00
	Sum:	2.20E+03	1.74E+06	2.96E+13	8.75E-10	1.74E+00
Summary YTD		3.54E+03	1.85E+06	1.17E+14	Average: 2.32E-10	1.85E+00
notes: <ol style="list-style-type: none"> 1. Activity released from the stack: Activity sampled from Ch 3 of air going through the stack 2. Diluted Concentration equal to: Total Release Concentration multiplied by 0.005 (Technical Specification 3.5.2, dilution value for release concentration at exclusion boundary) 3. Exhaust Volume equal to: (# days/month)*(24hrs/day)*(60min/hr)*(7875 cfm)/3.53E-5cc 4. Additional Release equal to: (Individual releases calculated from facility air monitoring data) 5. Total Release equal to: (Sum Released Activity + Additional Releases)*Conversion Factor 						

5.6 Liquid Effluent Monitoring

Radioactive Liquid effluents are maintained in collection tanks before release from the confines of the Nuclear Science Center. Sample activity concentrations and isotope identifications were determined before each release. The concentration values for each isotope were compared with the effluent concentrations in water (10 CFR 20) and were determined to be in compliance. Sample activity concentrations were then compared with sewer line concentrations (10 CFR 20) and were determined to be in compliance. There were 30 releases in 2014, totaling 4.31×10^5 gallons including dilution. The total radioactivity released was 3.39 mCi with an annual average concentration of 2.16×10^{-5} $\mu\text{Ci/cc}$. The annual dose to the public calculated from liquid effluents is about 1.38 mrem. Summary of the release data are presented in the following Table 5-6. Radioactivity concentrations for each isotope found were below the Effluent Concentration limits specified in 10 CFR 20, Appendix B. The radionuclides identified in the waste stream were Sc-46, Cr-51, Mn-54, Ir-192, Co-58, Co-60, Zn-65, Sb-122, Sb-124, and Cs-137.

Table 5-6: Liquid Effluent Releases

Quarter	Month	Number of Releases	Volume Released (cc)	Total Radioactivity (Ci)	Average Concentration (μCi/cc)
I	January	0	0	0	0
	February	2	1.14E+08	2.02E-04	1.76E-06
	March	4	2.00E+08	6.84E-04	3.42E-06
	Total	6	3.14E+08	8.86E-04	5.19E-06
II	April	1	4.77E+07	7.06E-05	1.48E-06
	May	2	1.13E+08	1.75E-04	1.55E-06
	June	3	2.00E+08	5.53E-04	2.76E-06
	Total	6	3.61E+08	7.98E-04	5.79E-06
III	July	4	1.91E+08	3.98E-04	2.09E-06
	August	4	2.37E+08	3.65E-04	1.54E-06
	September	3	1.96E+08	3.55E-04	1.81E-06
	Total	11	6.24E+08	1.12E-03	5.43E-06
IV	October	2	1.03E+08	7.96E-05	7.77E-07
	November	3	1.43E+08	3.02E-04	2.11E-06
	December	2	8.68E+07	2.01E-04	2.32E-06
	Total	7	3.32E+08	5.83E-04	5.21E-06
Annual Summary	Total	30	1.63E+09	3.39E-03	2.16E-05

6. Environmental Monitoring

In conjunction with representatives from the Texas Department of State Health Services (TDSHS) Radiation Control, a quarterly environmental survey is conducted to insure compliance with federal regulations. This program consists of TLD monitors located at various locations on the NSC site and two background monitors; one located at 3.84 miles NW of facility and the other at 0.25 miles SE of facility.

6.1 Environmental Samples

Since the implementation of discharging liquid waste to the sewer, TDSHS no longer requires the collection of a quarterly sediment sample. A letter from TDSHS to this effect is on file.

6.2 Site Boundary Dose Rate

The environmental survey program measures the integrated radiation exposures at the exclusion area boundaries. These measurements are made for periods of approximately 92 days using TLDs. Monthly measurements of direct gamma exposure rate in $\mu\text{R/h}$ are also made at each of the TLD locations. The dosimeters were provided and processed by Texas Department of State Health Services, Environmental Monitoring, Division of Regulatory Services, Austin, Texas.

The total TLD dose is multiplied by the occupancy factor (1/16) to determine the deep dose. To determine the dose to the public outside the site area from air effluents, the EPA approved code COMPLY was used. The annual dose calculated using COMPLY was 0.1 mrem/yr. This is added to the deep dose to determine the total dose to the general public and the maximum dose.

Table 6.2: Site Boundary Dose Rates 2014

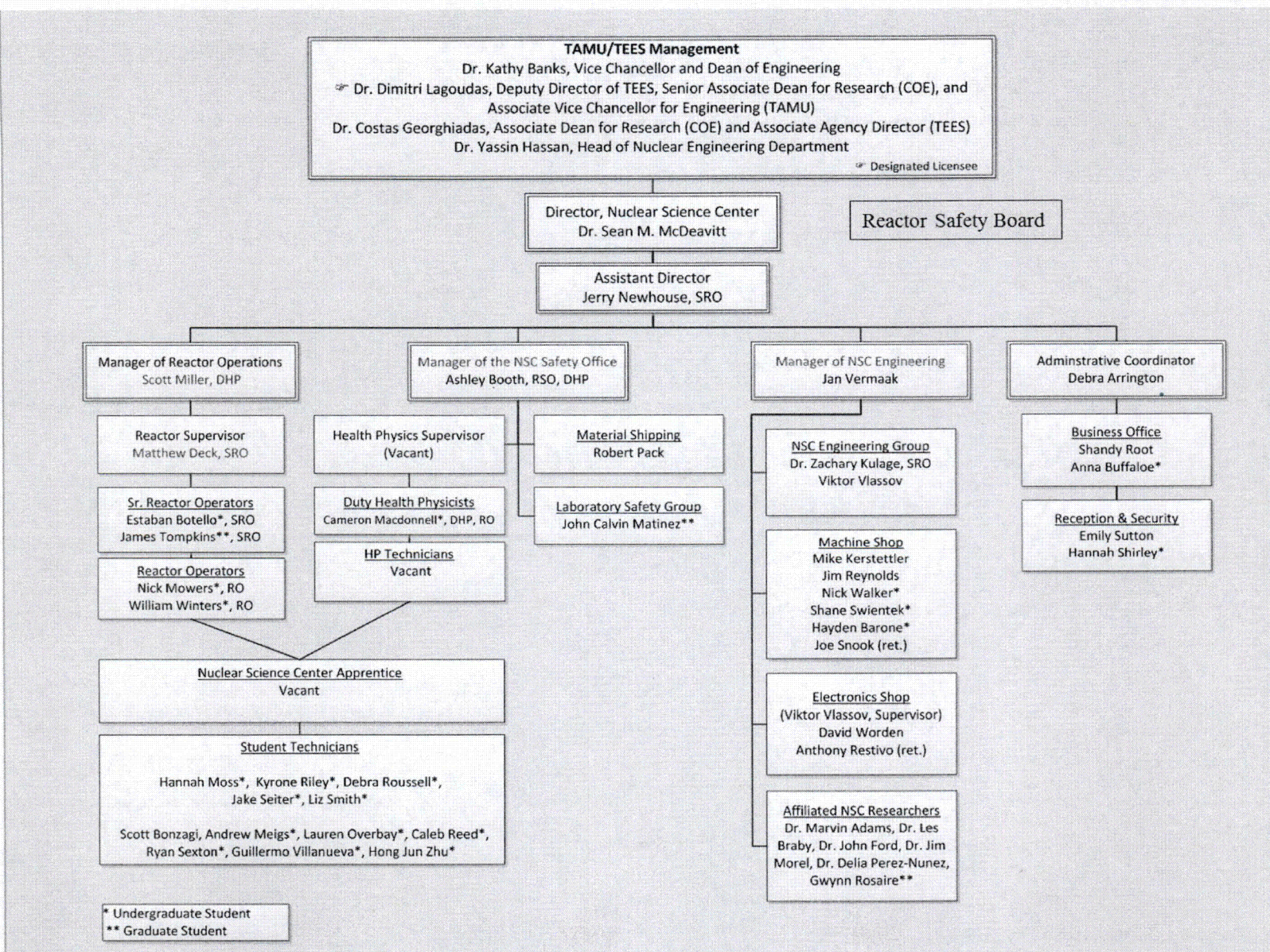
Site #	Location	Quarterly Exposure rates (mrem/91 days)				TLD Dose (total)	Deep Dose=TLD dose*(1/16)	Internal Dose (mrem)_comply	Total Dose (mrem)
2	300 ft. W of reactor building, near fence corner	5	11	5	2	23	1.4375	0.1	1.5375
3	250 ft W-SW of reactor building, on SW chain link fence	3	3	0	0	6	0.375	0.1	0.475
4	200 ft NW of reactor building, on chain link fence, near butane tank	4	5	6	3	18	1.125	0.1	1.225
5	225 ft NE of reactor building, on fence N of driveway	3	0	2	1	6	0.375	0.1	0.475
10	190 ft SE of reactor building, near fence corner	1	0	0	1	2	0.125	0.1	0.225
11	300 ft NE of reactor building, near fence corner	2	0	0	0	2	0.125	0.1	0.225
*14	3.84 miles NW of facility	0	0	0	0	0	0	0.1	0.1
18	375 ft NE of reactor building	3	0	2	1	6	0.375	0.1	0.475
19	320 ft NE of reactor building	0	0	0	0	0	0	0.1	0.1
20	E Wall of accelerator building	0	0	0	0	0	0	0.1	0.1
21	W Wall of accelerator building	0	0	0	0	0	0	0.1	0.1
22	S Wall of accelerator building	0	0	1	0	1	0.0625	0.1	0.1625
*23	0.25 miles SE of facility	0	0	0	0	0	0	0.1	0.1
24	North Wall of Accelerator Building, First Floor	6	7	3	0	16	1	0.1	1.1
25	North Wall of Accelerator Building, Second Floor	1	9	6	2	18	1.125	0.1	1.225
26	W Fence of hyperbaric lab, 10ft from SW corner	2	1	0	1	4	0.25	0.1	0.35
27	E fence of hyperbaric lab, 10ft S of entrance	1	0	0	0	1	0.0625	0.1	0.1625
28	S fence of hyperbaric lab, 10ft E of personnel gate	1	0	0	0	1	0.0625	0.1	0.1625
29	325ft SW from reactor building, SW corner	0	0	0	3	3	0.1875	0.1	0.2875

7. Radioactive Waste Shipments

There were no radioactive waste shipments from the Nuclear Science Center in 2014.

Appendix A

Nuclear Science Center Organizational Chart



Appendix B

Reactor Safety Board Membership (2014)

Chairman/Licensee:

Dr. Emile Schweikert, Professor
Chemistry Department

Members:

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Nuclear Engineering Department

Dr. Marvin Adams, Associate Professor
Nuclear Engineering Department

Dr. Bill Charlton, Associate Professor
Nuclear Engineering Department

Dr. William Dennis James, Research Chemist
Chemistry Department

Dr. John Hardy, Professor
Physics Department

Dr. Teruki Kamon, Professor
Physics Department

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Nuclear Engineering Department

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Nuclear Science Center

Mrs. Ashley Booth, NSC RSO
Nuclear Science Center

Dr. Yassin Hassan, Professor and Head
Nuclear Engineering Department

Dr. Latha Vasudevan, RSO
Environmental Health and Safety Department