TEXAS A&M ENGINEERING
EXPERIMENT STATION
NUCLEAR SCIENCE CENTER

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Subject: TEES Nuclear Science Center, License R-83, 2015 Annual Report

Enclosed please find the TEES Nuclear Science Center 2015 annual report. If you have any questions, please contact Mr. Jerry Newhouse at 979-845-7551.

Sincerely,

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

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Texas A&M University System
Texas Engineering Experiment Station

<u>2015 Annual Report</u>

Facility Operating License R-83

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

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Reviewed By: S. McDeavitt, NSC Director

March 2016

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1. Introduction

The Texas A&M Engineering Experiment Station 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 five neutron beam ports, a neutron/gamma irradiation cell, , 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 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 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 1358 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 telemanipulator handling cell, replaced the heat exchanger, and began replacing the demineralizer system. These purchases will enhance and help extend the safe operation of the NSC for many years to come.

The NSC received a renewed facility license in October, 2015.

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 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 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 2015

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 1520.7 hours in 2015 with a total integrated power of 57.3 MW-days. There were 435 "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 678.6 MW-days. Table 2 shows the reactor utilization summary in 2015 and Figure 2 shows the annual reactor utilization in MW-hrs of operation.

Table 2: Reactor Utilization Summary in 2015

Days of Reactor Operation	236
Integrated Power (MW-days)	57.3
Number of Hours at Steady-State	1520.7
Number of Pulses	37
Number of Reactor Irradiations (RFS)	435
Number of Visitors	1358
Unscheduled Shutdowns	20

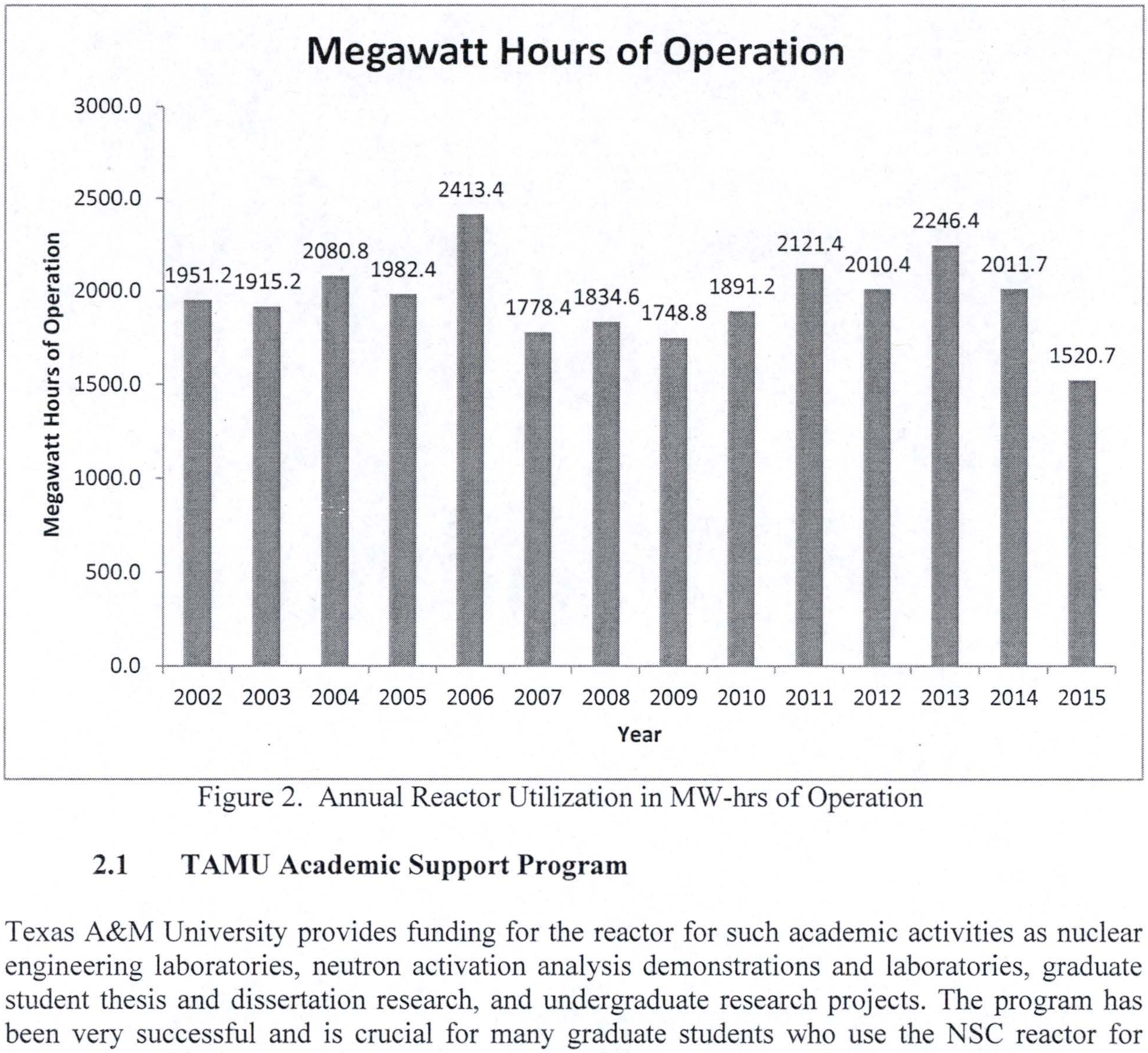


Figure 2. Annual Reactor Utilization in MW-hrs of Operation

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

Replacement of the Demineralizer System

3.2 Experiment Authorization and Modification Authorization

There were no new Experiment Authorizations (EA) and one Modification Authorization (MA) covered in 2015. Modification Authorization 62 was approved for the Water Demineralization System 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 July 2015 gave the following results. The total rod worth was $14.682. The most reactive control rod was Shim Safety #4 with a worth of $4.07. The shutdown margin was $4.399 and core excess was $5.365. 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 EFI w/Lanthanum ($0.2927).

4.2 Unscheduled Shutdowns

There were twenty unscheduled reactor shutdowns during 2015. The cause is detailed below in Table 4-2.

Table 4-2: Unscheduled Shutdowns

01/08/15	Reactor was manually scrammed after loss of signal was observed on Safety Amplifier #1
01/12/15	Reactor scrammed due to Safety Channel #2 High Power trip. Cause was determined to be electrical noise.
01/23/15	Safety Channel scram due to new worker increasing power too fast – reactor power was <3kw when event happened.
02/06/15	Shim Safety #3 magnet failed and dropped the control rod. Unit was checked and returned to service.
02/09/15	Shim Safety #3 magnet failed and dropped the control rod. Rod drive unit was replaced.
02/20/15	Manual scram due to object dropped into pool. Object was located and removed.
02/25/15	Manual scram due to object getting tangled on long stick and binding the sample rotisserie.

04/30/15	Safety Channel scram due to power increased too quickly. Reactor power at time of scram was <3kw.
05/12/15	Manual scram initiated due to accidental shutdown of facility air compressor.
05/18/15	Experiment scram due to loose wire accidentally grounded at the cave door experiment area.
05/27/15	Manual scram due to Shim Safety #1 control rod dropping due to magnet failure. Magnet was swapped out.
06/03/15	Manual scram due to Shim Safety #3 control rod dropping due to magnet failure. Magnet was swapped out.
08/04/15	Startup was aborted due to fluctuation of magnet current on Shim Safety #1. Magnet was replaced.
09/15/15	Startup was aborted due to the startup source not being in place. Source was installed and startup proceeded normally.
09/18/15	Operator shutdown the reactor when it was noticed that the alarm reset/acknowledge button was sticking.
09/18/15	Operator shutdown the reactor during startup because prior scram recovery checklist had not been reviewed.
10/14/15	Startup was aborted when it was noticed that Shim Safety #1 was driving in with no operator input.
10/30/15	Reactor was shutdown due to the facility receiving a tornado warning.
11/30/15	Reactor was shutdown, facility evacuated due to fire alarm activation. Alarm was the result of construction work on the demineralizer system causing large amounts of dust.
11/30/15	Manual scram initiated due to loss of FAM pump going offline due to flooding in the mechanical room as a result of a broken pipe.

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 2015.

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. Facility inspections were performed by the U.S. Nuclear Regulatory Commission in March and November 2015. Both inspections were concluded favorably and closed all previously open items.

4.6 NRC Inspection Results

The U.S. Nuclear Regulatory Commission conduced two inspections, one in March and the other in November. Both inspections were concluded favorably, no new findings were opened, and the two findings opened in 2014 were closed.

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 2015 assured minimal exposure during sample handling, shipment of radioactive material, and normal reactor operation. The radiation exposures were maintained ALARA. During 2015, about 248 radioactive samples were handled and released to various facilities including Texas A&M University campus. A total of 242 curies were handled in 2015.

5.2 Personnel Monitoring

Personnel Monitoring was provided on a monthly basis to approximately 51 personnel. All measured doses to personnel were below the limits set forth in 10 CFR 20. One individual received whole body dose greater than 10% of the annual limit in 10 CFR 20. Their deep dose equivalent (DDE) recorded was 0.62R 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 2015. A total of 4.8 manrem was recorded for the year 2015. When total manrem/curie was determined for 2015, the dose per curie equaled 0.02 (manrem/Ci).

During 2015, about 1358 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 monthly by ion chamber readings 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 2015.

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	768
BLDG MNTR 2	Lower Research Level Mezzanine	850[a]
BLDG MNTR 3	Lower Research Level	1066[a]
AREA	Control Room	1527
AREA	Upper Research Level	386
AREA	Room next to MHA	34[b]

[a]Radioactive shipments were stored in the LRL area pending transport
[b]Radioactive 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 annual average release concentration was 1.05×10^{-17} μCi/cc. The total radioactivity released for 2015 was 2.63×10^{-2} μCi. Table 5-4 summarizes monthly particulate effluent releases during 2015. 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	Particulate Activity from channel 1 (uCI)	Exhaust Volume (cc)	Additional releases (μCi)	Dilution Concentration (μCi/cc)	Total activity released (Ci)
	January	<BG	9.96E+12	0.00E+00	<BG	<BG
	February	<BG	8.99E+12	0.00E+00	<BG	<BG
I	March	2.65E-03	9.96E+12	0.00E+00	1.33E-18	2.65E-09
	Average:	**2.65E-03**	**2.89E+13**	0.00E+00	**4.59E-19**	**2.65E-09**
	April	3.28E-02	9.64E+12	0.00E+00	1.70E-17	3.28E-08
	May	<BG	9.96E+12	0.00E+00	<BG	<BG
II	June	<BG	9.64E+12	0.00E+00	<BG	<BG
	Average:	**3.28E-02**	**2.92E+13**	0.00E+00	**5.61E-18**	**3.28E-08**
	July	<BG	9.96E+12	0.00E+00	<BG	<BG
	August	<BG	9.96E+12	0.00E+00	<BG	<BG
III	September	3.13E-02	9.64E+12	0.00E+00	1.62E-17	3.13E-08
	Average:	**3.13E-02**	**2.96E+13**	0.00E+00	**5.30E-18**	**3.13E-08**
	October	4.96E-03	9.96E+12	0.00E+00	2.49E-18	4.96E-09
	November	<BG	9.64E+12	0.00E+00	<BG	<BG
IV	December	7.13E-02	9.96E+12	0.00E+00	3.58E-17	7.13E-08
	Average:	**3.82E-02**	**2.96E+13**	**0.00E+00**	**6.45E-18**	**3.82E-08**
Summary YTD		**2.62E-02**	**1.17E+14**	**0.00E+00**	**4.46E-18**	**2.62E-08**

notes:

1. Activity released from the stack: Activity sampled from Ch 1 multiplied by volume of air going through the stack
2. Diluted Concentration equal to: Activity Released/exhaust volume * 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: (Activity Released+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 2015 was approximately 12.5 mCi with an annual average release concentration of 5.32×10^{-13} µCi/cc. Table 5-5 summarizes monthly gaseous effluent (Ar-41) releases during 2015.

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

Quarter	Month	Argon-41 Activity from channel 3 (µCi)	Exhaust Volume (cc)	Additional releases (µCi)	Dilution Concentration at boundary (µCi/cc)	Total activity released (Ci)
	January	2.33E+02	9.96E+12	0.00E+00	1.17E-13	2.33E-04
	February	3.06E+02	8.99E+12	0.00E+00	<BG	<BG
I	March	3.62E+02	9.96E+12	0.00E+00	1.82E-13	3.62E-04
	Sum:	**9.01E+02**	**2.89E+13**	0.00E+00	**1.56E-13**	**9.01E-04**
	April	2.12E+03	9.64E+12	0.00E+00	1.10E-12	2.12E-03
	May	<BG	9.96E+12	0.00E+00	<BG	<BG
II	June	1.43E+03	9.64E+12	0.00E+00	7.40E-13	1.43E-03
	Sum:	**3.54E+03**	**2.92E+13**	**0.00E+00**	**6.06E-13**	**3.54E-03**
	July	<BG	9.96E+12	0.00E+00	<BG	<BG
	August	1.02E+02	9.96E+12	0.00E+00	5.13E-14	1.02E-04
III	September	<BG	9.64E+12	0.00E+00	<BG	<BG
	Sum:	**1.02E+02**	**2.96E+13**	0.00E+00	**1.73E-14**	**1.02E-04**
	October	<BG	9.96E+12	0.00E+00	<BG	<BG
	November	1.33E+03	9.64E+12	0.00E+00	6.89E-13	1.33E-03
IV	December	6.65E+03	9.96E+12	0.00E+00	3.34E-12	6.65E-03
	Sum:	**7.98E+03**	**2.96E+13**	**0.00E+00**	**1.35E-12**	**7.98E-03**
Summary YTD		**1.25E+04**	**1.17E+14**	**0.00E+00**	**5.32E-13**	**1.25E-02**

notes:

1. Activity released from the stack: Activity sampled from Ch 3 multiplied by volume of air going through the stack
2. Diluted Concentration equal to: Activity Released/exhaust volume * 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: (Activity Released+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. There were 30 releases in 2015, totaling 3.8×10^5 gallons including dilution. The total radioactivity released was 2.49 mCi with an annual average concentration of 3.86×10^{-6} μCi/cc. The annual dose to the public calculated from liquid effluents is about 0.96 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)	Total Concentration (μCi/cc)
I	January	3	1.53E+08	4.27E-04	2.80E-06
	February	0	0.00E+00	0.00E+00	0.00E+00
	March	3	1.28E+08	2.66E-04	2.07E-06
	Total	**6**	**2.81E+08**	**6.93E-04**	**4.87E-06**
II	April	1	5.01E+07	9.53E-05	1.90E-06
	May	5	2.77E+08	3.94E-04	1.43E-06
	June	2	9.49E+07	1.12E-04	1.18E-06
	Total	**8**	**4.22E+08**	**6.01E-04**	**4.51E-06**
III	July	5	2.41E+08	3.06E-04	1.27E-06
	August	3	1.12E+08	8.91E-05	7.98E-07
	September	3	1.53E+08	2.43E-04	1.60E-06
	Total	**11**	**5.06E+08**	**6.38E-04**	**3.67E-06**
IV	October	3	1.34E+08	1.47E-04	1.09E-06
	November	2	9.68E+07	1.03E-04	1.06E-06
	December	0	0.00E+00	0.00E+00	0.00E+00
	Total	**5**	**2.35E+08**	**5.59E-04**	**2.40E-06**
Annual Summary	**Total**	**30**	**1.44E+09**	**2.49E-03**	**Average 3.86E-06**

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 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 91 days using TLDs. Monthly measurements of direct gamma exposure rate in μR/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 4.1×10^{-4} mrem/yr. This is added to the deep dose to determine the total dose to the general public and the maximum dose

Table 6-1: Site Boundary TLD Data

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	4	52	544	107	707	44.1875	4.1E-04	44.29
3	250 ft W-SW of reactor building, on SW chain link fence	1	3	1	2	7	0.4375	4.1E-04	0.538
4	200 ft NW of reactor building, on chain link fence	5	7	5	2	19	1.1875	4.1E-04	1.29
5	225 ft NE of reactor building, on fence N of driveway	3	5	1	1	10	0.625	4.1E-04	0.73
10	190 ft SE of reactor building, near fence corner	0	4	0	0	4	0.25	4.1E-04	0.36
11	300 ft NE of reactor building, near fence corner	2	5	0	0	7	0.4375	4.1E-04	0.54
*14	3.84 miles NW of facility	0	0	0	0	0	0	4.1E-04	0.1
18	375 ft NE of reactor building	0	7	0	4	11	0.6875	4.1E-04	0.79
19	320 ft NE of reactor building	4	6	1	0	11	0.6875	4.1E-04	0.79
20	E Wall of Accelerator Building	0	4	0	0	4	0.25	4.1E-04	0.35
21	W Wall of Accelerator Building	11	23	0	0	34	2.125	4.1E-04	2.23
22	S Wall of accelerator	0	2	0	0	2	0.125	4.1E-04	0.23
*23	0.25 miles SE of facility	0	0	0	0	0	0	4.1E-04	0.1
24	North Wall of Accelerator Building, First Floor	1	4	3	0	8	0.5	4.1E-04	0.6
25	North Wall of Accelerator Building, Second Floor	0	3	9	0	12	0.75	4.1E-04	0.86
26	W Fenceof hyberbaric lab, 10 ft from SW Corner	2	6	0	0	8	0.5	4.1E-04	0.6
27	E Fence of hyberbaric, lab 10 ft S of personnel gate	0	4	0	2	6	0.375	4.1E-04	0.48
28	S Fence og hyperbaric lab, 10 ft E of personnel gate	0	0	0	0	0	0	4.1E-04	0.1
29	325 ft SW from reactor building, SW corner	1	5	2	2	10	0.625	4.1E-04	0.73

*Background TLD station

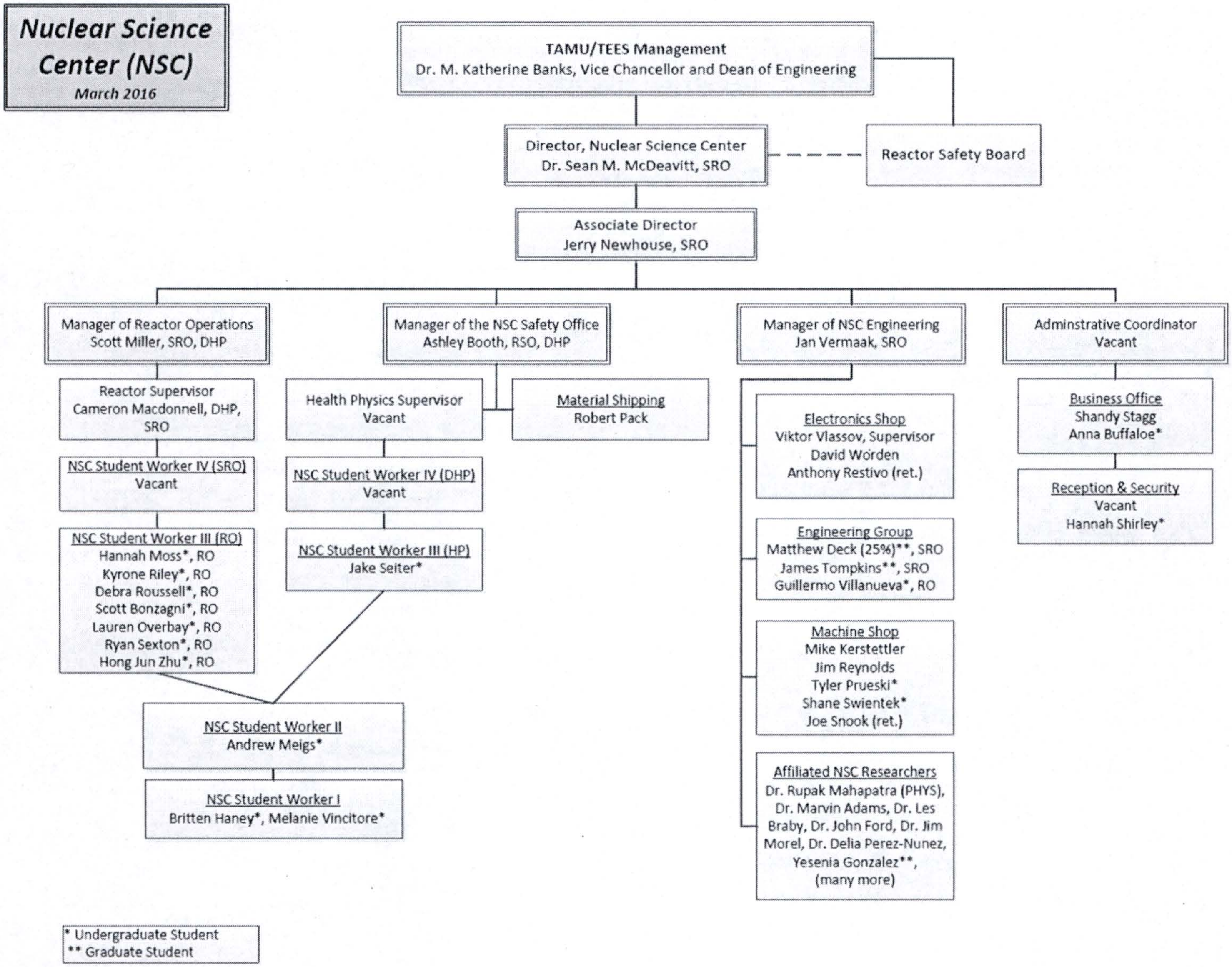
7. Radioactive Waste Shipments

In 2015, there was one radioactive waste shipment. Stored material was counted and packaged into appropriate shipping boxes and remanded into the care of the contracted waste hauler, Bionomics on 12/3/2015. The material was hauled to EnergySolutions (formerly Duratek), and processing was completed on 02/5/2016.

There were a total of 598.29 kg of waste shipped, with a total volume of 3.9 m^3. The total activity of the shipped waste was measured at 514.8 uCi (19.0MBq).

Appendix A

Nuclear Science Center Organizational Chart



Appendix B

Reactor Safety Board Membership (2015)

Chair/Licensee:

January – October: Dr. Dimitri Lagoudas, Deputy Director
Texas A&M Engineering Experiment Station

October - Present Dr. Kathy Banks, Director
Texas A&M Engineering Experiment Station

Chair pro temp:

Dr. Emile Schweikert, Professor
Chemistry Department

Members:

Dr. Marvin Adams, Associate Professor
Nuclear Engineering Department

June – Present: Dr. Steve Biegalski, Professor
Mechanical Engineering Department, University of Texas

January – May: Dr. Bill Charlton, Associate Professor
Nuclear Engineering Department

June – Present: Dr. Charles Folden, Assistant Professor
Cyclotron Institute

Dr. John Ford, Associate Professor
Nuclear Engineering Department

Dr. John Hardy, Professor
Physics Department

Dr. Teruki Kamon, Professor
Physics Department

June – Present: Dr. Bryan Tomlin, Manager
Center for Chemical Characterization and Analysis

Dr. Karen Vierow, Associate Professor
Nuclear Engineering Department

Ex-Officio Members:

Dr. Sean McDeavitt, Director
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