TEXAS ENGINEERING EXPERIMENT STATION

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March 31, 2003

2003-0034

U.S. Nuclear Regulatory Commission
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Washington, DC 20555

To Whom This May Concern:

Enclosed is a copy of the TAMU Nuclear Science Center 2002 Annual Report. Please feel free to call me if you have any questions at 979-845-7551.

Sincerely,

Michael Spellman
Associate Director

Enclosure

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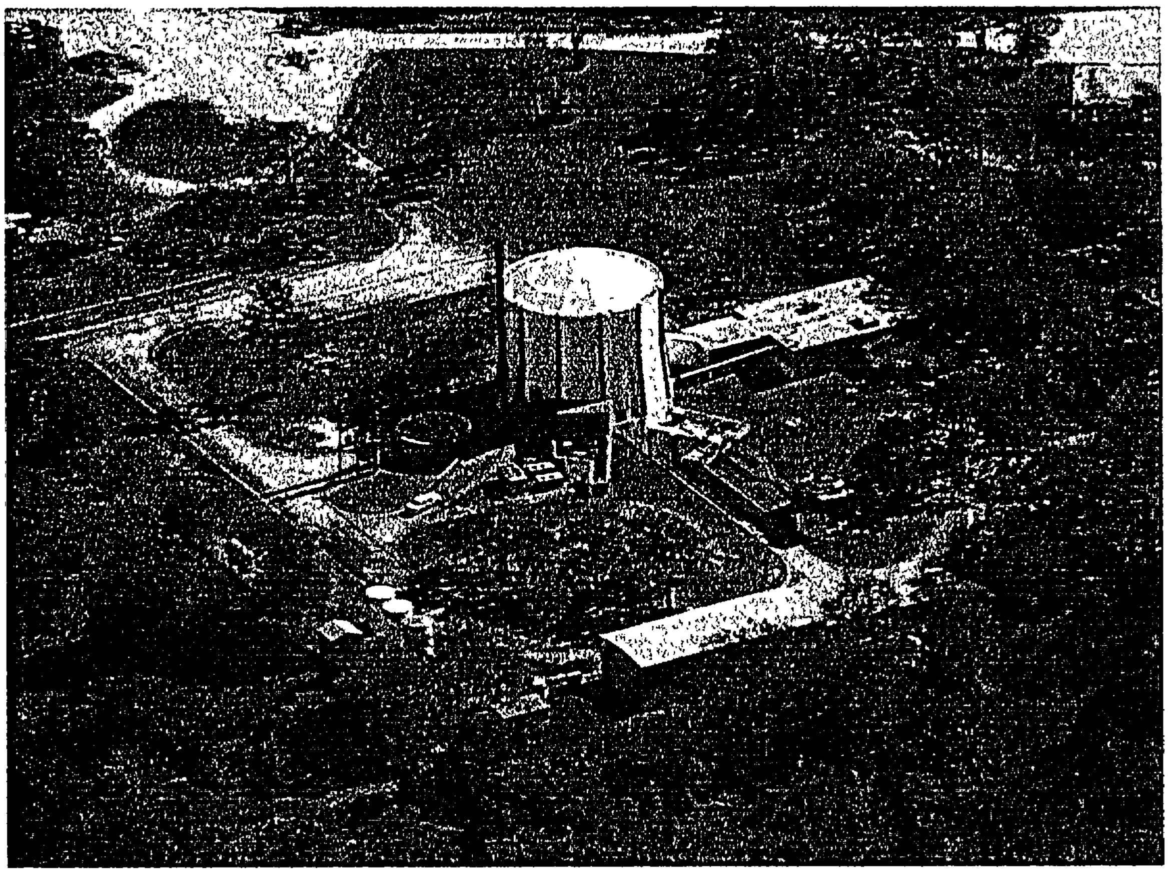
Texas A&M University

Nuclear Science Center

2002 Annual Report



Nuclear Science Center

Texas Engineering Experiment Station

Engineering Program

Texas A&M University System

College Station, TX

Texas A&M University System
Texas Engineering Experiment Station

Nuclear Science Center

2002 Annual Report

Facility Operating License R-83
Docket 50-128

1095 Nuclear Science Road
College Station, Texas 77843-3575

April 2003

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1. Introduction

The Texas A&M University 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, a 1-MW, pool-type TRIGA reactor, is at the heart of the NSC facilities which also includes: a 2-MW micro-beam accelerator, a ^{60}Co gamma calibration range, a real-time neutron radiography facility, a large-object irradiation cell, hot cells and manipulators, radiation measurement laboratories, radiochemical laboratories, five HPGe gamma spectroscopy systems, and a variety of instruments for radiation detection and measurement.

The NSC reactor design allows for easy load/unload of various types of samples. The NSC actively produces various kinds of radioisotopes for industry, researchers and academic users. The NSC provides nationally recognized neutron activation analysis (NAA) services to many research and academic institutions in the United States. The NSC reactor also actively supports the Nuclear Engineering Department on campus, one of the largest nuclear engineering programs in the United States. The NSC is one of the major attractions on campus. Last year alone, the NSC hosted 1,556 visitors including: elementary, middle and high school, college students, faculty members, clients and national laboratory and industrial scientists and engineers. Through these tours, the NSC teaches people with widely varying backgrounds what nuclear power is, and what radiation is and a little about nuclear science.

With the strong support from the University, the NSC is continuously increasing the diversity of its facilities and services. Currently, the NSC is developing a new Fast Flux Irradiation Device (FFID), which will have a cooling system to remove the heat generated in the device, a new topaz irradiation device for quality irradiation of gemstones, an ^{125}I recovery system and long-wire irradiation device. The NSC is developing a third generation Xe-124 irradiation system for ^{125}I production. In addition to these projects, the NSC and the Nuclear Engineering Department have won a grant to create Innovations in Nuclear Infrastructure for Education. As part of this, the NSC is building a robust neutron detection system and is producing the prototype for distance learning modules.

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). The facility license currently expired in March 2003 and currently enjoys timely renewal status.

1.1. Nuclear Science Center Staff

The staff at the Nuclear Science Center consists of five groups including: Reactor Operations, Reactor Maintenance, Health Physics, Technical Coordination and Administrative Service (see Figure 1). 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.

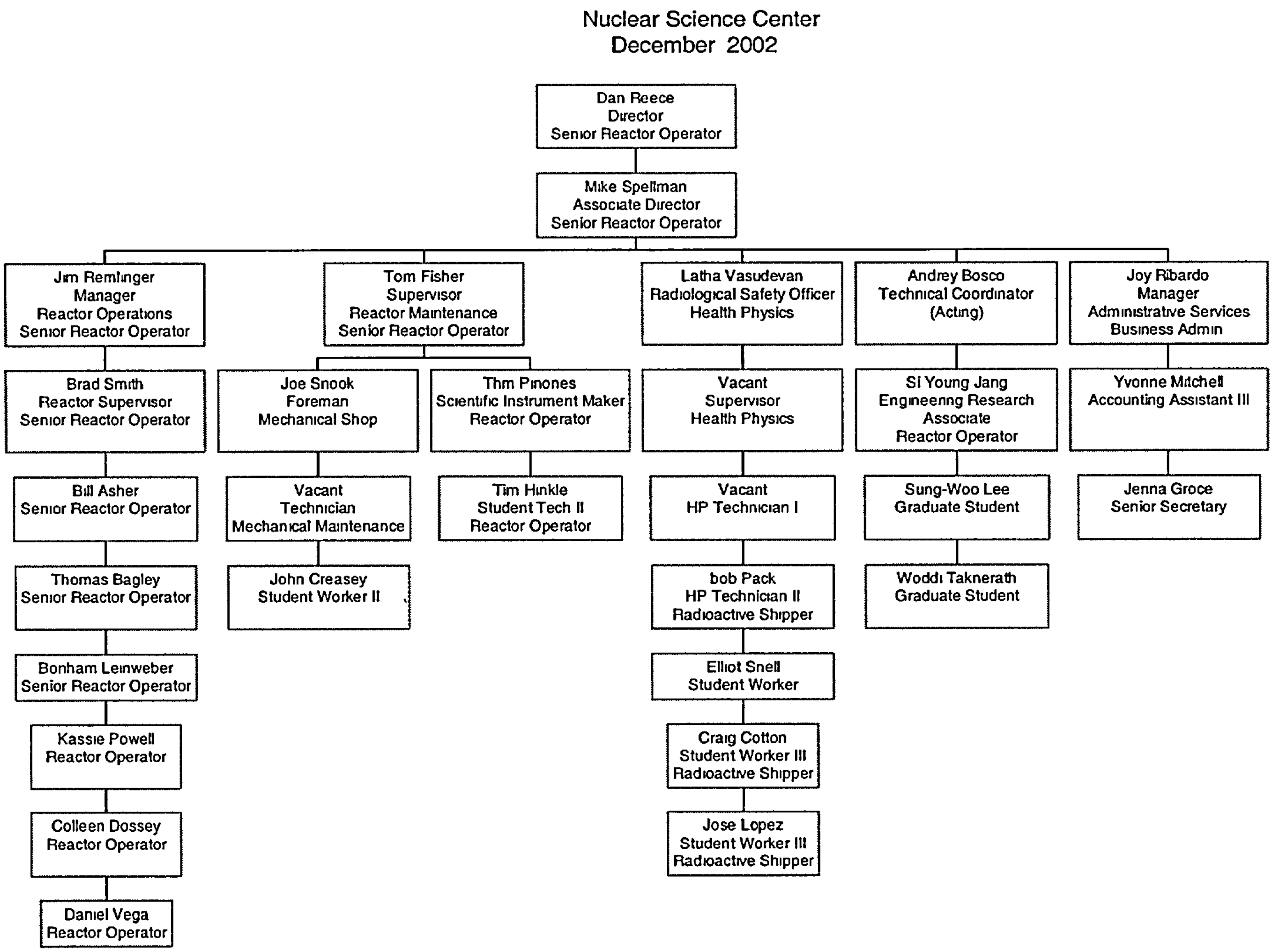

Figure 1: Nuclear Science Center Organization Chart

The Texas Engineering Experiment Station (TEES) of the Texas A&M University System operates the Nuclear Science Center (NSC). The Director of the Nuclear Science Center (NSC) is responsible to the Deputy Director of the TEES for the administration and the proper and safe operation of the facility. 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 it is required for emergencies and for special operations as agreed.

2. Reactor Utilization for 2002

The Nuclear Science Center (NSC) reactor has been in operation since 1962. The reactor is a 1-MW, MTR-converted TRIGA reactor. The reactor uses highly enriched uranium fuel (70%), but will use a 20% enriched fuel core when DOE funds become available. Core VIII-A is the current core configuration and has been in use since March 1986. The NSC reactor is pulse operational and is pulsed up to powers of approximately 1,100 MW for nuclear engineering laboratories, staff training and public tours.

The NSC reactor operated for 1965 hours in 2002 with a total integrated power of 81.3 MW-days. There were 546 irradiations and services performed 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. Many departments at TAMU and other universities used the reactor regularly in the past year. The NSC reactor had about 95% availability in 2002.

Table 2-1: Reactor Utilization Summary in 2002

Days of Reactor Operation	237
Integrated Power (MW-days)	81.3
Number of Hours at Steady-State	1965
Number of Pulses	85
Number of Reactor Irradiations (RFS)	546
Beam Port/Thermal Column Experiment Hours	869
Hours Irradiation Cell Use	205
Number of Visitors	1,556
Unscheduled Shutdowns	0

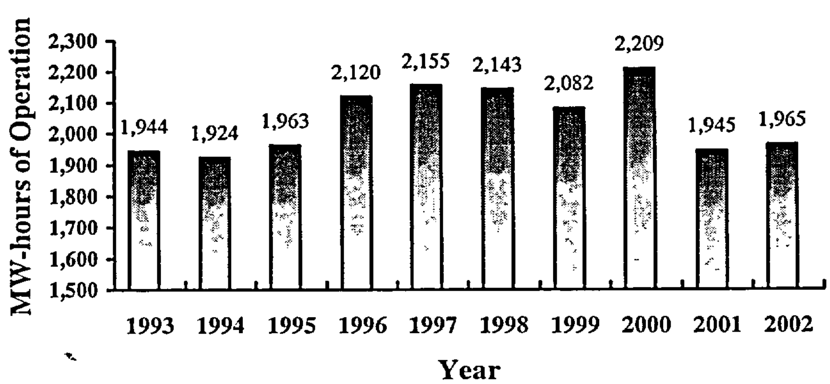

Figure 2: Annual Reactor Utilization

2.1. Research Enhancement Program (REP)

The 70th Texas Legislature established the Research Enhancement Program (REP) in 1987 to "encourage and provide for research conducted by faculty members." The REP replaced the former "Organized Research" program. The TAMU Office of the Vice President for Research administers the REP funds and generally allocates these funds to the NSC early in the fiscal year. TAMU faculty members who desire to use the irradiation services at the NSC reactor must apply at the NSC to receive local funding for each individual project. This proposal method is flexible and does not hinder a project's start-up time.

2.2. TAMU Academic Support Program

Texas A&M University (TAMU) 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.

2.3. DOE University Reactor Sharing Program

The DOE University Reactor Sharing Program provides funds for reactor experimentation to those institutions that do not normally have access to a research reactor. The Nuclear Science Center (NSC) has participated in the program since 1980. During the 2001-2002-contract year, nine research institutions utilized the NSC with the support of the Reactor Sharing Program. Additionally, the funding provided reactor tours and "hands-on" projects to many secondary schools. The research projects supported by the program include items such as dating geological material and producing high current super conducting magnets. The funding gave several small colleges and universities the opportunity to use the NSC facilities for teaching courses in nuclear processes, specifically neutron activation analysis and gamma spectroscopy. The Reactor Sharing Program supported the use of the Fast Flux Irradiation Device for multiple users at New Mexico Institute of Mining and Technology and the University of Nevada at Las Vegas. This device has near optimum neutron fluxes for $^{39}Ar/^{40}Ar$ dating.

2.4. Commercial Activity and External Research

The NSC provides services to a variety of users who provide their own funding. The majority of commercial activities relate producing radioactive tracers for the Texas petroleum and chemical industries. Another commercial activity uses the converted Thermal Column area to produce micropore filters used in ultra-pure water systems in the semiconductor industry. Outside research grants fund a significant amount of the NSC's research. 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 significant activities. The NSC staff takes precautions to minimize their exposures during the transfer of radioactive materials to shipping shields.

3. Facility and Procedure Changes

3.1. Facility Modifications

The following are facility modifications and maintenance items authorized and implemented in accordance with 10 CFR 50.59. NSC staff meeting minutes or RSB meeting minutes document the approval for these items as appropriate.

The NSC staff made no modifications to the facility in 2002.

3.2. Experiment Authorizations and Modifications

3.2.1. Third Revision to Experiment Authorization to Produce I-25 (November 2002)

This change of the Xenon irradiation project changed the limit on pressure in the Xenon Irradiation Device. Specifically, the pressure limit is now a multiple of the manufacturer's limit of the most limiting component. The Reactor Safety Board and the NSC staff reviewed the authorization per 10CFR50.59.

3.2.2. Full Power Cell Operations

The "Operation of the NSCR at Full Power in the Cell Location" increases the power limit during Irradiation Cell operations to the same limit as other conditions. The NSC staff conducted test runs to determine facility radiation levels and thus establish necessary controls for this operation. The Reactor Safety Board and the NSC staff reviewed the authorization per 10CFR50.59.

3.2.3. Iodine Processing

The NSC staff may chemically recover I-125 provide an I-125 solution to NSC customers. Recent upgrades to the Chemistry Lab, including the addition of glove boxes, facilitated this change. The Reactor Safety Board and the NSC staff reviewed the authorization per 10CFR50.59.

3.2.4. Sample Gas Cooling System

The NSC may now use cooling gases to keep samples at low temperatures during irradiations. The gas-cooling system will support gemstone irradiations and will supply cooling for the Fast Flux Irradiation Device. The Reactor Safety Board and the NSC staff reviewed the authorization per 10CFR50.59.

3.2.5. Neutron Radiography

The NSC staff replaced decades of experiment authorizations for specific situations with guidance for future applications. The new Experiment Authorization is specific and rigorous concerning safety controls and allows the researcher more flexibility for actual radiography methods.

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 surveillances required by the reactor license. Control rod worth and scram time measurements performed in September 2002 gave the following results. The total rod worth is $16.09. The most reactive control rod is Shim Safety #4 with a worth of $4.32. The shutdown margin was $4.91 and core excess was $4.96. 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 the most reactive fixed experiment is the Fast Flux Pneumatic Receiver (-$1.35) with leveling high boron loading the negative worth.

4.2. Unscheduled Maintenance

Table 4-1: Unscheduled Maintenance

1/4	Replaced two diodes in the thermal column Continuous Air Monitor. This fault cause pump failure.
1/4	Replaced the brass gear and adjusted the worm gear position on Facility Air Monitor channel-4 paper drive.
1/7	Replaced Switch on Beam Port-4 Cave door.
2/4	Replaced crane control pendant.
2/21	Replaced the bridge push-button switch on the Console to restore communication with personnel on Reactor Bridge.
3/28	Repaired air lines for Evacuation Alarm to restore the ability to silence alarm from the Reception Room.
4/4	Replace blown IC chip on the Transient Rod Control Board.
5/8	Repaired the concrete floor under the gravel-bed filter in the Demineralizer Room. This restored the structure of the filter.
6/7	Replaced IC chips in Laboratory-5 Area Radiation Monitor. Lightning damaged the chip.
7/3	Repaired grounding wire on gate entrance circuit. This damage was also from lightning.
7/18	Replaced IC chips in the fire alarm circuit. (Lightning damage)
7/22	Replaced defective area monitoring cameras. (Lightning damage)
8/1	Replaced IC chips in Laboratory-5 Area Radiation Monitor. Lightning damaged the chip.
10/4	Replaced Defective IC chip in Transient Rod Control Module.

4.3. Emergency Planning and Review

The NSC staff and Reactor Safety Board reviewed the NSC Security Plan on April 9, 2002 and December 12, 2002 respectively. Reactor Safety Board members completed all required external audits for the Emergency and Security plans during the reporting period.

4.4. Unscheduled Shutdowns

There were two unscheduled reactor shutdowns during 2002. The causes are detailed below:

Table 4-2: Unscheduled Shutdowns

8/7	Reactor Scrammed during startup due to spurious signal from Wide Range Monitor (Log Drawer). NSC Staff verified the instrument was operational and continued with the startup.
8/13	Reactor Scrammed due to loss of power from offsite.
1/7	Reactor Scram. Supply breaker to the Reactor Console tripped. NSC staff verified the breaker was operational.
2/4	Replaced crane control pendant.

5. Health Physics Surveillance

The purpose of Health Physics surveillance is to ensure safe use of radioactive materials in Nuclear Science Center's (NSC) research and service activities and to fulfill the regulatory requirements of U.S. Nuclear Regulatory Commission and State agencies. A dedicated Health Physics group is an integral part of the NSC organization. They are responsible for chemical and physical safety concerns as well as radiological. 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 2002 monitoring and technical support assured minimal exposure during sample handling, shipment of radioactive material, and normal reactor operation. The radiation exposures were ALARA. During 2002, NSC staff handled about 340 radioactive samples and shipped 255 to various research facilities including Texas A&M University campus. The NSC retained the remainder onsite. The staff handled a total of 255 curies in 2002.

5.2. Personnel Monitoring

The Personnel Monitoring program covered approximately 59 individuals. All measured doses to personnel were below the limits set forth in 10 CFR 20. Two individuals received whole body dose greater than 10% of the annual limit in10 CFR 20. Those doses were 739 mrem and 927 mrem deep dose equivalent 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 2002. The NSC recorded 7.73 manrem for all of 2002. When total manrem/curie was determined for 2002, the dose per curie equaled 0.03.

During 2002, approximately 1556 visitors toured the Nuclear Science Center. The NSC measured minimal exposures with pocket ion chambers worn by these visitors by their respective tour guides.

NSC employees who were likely to exceed 10% of their total annual dose wore TLDs/film badges and extremity dosimetry provided by Landauer, a NVLAP accredited supplier. Landauer also provided the analysis reports of the doses received.

5.3. Facility Monitoring

Surveys of the Nuclear Science Center facilities assessed radiological hazards to NSC workers. The Health Physics staff routinely monitored radiation levels and sources of radioactive contamination. The Health Physics staff collected and evaluated Approximately 350 smear samples each month. The surveyed all accessible areas at the NSC for radiation and contamination levels monthly. Areas where contamination is expected, access / egress controls are evaluated on shorter intervals. Area monitors were placed at strategic locations in the reactor facility, which provides dose equivalent (mrem) on a monthly basis. The following table summarizes the annual accumulated dose equivalent (mrem) recorded on the area monitors for 2002.

Table 5-1: Total Dose Equivalent (mrem) Recorded on Area Monitors

Monitor ID	Location	Accumulated Dose Equivalent (mrem)
BLDG MNTR 1	Upper Research Level Mezzanine	1257
BLDG MNTR 2	Lower Research Level Mezzanine	187
BLDG MNTR 3	Lower Research Level	116
AREA	Control Room	264
AREA	Upper Research Level	995
AREA	Hand and Foot Monitor Room	1180

5.4. Particulate Effluent Monitoring

Facility Air Monitors collect radioactive particulates at the base of the central exhaust stack The Health Physics staff summarized the results on a monthly basis. The annual average release concentration was 1.09E-11 µCi/cc. Total activity released for 2002 before dilution was 6.1E-04 Ci. The following table summarizes monthly particulate effluent releases during 2002.

Table 5-2: Monthly Particulate Effluent Release

Quarter	Month	Average Release Conc. (µCi/cc)	Diluted Concentration (µCi/cc)	Exhaust Volume (cc)	Total Release (Ci)	Total Release After dilution (Ci)
I	January	<MDA	<MDA	6.323E+12	<MDA	<MDA
	February	1.12E-11	5.58E-14	5.711E+12	6.37E-05	3.19E-07
	March	1.20E-11	6.01E-14	6.323E+12	7.61E-05	3.80E-07
	Average:	1.16E-11	5.80E-14	6.119E+12	7.09E-05	3.55E-07
			Total:	1.815E+13	1.40E-04	6.99E-07
II	April	2.05E-11	1.02E-13	6.119E+12	1.25E-04	6.27E-07
	May	5.48E-12	2.74E-14	6.323E+12	3.47E-05	1.73E-07
	June	8.02E-12	4.01E-14	6.119E+12	4.91E-05	2.45E-07
	Average:	1.13E-11	5.67E-14	6.187E+12	7.01E-05	3.50E-07
			Total:	1.863E+13	2.09E-04	1.05E-06
III	July	6.74E-12	3.37E-14	6.323E+12	4.26E-05	2.13E-07
	August	1.24E-11	6.22E-14	6.323E+12	7.87E-05	3.94E-07
	September	<MDA	<MDA	6.119E+12	<MDA	<MDA
	Average:	9.59E-12	4.80E-14	6.255E+12	6.00E-05	3.00E-07
			Total:	1.876E+13	1.21E-04	6.07E-07
IV	October	2.23E-12	1.12E-14	6.323E+12	1.41E-05	7.06E-08
	November	<MDA	<MDA	6.119E+12	<MDA	<MDA
	December	1.99E-11	9.96E-14	6.323E+12	1.26E-04	6.30E-07
	Average:	1.11E-11	5.54E-14	6.255E+12	6.93E-05	3.46E-07
			Total:	1.876E+13	1.40E-04	7.00E-07
Annual Summary	Average:	1.09E-11	5.45E-14	6.204E+12	6.76E-05	3.38E-07
			Total:	7.431E+13	6.10E-04	3.05E-06

* Minimum detectable activity (MDA): 1.25 E-11 µCi/cc

5.5. Gaseous Effluents Monitoring

Argon-41 is the major gaseous effluent produced and released at the Nuclear Science Center. The Facility Air Monitors monitor Ar-41 at the central exhaust stack. Total Argon-41 released during 2002 was 5.97 Ci with an annual average release concentration of 7.97 E-8 µCi/cc and with a diluted concentration of 3.98 E-10 µCi/cc.

The following table summarizes monthly gaseous effluent releases during 2002.

Table 5-3: Gaseous Effluent release

Quarter	Month	Average Release Conc. (µCi/cc)	Diluted Concentration (µCi/cc)	Exhaust Volume (cc)	Total Release (Ci)	Total Release after dilution (Ci)
I	January	1.15E-07	5.77E-10	6.323E+12	7.29E-01	3.65E-03
	February	4.66E-08	2.33E-10	5.711E+12	2.66E-01	1.33E-03
	March	8.45E-08	4.22E-10	6.323E+12	5.34E-01	2.67E-03
	Average:	8.21E-08	4.11E-10	6.119E+12	5.03E-01	2.51E-03
			total:	1.815E+13	1.53E+00	7.65E-03
II	April	7.20E-09	3.60E-11	6.119E+12	4.41E-02	2.20E-04
	May	1.98E-07	9.90E-10	6.323E+12	1.25E+00	6.26E-03
	June	1.39E-07	6.95E-10	6.119E+12	8.50E-01	4.25E-03
	Average:	1.15E-07	5.74E-10	6.187E+12	7.10E-01	3.55E-03
			total:	1.863E+13	2.15E+00	1.07E-02
III	July	3.20E-08	1.60E-10	6.323E+12	2.02E-01	1.01E-03
	August	1.57E-07	7.85E-10	6.323E+12	9.93E-01	4.96E-03
	September	1.79E-08	8.96E-11	6.119E+12	1.10E-01	5.48E-04
	Average:	6.90E-08	3.45E-10	6.255E+12	4.31E-01	2.16E-03
			total:	1.876E+13	1.30E+00	6.52E-03
IV	October	6.44E-08	3.22E-10	6.323E+12	4.07E-01	2.04E-03
	November	9.43E-08	4.72E-10	6.119E+12	5.77E-01	2.89E-03
	December	7.22E-11	3.61E-13	6.323E+12	4.57E-04	2.28E-06
	Average:	5.29E-08	2.65E-10	6.323E+12	3.35E-01	1.67E-03
			total:	1.876E+13	9.85E-01	4.92E-03
Annual Summary	**Average:**	7.97E-08	3.98E-10	6.221E+12	4.95E-01	2.47E-03
			total:	7.431E+13	5.97E+00	2.98E-02

* Minimum Detectable Activity (MDA): 1.56 E-07 µCi/cc

5.6. Liquid Effluents Monitoring

Collection tanks hold radioactive liquid effluents before release from the confines of the Nuclear Science Center. Before each release, the staff quantifies the activity of the water and identifies any isotopes. There were 19 releases in 2002, totaling 1.19E+6 gallons including dilution. The total radioactivity released was 6.35E-04 Ci with an annual average concentration of 1.40 E-07 µCi/cc. Summaries of the release data are in the table below. Radioactivity concentrations for each isotope found were below the Effluent Concentration limits specified in 10 CFR 20, Appendix B. Some of the major radionuclides identified in the waste stream are ^{24}Na, ^{46}Sc, ^{124}Sb, ^{54}Mn and ^{60}Co.

Table 5-4: Monthly Liquid Effluent Releases

Quarter	Month	Number of Releases	Volume Released (cc)	Total Radioactivity (Ci)	Average Concentration (µCi/cc)
I	January	2	3.81 E+08	7E-05	1.84 E-07
	February	*			
	March	*			
	Quarter Total:	2	3.81E+08	7 E-05	
II	April	2	3.51 E+08	2.93 E-05	8.35 E-08
	May	2	2.82 E+08	2.02 E-05	7.14 E-08
	June	2	2.9 E+08	3.13 E-05	1.08 E-07
	Quarter Total:	6	9.23 E+08	8.07 E-05	
III	July	4	9.83E+08	1.43 E-04	3.63 E-08
	August	3	7.15 E+08	2.25 E-05	1.05 E-08
	September	1	1.77 E+08	3.88 E-05	2.19 E-07
	Quarter Total:	8	1.88 E+09	2.04 E-04	
IV	October	3	7.15 E+08	9.36 E-05	1.31 E-07
	November	1	1.77 E+08	1.19 E-04	6.72 E-07
	December	2	4.49E+08	6.79E-05	1.51E-07
	Quarter Total:	6	1.34 E+09	2.8 E-04	
Annual Summary	**Total:**	22	4.52E+09	6.35E-04	1.4E-07

* No releases

6. Environmental Monitoring

A quarterly environmental survey program insures compliance with federal regulations in conjunction with representatives from the Texas Department of Health, Bureau of Radiation Control. This program consists of TLD monitors located at various locations on the NSC site and two background monitors one located 3.84 miles NW of facility and the other 0.25 miles SE of facility. The program also includes the collection, analysis and evaluation of NSC creek sediment and milk samples from the dairy downwind of the facility.

6.1. Environmental Survey Samples

The cooperative surveillance program between the Texas Department of Health and the Texas A&M University govern the schedule for collecting the environmental samples. The NSC staff uses an intrinsic germanium detection system for isotopic identification and analysis for the NSC creek sediment and milk samples from the dairy. The Texas Department of Health analyzed a second set of sediment and milk samples for comparison.

The concentrations of environmental samples determined for each quarter are below.

Table 6-1: Environmental Sample Analysis

MILK		
2002 Quarter	**Sample Location**	**Concentration (µCi/mL)-TDH**
1st	TAMU Dairy	< 5.7 E-09
2nd	TAMU Dairy	< 3.9 E-09
3rd	TAMU Dairy	< 2.9 E-09
4th	TAMU Dairy	< 9.8 E-09
	SEDIMENT	**(µCi/g)-NSC**
1st	NSC creek	<8.0 E-07
2nd	NSC creek	<7.0 E-07
3rd	NSC creek	<4.1 E-08
4th	NSC creek	<3.0 E-07

6.2. Site Boundary Dose Rate

The environmental survey program measures the integrated radiation exposures at the exclusion area boundaries. These measurements are for periods of approximately 91 days using TLDs . Monthly measurements of direct gamma exposure provide indication of radiation in microrem/h at each of the TLD locations. The Texas Department of Health (TDH), Bureau of Radiation Control, Division of Environmental Programs provides and processes the dosimeters. Total TLD dose is multiplied by the occupancy factor (1/16) to determine total deep dose to the general public.

The EPA has approved code, *COMPLY,* determined internal exposure to individuals outside the site area. The exposure calculated via *COMPLY* was 0.3 mrem/yr. This exposure, added to the calculated total deep dose, provides the dose received by the general public.

Table 6-2: Site Boundary Dose Rates

Site #	Location	Quarterly Exposure Rate (mrem/91 days)				TLD Dose	Deep Dose (mrem)	Internal Dose (mrem)	Total Dose (mrem)
2	300 ft. W of reactor building, near fence corner	3.2	4.0	3.9	3.8	14.9	0.93	0.08	1.01
3	250 ft W-SW of reactor building, on SW chain link fence	3.2	1.6	2.6	2.8	10.2	0.63	0.08	0.71
4	200 ft NW of reactor building, on chain link fence, near butane tank.	9.6	8.1	9.1	10.4	37.2	2.3	0.08	2.38
5	225 ft NE of reactor building, on fence N of driveway	2.1	3.2	3.9	3.8	13	0.81	0.08	0.89
10	190 ft SE of reactor building, near fence corner	1.1	1.6	2.6	4.7	10	0.625	0.08	0.705
11	300 ft NE of reactor building, near fence corner	1.1	0.8	1.3	3.8	7	0.43	0.08	0.51
18	375 ft NE of reactor building	2.1	4.8	4.0	4.7	15.6	0.97	0.08	1.05
19	320 ft NE of reactor building	2.1	2.4	2.6	5.7	12.8	0.8	0.08	0.88
14	3.84 miles NW of facility	0.0	0.8	0.0	2.8	3.6	0.22	0.08	0.3
23	0.25 miles SE of facility	0.0	0.0	0.0	0.0	0.0	0.0	0.08	0.08

7. Radioactive Waste Shipments

During the year 2002 there was no solid waste released from the NSC for disposal offsite.

8. Reactor Safety Board

The Reactor Safety Board is responsible for providing an independent review and audit of the safety aspects of the NSCR. The RSB meets at least once a year to review audit reports, security and emergency plans, new experiments and modifications to the facility.

8.1. Reactor Safety Board Membership (2002)

Chairman/Licensee:

Texas Engineering Experiment Station

Members:

Dr. Marvin Adams, Associate Professor
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