TEXAS ENGINEERING EXPERIMENT STATION

TEXAS A&M UNIVERSITY

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March 26, 2004

2004-0028

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C 20555

Subject: 2003 Annual Report (NRC Facility License R-83)

To Whom It may Concern:

Enclosed please find the 2003 Annual Report for the Texas A&M University Nuclear Science Center. If you have any questions regarding this, pleas feel free to call me at (979) 845-7551.

Sincerely,

Dr. W. D. Reece, Director

Enclosure

LV/jlg

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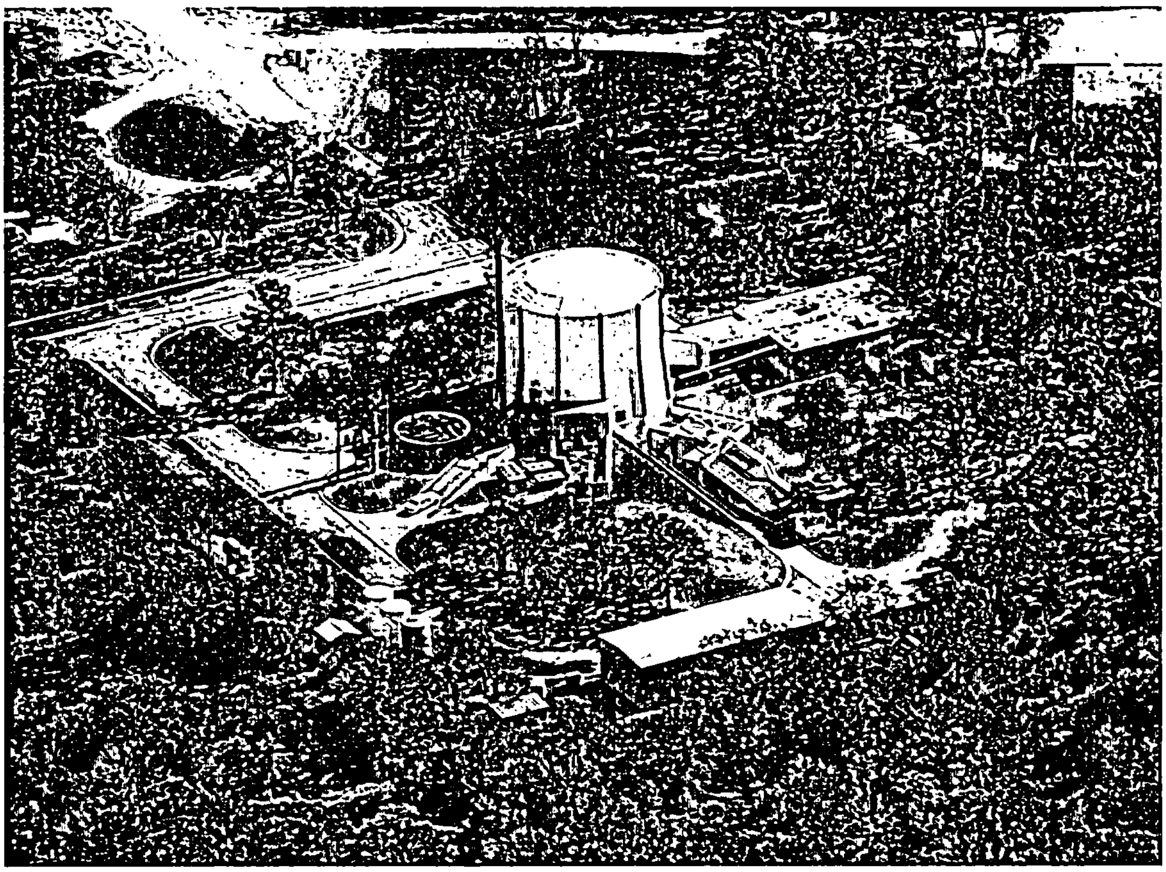
Annual Report

A020

Texas A&M University

Nuclear Science Center

2003 Annual Report



Nuclear Science Center

Texas Engineering Experiment Station

Texas A&M University System

College Station, Texas.

Texas A&M University System
Texas Engineering Experiment Station

Nuclear Science Center

2003 Annual Report

Facility Operating License R-83

1095 Nuclear Science Road
College Station, Texas 77843-3575

March 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 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, hospitals, 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 1164 visitors including: elementary, middle, high school, and 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. The NSC is continuing to develop the third generation ^{124}Xe irradiation system for ^{125}I. NSC and the Nuclear Engineering Department are maintaining the Innovations in Nuclear Infrastructure for Education Grant. As part of this, the NSC is building a robust neutron detection system and is producing the prototype for distance learning modules. NSC refurbished the delayed neutron counting system and the neutron radiography system.

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 renewal application was filed with NRC on February 2003. The facility is currently operating under timely renewal.

1.1 Nuclear Science Center Staff

The staff at the Nuclear Science Center consists of into four major groups including: Reactor Operations, Reactor Maintenance, Health Physics/Technical Coordination, and Administrative Services (Figure 1-1). 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.

Nuclear Science Center
December 2003

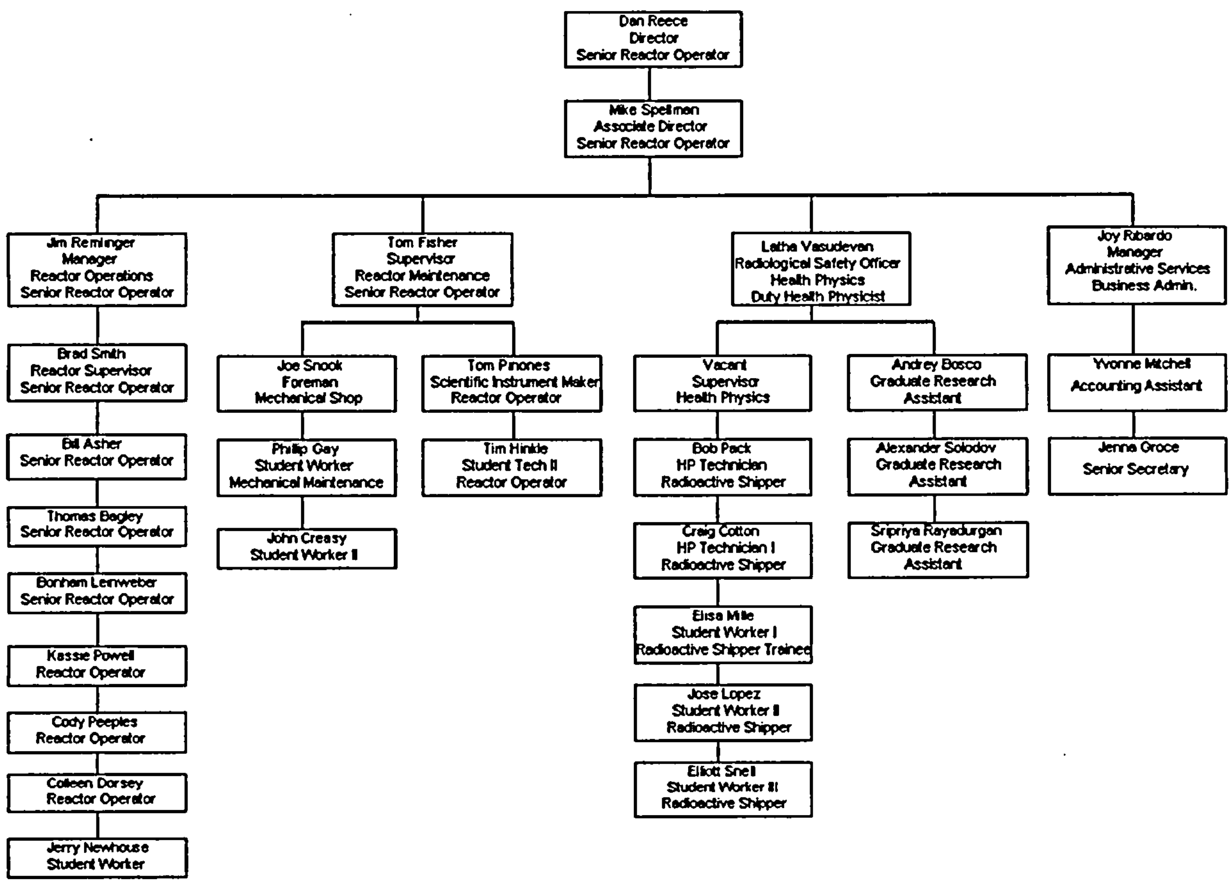

Figure 1-1. NSC Organization Chart

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) provide assistance when it is required for emergencies and for special operations as agreed.

2. Reactor Utilization for 2003

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 1947.2 hours in 2003 with a total integrated power of 79.8MW-days. There were 526 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 97% availability in 2003.

Table 2-1. Reactor Utilization Summary in 2003

Days of Reactor Operation	241
Integrated Power (MW-days)	79.8
Number of Hours at Steady-State	1947.2
Number of Pulses	55
Number of Reactor Irradiations (RFS)	526
Beam Port/Thermal Column Experiment Hours	535.1
Hours Irradiation Cell Use	2.8
Number of Visitors	1164
Unscheduled Shutdowns	6

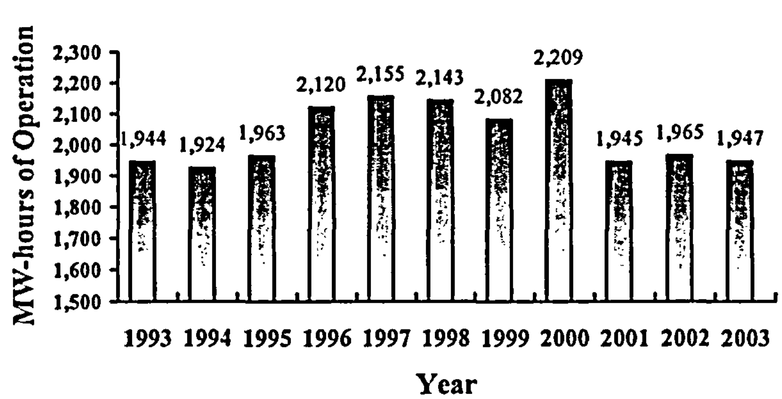

Figure 2-1. Annual Reactor Utilization

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. TAMUS 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 2002-2003-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 high 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

New Color Surveillance Monitors & Cameras were installed in December 2003. The electronic staff replaced the three monochrome monitors, in the control room, with two new color monitors. The new monitors have a split screen option, allowing up to eight cameras being viewed simultaneously. The existing black & white cameras were replaced with color cameras, and more cameras were added in strategic locations.

3.2 Experiment Authorizations and Modifications

There were no new experiment/modification authorizations initiated during the year 2003.

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 August 2003 gave the following results. The total rod worth is $15.67. The most reactive control rod is Shim Safety #4 with a worth of $3.92. The shutdown margin was $5.40 and core excess was $4.45. 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

1/23/03	Safety Channel #2 meter reading pegged low when the magnet power was on. One of the Safety Cannel's detector cables was grounding to the bridge. The cable was repaired and the unit was returned to service.
1/23/03	Shim Safety 3 magnet was not holding and the controller was resetting to a wrong indication. The magnet wiring

	and the controller logic circuit was repaired.
2/1/03	The Log Power drawer failed. A new pre-amp and an external power supply were installed and unit was returned to service.
2/20/03	The Up-Ramp Door was indicating open all of the time. The connections on the door switch were repaired.
3/15/03	The brass gear in the F.A.M. Channel 1 paper drive was replaced.
4/10/03	The South Core Light was replaced.
5/5/03	The wiring between the Beam Port 4 Cave door and the panel alarm was repaired after it failed to indicate an opened door.
10/9/03	An amplifier I.C. was replaced in the Control Room Intercom restoring communications with the front gate.
12/19/03	An I.C. was replaced in the Misc. Panel restoring proper indication of the Lower Research Level Access, in the Control Room.

4.3 Emergency Planning and Review

The Reactor Safety Board completed their audits of the emergency and security plans in 2003. The NSC staff and the Reactor Safety Board reviewed the NSC Security and Emergency Plans and audits at the August, 2003 board meeting. A successful facility wide emergency drill was conducted on December 16, 2003. Due to continuing concerns with terrorism consider review of the security plan was required during mid 2003. A set of compensatory security measure were submitted to the Nuclear Regulatory Commission for review and adoption. As of this date these measures are still in review.

4.4 Unscheduled Shutdowns

There were six unscheduled reactor shutdowns during 2003. The causes are detailed below:

Table 4-2: Unscheduled Shutdowns

1/14/03	Reactor Scrammed due to anticipatory circuitry in Safety Channel #2 during startup next to the Thermal Column.
4/15/03	Reactor Scrammed due to loss of power from offsite.
6/11/03	Reactor Scrammed due to high power circuitry in Safety Channel from high neutron reflection while operating next to the Thermal Column.
6/13/03	Reactor Scrammed due to loss of power from offsite.
6/24/03	Reactor Scrammed due to loss of power from offsite.
9/03/03	Reactor Scrammed due to high power circuitry in Safety Channel from slight sample position fluctuations and high neutron reflection while operating next to the Thermal Column.

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. The NSC maintains a Health Physics group as an integral part of the 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 monitoring and technical support that was provided in 2003 assured minimal exposure during sample handling, shipment of radioactive material, and normal reactor operation. The radiation exposures were maintained ALARA. During 2003, about 342 radioactive samples were handled of which 304 were sent to various research facilities including Texas A&M University campus and the rest retained at the Nuclear Science Center facility. A total of 231 curies were handled in 2003.

5.2 Personnel Monitoring

Personnel Monitoring was provided to approximately 71 personnel. All measured doses to personnel were below the limits set forth in 10 CFR 20. Five individuals received whole body dose greater than 10% of the annual limit in10 CFR 20. The doses recorded were 618, 717, 695, 779, and 571 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 2003. A total of 6.65 manrem was recorded for all of 2003. When total manrem/curie was determined for 2003, the dose per curie equaled 0.028.

During 2003, about 1164 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 TLDs/film badges and extremity dosimeters that were 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 were performed to assess radiological hazards to NSC workers. Radiation levels and sources of radioactive contamination were routinely monitored. Approximately 350 smear samples were collected and evaluated each month. All accessible areas at the NSC are surveyed for radiation and contamination levels monthly. Areas where contamination is expected, access / egress controls are in place and are evaluated on shorter intervals. Area monitors were placed at strategic locations in the reactor facility, this provides dose equivalent (mrem) on a monthly basis. The following table summarizes the annual accumulated dose equivalent (mrem) recorded on the area monitors for 2003.

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	1239
BLDG MNTR 2	Lower Research Level Mezzanine	163
BLDG MNTR 3	Lower Research Level	88
AREA	Control Room	194
AREA	Upper Research Level	798
AREA	Hand and Foot Monitor Room	2584

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 1.73E-11 µCi/cc. Total activity released for 2003 was 9.85E-04 Ci. The following table summarizes monthly particulate effluent releases during 2003.

Table 5-2. Monthly Particulate Effluent Releases

Quarter	Month	Average Release Conc.*1 (µCi/cc)	Diluted Concentration*2 (µCi/cc)	Exhaust Volume*3 (cc)	Total Release*4 (Ci)
I	January	1.52E-11	7.58E-14	6.32E+12	9.58E-05
	February	1.68E-11	8.41E-14	5.71E+12	9.60E-05
	March	1.38E-11	6.88E-14	6.32E+12	8.71E-05
	Average:	1.52E-11	7.62E-14	6.12E+12	9.30E-05

			total:	1.82E+13	2.79E-04
II	April	2.22E-11	1.11E-13	6.12E+12	1.36E-04
	May	2.90E-11	1.45E-13	6.32E+12	1.83E-04
	June	2.72E-11	1.36E-13	6.12E+12	1.66E-04
	Average:	2.61E-11	1.30E-13	6.19E+12	1.62E-04
			total:	1.86E+13	4.85E-04
III	July	<MDC	<MDC	6.32E+12	<MDC
	August	8.54E-12	4.27E-14	6.32E+12	5.40E-05
	September	6.49E-12	3.25E-14	6.12E+12	3.97E-05
	Average:	7.52E-12	3.76E-14	6.25E+12	4.69E-05
			total:	1.88E+13	9.37E-05
IV	October	<MDC	<MDC	6.32E+12	<MDC
	November	<MDC	<MDC	6.12E+12	<MDC
	December	2.02E-11	1.01E-13	6.32E+12	1.28E-04
	Average:	2.02E-11	1.01E-13	6.25E+12	1.28E-04
			total:	1.88E+13	1.28E-04
Annual Summary	Average:	1.72683E-11	8.63415E-14	6.20397E+12	0.000107325
			total:	7.43116E+13	0.000985395

notes:

1. Average Release Concentration data Form 805, Channel 1 * Activity Released
2. Diluted Concentration equal to Average 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)*(5000cfm)/ 3.53E-5cfm/cc)
4. Total Release equal to:(Average Release Concentration)*(Exhaust volume)* (1Ci/ 1E6 uCi)

- Minimum Detectable Concentration (MDC) 1.1 E-11 µCi/cc

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 2003 was 5.25 Ci with an annual average release concentration of 7.01E-8 µCi/cc and with a diluted concentration of 3.51E-10 µCi/cc.

The following table summarizes monthly gaseous effluent releases during 2003.

Table 5-3. Monthly Gaseous Effluent Releases

Quater	Month	Average Release Conc. *1 (µCi/cc)	Diluted Concentration*2 (µCi/cc)	Exhaust Volume*3 (cc)	Total Release*4 (Ci)
I	January	1.04E-07	5.19E-10	6.32E+12	6.56E-01
	February	5.98E-08	2.99E-10	5.71E+12	3.41E-01

	March	4.19E-08	2.10E-10	6.32E+12	2.65E-01
	Average:	6.85E-08	3.42E-10	6.12E+12	4.21E-01
			total:	1.82E+13	1.26E+00
II	April	6.26E-08	3.13E-10	6.12E+12	3.83E-01
	May	7.00E-09	3.50E-11	6.32E+12	4.43E-02
	June	2.20E-08	1.10E-10	6.12E+12	1.35E-01
	Average:	3.05E-08	1.53E-10	6.19E+12	1.87E-01
			total:	1.86E+13	5.62E-01
III	July	8.25E-08	4.13E-10	6.32E+12	5.22E-01
	August	4.85E-08	2.43E-10	6.32E+12	3.07E-01
	September	4.68E-08	2.34E-10	6.12E+12	2.86E-01
	Average:	5.93E-08	2.96E-10	6.25E+12	3.72E-01
			total:	1.88E+13	1.12E+00
IV	October	1.06E-07	5.31E-10	6.32E+12	6.73E-01
	November	4.93E-08	2.47E-10	6.12E+12	3.02E-01
	December	2.11E-07	1.05E-09	6.32E+12	1.33E+00
	Average:	1.22E-07	6.11E-10	6.32E+12	7.69E-01
			total:	1.88E+13	2.31E+00
Annual	**Average:**	7.01E-08	3.51E-10	6.22E+12	4.37E-01
Summary			total:	7.43E+13	5.25E+00

notes:

1. Average Release Concentration data Form 805, Channel 3 " Activity Released
2. Diluted Concentration equal to Average 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)*(5000cfm)/ 3.53E-5cfm/cc)
4. Total Release equal to:(Average Release Concentration)*(Exhaust volume)* (1Ci/ 1E6 uCi)

- Minimum Detectable Concentration (MDC) 1.1 E-07 µCi/cc

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. There were 17 releases in 2003, totaling 5.29E+5 gallons including dilution. The total radioactivity released was 9.55E-04 Ci with an annual average concentration of 4.77E-07 µCi/cc. Summaries of the release data are presented 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 Mn^{54}, Sc^{46}, Sb^{124} and Co^{60}.

Table 5-4. Monthly Liquid Effluent Releases					
Quarter	Month	Number of Releases	Volume Released (cc)	Total Radioactivity (Ci)	Average Concentration (µCi/cc)
I	January	*	*	*	*
	February	1	1.01 E+08	4.79 E-05	4.76 E-07
	March	1	1.07 E+08	4.14 E-05	3.86 E-07
	Quarter Total:	2	2.08 E+08	8.93 E-05	
II	April	2	1.89 E+08	2.25 E-04	1.19 E-06
	May	2	2.79 E+08	9.63 E-05	3.45 E-07
	June	1	2.55 E+08	2.46 E-05	9.65 E-08
	Quarter Total:	5	7.23 E+08	3.45 E-04	
III	July	1	2.44 E+08	1.18 E-05	4.84 E-08
	August	3	1.59 E+08	6.92 E-05	4.34 E-07
	September	1	1.21 E+08	5.91 E-05	4.87 E-07
	Quarter Total:	5	5.24 E+08	1.40 E-04	
IV	October	3	3.71 E+08	9.49 E-05	2.56 E-07
	November	2	1.76 E+08	2.85 E-04	1.61 E-06
	December	*	*	*	*
	Quarter Total:	5	5.47 E+08	3.80 E-04	
Annual Summary	**Total:**	17	2.00 E+09	9.55 E-04	4.77 E-07

* No releases

6. Environmental Monitoring

In conjunction with representatives from the Texas Department of Health, Bureau of 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. The collection, analysis, and evaluation of NSC creek sediment, and milk samples from the dairy downwind of the facility are also included in the program.

6.1 Environmental Samples

The environmental samples were collected in accordance with the schedules of the cooperative surveillance program between the Texas Department of Health and the Texas A&M University. NSC creek sediment and milk samples from the dairy were analyzed using an intrinsic germanium detection system for isotopic identification at the NSC. A second set of sediment and milk samples were analyzed by the Texas Department of Health for comparison.

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

Table 6-1. Environmental Sample Analysis MILK		
2003 Quarter	**Sample Location**	**Concentration (µCi/mL)-TDH**
1st	TAMU Dairy	< 1.3 E-06
2nd	TAMU Dairy closed out	*
3rd	TAMU Dairy closed out	*
4th	TAMU Dairy closed out	*
	SEDIMENT	**(µCi/g)-NSC**
1st	NSC creek	<1.37E-06
2nd	NSC creek	<4.9 E-06
3rd	NSC creek	<5.4 E-06
4th	NSC creek	<7.6 E-06

* Since the A&M dairy was closed, TDH no longer require NSC to submit milk samples.

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 91 days using TLDs. Monthly measurements of direct gamma exposure rate in µrem/h are also made at each of the TLD locations. The dosimeters are provided and processed by Texas Department of Health (TDH), Bureau of Radiation Control, Division of Environmental Programs Total TLD dose is multiplied by the occupancy factor (1/16) to determine total deep dose to the general public.

To determine internal exposure to individuals outside the site area the EPA's approved code COMPLY was used. The exposure calculated via COMPLY was 0.077 mrem/yr. This exposure is added to the calculated total deep dose. This total is 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	4.0	2.8	3.5	3.2	13.5	0.84	0.077	0.92
3	250 ft W-SW of reactor building, on SW chain link fence	4.0	1.9	3.5	1.6	11	0.69	0.077	0.77
4	200 ft NW of reactor building, on chain link fence, near butane tank.	8.1	5.6	8.3	8.0	30	1.9	0.077	1.98
5	225 ft NE of reactor building, on fence N of driveway	5.1	1.9	4.7	3.2	14.9	0.93	0.077	1.0
10	190 ft SE of reactor building, near fence corner	3.0	0.9	2.4	2.4	8.7	0.54	0.077	0.62
11	300 ft NE of reactor building, near fence corner	3.0	0.9	2.4	1.6	7.9	0.5	0.077	0.58
18	375 ft NE of reactor building	7.1	3.7	5.9	4.0	20.7	1.3	0.077	1.38

19	320 ft NE of reactor building	4.0	3.7	4.7	2.4	14.8	0.93	0.077	1.0
14	3.84 miles NW of facility	0.0	0.9	2.4	0.8	4.1	0.26	0.077	0.34
23	0.25 miles SE of facility	0.0	0.0	0.0	0.0	0.0	0.0	0.077	0.077

7. Radioactive Waste Shipments

During the year 2003 there was no solid waste released from the NSC for disposal offsite. But some solid waste stored for decay with short half-lives (<300 d) were segregated and sorted as non-radioactive.

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.

Membership (2003)

Chairman/Licensee:

Dr. Kenneth Hall, Interim Deputy Director
Texas Engineering Experiment Station

Members:

Dr. John Ford, Assistant Professor
Nuclear Engineering Department

Dr. Marvin Adams, 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

Ex-Officio Members:

Dr. Warren Reece, Director
Nuclear Science Center

Dr. Latha Vasudevan, NSC RSO
Nuclear Science Center

Dr. William Burchill, Professor and Head
Nuclear Engineering Department

Mr. John Salsman, Assistant Director/RSO
Environmental Health and Safety Department

Mr. Robert Berry, Reactor Supervisor
AGN201, Nuclear Engineering Department