STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

RHODE ISLAND ATOMIC ENERGY COMMISSION
Rhode Island Nuclear Science Center
16 Reactor Road
Narragansett, RI 02882-1165

REQUESTING A RENEWAL OF
OPERATING LICENSE NO. R-95

May 3, 2004

United States Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555-001

RE: Docket No.50-193: Rhode Island Atomic Energy Commission
Application for Renewal of Operating License No. R-95

The Rhode Island Atomic Energy Commission (RIAEC) hereby applies for renewal of its Operating License No. R-95 issued in July 1964 by the Nuclear Regulatory Commission (NRC). The RIAEC license is currently scheduled to expire on July 21, 2004.

Specifically, in accordance with Title 10 of the Code of Federal Regulations, the RIAEC encloses the following materials for your review:

1. Enclosure 1: General Information (10 C. F. R. § 50.33);
2. Enclosure 2: Updated Safety Analysis Report (SAR) for the RIAEC Training Reactor (10 C. F. R. § 50.33).
3. Enclosure 3: Environmental Report (10 C. F. R. Part 51)
4. Technical Specifications (ANSI/ANS 15.1/ NUREG-1537) SAR Chapter 14
5. Enclosure 5. Oath (10 C.F. R. 50.30(b))
6. Financial Qualifications (10 C. F. R. 50.33(f))
7. Operator Re-qualification Program (10 CFR50.54 and 10 CFR Part 55)

No changes are being requested to The Emergency Plan (10 C. F. R. 50.54(q) and (r) and 10 C. F. R. Part 50) or The Physical Security Plan (10 C. F. R. 73.67), which are currently held by the NRC. Therefore, they are not enclosed in this document.

By copy of this letter, the RIAEC is also transmitting one copy of the Application for Renewal to the inspector of the RINSC and Mr. Alexander Adams, Jr., Senior Project Manager, Events Assessment, Generic Communications and Non-Power Reactors Branch, Division of Regulatory Improvement Programs of the NRC, United States Nuclear Regulatory Commission Document Control Desk.

A020
A053
4003
IE25

Please contact Dr. Terry Tehan, RIAEC Director, at (401- 789-9391) for any additional information and clarification and to schedule a visit to the RIAEC. Thank you for your consideration.

Vincent Rose

Vincent Rose Ph.D.
Chairman, RIAEC

Copy to: - Mr. Marvin Mendonca NRC
Mr. Daniel Hughes- NRC
Mr. Alexander Adams, Jr. - NRC
RIAEC (W/O enclosures)

Enclosure 1
General Information (10 C. F. R. 50.33)

Name of Applicant: Rhode Island Atomic Energy Commission

Address of Applicant: c/o Dr. Vincent Rose, Chairman
Rhode Island Nuclear Science Center
16 Reactor Rd.
Narragansett, R.I.

Description of Business of Applicant:

The mission of the Rhode Island Atomic Energy Commission (RIAEC) is specified in Rhode Island General laws. The Commission will:

(1) Conduct studies and make recommendations to the governor and the general assembly for the enactment of laws or amendments to laws or the promulgation of regulations as may appear necessary and appropriate regarding nuclear materials and nuclear facilities.

(2) Advise the governor and the general assembly with respect to nuclear related industrial development within the state.

(3) Coordinate the development and regulatory activities of the state relating to the industrial and commercial uses of atomic energy.

(4) Cooperate with the federal commissions and with like commissions or agencies of the other states in all matters relating to nuclear science and technology.

(5) Operate the Nuclear Science Center and its nuclear reactor for the purpose of research, experimentation, training personnel, testing of materials and techniques, and for such other purposes, as the commission shall deem necessary for the health, welfare, and economy of the people of this state.

(6) To cooperate with and make available, under proper safeguards, the use of the Rhode Island Nuclear Science Center by the colleges, universities, and industries of this state and to contract for and engage engineers, technicians, and other assistance.

Legal Status and Organization:

Applicant is a Rhode Island state agency established under Rhode Island General law 42-27 for matters relating to nuclear power.

Principal Administrative Officers of the RIAEC:

Dr. Vincent Rose, chairman, RIAEC
Dr. Stephen Mecca, Commissioner, RIAEC
Dr. Stanley Pickart, Commissioner, RIAEC
Dr. Alfred L. Allen, Commissioner, RIAEC
Dr. L. Peter Gromet, Commissioner, RIAEC
Dr. Terry Tehan, Director RIAEC

Correspondence for to the Rhode Island Atomic Energy commission can be sent to

Rhode Island Atomic Energy Commission
16 Reactor Rd.
Narragansett, RI 02882
Telephone: 401-789-9391, fax 401-782-4201

Enclosure 1 – 1

Class of License: The Rhode Island Atomic Energy Commission seeks renewal of a Class 104 operating license for a renewal term of twenty (20) years. RINSC will continue to be used during the period of renewal primarily for research, training, and education in support of its mission to support educational institutions and industries in the state. This application does not seek approval for any construction or alteration in the structure of the RINSC reactor facility. This application requests a renewal of any and all NRC licenses that are currently subsumed or combined with the current operating license.

Communications:

All communications to the RIAEC relating to this Application should be sent to the following persons at the RIAEC:

Dr. Vincent Rose, Chairman, RIAEC
Rhode Island Nuclear Science Center
16 Reactor Rd.
Narragansett, RI 02882

Dr. Terry Tehan, Director
Rhode Island Nuclear Science Center
16 Reactor Rd.
Narragansett, RI 02882

Enclosure 5: OATH

AFFIRMATION of Rhode Island Atomic Energy Commission. Docket No. 50-193
WASHINGTON COUNTY, RI. United States Nuclear Regulatory Commission

I, Dr. Terrence N. Tehan am the director of the Rhode Island Atomic Energy Commission and certify that I am duly authorized to execute and file this Application for Renewal of Operating License No. R-95 for a Class 104 facility on behalf of the Rhode Island Atomic Energy Commission To the best of my knowledge and belief, the statements contained in the documents comprising this Application for Renewal are true and correct. To the extent that statements are not based on my personal knowledge, they are based upon information provided by other Rhode Island Atomic Energy Commission employees, officers or agents. I have reviewed such information and believe it to be reliable. This Affirmation is submitted in accordance with Title 10 Code of Federal Regulations Section 50.30(b).

Dr. Terrence N. Tehan
Rhode Island Atomic Energy Commission

NOTARY PUBLIC, STATE OF RHODE ISLAND

Subscribed and sworn before me, a Notary Public in and for the State of Rhode Island and Washington County, this 29th Day of April, 2004.

Witness my Hand and Notarial Seal:

Notary Public Joyce L Lemoi

My Commission Expires: 18 June 2005

Environmental Effects Assessment for Re-licensing the Rhode Island Nuclear Sciences Center Research Reactor

Prepared by:
CN Associates, Inc.
Harvard, MA 01451
April 2004

Executive Summary

The operating license for the Rhode Island Nuclear Science Center (RINSC) reactor was issued on July 21, 1964 and is due to expire on July 21, 2004. RINSC is currently in the process of preparing a license renewal application for an additional twenty-year period of operation, which will include an environmental report, as specified in 10 CFR 51.45. The RINSC management, in preparation of their license renewal application, has requested an independent assessment of the impact of current and future facility operations on the environment. The RINSC conversion from HEU to LEU fuel, which occurred in 1993/1994, and accompanying major revision of the Technical Specifications (Amendment 18, dated 3/9/1994), provided a convenient point in the operating history for a retrospective review of RINSC practices and documents.

Various operating procedures, reports, logs and raw data sheets were reviewed in the assessment, along with the operating license and technical specifications. In addition, pertinent standards, regulations and guidance documents were reviewed. RINSC staff provided a tour of the facility and participated in numerous discussions involving general operating practices.

The format of the assessment report follows the form and content of the section on "environmental effects of facility operation" in the generic environmental assessment found in NUREG1537 Part 2, Appendix 12.1. This RINSC report describes the assessment activities performed, identifies and discusses observations, and makes recommendations.

In general, the assessment determined that RINSC is in compliance with all federal and state regulations reviewed. Radioactive effluent releases were well within the limits of 10CFR20 requirements. Chemical and solid radioactive wastes are handled in a proper manner, and other environmental effects, such as thermal effects, are negligible. The RINSC reactor, if operated in accordance with current practices, is not likely to produce any adverse effects on the environment as a result of continued operation.

The assessment did identify several errors, omissions, and inconsistencies in record keeping and reporting practices that should be of concern to the facility. These are identified in detail in the body of the report. In addition, several recommendations were made concerning data clarification and the initiation of some industry "good practices".

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Introduction

The operating license for the Rhode Island Nuclear Science Center (RINSC) reactor was issued on July 2, 1964 with an expiration date of August 27, 2002. The license was amended on July 28, 2000 to extend the expiration date to July 21, 2004. RINSC is currently preparing a license renewal application for an additional twenty-year period of operation.

In accordance with the National Environmental Protection Act (NEPA), all agencies of the Federal Government are required to include, in every recommendation or report on proposals for legislation, a detailed statement by the responsible official on the environmental impact of the proposed action. Sections 10 CFR 51.41 and 10 CFR 51.45 of the Code of Federal Regulations describe the preparation of an environmental report by an applicant or petitioner for rulemaking, which may be useful in aiding the Nuclear Regulatory Commission in complying with section 102(2) of NEPA. Further guidance is given in NUREG 1537 PART 1, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors", Chapter 12, on preparation of an environmental report to support the license renewal process. A generic environmental assessment is given in NUREG 1537 Part 2, Appendix 12.1. The Rhode Island Nuclear Science Center (RINSC), in preparing their application for license renewal, has requested an independent assessment of the impact of current and future facility operations on the environment. This assessment can be used as supportive documentation to the formal environmental report, and also as a tool for management to assess where further improvements can be made.

In 1993/1994, the 2 MW RINSC open pool reactor was converted from 93% UAL-High Enriched Uranium (HEU) fuel to 20% enrichment U3Si2-Al Low Enriched Uranium (LEU) fuel. Along with this conversion, a major revision of the Technical Specifications to reflect the ANSI N378 (later ANSI/ANS 15.1) format and content occurred (Amendment 18, dated 3/9/1994). This point in the operating history marked not only a significant change in reactor operation, but also a significant change in the Technical Specifications requirements. As such, it provides a convenient end point for a retrospective review of RINSC practices and documents. The goal of this review, as it supports the re-licensing effort, is to assess the potential future environmental impact from continued operation of the RINSC reactor facility. Thus, a comprehensive review of current practices and historical data since 1994 was conducted.

The current practices related to environmental impact were reviewed with regard to the requirements set forth in the following documents:

1. Facility License (R-95)
2. The Operating Technical Specifications (Docket 50-193, License R-95 Revision 1, Amendment 28)
3. RINSC Standard Operating Procedures
4. Regulatory Guidance
5. The commitments made in the draft Safety Analysis Report (SAR)

The annual reports submitted to the Nuclear Regulatory Commission (NRC) and the semi-annual NRC inspection reports were also reviewed. Table 1 provides a summary of all documents reviewed. The Item Numbers in Table 1 identify the areas of review, and are referenced in subsequent sections of this report where they are discussed.

The format of this report follows the form and content of the section on "Environmental Effects of Facility Operation" in the generic environmental assessment found in NUREG 1537 Part 2, Appendix 12.1.

Table 1 - Summary of RINSC Documents Reviewed

Item	Reviewed Document	Operations Category	Subject
1	° Annual Reports 94-02 ° Operator's Daily Log ° Draft Procedure 810, Stack Monitor Gas Calibration ° Canberra Industries Detector Manual, Section 7.9, 2002 ° NRC Inspection Report, March 2001	TS 3.7.1.a TS 4.7.a TS 6.8.4.g	Gaseous Effluent Releases Required: Annual Calibration, Channel Check Prior to Use of Air Monitors Reporting Requirements
2	° Annual Reports 94-02 ° Draft Procedure 210 ° Comply Code outputs ° SAR section 11.1.7 ° NRC Inspection Report, March 2001	TS 6.8.4.e TS 6.5.6 Public Dose	Environmental Exposure Radiation Control Procedures Demonstrating Compliance with 10CFR20 Public Dose Limit
3	° Annual Reports 94-02 ° Canberra Industries Detector Manual, Section 7.9, 2002 ° Packard Tricarb Manual ° "Rhode Island Radiological Emergency Response for the Ingestion Pathway Progress and Data Report for 1997/1998"	TS 3.7.2.b TS 4.7.b TS 6.8.4.g	Liquid Effluent Releases Storage Tank Sampled and Evaluated for Radioactive Concentrations and pH Prior to its Release. Reporting Requirements
4	° Procedure 501 ° Draft Procedure 502 ° Procedure 510 ° Draft Procedure 512 ° "The Rhode Island Nuclear Science Center Conversion from HEU to LEU Fuel," T. Tehan, Ph.D. Director, Rhode Island Nuclear Science Center Narragansett, Rhode Island	Radwaste	Radioactive Waste Packaging Decay-In-Storage Neutron Collimator Disposal BIOPAL Wastes
5	Annual Reports 1994-2003	Chemical Waste	
6	° Pool Leak File ° Memo to Pool Leak File, " "Update of Pool Leak Status," March 8, 2004 ° Annual Reports 1994-2003		Treatment of Pool Leak Water
7	15K/1K Underground Storage Tanks File		Decommissioning of Underground Liquid Waste Storage Tanks
8	TS 6.9 Plant Operating Records	TS 6.9.2	Life of Facility: Effluents, Off-Site Exposure, Personnel Exposure, Minutes of NRSC Meetings, Facility Drawings
9	License No. R-95	General	Issue Date: 9.10.68 Expiration Date: 8.27.02

Thermal Effluents

The operation of the RINSC reactor has no thermal effects on the environment. Cooling of the primary system is achieved by the transfer of heat, via a heat exchanger, to a recirculating secondary coolant loop. The secondary side water is pumped to a cooling tower where the heat is dissipated to the environment. No significant fog is produced. An additional redundant secondary system is in place. Each secondary loop is capable of cooling at a 3MW reactor power level. Upgrade of the Cooling Loop No. 1 Pump to increase the flow rate, and installation of a second secondary cooling system with a 3MW cooling capacity, has optimized the coolant safety margins. At the current licensed reactor power level of 2MW, the second coolant system provides redundancy.

Gaseous Effluents

A. Specification: Table 1 Item 1 corresponding to TS - 3.7.2.a

Regulatory Guidance:

10CFR 20 Appendix B, Table 2.

Procedure Summary and/or General Practices:

The ventilation stack is equipped with a continuous air monitor (CAM) that consists of a particulate filter, a charcoal cartridge for retention of iodine, and a noble gas monitor. The gas monitor readout (cpm due to Ar-41 gas) is in the control room and is logged during each run. The release concentration is determined by applying a stack monitor calibration factor in uCi/cc per cpm. This concentration is compared to the release limit specified in 10CFR20, adjusted upward, since the release measurements are made prior to dilution. Specification 1 of Technical Specification Section 3.7.2 stipulates that the concentration released will not exceed 10^5 times the 10CFR20 concentration for Ar-41 or 1E-03 uCi/cc at the stack.

The particulate filter is changed on a weekly basis, held for a week to allow for decay of short-lived radionuclides, and analyzed for gross beta activity using a gas proportional counter.

In the event that an abnormal effluent level is detected, an alarm sounds, and the console operator may activate the emergency exhaust system for the building.

Summary of Assessment Activities:

- Review of Operator's Daily log
- Review of Gaseous Release Results reported in the Annual Report to the NRC for the time period 1996 – present, against the Technical Specification release criteria of 1E-03 uCi/cc (determined from the Ar-41 10CFR20 Appendix B, Table 2 limit of 1E-08 uCi/cc.)

Assessment Results and Discussion:

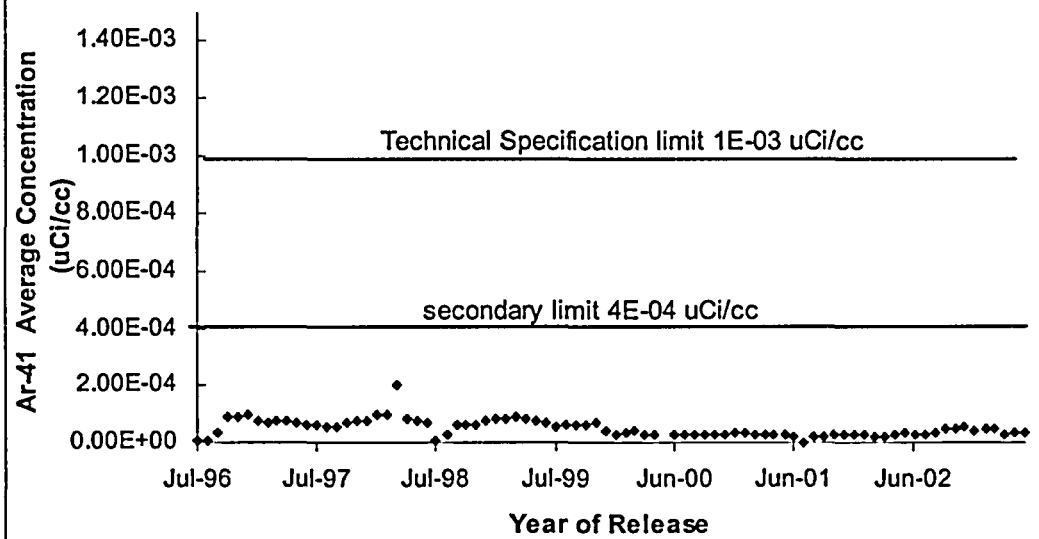
All available gaseous effluent data for the ten-year retrospective time frame were reviewed to ensure that releases met the criteria set forth in the Technical Specifications and based on 10 CFR 20.1302.b.2.i. The concentration of the gaseous Ar-41 releases from July 1996 through June 2003 are shown in Figure 1 along with the Ar-41 release limit, 1E-03uCi/cc, determined from 10CFR 20, Appendix B, Table 2, as explained above. A second limit of 4E-04 uCi/cc is also presented in Figure 1. This value is

calculated by applying the "dilution factor" of 4E04, given in the "bases" section of Technical Specification 3.7.2, to the value in 10CFR 20 Appendix B.

The 1994/1995 annual report did not list the gaseous effluent data expressed as uCi/cc (only as cpm and % EC) so this data could not be included in Figure 1. The 1995/1996 report was missing the monthly information sheets (Form NSC-78), so this data was also excluded from the graph. It should also be noted that some annual reports referenced the 1 E-03 uCi/cc limit, some referenced the 4 E-04 uCi/cc limit, and the limit in the 2003 report varied by month between the two.

All gaseous effluent releases were found to be well below the Tech Spec limit of 1E-03 uCi/cc. The only finding in this area was that the effluent concentrations were summed for the month in the annual report instead of averaged. An average concentration would be more useful for determining compliance.

Figure 1- RINSC Ar-41 Gaseous Effluent Average Monthly Concentration (1996-2003)



NRC Inspection Report Review:

The Effluent and Environmental Monitoring Program was inspected in March of 2001. The inspector concluded that "Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory and Technical Specifications limits."

Recommendations:

1. Perform a comprehensive review of past annual reports to correct inconsistencies in the forms used and the type of data presented. Correct all results determined to be in error in previously submitted Annual Reports.
2. Review the "Specification" and "Bases" sections of 3.7.2 to resolve the seemingly contradictory factors given (10^5 and $4x10^4$) that result in the two different limits shown above.

B. Specification: Table 1 Item 1 corresponding to TS - 4.7.2.a

Regulatory Guidance:

ANSI/HPS N13.1-1999, "Sampling and Monitoring Releases of Airborne Radioactive Substances from Stacks and Ducts of Nuclear Facilities", Section 7, "Quality Assurance and Quality Control"

Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations)-Effluent Streams and the Environment", Section 6, "Quality Control in the Radioanalytical Laboratory"

Procedure Summary and/or General Practices:

Discussions with the staff indicate that the gas proportional counter is calibrated annually using a simulated particulate filter standard containing Sr-90/Y-90. According to draft instrumentation Procedure 810, "Stack Monitor – Gas Calibration", revised 09/06/00, the noble gas stack monitor is calibrated annually by analyzing an Ar-41 gas sample on the HPGe gamma spectrometry system.

Summary of Assessment Activities:

- Review of the draft Procedure 810, "Stack Monitor – Gas Calibration", revised 09/06/00.
- Review of the Stack Gaseous Monitor Ar-41 Calibration Data Summary.

Assessment Results and Discussion:

Procedure 810 discusses the collection and measurement of Ar-41 stack gas on a calibrated Ge(Li) detector to determine the concentration of Ar-41. This concentration is divided by the continuous stack monitor count rate (cpm) to determine the stack monitor "calibration factor" for Ar-41 in uCi/cc per cpm. This factor is used to determine the concentration of Ar-41 released from the stack. The Ar-41 concentration is compared to the 10CFR20 release limits to show compliance with the limits.

The summary in Table 2 - "Stack Gaseous Monitor Argon-41 Calibration Data Summary" shows the following:

1. Calibration is not explicitly performed on an annual basis, that is, with the calibration "due date" being one year after the previous calibration. For example, the stack monitor calibration factor listed in the 2003 annual report was determined in May-02, but appears to have been used to determine results until the end of the fiscal year in June.

2. The stack monitor calibration factor has varied by 33% over the period from 1996 to 2003 (with the removal of obvious outlier data and re-analyses taken into account).

Table 2 - Summary of "Stack Gaseous Monitor Ar-41 Calibration Data Summary"

Month/Year of Calibration	Stack Monitor (cpm)	Measured Ar-41 Conc. (uCi/cc)	Calibration Factor (uCi/cc)/cpm	
Feb-94	11000	5.52E-05	5.02E-09	
Jun-94	6500	3.20E-05	4.92E-09	
Jun-94	7500	3.00E-05	4.00E-09	
Jul-94	10000	2.74E-05	2.74E-09	
Jul-94	10500	3.47E-05	3.30E-09	
Jul-94	11000	3.60E-05	3.27E-09	
Apr-95	15000	3.84E-05	2.56E-09	
Apr-95	15000	3.73E-05	2.49E-09	*
Sep-96	13000	4.40E-05	3.38E-09	
Dec-96	16000	3.14E-05	1.96E-09	
Dec-96	16000	3.13E-05	1.96E-09	*
Dec-97	20000	3.39E-05	1.70E-09	
Apr-98	19000	3.46E-05	1.82E-09	
Apr-99	18000	3.25E-05	1.81E-09	
May-00	11000	3.34E-05	3.04E-09	
Apr-01	10000	3.58E-05	3.58E-09	
May-02	7200	3.15E-05	4.38E-09	**
May-02	8500	3.87E-05	4.55E-09	
Sep-02	7500	4.55E-05	6.07E-09	*
Sep-02	10000	4.41E-05	4.41E-09	*
Apr-03	8900	3.77E-05	4.24E-09	
		Average:	3.31E-09	
		Std. Dev:	1.10E-09	
		Precision:	33.32%	
		Range:	1.70E-09 -	5.02E-09
		Varies by factor of:		3

* Not used in calculation of the average
** Calibration factor shown in 2002-03 Annual Report

NRC Inspection Report Review:

See the discussion in Part A above.

Recommendations:

1. NUREG-1537 Part 1 makes numerous references to the need for programs and procedures for protecting the health and safety of the public and the environment. For example, Chapter 11 indicates "The applicant should require procedures to ensure that radiation exposures and releases of radioactive material are adequately assessed and controlled." Furthermore, RINSC Technical Specification section 6.5.6

indicates that written procedures, reviewed and approved by the NRSC, shall be used for radiation control. Because the stack monitor calibration factor is used to show compliance with the Ar-41 10CFR20 release and dose limits, it is recommended that the draft Procedure 810 be expanded to include: 1) specific wording on the due date of recalibrations and expiration of calibrations (such as, the end of the FY), 2) explicit acceptance criteria for the re-calibration of the stack monitor, typically set at 15% (unless there has been a major change identified in equipment performance or an equipment change), and 3) documentation and sign-off of any change in calibration factor.

It should be noted that calibration of the 2-liter marinelli beaker gamma spectrometry system, referenced in Procedure 810 and used to determine the stack Ar-41 concentration, was not reviewed.

2. Set up a Quality Control procedure to govern the operability of all equipment, not just the gamma spectrometry system, used to assay the gaseous and liquid effluents.

3. Finalize draft Procedure 810 and obtain approval from the Nuclear and Radiation Safety Committee (NRCS). Include an industry standard technical reference that supports the methodology used.

Dose to the Public

A. Specification: Table 1 Item - TS – 6.5.6 Radiation Control Procedures, TS 6.8.4.e Environmental Exposure

Regulatory Guidance:

10CFR20.1301 "Dose limits for individual members of the public,"
10CFR20.1302 "Compliance with dose limits for individual members of the public,"
10CFR20.1101 "Radiation protection programs",
Regulatory Guide 4.2 "Constraint on Releases of Airborne Radioactive Materials to the Environment for Licensees Other Than Power Reactors,"
NUREG 1537 Parts 1 and 2, Chapters 11, 12, and 14.

10CFR20 requires licensees to meet the limits and demonstrate compliance with 10CFR20.1301 and 10CFR20.1302.

10CFR20.1301 presents the dose limits:

> (a) Each licensee shall conduct operations so that —
>
> (1) The total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem (1 mSv) in a year, exclusive of the dose contributions from background radiation, from any administration the individual has received, from exposure to individuals administered radioactive material and released under § 35.75, from voluntary participation in medical research programs, and from the licensee's disposal of radioactive material into sanitary sewerage in accordance with § 20.2003, and
>
> (2) The dose in any unrestricted area from external sources, exclusive of the dose contributions from patients administered radioactive material and released in accordance with § 35.75, does not exceed 0.002 rem (0.02 mSv) in any one hour.

And, 10CFR20.1302 discusses demonstration of compliance as follows:

> (1) Demonstrating by measurement or calculation that the total effective dose equivalent (TEDE) to the individual likely to receive the highest dose from the licensed operation does not exceed the annual dose limit; **or**
>
> (2) Demonstrating that—
> (i)The annual average concentrations of radioactive material released in gaseous and liquid effluents at the boundary of the unrestricted area do not exceed the values specified in Table 2 of Appendix B to Part 20; **and**
> (ii)If an individual were continuously present in an unrestricted area, the dose from external sources would not exceed 0.002 rem (0.02 mSv) in an hour and 0.05 rem (0.5 mSv) in a year.

Procedure Summary and/or General Practices:

RINSC draft Operating Procedure 210, "Determining Public Dose," Revised 3/28/01 states:

> "We must ensure that:
>
> The radiation dose received by individual members of the public does not exceed 100mrem (1mSv) in one calendar year resulting from our possession and/or use of radioactive materials,
>
> The radiation dose in unrestricted areas does not exceed 2mrem (0.02mSv) in any one hour,
>
> Air emissions of radioactive materials do not result in doses greater than 10mrem (0.1mSv) total effective dose equivalent (TEDE)"

Doses to the public outside the reactor building from facility operations are measured by Optically Stimulated Luminescence (OSL) dosimeters affixed to the building in three locations, as indicated in the annual operating reports. According to the 2003 Annual Report, "the allowable external dose rates must be below 50 mrem per year". Compliance with the annual limit is demonstrated by taking into account an occupancy factor. Currently, an occupancy factor of 0.01 (15minutes/24 hours) is applied to account for the maximum time a member of the general public is expected to be present at one of these exterior building locations. Prior to the 1998/1999 reporting year, an occupancy factor of 0.04 (15 minutes/7 hours) was applied to the two locations where the dose rates were present only when the reactor was operating. The reactor operation time was assumed to be seven hours per day.

Compliance with 10CFR20.1101 dose limits for individual members of the public from gaseous effluents (10mrem/y) is currently demonstrated by calculation through the use of the COMPLY code according to Section 5 of Procedure 210 and Section 11.1.7 of the SAR.

Summary of Assessment Activities:

- Review of the annual OSL dosimeter data and monthly stack releases (in Ci) reported in the Annual Report to the NRC for the time period 1996 to present.
- Verification of the application of the occupancy factor to the dosimeter results.
- Evaluation of the adjusted doses to the public from the OSL dosimeter data against the limit given in 10CFR20.1301.

- Evaluation of the total Ar-41 activity released (in Ci) reported in the annual reports against the inputs used for the Comply runs for the same years.
- Evaluation of the annual doses from gaseous effluents against the ALARA criteria given in section 11.1.7 of the SAR and 10CFR20.1101.

Assessment Results and Discussion:

The section entitled "Environmental Effects of Facility Operation" of Appendix 12.1 to NUREG 1537 Part 2, indicates that "Yearly doses to unrestricted areas will be at or below established guidelines in 10CFR Part 20." Figure 2 shows the annual doses to a hypothetical individual at each of the three exterior locations of the RINSC facility monitored by OSL dosimeters. The doses shown are well below the 100 mrem per year requirement of 10CFR 20.1301.a.1. It is unclear as to why RINSC has specified a 50 mrem per year requirement in the annual report, as this limit is not defined in the SAR, Procedure 210, or the Technical Specifications. 10CFR20.1302.2.ii specifies a 50 mrem per year limit, but this limit applies to a continuously exposed individual, and is not applicable to a situation where an occupancy factor is applied.

Surveys showing compliance with the 2 mrem in any one hour requirement, specified in 10CFR20.1301.a.2 and Procedure 210, were not reviewed. The only finding in this area is that the dose that would be received at the heat exchanger door was incorrectly reported in the 2002/2003 report as 0.07mrem instead of 0.7 mrem.

RINSC Annual Reports, submitted to the NRC from 1995-present, were reviewed to support the presentation of data/releases in the Environmental Report. This review showed numerous errors in the reported metrics and the use of outdated forms. In conjunction with this finding, the Ar-41 activity released via the stack and used as an input to the COMPLY code was incorrect. The specific Annual Reports in question have been communicated to the RINSC staff.

The updated annual Ar-41activities released from the stack are shown in Figure 3. Discussions with RINSC staff and Section 11.1.1.1 of the SAR indicate that a release of 476 Ci of Ar-41 is equivalent to the annual dose limit of 10 mrem to the maximally exposed individual in the NE sector, 100 meters from the facility. Thus, by reviewing the releases in Figure 3, it is shown that the annual doses from airborne effluent releases meet the ALARA criteria of 10 mrem/year, per 10 CFR 20.1101 and section 11.2.2.3 of the SAR.

RINSC staff indicated that water from the reactor pool evaporated at a rate of 7.2 gallons/day, which results in a gaseous H-3 release of 4.36 uCi/day or 1.6 E-03 Ci/year. This release is considerably lower than the release for Ar-41. A dose analysis for H-3 using the Comply code indicated a dose of 6.5 E-06 mrem/year.

Figure 2 - Annual Dose to an Individual Outside the RINSC Facility (Occupancy Factors applied)

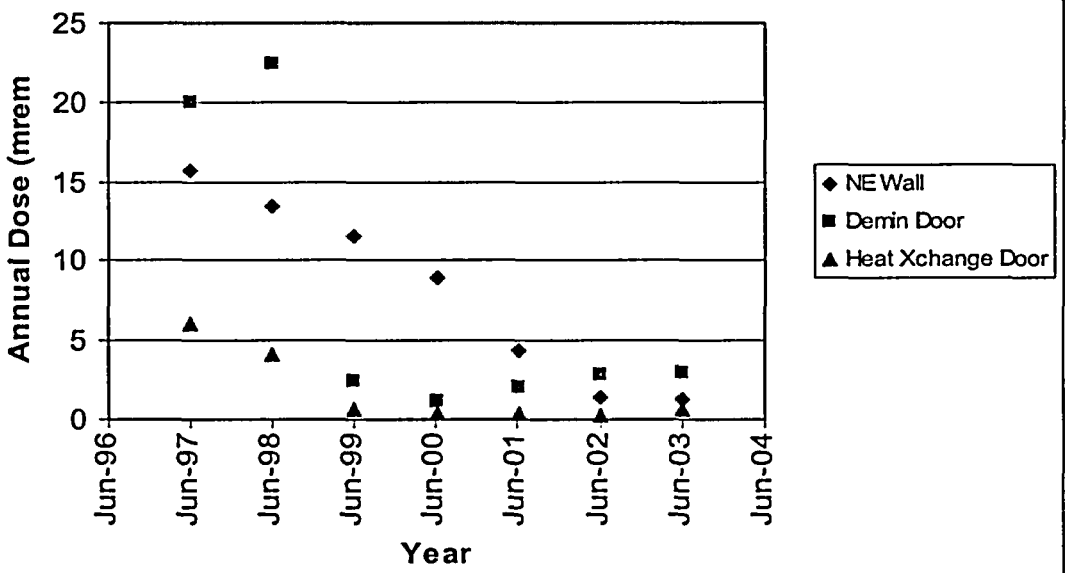
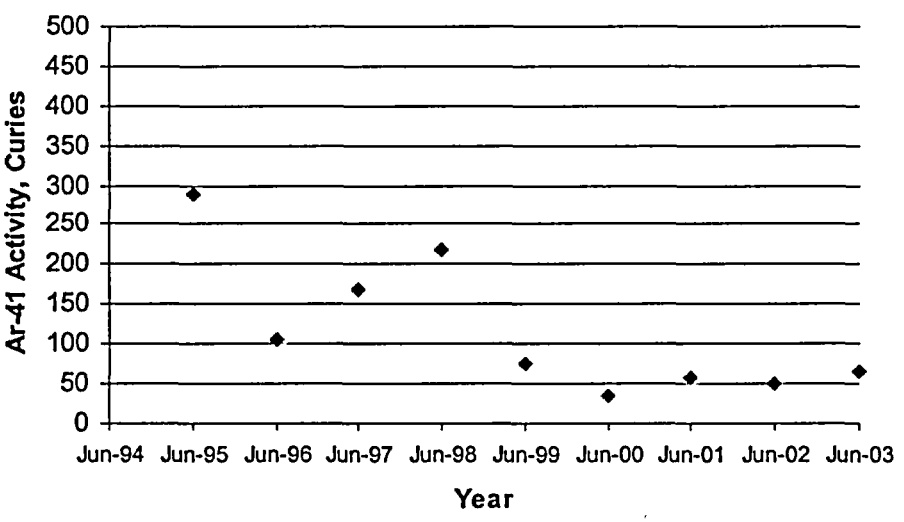


Figure 3 - RINSC Gaseous Effluent Annual Ar-41 Activity Released



NRC Inspection Report Review:

The dosimetry records (personnel and environmental) were inspected in March of 2001. The inspector concluded that "An examination of the records of radiological exposures at the facility for the past two years through the date of the inspection showed that occupational doses and doses to the public were well within 10 CFR Part 20 limitations."

Recommendations:

1. As stated above, the occupancy factor applied to the dose calculations at the demineralizer and heat exchanger doors changed from 0.04 to 0.01 in the 1998/1999 reporting year. It is recommended that the RINSC staff review this change (as it is in the non-conservative direction) and document the basis for the selection of the factor used.

   Draft Procedure 210, Section 5.1.2 discusses that "more realistic assumptions" may be used if the occupancy factor of 1 does not demonstrate compliance with the public dose limit (for FY 2003 the dose would be > 50mrem at two of the exterior locations). In addition, the reference for these assumptions should be clearly stated and the Table of Standard Occupancy Factors in the procedure could be updated to include the RINSC Specific Occupancy Factor. It is recommended that the RINSC review the basis of the 50 mrem per year limit in the annual report.

2. Tech Spec 6.8.e requires that the annual report include "A description of any environmental surveys performed outside the facility." Survey results that show compliance with the "2 mrem in any one hour" requirement for unrestricted areas should be included in this section of the report. Also, the survey method and frequency should be included in Procedure 300, "Routine Surveys" or an analogous procedure.

   Procedure 201, "External Monitoring" discusses the use and handling of dosimeters to monitor personnel exposure, including the use of control dosimeters, but does not address the environmental dosimeters. It is recommended that RINSC staff either expand this procedure to include the environmental dosimeters, or develop an analogous procedure.

3. It is recommended that RINSC conduct a comprehensive review of the annual reports, operational logs, and RS calculations to correct the Ci/day or % of limit (depending on the form in effect) and stack release data previously submitted to the NRC. It is also recommended that a policy be implemented to control the use of forms associated with records management and reporting to the NRC and develop an Annual Report "review and sign off" procedure to minimize the risk of reporting incorrect and erroneous results.

4 Section 3.7.1.4 of Chapter 14 "Technical Specifications" of NUREG 1537 Part 1 indicates that "There should be at least one monitoring station near the facility" and that "The specification should state that environmental monitors are used to verify that the potential maximum dose, annual or other, is within the values analyzed in the SAR." RINSC may want to consider confirming the Comply code analysis with a TLD measurement, even though it is not required by the current Tech Specs.

Liquid Effluents

A. Specification: Table 1 Item 3, corresponding to TS 3.7.2.b and TS 6.8.4.e

Regulatory Guidance:

10 CFR 20.2003, "Disposal by Release into Sanitary Sewerage," NUREG 1537 Part 1.

Procedure Summary and/or General Practices:

No standard operating procedures were identified that governed the batch sampling of the liquid waste retention tanks.

RINSC does not discharge liquids to the environment other than to the sanitary sewer system. The RINSC facility is equipped with three interconnected 300-gallon retention tanks for storing liquid effluents. These tanks replaced two underground storage tanks (discussed below) that were removed from service in 1995. The current tanks receive overflow water from the pool and drainage from sinks in the reactor building. Radioactive waste liquids from laboratories in the adjacent administration building may also be discarded into the retention tanks by the Health Physics staff. The retention tanks allow short-lived radionuclides such as Na-24 (T1/2 = 15h) to decay before the liquid is discharged. The contents of the tanks are sampled and analyzed to assure that concentrations meet the requirements of 10 CFR 20.2003. The effluents are filtered through a roughing filter, a 10-micron filter, and a 1-micron filter before being discharged into the sanitary sewer system. Thus, only soluble effluents are discharged.

The RINSC staff has taken steps to reduce the amount of liquid effluents discharged into the sewer system. First, the policy of draining the pool during annual pool inspections has been discontinued. Second, a recovery system for pool leak water (discussed below) was installed in fiscal year 1995/1996, which allowed the water to be filtered and directed back into the pool and not discharged into the sewer. Third, the pool water level was lowered approximately two inches to minimize the possibility of normal pool water temperature changes causing a pool water discharge to the retention tanks. All of these measures have resulted in a decrease in the volume of liquid discharged in recent years as indicated by the infrequent number of releases shown in Figure 4.

Summary of Assessment Activities (see Table 3):

- Raw data review (gamma spectra, liquid scintillation counting data and summary forms NSC-9a, NSC-9b or NSC-52) for three fiscal years, 1998/1999, 2000/2001, and 2002/2003.
- Comparison of raw data results with the annual report summaries for the corresponding years.
- Comparison of all releases into the municipal sewer system since 1995 to the requirements of 10CFR 20.2003.

Assessment Results and Discussion:

The results of the assessment are given in Table 3.

Table 3 – Review of Liquid Batch Sample Analyses

Year	Designation	Date	Analysis Method	Nuclide	Concentration (uCi/ml)	Volume of Liquid Discharged (ml)	Total Activity (uCi)	Consistency of Raw Data w/ Annual Report	Percent of 10CFR20 Limit
1998/1999	delay tank	08/31/98	liquid scintillation	H-3	2.79 E-04	11,356,230	3.17E+03	yes[a]	2.79
1998/1999	delay tank	08/31/98	gamma spectrometry	Sc-46	3.45 E-08	11,356,230	3.92E-01	yes[a]	3.45E-02
1998/1999	delay tank	08/31/98	gamma spectrometry	Sb-122	1.48 E-07	11,356,230	1.68E+00	yes[a]	1.48E-01
1998/1999	900K tank	01/07/99	liquid scintillation	H-3	1.03 E-04	1,703,250	175	yes	1.03
1998/1999	900K tank	01/07/99	gamma spectrometry	none detected	-	-	-	yes	-
1998/1999	15K tank transfer #2	1/11/99	liquid scintillation	H-3	8.685 E-05	3,255,100	282	yes[b]	0.87
1998/1999	15K tank transfer #2	1/11/99	gamma spectrometry	none detected	-	-	-	yes	-
1998/1999	15K tank and 1 K tank	01/12/99	liquid scintillation	H-3	2.657E-5	3,487,500	93	yes	0.27
1998/1999	15K tank and 1 K tank	01/12/99	gamma spectrometry	none detected	-	-	-	yes	-
2000/2001	pool water, labs, various	12/06/00	liquid scintillation	none detected	-	-	-	yes	-
2000/2001	pool water, labs, various	12/06/00	gamma spectrometry	Cs-137	2.34E-11		4.33 E-5	yes[c]	2.34E-04
2000/2001	pool water, labs, various	12/06/00	gamma spectrometry	Na-22	3.62E-11		6.7 E-05	yes[c]	6.03E-05
2002/2003	retention tank	10/10/02	liquid scintillation	H-3	5.8 E-5	2,460,000	142.7	no[d]	0.58
2002/2003	retention tank	10/10/02	gamma spectrometry	none detected	-	-	-	no[d]	-
2002/2003	stored pool leak water	10/15/02	liquid scintillation	H-3	7.8 E-05	908,000	70.8	no[d]	0.78
2002/2003	stored pool leak water	10/15/02	gamma spectrometry	none detected	-	-	-	no[c]	-

[a] The total activity in the annual report represents H-3 only. However, Sc-46 and Sb-122 are included in the percentage of the limit given in the annual report.
[b] The percentage of the limit given in the annual report is 0.8%
[c] The monthly sewer limit of 6 E-5 uCi/ml given in the annual report is for Na-22. The monthly limit for Cs-137 is 1 E-5 uCi/ml.
[d] The annual report dated August 5, 2003, indicated that no liquids were discharged during the reporting period.

All available liquid effluent data for the ten year retrospective time frame was reviewed to ensure that releases met the criteria set forth in 10 CFR 20.2003.a.2 - 10 CFR 20.2003.a.4. Liquid release data from July 1995 through June 2003 are shown below as a percentage of the limits specified in 10CFR 20, Appendix B, Table 3. In instances where more than one radionuclide was measured in a sample, the fractions of the individual allowable limits were summed in accordance with 10 CFR 20.2003.a.3. The percentages of the release limits were calculated using the actual measured concentrations of the liquids released. No dilution was included for the average monthly volume of water released into the sewer by the licensee. If more than one release was made in a given month, the total monthly release concentration was not calculated. However, the total release concentration for the month would not be greater than the release with the highest activity concentration. Since all individual releases were well below the monthly limits, the criteria in 10 CFR 20.2003.a.2 were met. The individual releases from 1995 to 2003 are shown in Figure 4 as a percent of the monthly release limit. The total annual activity released was also reviewed to ensure that the limits in 10CFR20.2003.a.4 were not exceeded (Figure 5).

Liquid releases were confirmed to be well within the limits of 10 CFR 20.2003. The releases in Figure 5 include H-3, and are still well below the annual limit for combined radionuclides of 1 Ci/yr (the limit for H-3 is 5 Ci/yr).

The only significant finding in this area was that the liquid releases for fiscal year 2002/2003 were not reported in the annual report for that year as required by Section 6.8.4.g. of the RINSC technical specifications.

Figure 4 - Liquid Discharges as a Percent of 10CFR 20 Appendix B Table 3 Monthly Sewer Limit

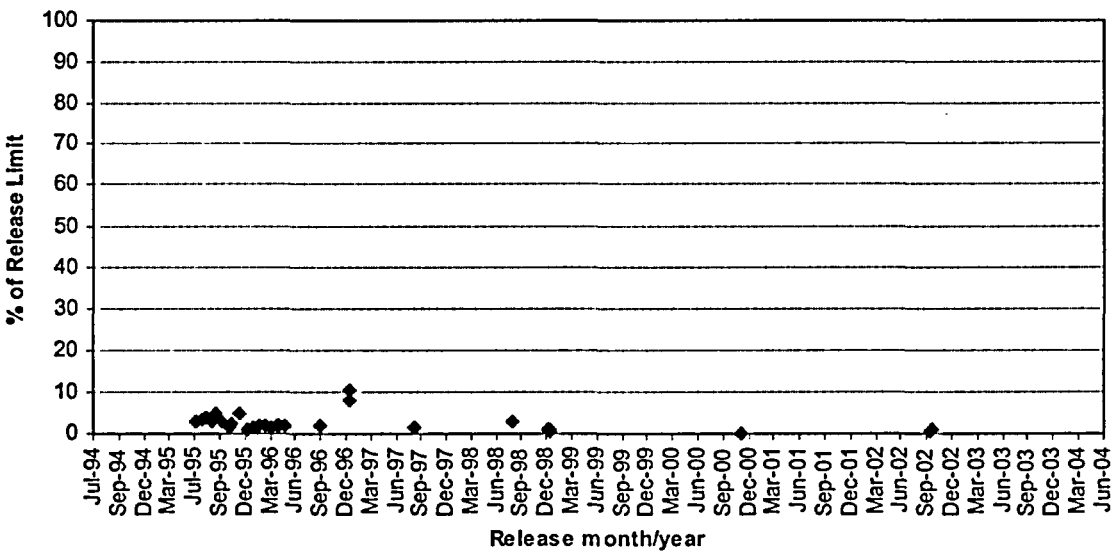
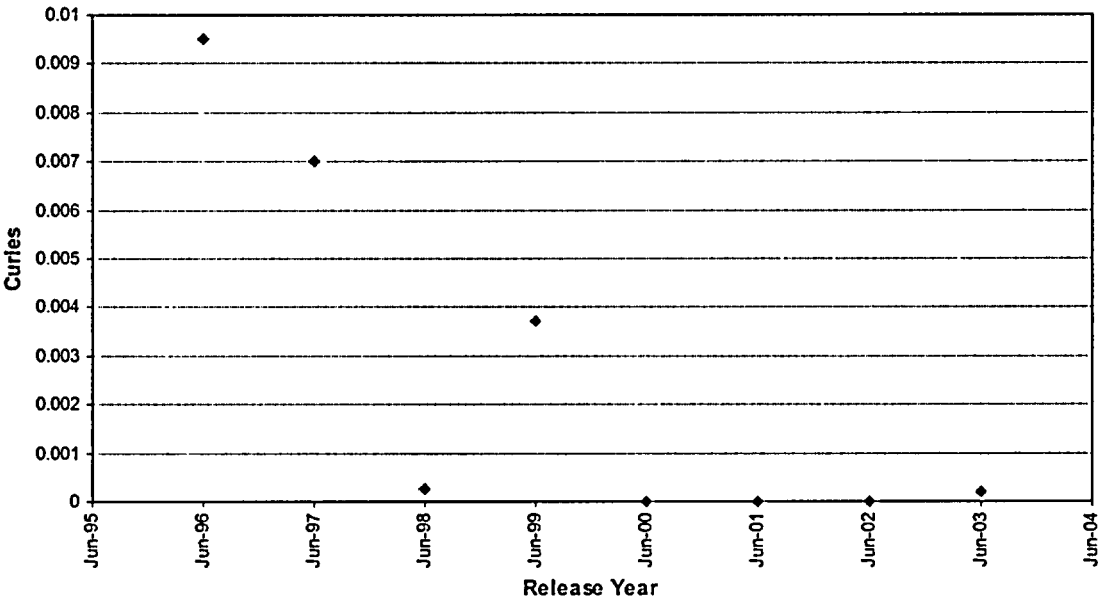


Figure 5 - Annual Liquid Discharges to the Sewer (Curies)



NRC Inspection Report Review:

The Effluent and Environmental Monitoring program was inspected in March of 2001. The inspector concluded that "Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory and Technical Specifications limits."

Recommendations:

1. NUREG 1537 Part 1 makes numerous references to the need for programs and procedures for protecting the health and safety of the public and the environment. For example, Chapter 11 indicates "The applicant should require procedures to ensure that radiation exposures and releases of radioactive material are adequately assessed and controlled." Furthermore, RINSC Technical Specification Section 6.5.6 indicates that written procedures, reviewed and approved by the NRSC, be used for radiation control. It is therefore recommended that a standard operating procedure for sampling and analysis of liquid effluents be developed. The procedure should indicate: 1) the type of analyses to be performed (i.e. gamma spectrometry, liquid scintillation counting, pH), 2) the required sample geometry, counting times or detection limits, 3) the analysis software to be used, and 4) the reporting and approval requirements, and any other measures to ensure consistent sampling, analysis and reporting.

2. It is also recommended that the monthly concentrations discharged and annual activity discharged be recorded explicitly in the annual reports. This will allow for a straightforward comparison with the criteria in 10CFR20.2003.

B. Specification: Table 1 Item 3, corresponding to TS 4.7.b, TS 6.8.4.e

Regulatory Guidance:

ANSI/ANS 15.11-1977, "Radiological Control at Research Reactor Facilities," Section 7.1.4, Laboratory Instrumentation, discusses the need for a response check prior to use of portable monitoring instruments. Although portable equipment is specifically discussed, this guidance is pertinent to all nuclear instrumentation.
ANSI/ANS 15.1-1990, "The Development of Technical Specifications for Research Reactors," Section 4.7, Radiation Monitoring Systems and Effluents, also discusses the requirement for operability of Monitoring Systems.

Procedure Summary and/or General Practices:

No standard operating procedures were identified that governed the analysis of the liquid waste retention tank samples, or the calibration of the associated instrumentation. The SAR Section 11.2.2.3 refers to an acceptable range of liquid waste pH between 7 and 9. Discussions with the RINSC staff indicated that the instruments are calibrated and operated in accordance with the pertinent manuals supplied by the instrument manufacturer.

Summary of Assessment Activities (see Table 4):

- Data for the three fiscal years, 1998/1999, 2000/2001, and 2002/2003, as in Section A, were reviewed in detail.

Table 4 - Review of Liquid Batch Sample Analysis Methods and Calibration Requirements

Year	Designation	Analysis Date	Analysis Method	Detector Designation	Measured pH	Reported Energy Calibration Date	Reported Efficiency Calibration Date	Calibration Check Date	Within 1 Year Limit?
1998/1999	delay tank	08/31/98	liquid scintillation	Packard Tricarb	7.2				
1998/1999	delay tank	08/31/98	gamma spectrometry	unavailable					
1998/1999	900K tank	01/07/99	liquid scintillation	Packard Tricarb	6.7	N/A	at time of count	N/A	yes
1998/1999	900K tank	01/07/99	gamma spectrometry	unavailable		-	-		-
1998/1999	15K tank transfer #2	1/11/99	liquid scintillation	Packard Tricarb	6.9	N/A	at time of count	N/A	yes
1998/1999	15K tank transfer #2	1/11/99	gamma spectrometry	unavailable		-	-		-
1998/1999	15K tank and 1 K tank	01/12/99	liquid scintillation	Packard Tricarb	6.9	N/A	at time of count	N/A	yes
1998/1999	15K tank and 1 K tank	01/12/99	gamma spectrometry	unavailable		-	-		-
2000/2001	pool water, labs, various	12/06/00	liquid scintillation	Packard Tricarb	6.0	-	-	N/A	yes
2000/2001	pool water, labs, various	12/06/00	gamma spectrometry	pearl		03/28/00	03/28/00	none noted	yes
2002/2003	retention tank	10/10/02	liquid scintillation	Packard Tricarb	7.5-8.0	N/A	at time of count	N/A	yes
2002/2003	retention tank	10/10/02	gamma spectrometry	rose		03/29/00	03/28/00	01/08/02	yes[a]
2002/2003	stored pool leak water	10/15/02	liquid scintillation	Packard Tricarb	not measured	N/A	at time of count	N/A	yes
2002/2003	stored pool leak water	10/15/02	gamma spectrometry	rose		03/29/00	03/28/00	01/08/02	yes[a]

N/A – Not Applicable

[a] This determination was made via review of raw analysis paperwork versus bbbreview of documentation of the completion of an annual calibration check.

Assessment Results and Discussion:

The results of the assessment are given in Table 4.

Liquid scintillation counter review:

The efficiency of the Packard Tricarb liquid scintillation counter for H-3 is determined at the time of sample analysis. This is accomplished by analyzing a H-3 standard in the same counting geometry as the samples. Evaluation of the calculated H-3 efficiencies for the samples reviewed indicated that they compared favorably with the expected H-3 efficiency listed in the Packard instrument manual.

Gamma spectrometry system review:

The 1998/1999 samples were analyzed on the VAX/VMS gamma acquisition system. The detector designation wasn't apparent on the raw analysis paperwork or

accompanying forms, so a cross-reference to the detector calibration could not be made. However, review of the annual report of the "Rhode Island Radiological Emergency Response for the Ingestion Pathway" program indicates that five germanium detectors were being maintained in calibration for the 1997/1998 timeframe (within the 1 year calibration timeframe specified in Technical Specification 4.7.b.) In addition, detector response checks, performed approximately weekly, are available in this report and demonstrate acceptable instrument responses for the metrics of detection efficiency, photopeak resolution, and energy calibration.

In 1999, the VAX/VMS system was replaced with a Canberra Industries Genie 2000 PC based gamma spectrometry system. The detector designation and detector calibration date are now listed on the analysis printout. The printouts indicate that detectors "rose" and "pearl" were calibrated on 03/28/00.

The calibration dates were still listed as 03/28/00 on the printouts for samples analyzed in October of 2002. Although it would appear that these detectors were outside the 1 year calibration, review of the calibration records indicated that "calibration checks" were performed on rose and pearl on 01/08/02. A calibration check *would meet* the intent of the Technical Specification *if* it were documented that the efficiencies had not changed from the original values (presumably determined in 2000) by more than a specified acceptable percentage, or if the efficiency values in use were updated as a result of the calibration check. No data was provided to document the acceptability of the calibration checks or the acceptance criteria. No published acceptance criteria could be found in either the Canberra Detector Manual or the Canberra Genie 2000 Operators Manual. Discussions with the RINSC staff indicated that the "Rhode Island Radiological Emergency Response for the Ingestion Pathway" program was discontinued in 2000, and that weekly response checks were also discontinued at that time.

pH measurement review:

The pH of the liquid effluent samples was measured in all instances except 1 (see Table 4). The SAR stipulates an acceptable range between 7 and 9 for these values.

NRC Inspection Report Review:

The Effluent and Environmental Monitoring program was inspected in March of 2001. The inspector reviewed counting and analysis records and concluded that "Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory and Technical Specifications limits."

Recommendations:

1. Either update the gamma detector energy, efficiency, and resolution parameters and calibration date annually, or determine acceptance criteria for a calibration check of these values including clear documentation that the criteria have been met, and annotate the analysis printouts with the new "calibration" date.
2. Reinstate a before-use response check, which will evaluate the metrics of energy, efficiency and resolution on the gamma detector, as was performed under the "Rhode Island Radiological Emergency Response for the Ingestion Pathway" program. Determine acceptance criteria for each metric and identify remedial actions in case of failure.
3. Document the acceptance range for the measured pH on sewer disposal Form NSC 52.
4. Retain these records as a part of the permanent effluent monitoring records.
5. Incorporate these practices in a standard operating procedure.

Solid Radioactive Waste

Table 1 Item 4: No corresponding Technical Specification

Regulatory Guidance:

"Rules and Regulations for the Control of Radiation" [R23-1.3-RAD], State of Rhode Island and Providence Plantations Department of Health, Part A.4 "Waste Disposal"

Procedure Summary and/or General Practices:

RINSC handles radioactive waste in accordance with the above procedures and in accordance with the Rhode Island Department of Health document listed above. Radioactive waste that contains radionuclides with half-lives less than ninety days is allowed to decay in storage and is disposed of as normal waste following verification of background radioactivity levels. Dry active waste is packaged in Department of Transportation (DOT) approved drums. Discussions with RINSC staff indicate that solid radioactive waste disposal is conducted by a qualified disposal company, selected through a bidding process.

LEU spent fuel is removed through a contract with EG&G Idaho, Inc. in accordance with the requirements of the Nuclear Waste Policy Act of 1982.

All HEU fuel has been removed from the RINSC site. A total of 34 spent fuel elements with 18,767 curies of activity were transported to Savannah River in two shipments during January 1993. Shipments were made in casks supplied by the Department of Energy (DOE). After the HEU core was unloaded, an additional 39 HEU fuel elements were subsequently shipped, removing all spent fuel from the facility.

Summary of Assessment Activities:

- Reviewed four 500 Series Radioactive Waste procedures (501,502,510 & 512).
- Reviewed the HEU to LEU conversion paper listed in Table 1, item 4.

Assessment Results and Discussion:

No documents or waste manifests corresponding to actual waste shipments were reviewed.

Recommendations:

None

Chemical and Mixed Waste

Table 1 Item 5: No corresponding Technical Specification

Procedure Summary and/or General Practices:

No releases of potentially hazardous chemicals to the environment are made during normal facility operation. Discussions with RINSC staff indicate that disposal of chemical waste generated in the laboratories located in the RINSC facility is the responsibility of individual researchers. Private researchers have individual contracts with licensed commercial vendors. Disposal of waste, generated by individuals associated with the University of Rhode Island, is conducted by the URI Dept of Safety and Risk Management. The Safety and Risk Management organization provides training for users and performs compliance inspections. The RINSC waste management program also complies with OSHA and EPA regulations. A chemical inventory is submitted to local agencies in accordance with Section 312 of Title III of the Superfund

Amendments and Reauthorization Act (SARA). This submittal is performed as a courtesy to the local municipal fire department and other local agencies as the quantities of hazardous materials at the RINSC facility are below the thresholds that would require the submittal.

Mixed waste consists primarily of liquid scintillation vials containing H-3 and/or C-14. These vials are packaged into DOT approved drums. The drums are classified as "regulated" or "deregulated" according to the radioactivity content.

Summary of Assessment Activities:

Review of the Annual Reports, 1994-present
Discussions with RINSC staff
Review of Procedure 501, "Radioactive Waste Packaging"

Assessment Results and Discussion:

Efforts have been made by the RINSC staff to reduce the amount of hazardous chemicals stored on site and to reduce personnel exposure to them. In 1997, the reactor makeup water demineralizer system was replaced by two new commercial units. The new cartridge tank system is serviced by the vendor, thus eliminating the potential risk of exposure for the RINSC staff to relatively strong acids and bases from resin regeneration. In fiscal year 1999/2000, an effort was made to identify all the hazardous materials that have been stored in the facility. Materials that were not currently in use were collected and disposed of through the University of Rhode Island Department of Safety and Risk Management.

No shipping documents or disposal records pertaining to actual chemical waste shipments were reviewed. Also, SARA reports and training records were not reviewed.

Recommendations:

None

Other Potential Effects of the Facility

Pool Leak Records

Table 1 item 6

Procedure Summary and/or General Practices:

N/A

Summary of Assessment Activities:

- Review of the Pool Leak File
- Review of the Memo to Pool Leak File, "Update of Pool Leak Status," March 8, 2004
- Review of discussions in the Annual Reports related to the pool leak
- Discussions with RINSC staff

Assessment Results and Discussion:

Historical documents regarding the pool leak that developed in 1983 in the area of the thermal column door were reviewed. The leak rate appears to be dependent on the temperature of the primary coolant (pool water). The upgrade of the secondary coolant system cooling towers in the 1990's and the short weekly operating schedule, maintain a reduced primary coolant temperature and consequently the leak is not active. In addition, a pool leak recovery system is in place to collect, filter and return water to the

pool, and a daily log of the pool fill times indicates normal fill times attributed to evaporation and pool water temperature increases.

Recommendations:
None

Removal of Underground Liquid Storage Tanks

Table 1 item 7

Procedure Summary and/or General Practices:
N/A

Summary of Assessment Activities:
- Review of the15K/1K UST Removal File
- Review of Minutes of a Joint Meeting of the Reactor Utilization Committee and the Radiation Safety Committee, held September 28, 1994, issued October 5, 1994
- Review of a Memo to T. Tehan, Director," Project Summary for 15k and 1K Gal UST Removal," February 28, 1999
- Review of a Memo to File, "15K Tank," August 11, 2000

Assessment Results and Discussion:
In 1995, the underground storage tanks (15K and 1K gallons) were taken out of service and drained. In 1999, the tanks were removed by procedures developed specifically for this activity and inspected to discern more information about the cause of the leak. Inspection of the tank indicated it to be in good condition and the leak was attributed to a suction line. Inspection activities were performed according to OSHA regulations. The tanks were decontaminated and were disposed of as scrap metal in 2000/2001. Worker training in radiation safety and the radiological status of the tanks were conducted prior to the start of work.

Soil samples were collected under and around the tanks and at background locations for comparison. All surveys, smears and lab analyses indicated background radioactivity.

A review of the gamma isotopic "raw data" analysis sheets corresponding to the soil measurements was conducted to confirm the assertion that only natural soil radioactivity was present.

Recommendations:
To complete the documentation of the survey and measurement activities associated with the removal of the tanks, a table of radioactivity results should be developed to allow access and review of the data and results. Such a table should tabulate the gamma isotopic analyses, smear and survey results and a summary of personnel doses to support the conclusions made in the August 11, 2000 memo. This information (specifically the gamma isotopic analyses) will be of particular importance for decommissioning of the RINSC facility in the future.

Appendix A
Technical Specification Details

Gaseous Effluents:

Technical Specification Reference:

3.7.2. Effluents
a. Airborne Effluents

Applicability:
This specification applies to the monitoring of airborne effluents from the Rhode Island Nuclear Sciences Center.

Objectives:
To assure that containment integrity is maintained during reactor operations and that the release of airborne radioactive material from the RINSC is maintained below the limits established in 10CFR20.

Specification:
1. The concentration of radioactive materials in the effluent released from the facility exhaust stacks shall not exceed 10^5 times the concentrations specified in 10CFR20, Appendix B, Table II, when averaged over the time period permitted by 10CFR20.

Bases:
The limits established in specification 3.7.2 incorporate a dilution factor of 4x10^4 for effluent concentrations released through the exhaust stacks.....

Technical Specification Reference:

4.7 Radiation Monitoring Systems and Effluents
a. Airborne Effluents

Applicability:
This specification applies to the surveillance of the monitoring equipment used to measure the radioactivity in liquid effluents.

Objectives:
The objective is to assure that accurate assessment of liquid effluents can be made.

Specification:
1. The particulate air monitors shall be calibrated annually.
2. The gaseous activity monitor shall be calibrated annually.
3. A channel check of the stack monitor and the main floor monitor shall be performed daily when the reactor is in operation.

Bases:
Experience with the electronic reliability and calibration stability of the units used by the RINSC reactor demonstrates that the above periods are reasonable surveillance frequencies.

Liquid Effluents:

Technical Specification Reference:

3.7.2. Effluents
b. Liquid Effluents

Applicability:
This specification applies to the monitoring of radioactive liquid effluents from the Rhode Island Nuclear Sciences Center.

Objectives:
The objective is to assure that exposure to the public resulting from the release of liquid effluents will be within the regulatory limits and consistent with as low as reasonably achievable requirements.

Specification:
The liquid waste retention tank discharge shall be batch sampled and the gross activity per unit volume determined before release. All off-site releases shall be directed into the municipal sewer system.

Bases:
All radioactive liquid and solid wastes disposed of off-site shall be within the limits established by 10CFR20 or shall be removed from the site by a commercial licensed organization.

Technical Specification Reference:

4.7 Radiation Monitoring Systems and Effluents
b. Liquid

Applicability:
This specification applies to the surveillance of the monitoring equipment used to measure the radioactivity in liquid effluents.

Objectives:
The objective is to assure that accurate assessment of liquid effluents can be made.

Specification:

1. The monitoring equipment used to measure the radioactive concentrations in the waste retention tanks shall be calibrated annually.
2. The contents of every tank released shall be sampled and evaluated for radioactive concentrations and pH prior to its release.

Bases:

Experience with the electronic reliability and calibration stability of the units used by the Rhode Island Nuclear Science Center Reactor demonstrates that the above periods are reasonable surveillance frequencies.

Technical Specification Reference:

6.5 Operating Procedures

Written procedures, reviewed and approved by the NRSC, shall be used for items 1-9 listed below. The procedures shall be adequate to assure the safe operation of the reactor, ...

6. Radiation Control procedures

Substantive changes to the above procedures shall be made only with the approval of the NRSC.

Technical Specification Reference:

6.8 Reporting Requirements

...The written reports shall include the following:

4. An annual report shall be submitted in writing within 60 days following the 30th of June of each year.

e. A description of any environmental surveys performed outside the facility.

g. A summary of the nature and amount of radioactive effluents released or discharged to the environs beyond the effective control of the licensee as measured at or prior to the point of such release or discharge.

Technical Specification Reference:

6.9 Plant Operating Records

...Records and logs of the following items, as a minimum, shall be kept in a manner convenient for review and shall be retained as indicated:

2. Records to be retained for the life of the facility:

a. Gaseous and liquid radioactive effluents released to the environs;

b. Off-site environmental monitoring surveys;

Enclosure 6- Financial Qualifications

Chapter 16 of the Safety Analysis Report describes the financial information submitted to the Nuclear Regulatory Commission for a non-power reactor license to establish that the applicant is financially qualified to own, construct, operate, and decommission a non-power reactor.

In order to provide the latest information available regarding the financial qualifications of the Rhode Island Atomic Energy Commission, additional data is being provided in the following enclosures:

8-1 R.I. Governor's Budget Submission for fiscal year 2005 which includes revenue and expense account listings
8-2 R.I. Atomic Energy Commission Capital/Asset Protection Budget for fiscal years 2005-2009

The above listed documents show that the State is meeting is financial responsibilities as stated in Rhode Island General Law 42-27-4, which reads:

> Appropriations and Disbursements- The General Assembly shall annually appropriate, out of any money in the treasury not otherwise appropriated, A sum sufficient to carry out the purposes of this chapter; and the state controller is hereby authorized and directed to draw his or her orders upon the general treasurer for the payment of that sum.

The R.I. Atomic Energy Commission Capital/Asset protection Budget lists a line item for decommissioning the reactor, which is currently estimated at $30,000,000.00. This figure has been audited by the State Bureau of Audits and is believed to be reasonable given the large uncertainties in such a project. This budget is reviewed and approved annually by the Legislature and the Governor's staff.

Since the Rhode Island legislature meets annually and approves a one year budget, it would be unrealistic to provide a five year budget. Historical data is available on request.

Rhode Island Atomic Energy Commission

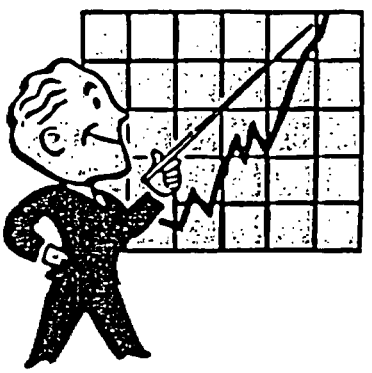
	FY 2002 Actual	FY 2003 Actual	FY 2004 Revised	FY 2005 Recommended
Expenditures By Object				
Personnel	670,338	742,984	774,515	805,344
Other State Operations	100,599	61,863	305,268	403,869
Aid To Local Units Of Government	-	-	-	-
Assistance, Grants and Benefits	-	-	100,000	-
Subtotal: Operating Expenditures	$770,937	$804,847	$1,179,783	$1,209,213
Capital Improvements	18,540	-	-	55,000
Capital Debt Service	-	-	-	-
Total Expenditures	$789,477	$804,847	$1,179,783	$1,264,213
Expenditures By Funds				
General Revenue	631,147	664,107	702,450	727,045
Federal Funds	8,881	(2,558)	325,000	325,000
Other Funds	149,449	143,298	152,333	212,168
Total Expenditures	$789,477	$804,847	$1,179,783	$1,264,213
FTE Authorization	8.6	8.6	8.6	8.6
Agency Measures				
Minorities as a Percentage of the Workforce	-	-	-	-
Females as a Percentage of the Workforce	12.5%	25.0%	25.0%	33.3%
Program Measures				
Actual Megawatt Research Hours Spent as a Percentage of Megawatt Research Hour Goal of 2,000	25.0%	50.0%	15.0%	20.0%
Pneumatic Irradiations Provided Annually	123.0%	100.0%	90.0%	95.0%

Rhode Island Atomic Energy Commission

	FY 2000 Actual	FY 2001 Actual	FY 2002 Revised	FY 2003 Recommended
Expenditures By Object				
Personnel	591,661	664,743	656,948	701,143
Other State Operations	143,600	202,296	820,784	925,774
Aid To Local Units Of Government		-		
Assistance, Grants and Benefits		-		
Subtotal: Operating Expenditures	$735,261	$867,039	$1,477,732	$1,626,917
Capital Improvements		-	21,400	-
Capital Debt Service		-		-
Total Expenditures	735,261	867,039	1,499,132	1,626,917
Expenditures By Funds				
General Revenue	576,744	629,357	644,995	655,951
Federal Funds	59,992	59,635	703,000	825,947
Other Funds	151,137	177,690	151,137	144,876
Total Expenditures	$735,261	$867,039	$1,499,132	$1,626,774
FTE Authorization	7.6	8.6	8.6	8.6
Agency Measures				
Minorities as a Percentage of the Workforce	-	-	-	-
Females as a Percentage of the Workforce	27.3%	18.2%	18.2%	20.0%
Program Measures				
Actual Beam Port Megawatt Research Hours Spent as a Percentage of Megawatt Research Hour Goal of 2,000	25.0%	50.0%	50.0%	100.0%
Pneumatic Irradiations Provided Annually	50.0%	68.0%	100.0%	100.0%

RI ATOMIC ENERGY COMMISSION

RI Nuclear Science Center



Capital/Asset Protection Projects
FY 2005 – 2009

July 25, 2003

Form 1: Summary of Capital/Asset Protection Projects

Department Rhode Island Atomic Energy Commission			
Project Ranking	**Project Name**	**Project Identifier**	**Total Cost in CIP**
1	Interior Reactor Building Wall Repair/Paint	AEC-RINSC2	55,000
2	Sensor Research laboratory	AEC-PPL	300,000
3	Cancer treatment Facility	AEC-CTC	2,150,000
4	Decommissioning RINSC & Reactor-	AEC- RINSC5	30,000,000

Form 2: Project Information

Department/Agency: RI ATOMIC ENERGY COMMISSION	
Project Name: Repair & painting Reactor Building Interior	Project Identifier: AEC-RINSC2
Priority Ranking: 1	Year First Shown in Agency CIP: FY2001
Project Start Date: September 2005	Project End Date: October 2006
Is Project in Approved CIP? No	Geographic Location: Narragansett, RI

Description:

Repair and painting of interior reactor building walls.

Reason for Project/Benefits:

The interior walls need to have cracks and holes repaired and the surface prepared and painted.

Status of On-going Project:

Contracting will commence when the project is approved.

Other Projects Affected:

None.

Additional Information:

Contact:

Terry Tehan, Ph. D.

Form 3: Project Costs/Financing

Department/Agency Name: RI ATOMIC ENERGY COMMISSION					Project Identifier: AEC- RINSC2				
Project Name: Repair & Paint Reactor Building Interior Walls									
Project Costs	**PreFY 2005**	**FY 2005**	**FY 2006**	**FY 2007**	**FY 2008**	**FY 2009**	**FY 2010**	**Post FY2010**	**Total**
Program Planning									0
A&E/Professional									0
Land and ROW Acquisition									0
Site Improvement									0
Construction/Development									0
Furniture, Fixtures, Equipment		55,000							55,000
Contingency									0
Fees (list each) State Building Code Percent for Arts									0
Other (specify)									0
Total Project Costs	**0**	**55,000**	**0**	**0**	**0**	**0**	**0**	**0**	**55,000**

Form 3: Project Costs/Financing

Department/Agency Name: RI ATOMIC ENERGY COMMISSION					Project Identifier: AEC- RINSC2				
Project Name: Repair & Paint Reactor Building Interior Walls									
Financing	**Pre-FY 2005**	**FY 2005**	**FY 2006**	**FY 2007**	**FY 2008**	**FY 2009**	**FY 2010**	**Post FY 2010**	**Total**
Authorized G.O. Bonds									0
Issued									
Account #									
Unissued									
Account #									
New Bond Authorization									
General Revenues									
Account #									
Federal Funds									
Account #									
Restricted Receipts									
Account #									
Delaware Plan		55,000							55,000
Account #									
COPS									
Other: (specify)									
Total Financing	**0**	**55,000**	**0**	**0**	**0**	**0**	**0**	**0**	**55,000**

Form 2: Project Information

Department/Agency: RI ATOMIC ENERGY COMMISSION	
Project Name: SENSOR RESEARCH LABORATORY	Project Identifier: AEC-PPL
Priority Ranking: 2	Is Project in Approved CIP: fy1999

Description:
This project initially involved construction of a pharmaceutical production facility by Boston Life Sciences Inc. and Isotex Diagnostics Inc. These companies were unable to finish the project due to financial problems after the outside of the building and loading dock had been completed. SubChem systems, a Rhode Island company that has received several technology development grants from R.I. economic development programs, is currently working to complete the project. They have hired a contractor, Design Built, Inc. who has submitted plans to the Building Codes Commission for approval. Construction should start in the fall. The laboratory will conduct research on various types of underwater sensors and will utilize equipment and expertise at RINSC.

Reason for Project/Benefits:
The project will give a new Rhode Island Company the needed space and technical support to grow into a significant player in the state's efforts to develop high technology industries. The state will acquire a state of the art research laboratory and the company will receive a 15 year lease on the building.

Status of On-going Project:

The outside of the building is complete. The interior, HVAC and electrical work needs to be completed. Plans have been submitted to the Building Codes Commission for approval.

Additional Information:
none

Contact:
Terry Tehan, Ph.D. Director

Form 3: Project Costs/Financing

Department/Agency Name: RI ATOMIC ENERGY COMMISSION					Project Identifier: AEC-PPL				
Project Name: Sensor research Laboratory									
Project Costs	**Pre FY 2005**	**FY 2005**	**FY 2006**	**FY 2007**	**FY 2008**	**FY 2009**	**FY 2010**	**Post FY 2010**	**Total**
Program Planning									0
A&E/Professional									0
Land and ROW Acquisition									0
Site Improvement									0
Construction/Development	150,000	100,000							250,000
Furniture, Fixtures, Equipment		50,000							50,000
Contingency									0
Fees (list each) State Building Code Percent for Arts									0
Other (specify)									0
Total Project Costs	**150,000**	**150,000**	**0**	**0**	**0**	**0**	**0**	**0**	**300,000**

Form 3: Project Costs/Financing

Department/Agency Name: RI ATOMIC ENERGY COMMISSION					Project Identifier: AEC-PPL				
Project Name: Sensor research Laboratory									
Financing	**Pre FY 2005**	**FY 2005**	**FY 2006**	**FY 2007**	**FY 2008**	**FY 2009**	**FY 2010**	**Post FY 2010**	**Total**
Authorized G.O. Bonds									
Issued									
Account #									
Unissued									
Account #									
New Bond Authorization									
General Revenues									
Account #									
Federal Funds									
Account #									
Restricted Receipts									
Account #									
Delaware Plan									
Account #									
COPS									
Other: (specify)									
BOSTON LIFE SCIENCES INC	140,000								140,000
SubChem Systems Inc.	10,000	150,000							160,000
Total Financing	**150,000**	**150,000**	**0**	**0**	**0**	**0**	**0**	**0**	**300,000**

Form 2: Project Information

Department/Agency: RI ATOMIC ENERGY COMMISSION	
Project Name: CANCER TREATMENT FACILITY	Project Identifier: AEC-CTC
Priority Ranking: 3	Year First Shown in Agency CIP: FY1999
Project Start Date: DECEMBER 1998	Project End Date: TO BE DETERMINED
Is Project in Approved CIP? Yes	Geographic Location: Narragansett, RI

Description:

The commission is pursuing a project with the Neutron Cancer Therapy Company to construct a cancer treatment facility within the existing reactor building and a new addition. The costs would be borne by the private company, who would enjoy a 15-year lease at $1.00 per year. The treatment facility would revert to the Commission at the end of this lease.
The project involves attaching a new improved neutron filter to the reactor for use when irradiating brain tumors. It consists of the filter and a treatment room. Should the facility prove to be a success the company has the option of constructing medical suites for commercial treatment of cancer patients. The cost of the building has been estimated at $150,000. The company would pay for construction, and reimburse the Commission for reactor use and additional costs.

Reason for Project/Benefits:

When completed, this facility will provide a cancer treatment and research capabilities which is at the cutting edge of medical technology and not available except at a few large research reactors in the United States.

Status of On-going Project:

A 15-year lease has been approved by the State Property Commission. Filter design and construction was completed by Argonne National Laboratory and Sargent & Lundy has completed the construction plans for the filter. Dr. Ott is negotiating with several perspective parties for the additional funding to complete the project

Other Projects Affected:

None.

Outside Agencies Clearance or Coordination Needed:

If the facility is successful the company will construct a medical suite. The State Building Commission will require a building permit for the construction.

Additional Information:

Upon successful completion of testing of the new design filter, Nuclear Regulatory Commission and Health Department clearances will be required to operate a treatment facility. The lease will be negotiated at this point to specify compensation levels for all parties involved in the operation.

Contact:

Terry Tehan, Ph.D.

Form 3: Project Costs/Financing

Department/Agency Name: RI ATOMIC ENERGY COMMISSION					Project Identifier: AEC-CTC				
Project Name: CANCER TREATMENT FACILITY									
Project Costs	**PreFY 2005**	**FY 2005**	**FY 2006**	**FY 2007**	**FY 2008**	**FY 2009**	**FY2010**	**Post FY2010**	**Total**
Program Planning									0
A&E/Professional	620,000								620,000
Land and ROW Acquisition									0
Site Improvement									0
Construction/Development	680,000	50,000	800,000						1,530,000
Furniture, Fixtures, Equipment									0
Contingency									0
Fees (list each) State Building Code Percent for Arts									0
Other (specify)									0
Total Project Costs	**1,300,000**	**50,000**	**800,000**	**0**	**0**	**0**	**0**	**0**	**2,150,000**

Form 3: Project Costs/Financing

Department/Agency Name: RI ATOMIC ENERGY COMMISSION					Project Identifier: AEC-CTC				
Project Name: CANCER TREATMENT FACILITY									
Financing	**Pre 2005**	**FY 2005**	**FY 2006**	**FY 2007**	**FY 2008**	**FY 2009**	**FY2010**	**Post FY 2010**	**Total**
Authorized G.O. Bonds									0
Issued									
Account #									
Unissued									
Account #									
New Bond Authorization									
General Revenues									
Account #									
Federal Funds									
Account #									
Restricted Receipts									
Account #									
Delaware Plan									
Account #									
COPS									
Other: (specify)									
NCT COMPANY FUNDING and Argonne Lab Suport	1,300,000	50,000	800,000						
Total Financing	**1,300,000**	**50,000**	**800,000**	**0**	**0**	**0**	**0**	**0**	**2,150,000**

Form 2: Project Information

Department/Agency: RI ATOMIC ENERGY COMMISSION	
Project Name: Decommissioning RINSC and Reactor	Project Identifier: AEC-RINSC5
Priority Ranking: 4	Year First Shown in Agency CIP: FY2000
Project Start Date: To Be Determined	Project End Date: TO BE DETERMINED
Is Project in Approved CIP? No	Geographic Location: Narragansett, RI

Description:

The project includes decommissioning and characterization plans, cost estimates and risk assessments, decontamination and dismantling, final surveys and license termination.

Reason for Project/Benefits:
This item provides a means of tracking a future un-funded financial liability.

Status of On-going Project:

Contracting will commence when the project is approved.

Other Projects Affected:

All the other RIAEC capital projects.

Outside Agencies Clearance or Coordination Needed:

Nuclear Regulatory Commission
Environmental Protection Agency
Department of Energy
State Health Department

Additional Information:

Contact:

Terry Tehan, Ph.D.

Form 3: Project Costs/Financing

Department/Agency Name: RI ATOMIC ENERGY COMMISSION					Project Identifier: AEC-RINSC5				
Project Name: Decommissioning RINSC and Reactor									
Project Costs	**Pre FY2005**	**FY2005**	**FY 2006**	**FY 2007**	**FY 2008**	**FY 2009**	**FY 2010**	**POST 2010**	**Total**
Program Planning		6,000,000							6,000,000
A&E/Professional									0
Land and ROW Acquisition									0
Site Improvement			6,000,000	6,000,000	6,000,000	6,000,000			24,000,000
Construction/Development									0
Furniture, Fixtures, Equipment									0
Contingency									0
Fees (list each) State Building Code Percent for Arts									0
Other (specify)									0
Total Project Costs	**0**	**6,000,000**	**6,000,000**	**6,000,000**	**6,000,000**	**6,000,000**	**0**	**0**	**30,000,000**

Form 3: Project Costs/Financing

Department/Agency Name: RI ATOMIC ENERGY COMMISSION					Project Identifier: AEC-RINSC5				
Project Name: Decommissioning RINSC and Reactor									
Financing	**Pre 2005**	**FY 2005**	**FY 2006**	**FY 2007**	**FY 2008**	**FY 2009**	**FY2010**	**Post FY 2010**	**Total**
Authorized G.O. Bonds									0
Issued									
Account #									
Unissued									
Account #									
New Bond Authorization									
General Revenues									
Account #									
Federal Funds									
Account #									
Restricted Receipts									
Account #									
Delaware Plan		6,000,000	6,000,000	6,000,000	6,000,000	6,000,000			
Account #									
COPS									
Other: (specify)									
Total Financing	**0**	**6,000,000**	**6,000,000**	**6,000,000**	**6,000,000**	**6,000,000**	**0**	**0**	**30,000,000**

RINSC OPERATING PROCE

		Reactor Operator Re-Qualification

I. SCOPE:

This instruction outlines the requirements for re-qualifying reactor operators and senior reactor operators at the RINSC.

II. DISCUSSION:

The RO/SRO re-qualification program is designed to demonstrate RO/SRO competence and to satisfy the requirements of 10CFR55.53 and 10CFR55.59 For the purpose of this procedure, RO shall refer to any licensed Reactor Operator, SRO shall refer to any licensed Senior Reactor Operator, and Operator shall refer to any licensed operator, reactor, or senior reactor.

III. REFERENCES:

A. 10CFR55.53

B. 10CFR55.59

C. Non-Power Reactor Operator Licensing Examiner Standards –NUREG 1478, June 1995.

IV. PRECAUTIONS:

A. To maintain an active Operator's License at the RINSC one shall:

1. Be the console operator at least once every three months and operate a total of at least 4 hours or complete SRO duties for at least 4 hours (10CFR 55.53e)

2. Complete a yearly operational re-qual exam, and a two year written exam successfully and in a timely manner (within 30 days)

3. Renew one's NRC Operator License every six years in a timely manner

4. Review changes to the Facility License, Technical Specifications, Operating Procedures, Emergency Plan and Implementing Procedures, Security Plan, Facility Design Changes, NRC Notices, and other important reactor related material in a timely manner

5. Successfully complete a biennial medical evaluation

V. PROCEDURES:

A. INTRODUCTION

The Re-qualification Program is designed to demonstrate Operator and Senior Operator competence, and to satisfy the requirements of 10CFR55.59 for license renewal. The Program embodies the substance of 10CFR55.59, including provisions for an annual operational examination, a biennial written examination, a structured lecture and study program when necessary to correct deficiencies, on the job training and evaluation of licensees, and a records maintenance system.

During each year, an operational examination shall be administered to all licensed personnel having regular operational responsibility at the RINSC. Every other year, a written examination shall be administered.

Subsequent to determining any deficiencies indicated by the annual examination, a retraining program will be initiated which consists of a combination of lectures, self-study by the licensee, tutoring of the licensee, and appropriate examination on the material covered. The final selection of the combination of retraining sessions will depend upon the performance of the licensee on the written examination.
All study materials used in the program shall be reviewed to assure they remain current. Study materials shall be collected and made available to all licensees throughout the course of the program.

B. PROGRAM ADMINISTRATION AND REVIEW

The Assistant Director for Operations of the RINSC shall serve as the Training Coordinator, and shall be responsible for the implementation, coordination, and operation of the Re-qualification Program. The duties of the Training Coordinator shall be designated to another SRO on alternate years. The Training Coordinator or his designee will prepare, administer, grade, and review all examinations and quizzes required by the program. In this capacity, and since he is a licensed Senior Operator, he will be considered as having completed the examination and retraining program requirements for that period.

C. BIENNIAL WRITTEN EXAMINATION

1. The biennial written examination given to all licensed personnel, will include questions taken from:

   a. Reactor Theory, Thermodynamics, and Facility Operating Characteristics.

b. Normal and Emergency Operating Procedures and Radiological Controls.
c. Facility and Radiation Monitoring Systems.

2. The exam should contain at least 10 objective questions from each section.

3. The examinations may be open book.

4. The exams will be graded, reviewed and retained at the RINSC. For each licensee, a review form will be prepared indicating his/her grade in each exam category. The areas of deficiency and the retraining to be followed in improving the licensee's competence in that area will then be determined. A grade below 70% in a single category shall require retraining for that licensee in that area of deficiency. An overall score below 70% on the exam shall require that:

   a. The licensee shall be immediately enrolled in a retraining program.
   b. Prior to continuing his/her responsibilities of operation of the reactor, the licensee shall be given an oral exam to verify competence as a console operator.

D. RETRAINING PROGRAM

1. The retraining program shall consist of an appropriate combination of:

   a. Lectures,
   b. Self-study of reference materials,
   c. Tutoring sessions,
   d. Examinations.

2. Retraining shall be completed within 90 days and require passing of a written exam on the appropriate section(s).

E. REACTOR OPERATIONAL EXAM

One reactor operation of each year for each licensee shall be devoted to operator re-qualification. The training coordinator shall be present in the control room during all reactivity control manipulations associated with the operation, and shall evaluate the operator's performance, competence, knowledge of the reactor system, and knowledge of operating and emergency procedures. If deficiencies are noted, a retraining program will be organized, implemented and conducted within a period of 90 days. The performance evaluation should include:

1. Administrative topics,
2. Control room systems,
3. Facility walkthrough,
4. Reactor operation.

F. RE-QUALIFICATION PROGRAM STUDY MATERIALS

The training coordinator shall provide a complete set of study and reference materials for use. It shall be his/her responsibility to perform a review of the contents of these reference materials to ensure they are adequate and accurately reflect operations, conditions, and design characteristics of the facility. As a minimum, these materials shall include copies of:

1. A suitable general reference text on reactor physics,
2. RINSC Operating Procedures,
3. RINSC Abnormal Procedures,
4. RINSC Emergency Plan & Implementing Procedures,
5. RINSC Technical Specifications,
6. GE Operation and Maintenance manual,
7. 10CFR19, 20, 50, 55, and 70,
8. RINSC Radiation Safety Guide,
9. Health Physics principles & techniques.

G. SPECIAL CONDITIONS

1. Operating Frequency

   a. A quarterly review shall be performed to ensure that each licensee has participated in at least one reactor operation during each three month period for at least four (4) hours or supervised licensed activities for at least four (4) hours or a combination totaling four (4) hours.
   b. A licensee who does not participate in reactor operation for three or more months shall be given an oral examination on facility and procedure changes, and shall perform a minimum of six (6) hours of supervised reactor operations before being reassigned regular operational duties at the facility, provided he is up to date on the comprehensive biennial written examinations. These actions are required to meet 10CFR55.53(f) re-certification requirements. Results of these examinations shall be retained in the licensee's file.

2. A licensee who does not complete the biennial exam shall not be allowed to assume the operator duties until the exam is successfully completed and graded.

3. Serious deficiencies in either the written exam (<55% overall) or the operational exam may result in removal of certification until retraining is successfully completed.

H. RECORDS

These records shall be retained at the RINSC for the period until the individual's license is renewed:

1. All exams and required re-examinations, which were taken by the licensee during each of the re-qualification period.
2. The examination review sheets filled out at the conclusion of the exam and after any indicated re-exams. There should also be an evaluation sheet completed for each operational exam.
3. Summaries of control manipulations for licensees involved in the re-qualification program (NSC-45).
4. Certification that each licensee has reviewed changes in the facility license, design, and procedures (Required Reading List sign-off sheet).
5. Certification of Medical Examination by Facility Licensee (NRC Form 396) for each licensee.

VI. ATTACHMENTS:

A. Exam Cover Sheet
B. Operator Requalification Program Checksheet

THE RHODE ISLAND NUCLEAR SCIENCE CENTER RESEARCH REACTOR

OPERATOR REQUALIFICATION EXAMINATION

Name: _____ License Number: _____

Date Administered: _____

Instructions:

Answers are to be written on the examination page itself. A grade of 70% is required to pass the examination. Three hours are permitted to complete the examination.

Candidate's Declaration:

All work done on this examination is my own. I have neither given nor received aid.

_____

Candidate's Signature

Examination Results:

SECTION	SECTION POINTS	SECTION SCORE	PERCENT OF SECTION
A. Reactor Theory, Thermodynamics, Facility Characteristics	10	_____	_____
B. Normal & Emergency Procedures, Radiological Controls	10	_____	_____
C. Facility and Radiation Monitoring Systems	10	_____	_____
TOTAL	30	_____	_____

Evaluation:

_____ Satisfactory (>70%)

_____ Unsatisfactory

Examiner's Signature: _____ Date: _____

NSC-45

OPERATOR REQUALIFICATION PROGRAM CHECKSHEET

Name: _____ License Level: SRO ____ RO: ____ Year: _____

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Complete 4 hours of RO duties, or 4 hours of SRO duties each	☐	☐	☐	☐
Review changes to Facility License, Tech Specs, Operating Procedures, Emergency Procedures, Security Plan, Facility Design Changes, NRC Notices, and other related material..	☐	☐	☐	☐

Complete yearly operational re-qual exam.	Date: _____
Complete two year written requal exam.	Date: _____
Complete a biennial medical evaluation.	Date: _____
Renew NRC Operator License every six years.	Date: _____