

November 19, 2003

Mr. Richard L. Holm, Reactor Administrator  
University of Illinois at Urbana-Champaign  
Department of Nuclear, Plasma and Radiological Engineering  
Radiation Science Laboratory  
214 Nuclear Engineering Laboratory  
103 South Goodwin Avenue  
Urbana, IL 61801-2984

SUBJECT: NRC INSPECTION REPORT NO. 50-151/2003-201

Dear Mr. Holm:

This letter refers to the inspection conducted on September 9-11, 2003, at your Illinois Advanced TRIGA Reactor Facility. The inspection included a review of activities authorized for your facility. The enclosed report presents the results of that inspection.

Areas examined during the inspection are identified in the report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations of activities in progress. Based on the results of this inspection, no safety concerns or noncompliances of NRC requirements were identified. No response to this letter is required.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) <http://www.nrc.gov/reading-rm/adams.html>.

Should you have any questions concerning this inspection, please contact Stephen Holmes at 301-415-8583.

Sincerely,

***/RA by Marvin Mendonca Acting for/***

Patrick M. Madden, Section Chief  
Research and Test Reactors Section  
New, Research and Test Reactors Program  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Docket No. 50-151  
License No. R-115

Enclosure: NRC Inspection Report No. 50-151/2003-201

cc w/encl.: Please see next page

University of Illinois

Docket No. 50-151

cc:

The Honorable Tod Satterthwaite  
Mayor of the City of Urbana  
P.O. Box 219  
Urbana, IL 61803

Illinois Department of Nuclear Safety  
Manager, Office of Nuclear Facility Safety  
1035 Outer Park Drive  
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Patrick M. Madden, Section Chief  
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Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

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U. S. NUCLEAR REGULATORY COMMISSION

Docket No.: 50-151

License No.: R-115

Report No.: 50-151/2003-201

Licensee: University of Illinois

Facility: Illinois Advanced TRIGA Reactor

Location: Urbana, Illinois

Dates: September 9-11, 2003

Inspector: Stephen W. Holmes

Approved by: Patrick M. Madden, Section Chief  
Research and Test Reactors Section  
New, Research and Test Reactors Program  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

## EXECUTIVE SUMMARY

This routine, announced inspection included onsite review of various aspects of the licensee's programs concerning operations, emergency preparedness, physical security and safeguards, radiation protection, material control and accounting, and transportation activities as they relate to the licensee's Class III Research Reactor. The licensee's programs were directed toward the protection of public health and safety and were in compliance with NRC requirements.

### Organization and Staffing

- Organization, staffing, reporting, and record keeping met Technical Specification Sections 6.1, 6.8, and 6.9 requirements.

### Review, Audit, and Design Change Functions

- The RC performed their review and oversight functions as required by Technical Specification Section 6.2. No 10 CFR 50.59 or Nuclear Reactor Laboratory design changes had been performed.

### Operations and Maintenance Activities

- The operational and maintenance activities were consistent with applicable Technical Specifications and procedural requirements.

### Operator Licenses, Requalification, and Medical Activities

- The Requalification Program was being completed as required and records were being maintained. The operators were maintaining their licenses in an active status.

### Fuel Handling and Movement

- Fuel handling activities and documentation was as required by Technical Specifications and facility procedures.

### Surveillance

- The program for Surveillance and Limiting Conditions for Operations confirmations was being implemented in accordance with Technical Specification Sections 3, 4, 5, 6 and licensee requirements.

### Emergency Preparedness

- The emergency preparedness program was conducted in accordance with the Emergency Plan.

### Radiation Protection Program

- The Radiation Protection Program being implemented by the licensee satisfied regulatory requirements.



Transportation Activities

- No radioactive material was transferred from or to the reactor since the last inspection.

Material Control and Accounting

- Special Nuclear Materials were being controlled and inventoried as required.

Physical Security and Safeguards

- The physical security features, equipment, and procedures of the Nuclear Reactor Laboratory satisfied the Physical Security Plan requirements.

Effluents

- Gaseous and liquid effluents were well below 10 CFR 20, Appendix B limits. Doses to the public were well below 10 CFR 20.1302(a)(1) and 10 CFR 20.1101(d) limits.

## **REPORT DETAILS**

### **Summary of Plant Status**

The NRC issued license Amendment No.10 on April 12, 1999, authorizing the licensee to possess, but not operate the Illinois Advanced TRIGA Reactor. On September 22, 1999, the NRC issued license Amendment No. 11 approving the SAFSTOR decommissioning plan for the reactor. Reactor fuel remains in onsite storage. The reactor building and offices are normally unoccupied with the reactor administrator using the office space as needed. Facilities are routinely entered for radiation surveys, calibrations, and surveillances. The licensee was maintaining the facility as required by the Technical Specifications.

### **1. Organization, Reporting, and Records**

#### **a. Inspection Scope (Inspection Procedure [IP] 40755)**

The inspector reviewed the following to ensure staffing, reporting, and record keeping requirements in Technical Specification (TS) Sections 6.1, 6.8, and 6.9 were being met:

- TS for the Illinois Advanced TRIGA Reactor (IATR), Amendment No. 12, dated December 23, 1999
- administrative controls and management responsibilities specified in TS Sections 6.1, 6.8, and 6.9.
- organization and staffing for the Nuclear Reactor Laboratory (NRL)
- NRL Rules and Regulations, Revision 17, dated November 1995
- Health Physics Guidelines (HPG) No. 11, Health Physics Records, dated August 1995
- Health Physics Procedure (HPP) No. 1, Instructions for Completing the Health Physics Daily Checklist, dated June 1995
- HPP No. 12, Pocket Dosimeter and Visitor's Log, dated November 1995
- IATR 2002 Annual Report, dated February 5, 2003
- IATR 2001 Annual Report, dated February 18, 2002
- IATR 2000 Annual Report, dated February 2, 2001

#### **b. Observations and Findings**

Staffing consists of two part-time staff, the Reactor Administrator (RA) and the Reactor Health Physicist (RHP). Both have primary duties in other departments but indicated that University management fully supports and gives priority to reactor-related work thereby satisfying the minimum staffing requirements specified by TS Section 6.1.2.a. The licensee's current organizational structure and assignment of responsibilities were consistent with those specified in TS Section 6.1.1. All positions were filled with qualified personnel. Through discussions with the RA the inspector determined that, although individual personnel had changed, no functional changes had occurred in the organization since last inspected (refer to NRC Inspection No. 50-151/2000-201, ADAMS



Accession No. ML003767548). Review of records verified that management responsibilities were administered and records maintained as required by TS Section 6.9 and licensee procedures.

The annual reports summarized the required information and were issued at the frequency specified in TS Section 6.8.d.

c. Conclusions

Organization, staffing, reporting, and record keeping met TS Sections 6.1, 6.8, and 6.9 requirements.

**2. Review, Audit, and Design Change Functions**

a. Inspection Scope (IP 40755)

The inspector reviewed the following to ensure that the licensee had established and conducted reviews and audits as required in TS Section 6.2 and to determine whether modifications to the facility, if any, were consistent with 10 CFR 50.59:

- TS for the IATR, Amendment No. 12, dated December 23, 1999
- Reactor Committee (RC) meeting minutes from November 2000 through the present
- RC operations, requalification program, and emergency plan audits from November 2000 through the present
- RC audits of licensee corrective actions to identified deficiencies from April 2001 to present
- HPP No. A, Radiation Protection Program (RPP), dated November 1, 1993
- HPP No. B, ALARA Program, dated December 6, 1993
- HPP No. C, Annual Review of the RPP and ALARA Programs, dated August 14, 1995
- Authority and Responsibility of the RC, not dated

b. Observations and Findings

The inspector reviewed minutes of the last five RC meetings. The minutes showed that the committee met at least semiannually not to exceed nine months as required by TS Section 6.2.1.d and that a quorum was present at each meeting. The topics considered during the meetings were appropriate and as stipulated in TS Section 6.2.2. The RC conducted audits and reviews of the facility operations, the ALARA and radiation protection program, the Physical Security and Emergency Plans, the Requalification Program, and SNM procedures as required by TS Section 6.2.3 and licensee procedures. Results and recommendations of the audits were discussed with the licensee. The inspector reviewed the committee's audits, the licensee's response and corrective actions taken for a missing health physics training record, and confirmed they were fulfilling their duties as required by TS Section 6.2.

No 10 CFR 50.59 or NRL design changes had been performed since the last inspection.

c. Conclusions

The RC performed their review and oversight functions as required by TS Section 6.2. No 10 CFR 50.59 or NRL design changes had been performed.

**3. Operations and Maintenance Activities**

a. Inspection Scope (IPs 40755 and 69001)

The inspector reviewed the following to ensure that activities at the site were proceeding as outlined in the TS and the applicable procedures:

- TS for the IATR, Amendment No. 12, dated December 23, 1999
- reactor console logs and maintenance logs for 2001 through the present
- NRL Rules and Regulations, Revision 17, dated November 1995
- HPP No. 2, Monthly Verification of Radiation Monitor Alarm Set Points, dated December 1999
- NRL Surveillance Procedure (NRLSP) No. 3, Weekly Checklist, dated May 1999
- NRLSP No. 4, Quarterly Checklist, dated May 1999
- NRLSP No. 9, Tunnel Inspection, dated August 1999
- NRLSP No. 10, Vault Inspection, dated August 1999
- NRLSP No. 13, Intrusion System, dated September 1974
- staffing for operations as recorded in the reactor log
- IATR 2000 Annual Report, dated February 2, 2001
- IATR 2001 Annual Report, dated February 18, 2002
- IATR 2002 Annual Report, dated February 5, 2003

b. Observations and Findings

Under University of Illinois at Urbana/Champagne's (UIUC) current license no power operations are authorized. All operations were focused on maintaining the integrity and security of the facility, monitoring fuel storage, performing required health physics operations, and fulfilling TS maintenance and monitoring requirements. These operations were carried out following written procedures. Information on the operational status of the facility was recorded in log books and on checklists as required by TS Section 6.9 and licensee procedures. Use of maintenance and repair records satisfied procedural requirements.

c. Conclusions

The operational and maintenance activities were consistent with applicable TS and procedural requirements.

#### **4. Operator Licenses, Requalification, and Medical Activities**

##### **a. Inspection Scope (IP 69001)**

The inspector reviewed the following to ensure that operator requalification activities and training were conducted as required and that medical requirements were met:

- UIUC NRL Reactor Operator Requalification Program (REQ), dated August 1998
- active license status of all current operators
- logs and records of reactor maintenance, monitoring, and surveillances from January 2001 through the present
- annual evaluations and biennial exams from January 2001 through the present
- individual operator records for the current training cycle
- medical examination records

##### **b. Observations and Findings**

The facility has two qualified, licensed senior reactor operators, limited fuel handlers. All of the operators' licenses were current.

Records reviewed verified that annual operational and biennial written examinations were being administered as required. Through exam reviews, the inspector confirmed that the test questions covered the subject matter specified in REQ Section II.b.1. The inspector noted that the licensee was tracking and documenting hours and practice fuel handling manipulations to ensure the operators met REQ Section II.a and II.b and 10 CFR 55.53(e) requirements to maintain operating licenses in an active status. To comply with the requirement for actively performing the functions of a senior operator for a minimum of four hours per calendar quarter, the licensee included time spent on facility reviews and on monitoring, surveillance, and maintenance of the bulk shielding and primary tanks as allowed by REQ Sections I and II.b.

##### **c. Conclusions**

The REQ was being completed and records were being maintained as required. The operators were maintaining their licenses in an active status.

#### **5. Fuel Handling and Movement**

##### **a. Inspection Scope (IP 69001)**

The inspector reviewed the following to ensure that TS Sections 4.1, 4.2, 4.7 and licensee fuel handling and inspection requirements were being met:

- TS for the IATR, Amendment No. 12, dated December 23, 1999
- reactor console logs for 2001 through the present

- UIUC NRL Reactor Operator Requalification Program (REQ), dated August 1998
- NRLSP No. 15, Control Rod Inspection, dated June 1995
- NRL Operating Procedure (NRLOP) No. 4, Core Changes, dated July 1995
- fuel handling equipment and instrumentation

b. Observations and Findings

Fuel elements from the IATR reactor core had been offloaded and the fuel stored in the bulk shield tank.

Fuel movement has been limited to quarterly in-pool practice handling transfer manipulations of standard “dummy” elements. These activities provide practice in safe fuel handling to maintain staff proficiency for future fuel shipments.

The inspector verified by records review and direct visual inspection that fuel storage in the reactor and bulk shielding tanks was as required by TS Sections 5.0 and 5.1.

c. Conclusions

The fuel handling activities and documentation were as required by facility TS and procedures.

**6. Surveillance**

a. Inspection Scope (IP 40755)

The inspector reviewed the following to ensure that surveillances and Limiting Conditions for Operations (LCO) verifications were being completed as required by TS Sections 3, 4, 5, and 6:

- TS for the IATR, Amendment No. 12, dated December 23, 1999
- reactor console logs for 2001 through the present
- NRL Rules and Regulations, Revision 17, dated November 1995
- HPP No. 2, Monthly Verification of Radiation Monitor Alarm Set Points, dated December 1999
- HPP No. 7, Calibration of the AMS-2 Continuous Air Monitors, dated October 1998
- HPP No. 8, Calibration of the Area Radiation Monitors, dated October 1998
- HPP No. 9, Calibration of the Exhaust Stack Monitor, dated October 1998
- HPP No. 13, Analysis of Radioactivity in water, dated May 1996
- NRLSP No. 3, Weekly Checklist, dated May 1999
- NRLSP No. 4, Quarterly Checklist, dated May 1999
- NRLSP No. 9, Tunnel Inspection, dated August 1999
- NRLSP No. 10, Vault Inspection, dated August 1999
- NRLSP No. 11, Lazy Susan Drive, dated July 1995

- NRLSP No. 13, Intrusion System, dated September 1974
- NRLSP No. 15, Control Rod Inspection, dated June 1995
- NRLSP No. 16, Special Nuclear Material, dated June 2000
- NRL Weekly and Quarterly checklists from September 2000, to present
- associated surveillance and calibration data and records from September 2000 to present

b. Observations and Findings

The inspector reviewed selected weekly, quarterly, semiannual, annual, biennial, and other periodic checks, tests, verifications, and calibrations for all TS-required surveillances and LCOs. They were being completed and documented as required by TS Sections 3, 4, 5, 6 and licensee requirements. A number were being performed more frequently than required. All the recorded results were within the TS and procedurally prescribed parameters and in close agreement with the previous surveillance results. The records and logs reviewed were accurate, complete, and were being maintained as required. All values checked by the inspector satisfied the limits/parameters listed in the procedure or checklist.

The surveillances for the reactor control, radiation monitoring, and engineered safety systems maintained the fuel in a safe, subcritical mode to protect the safety of the reactor staff and the public. The licensee tracked the surveillances using Microsoft Outlook.

c. Conclusions

The program for surveillance and LCOs confirmation was being implemented in accordance with TS Sections 3, 4, 5, 6, and licensee procedures.

**7. Emergency Preparedness**

a. Inspection Scope (IP 40755)

The inspector reviewed selected aspects of the following to ensure the emergency plan (E-Plan) was being implemented as required:

- TS for the IATR, Amendment No. 12, dated December 23, 1999
- E-Plan for the NRL at UIUC, dated May 1997
- RC meeting minutes from September 2000 to present
- Emergency Plan Implementing Procedures (EPIP) 1 to 15, dated June 23, 1997
- emergency drills from September 2000 to present
- emergency response facilities, supplies, equipment and instrumentation
- training records

b. Observations and Findings

The E-Plan in use at the reactor and emergency facilities was the same as the version most recently submitted to the NRC. The RC, emergency director, and emergency coordinator audited and reviewed the E-Plan at least annually as required by E-Plan Section 9.5. Implementing procedures were reviewed by the reactor administrator and reviewed by the RC as also required by E-Plan Section 9.5 and were revised as needed to effectively execute the E-Plan.

Through reviews of training and drill records, the inspector verified that initial, annual and biennial emergency response training was given as required by E-Plan Section 9.1. Training elements also satisfied E-Plan Section 9.1 requirements and were performed in accordance with EPIP-12. The inspector also confirmed through interviews with NRL and UIUC Police that emergency responders were knowledgeable of the proper actions to take in an emergency.

UIUC police and other emergency response are dispatched through the Champaign County Emergency Services and Disaster Agency (ESDA) using the Metropolitan Computer Aided Dispatch System (Metcad). The ESDA coordinator stated that they will respond to any incident for coordination or resource support. The ESDA coordinator confirmed that the Carle Hospital and Covenant Medical Center have a current Radiation Accident Program and can accept and treat a radiation casualty.

Emergency facilities, instrumentation, equipment, and supplies were being maintained, controlled, and inventoried semiannually or annually as required by E-Plan Sections 7.0 and 9.6. All telephone numbers in the plan were verified annually, not to exceed 15 months, required by E-Plan Section 9.2.

Onsite emergency drills and exercises (conducted as action drills) were conducted annually on an alternating basis, not to exceed 15 months, as required by E-Plan Section 9.2.

The inspector reviewed documentation of the emergency drill and emergency exercise held on September 17, 2002 and September 4, 2003 respectively. The 2002 drill involved UIUC emergency responders, Metcad, the Urbana Fire Department, and Arrow Ambulance. The drill scenario was that of a broken leg injury with no contamination. The drill scenario acceptably exercised the emergency response organization's capabilities and that of the fire and ambulance services.

The 2003 exercise tested the response to an intrusion alarm during normal working hours. The alarms service, Metcad, and UIUC police response satisfied E-Plan requirements.

Critiques were held following the drills to obtain comments from participants, to review problems encountered, and to provide correction of identified deficiencies.

c. Conclusions

The emergency preparedness program was conducted in accordance with the E-Plan.

## 8. Radiation Protection Program

### a. Inspection Scope (IPs 40755 and 69001)

The inspector reviewed the following to ensure that the requirements of 10 CFR Part 20, TS, and the licensee's Radiation Protection Program (RPP) were being met:

- TS for the IATR, Amendment No. 12, dated December 23, 1999
- UIUC Radiation Safety Manual (RSM), dated May 2003
- EPIP-14, Emergency Equipment Maintenance and Surveillance, dated June 23, 1997
- HPG No. 1, Health Physics Surveys, dated August 1993
- HPG No. 11, Health Physics Records, dated August 1995
- HPP No. A, Radiation Protection Program (RPP), dated November 1, 1993
- HPP No. B, ALARA Program, dated December 6, 1993
- HPP No. C, Annual Review of the RPP and ALARA Programs, dated August 14, 1995
- HPP No. 1, Instructions for Completing the Health Physics Daily Checklist, dated June 1995
- HPP No. 3, Quarterly background, efficiency, and MDC/MDA calculations for: BC-4 beta, DSC-4 alpha scintillation, and RM-14/HP-210T beta counters, dated December 1999
- HPP No. 6, basic radiation protection training
- HPP No. 7, Calibration of the AMS-2 Continuous Air Monitors, dated October 1998
- HPP No. 8, Calibration of the Area Radiation Monitors, dated October 1998
- HPP No. 9, Calibration of the Exhaust Stack Monitor, dated October 1998
- HPP No. 13, Analysis of Radioactivity in water, dated May 1996
- HPP No. 15, Calibration of GM and Count Rate Instruments, dated October 1998
- NRLSP No. 3, Weekly Checklist, dated May 1999
- NRLSP No. 4, Quarterly Checklist, dated May 1999
- NRLSP No. 9, Tunnel Inspection, dated August 1999
- NRLSP No. 10, Vault Inspection, dated August 1999
- NRLSP No. 15, Control Rod Inspection, dated June 1995
- RC meeting minutes from September 2000 through the present
- RC completed audits and reviews from September 2000 through the present
- IATR 2000 Annual Report, dated February 2, 2001
- IATR 2001 Annual Report, dated February 18, 2002
- IATR 2002 Annual Report, dated February 5, 2003
- Personnel dosimetry records from September 2000 to present
- selected NRL and Environment Health and Safety (EH&S) instrument calibration records



b. Observations and Findings

(1) Radiation Protection Program

Although individual procedures had been revised, the RPP had not appreciably changed since the last NRC inspection. The RPP consisted of the RSM, the NRLHPPs, and the NRL ALARA Program and was reviewed at least annually as required by 10 CFR 20.1101(c). This review and oversight were provided by the RC and performed in accordance with HPP No. C, Annual Review of the RPP and ALARA Programs.

The inspector's review of the annual RPP review, selected individual procedure changes, and HP records confirmed that the RSO and RHP reviewed RPP changes and radiation protection related events/conditions. The inspector determined that they were performing their required oversight of the RPP as required by TS Sections 6.1.1.c and 6.3 and licensee requirements.

(2) Postings and Notices

During tours, the inspector observed that caution signs, postings and controls in the controlled areas were acceptable for the hazards involving radiation and contaminated areas and were implemented as required by 10 CFR 20, Subpart J. Through observations of and interviews with licensee staff and UIUC police officers, the inspector confirmed that personnel complied with the signs, postings and controls. The facility's radioactive material storage areas were properly posted. No unmarked radioactive material was detected in the facility. The inspector confirmed that current copies of NRC Form-3 and notices to workers were posted in appropriate areas in the facility as required by 10 CFR Part 19.

(3) Surveys

The inspector audited selected monthly, quarterly, and other periodic contamination and radiation surveys and water analyses since September 2000. They were performed and documented as required by HPP Nos. 1 and 13 and NRLSP Nos. 3 and 4. Results were evaluated and corrective actions taken and documented when readings/results exceeded the licensee's limits of 33 dpm /100cm<sup>2</sup> average, 100 dpm /100cm<sup>2</sup> maximum of removable alpha, 1000 dpm /100cm<sup>2</sup> average, 5,000 dpm /100cm<sup>2</sup> maximum of fixed alpha, 100 pCi /100cm<sup>2</sup> average, 500 pCi /100cm<sup>2</sup> maximum of removable beta-gamma, 1000 pCi /100cm<sup>2</sup> average, 5,000 pCi /100cm<sup>2</sup> maximum of removable tritium, and a total fixed exposure rate of 250 microrem/hour at 1cm. The inspector's review of the survey records since September 2000, confirmed that contamination in the facility was infrequent. The inspector determined that the survey program satisfied 10 CFR 20.1501(a) requirements.



(4) Dosimetry

The dosimetry program requirements and procedures had not changed since the last inspection. A National Voluntary Laboratory Accreditation Program-accredited vendor was used to provide dosimetry for personnel, environmental, and area monitoring. The inspector confirmed that dosimetry was being issued to staff and visitors as required by 10 CFR 20.1502, the RSM, and HPP 12. All exposures were well within NRC limits specified in 10 CFR 20.1201 and licensee action levels of 300 mR/quarter. Most records showed no exposure above background.

(5) Radiation Monitoring Equipment

The calibration and periodic checks of the portable survey meters, radiation monitoring instruments, and laboratory counters and analyzers were performed by the reactor staff, the HP staff, or certified vendors. The instrument calibrations are tracked using the radiation safety section database. The inspector confirmed that the licensee's calibration procedures and frequencies satisfied TS Sections 4.7 and 6.3, RSM, E-Plan Section 9.0, EPIP-14, Emergency Equipment Maintenance and Surveillance, and 10 CFR 20.1501(b) requirements, and the American National Standards Institute N323 "Radiation Protection Instrumentation Test and Calibration" or the instrument's manufacturers' recommendations. The inspector verified that the calibration and check sources used were traceable to the National Institute of Standards and Technology and that the sources' geometries and energies matched those used in actual detection/analyses.

The inspector reviewed the NRL calibrations performed since September 2000, and confirmed that the calibration for the portable survey meters and laboratory instruments in use had been done as required. Calibrations of the permanently installed radiation area monitors and the continuous air monitors were completed in accordance with HPPs 6 and 7. All instruments checked had current calibrations appropriate for the types and energies of radiation they were used to detect and/or measure.

c. Conclusions

The inspector determined that, because: 1) surveys were being completed and documented as required by 10 CFR Part 20.1501(a), TS, and licensee procedures; 2) postings met regulatory requirements; 3) the personnel dosimetry program was acceptably implemented and doses were in conformance with licensee and 10 CFR Part 20 limits; and 4) portable survey meters and laboratory instruments were being maintained and calibrated as required, the RPP being implemented by the licensee satisfied regulatory requirements.

## **9. Inspection of Transportation Activities**

### **a. Inspection Scope (IP 86740)**

The inspector reviewed selected aspects of the following to ensure that transportation requirements of 10 CFR, 49 CFR, and licensee procedures were being met:

- IATR 2000 Annual Report, dated February 2, 2001
- IATR 2001 Annual Report, dated February 18, 2002
- IATR 2002 Annual Report, dated February 5, 2003
- UIUC RSM, dated May 2003
- HPG No. 4, Transportation of Radioactive Materials On and Off Campus, dated September 1993
- accountability records and fuel storage locations

### **b. Observations and Findings**

No radioactive material was transferred from or to the reactor since the last inspection. If required, material would be passed to the UIUC state license and then packaged and shipped by EH&S personnel under the state license.

### **c. Conclusions**

No radioactive material was transferred from or to the reactor since the last inspection.

## **10. Material Control and Accounting**

### **a. Inspection Scope (IP 85102)**

The inspector reviewed selected aspects of the following to ensure that 10 CFR Part 70 requirements were met:

- NRLSP No. 16, Special Nuclear Material (SNM), dated June 2000
- nuclear material inventories (DOE/NRC Forms 741 and 742) from September 2000 to present
- accountability records and fuel storage locations
- SNM physical inventories since September 2000

### **b. Observations and Findings**

The material control and accountability protocol established by the licensee tracked locations of fuel and fission detectors under the research reactor license. Since the reactor have been permanently shut down, no fuel burn-up calculations are required to be done.

A physical inventory of NRL SNM was conducted at least annually as required by 10 CFR 70.51(d). The inspector reviewed and verified that the material inventories had been performed as required.

The possession and use of SNM were limited to the locations and purposes authorized under the license. The material control and accountability forms (DOE/NRC Forms 741 and 742) were prepared and transmitted as required by 10 CFR 74.13(1).

c. Conclusions

SNM was being controlled and inventoried as required.

**11. Physical Security and Safeguards**

a. Inspection Scope (IPs 81401, 81402, 81431, and 81810)

The inspector reviewed selected aspects of the following to ensure that the physical security plan and safeguards requirements were being implemented as required:

- TS for the IATR, Amendment No. 12, dated December 23, 1999
- UIUC NRL Physical Security Plan (PSP), dated April 2003
- NRLSP No. 13, Intrusion System, dated September 1974
- RC meeting minutes from September 2000 through the present
- UIUC Police Off Hour Logs for August 2003
- City of Champaign letter Re: Mutual East Central Aid System Agreement, dated March 14, 2002
- Police Response protocol for Nuclear Reactor Building Alarms, revised August 2003
- Biennial PSP reviews
- annual key inventories
- security systems, equipment and instrumentations
- implementation of the PSP

b. Observations and Findings

The PSP was the same as the latest submitted to the NRC. The plan had been submitted, with sufficient description, within two months after the change was made. The NRC determined that the change did not decrease the overall effectiveness of the plan

The inspector reviewed the implementation of the licensee's PSP. The inspector toured the facility and confirmed that the physical security systems (barriers and alarms), equipment, and instrumentation were as required by the PSP. Keys to access doors were held and controlled only by designated personnel. Facilities and equipment were secured as required by the PSP. Access and key control was implemented in accordance with licensee procedures and as required by the plan. Annual key inventories were performed as required by the PSP.

The facility was patrolled by UIUC Police at intervals more frequent than required by the PSP. If required, back-up support would be provided by the neighboring police departments as outlined in the Mutual East Central Aid System Agreement. The inspector verified that the security checks, tests, verifications, and the biennial audits were performed and tracked as required by the PSP. Corrective actions were taken when required.

The inspector interviewed the ESDA coordinator, the UIUC Patrol Division Captain, a dispatcher, and several patrol officers. The ESDA coordinator, Captain, dispatcher, and officers were knowledgeable of their response responsibilities. Through records reviews and interviews the inspector confirmed that annual and biennial training was being given as required by the PSP and that implementing procedures contain sufficient detail to adequately accomplish their intended purpose.

Safeguards information was properly marked and was being handled and stored as required by 10 CFR Part 73. The inspector confirmed that there had been no safeguards events since the last inspection.

c. Conclusions

Based on the observations, the inspector found that the NRL physical security features, equipment, and procedures satisfied the PSP requirements.

**12. Effluents and Environmental Monitoring**

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to ensure compliance with 10 CFR Part 20 and TS Sections 3.7, 4.7, and 6.6 requirements:

- TS for the IATR, Amendment No. 12, dated December 23, 1999
- UIUC RSM, dated May 2003
- NRLOP No. 10 Retention Tank Discharge Procedure, dated May 1996
- HPP No. 13, Analysis of Radioactivity in Water, dated May 1996
- Analysis of Radioactivity in Water Data Sheets, Liquid Effluent Storage Tank from September 2000 to present
- Tritium gaseous release calculations from September 2000 to present
- COMPLY Code results for the NRL
- IATR 2000 Annual Report, dated February 2, 2001
- IATR 2001 Annual Report, dated February 18, 2002
- IATR 2002 Annual Report, dated February 5, 2003

b. Observation and Findings

Since the reactor is shut down the only gaseous effluents released have been tritium ( $H^3$ ) to the Reactor building atmosphere (and consequently out the exhaust stack) from the evaporation of water in the primary and the bulk shielding tanks. The calculated release is based on the measurement of the

highest activity of  $H^3$  in either tank, multiplied by the total volume of makeup water additions since the tanks were last sampled for  $H^3$  (yearly). The average concentration released via the exhaust stack has been less than a tenth of a percent of 10 CFR 20 Appendix B Table 2 Column 1 limits. The dose to the public calculated using the COMPLY Code has been well below the dose constraint of 10 millirem per year specified in 10 CFR 20.1101(d) for gaseous releases.

Waste water is collected in the reactor building retention tank. When the tank becomes full it is transferred to a holdup tank passing through a coarse and a fine filter assembly on route. The water is then sampled and discharged into the municipal sanitary sewer system when activity results are satisfactory and it is verified that no insoluble activity is present. If insoluble activity is detected the water is recirculated through a 0.4 micron process filter until all the insoluble activity has been removed then discharged. The average concentration of all soluble beta-gamma activity and  $H^3$  releases have been less than one percent of the 10 CFR 20 Appendix B, Table 3 limits.

Continuous environmental monitoring is conducted at the site boundary and in the surrounding environs utilizing thermoluminescent dosimeters supplied by a NAVLAP certified vendor. The site boundary is established at the reactor building walls with extensions at the fence around the cooling towers and the perimeter of the roof over the mechanical equipment room. This is also defined as the boundary between the restricted and unrestricted areas. Using the dosimetry results the RHP calculated the highest annual site boundary dose for members of the public, based on occupancy time pursuant to 10 CFR 20.1302 (b)(1). Annual doses have been less than 1 mRem, a fraction of the 10 CFR 20.1302(a)(1) limit of 100 mRem. The calculations are maintained and updated in the files of the RHP.

c. Conclusion

Gaseous and liquid effluents releases were well below 10 CFR 20, App. B limits. Dose to the public were well below 10 CFR 20.1302 (a) (1) and 10 CFR 20.1101(d) requirements.

**13. Exit Interview**

The inspection scope and results were summarized on September 11, 2003, with licensee representatives. The inspector discussed the findings for each area reviewed. The licensee acknowledged the findings.

## **PARTIAL LIST OF PERSONS CONTACTED**

### **Licensee**

*R. Holm,	Reactor Administrator
D. Scherer,	UIUC Radiation Safety Officer
F. Kallmayer	UIUC Patrol Division Captain
M. Knight	EH&S Health Physicist
M. Niswander	EH&S Health Physicist

\* attended exit interview

## **INSPECTION PROCEDURE USED**

IP 40755	Class III Non-power Reactors
IP 69001	Class II Non-Power Reactors
IP 81401	Plans, Procedures, and Reviews
IP 81402	Reports of Safeguards Events
IP 81431	Fixed Site Physical Protection of Special Nuclear Material of Low Strategic Significance
IP 81810	Protection of Safeguards Information
IP 85102	Material Control and Accounting
IP 86740	Inspection of Transportation Activities

## **ITEMS OPENED, CLOSED, AND DISCUSSED**

### **Opened**

NONE

### **Closed**

NONE

### **Discussed**

NONE



## **LIST OF ACRONYMS USED**

CFR	Code of Federal Regulations
EH&S	Environment Health and Safety
EPIP	Emergency Plan Implementing Procedures
E-Plan	Emergency Plan
ERO	Emergency Response Organization
ESDA	Champaign County Emergency Services and Disaster Agency
H <sup>3</sup>	Tritium
HPG	Health Physics Guidelines
HPP	Health Physics Procedure
IATR	Illinois Advanced TRIGA Reactor
IP	Inspection Procedure
LCO	Limiting Condition for Operations
Metcad	Metropolitan Computer Aided Dispatch System
NRC	Nuclear Regulatory Commission
NRL	Nuclear Reactor Laboratory
PSP	Physical Security Plan
NRLOP	Nuclear Reactor Laboratory Operating Procedure
NRLSP	Nuclear Reactor Laboratory Surveillance Procedure
RA	Reactor Administrator
RC	Reactor Committee Manual
REQ	Requalification Program
RHP	Reactor Health Physicist
RPP	Radiation Protection Program
RSM	Radiation Safety Manual
SNM	Special Nuclear Materials
SRO	Senior Reactor Operator
UIUC	University of Illinois at Urbana/Champagne
TS	Technical Specifications