August 17, 2006

Mr. Andrew Cook
Nuclear Reactor Program
Department of Nuclear Engineering
North Carolina State University
P. O. Box 7909
Raleigh, NC 27695-7909

SUBJECT: NRC INSPECTION REPORT NO. 50-297/2006-201

Dear Mr. Cook

This letter refers to the inspection conducted on May 22 - 26, 2006, at your PULSTAR research reactor 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 concern or noncompliance to NRC requirements was identified. No response to this letter is required.

In accordance with 10 CFR 2.390 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, please contact Mr. Marvin Mendonca at 301-415-1128.

Sincerely,

/RA/
Johnny Eads, Branch Chief
Research and Test Reactor Branch B
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-297
License No. R-120

Enclosure: NRC Inspection Report No. 50-297/2006-201

cc w/enclosures: Please see next page

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Gainesville, FL 32611

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U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Docket No:	50-297
License No:	R-120
Report No:	50-297/2006-201
Licensee:	North Carolina State University
Facility:	PULSTAR reactor
Location:	Raleigh, North Carolina
Dates:	May 22 - 26, 2006
Inspector:	Thomas F. Dragoun
Approved by:	Johnny Eads, Branch Chief Research and Test Reactor Branch B Division of Policy and Rulemaking Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

North Carolina State University
Report No:50-297/2006-201

The focus of this routine, announced inspection was the on-site review of selected aspects of the licensee's Class II non-power research reactor operation including: organization and staffing; logs and records; requalification training; surveillance and limiting conditions for operation; health physics; committees, audits, and reviews; and design changes.

Organization and Staffing

- The licensee's organization and staffing were in compliance with the requirements specified in the Technical Specifications Section 6.

Logs and Records

- Within the scope of this review, the licensee's record keeping program conformed to Technical Specifications requirements.

Requalification Training

- Operator requalification was conducted as required by the Requalification Program.

Surveillance and Limiting Conditions for Operation

- The conduct of surveillances satisfied the requirements in Technical Specifications Section 4.0.

Health Physics

- The radiation protection program satisfied NRC requirements.

Committees, Audits, and Reviews

- The Radiation Safety Committee and Reactor Safety and Audit Committee provided the oversight required by the Technical Specifications.

Design Changes

- The design change program satisfied NRC requirements.

REPORT DETAILS

Summary of Plant Status

The licensee's one megawatt open pool PULSTAR reactor operates in support of neutron activation analysis, isotope production, and undergraduate instruction. During the inspection, the reactor was not operated due to the replacement of ventilation ductwork in the reactor room.

1. Organization and Staffing

a. Inspection Scope (Inspection Procedure [IP] 69001)

The inspector reviewed the following regarding the licensee's organization and staffing to ensure that the requirements of Technical Specification (TS) Section 6.1. "Organization" Amendment No. 11, dated April 30, 1997, were being met:

- organizational structure
- management responsibilities
- staffing requirements for safe operation of the research reactor facility
- Console log book 001 covering January 6, 2005 to October 25, 2005
- Console log book 002 covering October 26, 2005 to April 14, 2006

b. Observations and Findings

The North Carolina State University Chancellor had changed since the last inspection. There was no impact on the reactor or nuclear educational programs. Support of these programs by the administration remains positive.

For a six month period from July 2005 to February 2006, the reactor was operated around the clock on a one-time basis. The minimum staffing when the reactor is not secured was specified in TS 6.1.2. The inspector reviewed the console records for the period of continuous operation and determined that staffing requirements were met. The licensee's administrative requirement for these records are found in Section 3 of the Operations Manual.

c. Conclusions

The licensee's organization and staffing were in compliance with the requirements specified in TS Section 6.

2. Logs and Records

a. Inspection Scope (IP 69001)

The inspector reviewed selected maintenance and reactor operations records to ensure that the requirements of TS Section 6.8 "Retention of Records" were being met:

- Procedure NRP-OP-103, "Reactor Operation" Revision 1, dated July 13, 2005
- Operating Parameters records for January 10 to December 22, 2005
- Reactor console logbooks numbers 001 and 002

b. Observations and Findings

The licensee's administrative procedure for recordkeeping specifies the use of black, red, and green pens for certain data. This enhances the subsequent reviews by management. Hourly readings from operating equipment are recorded in the Operating Parameters Log. This data was used for preemptive maintenance to prevent equipment failures during operation. In addition, equipment maintenance records contain detailed information regarding equipment failures, the failure mode, repairs, calibrations, and operational testing prior to return to service. A rubber stamp is used to document all of the factors used to calculate the Estimated Critical Position (ECP) of the control rods when the reactor is just critical. For the records included in this review, the licensee's administrative requirements were met.

c. Conclusions

Within the scope of this review, the licensee's recordkeeping program conformed to TS requirements.

3. Requalification Training

a. Inspection Scope (IP 69001)

The inspector reviewed the following to determine if the requalification training program was conducted in accordance with Special Procedure 2.6, "PULSTAR Operator Requalification Program" Revision 6, dated January 19, 1995, and 10 CFR 50.55 "Operators' Licenses":

- the Requalification Program
- operator licenses
- operator physical examination records
- operator oral and written examination records
- watchstanding proficiency evaluation

b. Observations and Findings

The progress of each reactor operator in the requalification program was maintained in a checklist called "PULSTAR Requalification Training, North Carolina State University Requalification Checklist 2005/2006." Records included physical exams, NRC license date, systems review, operational exam, emergency training, abnormal operation, written quizzes, and previously completed checklists. Entries made into the checklist are required to be dated instead of simply check marked. All checklists reviewed by the inspector were up-to-date. Currently, records are maintained on 5 permanent staff and 11 student operators.

c. Conclusions

Operator requalification was conducted as required by the Requalification Program.

4. Surveillance

a. Inspection Scope (IP 69001)

The inspector reviewed the following to determine if the periodic surveillance tests on safety systems were performed as stipulated in TS Section 4.0:

- The requirements in TS 4.3(a) and 4.3(b) to perform channel checks of measuring channels and channel test of each RSS channel is done each reactor startup
- Procedure PS-1-08-4A:S1, "Nitrogen-16 Channel B Calibration" Revision 2, dated March 24, 1993. Data for May 6, October 28, 2005, April 28, 2006
- Procedure PS-1-10:S1, "Temperature Channel Calibration" Revision 4, dated February 20, 1996. Data for May 6 and October 6, 2005 and April 28, 2006
- Procedure PS-2-03:S1, "Flow Channel Calibration," Revision 1, dated October 1, 1990. Data for May 27 and November 9, 2005, and May 11, 2006
- Procedure PS-2-02-5:S1, "Pool Level Channel Calibration." Data for May 27 and November 9, 2005, and May 19, 2006
- Procedure PS-1-03-4A:S1, "Linear Channel Calibration." Data for May 2 and November 9, 2005, and May 2, 2006
- Procedure PS-7-02-1A, "Auxiliary Generator", data for January 25, February 28, March 28, April 10, 2006. August 17, 2004, and August 26, 2003
- Procedure PS-5-08-1:S1, "Dampers, Gaskets, and Seals Inspection" revision 1 dated October 1, 1990. Data for June 3 and December 19, 2005
- Procedure PS-5-06-3:A1, "Magnahelic Gauge Calibration" Revision 1, dated October 1, 1990
- Procedure PS-5-04-01:M1, "Confinement Fan No. 2 Auxiliary Power Test" Revision 2, dated September 9, 1997. Data for June 27, 2005
- Memorandum: "Biennial Testing of Confinement Filter Trains" dated June 3, 1976. Data for May 2004 and August 2004

b. Observations and Findings

Surveillances were completed on schedule and in accordance with licensee procedures. The protocols and techniques were effective in verifying the performance of the safety equipment. All the recorded results were within the TS and procedurally prescribed parameters. The records and logs were complete and were being maintained as required. Checks and calibrations were completed as required by TS.

The records and logs reviewed by the inspector were complete and were being maintained as required.

c. Conclusions

The conduct of surveillances satisfied the requirements in TS Section 4.0.

5. Health Physics

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with 10 CFR Part 20 "Standards for Protection Against Radiation" and licensee administrative requirements:

- Procedure HP-1, "Radiation Protection Program" Revision 5, dated July 1, 2004
- Procedure HP-3, "Radiological Surveys" Revision 1, dated July 1, 2004 Records of monthly radiation level and weekly smear results for January to October 2004.
- Procedure HP-6, "Transport of Radioactive and Hazardous Material" Revision 1, dated September25, 2003
- Monthly radiation survey results for February 3, 2005 to April 14, 2006
- Weekly contamination survey results for September 28, 2005 to May 22, 2006
- Annual audit of HP program dated March 31, 2006
- Procedure HP-7, "Leak Testing, Inventory, and Accountability of Special Nuclear Material and Licensed Sealed Sources" Revision 1, dated April 12, 2001
- Procedure HP-8, "Radiation Work Permit" Revision 2, dated June 8,2004
- Procedure HP-9, "Respirator Use and Bioassay" revision 2, dated February 4, 2000. Respirator inspection and function data for January 17, February 17, March 17, April 18, and May 15, 2005. Respirator inventory done November 16, 2005 and May 15, 2006. Bioassay of each respirator user done November, 2004 to March 10, 2006.
- Procedure HP-10, "Calibration, Operation, and Maintenance of Radiation Survey and Chemistry Instruments" Revision 4, dated July 1, 2004
- Procedure PS 6-02-3:A1, "Vamp Area Radiation Monitor Calibration" revision 0, dated October 26, 1994
- Procedure PS 6-16-1, "Assessment of Airborne Effluents" Revision 0, dated March 2, 1998. Runs were completed on January 12, February 3, March 1, April 11, May 13, 2006, and December 6, November 1, October 14, September 9, August 5, and July 6, 2005. All results were less than 10 millirem
- Procedure PS 6-17-3, "Radiation Monitoring System Set point Verification" Revision 0, dated April 7, 2000. Weekly data for the period November 26, 2003 to May 25, 2004
- Annual Report dated February 28, 2006

b. Observations and Findings

The radiation protection program had not changed since the last inspection. The program documentation and implementation was concise, complete, and technically sound and satisfied the requirements in 10 CFR 20.1101. The annual personnel radiation dosimetry reports for the 4 year period 2001-2004 reported doses that were below the regulatory limits. The level of controls were appropriate for the radiological hazards in the facility.

The licensee reviewed the radiation protection program at least annually in accordance with 10 CFR 20.1101(c). The review included all areas and no weaknesses were reported. The licensee showed that the air emissions or radioactive material to the environment met the 10 millirem constraint specified in 10 CFR 20.1101(d).

Use of dosimeters and exit frisking practices were in accordance with radiation protection requirements. The licensee used a National Voluntary Laboratory Accreditation Program (NVLAP) accredited vendor to process dosimetry. Radiological exposure records showed that occupational doses and doses to the public were within 10 CFR Part 20 limitations. Training records showed that personnel were acceptably trained in radiation protection practices.

Radiation monitoring and survey activities were as required. Equipment used for these activities were maintained, calibrated and used acceptably.

The campus radiation protection office has established a respiratory protection program applicable to the entire campus that included the reactor facility. A campus Planned Special Exposure program was also available for use at the reactor facility. The inspector verified that these programs met regulatory requirements.

c. Conclusions

The radiation protection program satisfied NRC requirements.

6. Committees, Audits, and Reviews

a. Inspection Scope (IP 69001)

The inspector reviewed the following to ensure that the audits and reviews stipulated in TS Section 6.2 were being completed:

- Reactor Safety and Audit Committee (RSAC) membership
- RSAC minutes of meetings held May 6, 2005 and February 16, 2006
- Radiation Safety Committee (RSC) membership
- RSC minutes of meetings held May 16, 2005 and February 20, 2006

b. Observations and Findings

The composition of the RSC and RSAC were as specified in the TS. A review of records indicated that both committees met at the prescribed frequency and provided the oversight and reviews of the reactor programs as required by the TS.

c. Conclusions

The Radiation Safety Committee and Reactor Safety and Audit Committee provided the oversight required by the Technical Specifications.

7. Design Changes

a. Inspection Scope (IP 69001)

The inspector reviewed the program and equipment changes made by the licensee under the provisions in 10 CFR 50.59 as follows;

- Control #606, Neutron Imaging Facility dated December 8, 2004
- Control #609, Emergency Procedure 2, Off Site Notification dated December 30, 2004
- Control #610, Special Procedure 2.2 Reactor Operator Assistant Qualification dated March 13, 2005
- Control #611, Modification of Shim Rod Drive Mechanism dated February 21, 2005
- Control #621, NRP-OP-105 Response to Scrams, Alarms, and Abnormal Conditions dated March 29, 2005
- Control #623, NRP-OP-103 Reactor Operation dated May 6, 2005
- Control #624, Control Rod and Fission Chamber Drive Position Indication Modification dated May 3, 2005
- Annual Report for 2005, Section 6.7.4.e, “Changes in Facility, Procedures, Tests, and Experiments” dated February 28, 2006

b. Observations and Findings

Records and observations showed that changes at the facility were acceptably reviewed in accordance with 10 CFR 50.59 and applicable licensee administrative controls.

c. Conclusions

The design change program satisfied NRC requirements.

8. Exit Interview

The inspection scope and results were summarized on May 26, 2006, with members of licensee management. The inspector described the areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

Larry Broussard, Chief Reactor Operator
Andrew Cook, Associate Director, Nuclear Reactor Program, and Reactor Operations Manager
Kerry Kincaid, Chief of Reactor Maintenance
Gerry Wicks, Reactor Health Physicist

INSPECTION PROCEDURES

IP 69001 Class II Non-power Reactors

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

LIST OF ACRONYMS USED

CFR	Code of Federal Regulations
IFI	Inspector Follow-up Item
IP	Inspection procedure
NRC	Nuclear Regulatory Commission
RSAC	Reactor Safety and Audit Committee
RSC	Radiation Safety Committee
RSO	Radiation Safety Officer
TS	Technical Specification