

June 1, 2007

Dr. William A. Baeslack III  
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142A Hitchcock Hall  
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SUBJECT: NRC INSPECTION REPORT NO. 50-150/2007-201

Dear Dr. Baeslack:

On May 21 - 24, 2007, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Ohio State University Research Reactor facility. The enclosed report documents the inspection results, which were discussed on May 24, 2007, with Richard Denning, Director of the Nuclear Reactor Laboratory, Robert Peterson, Director of the Office of Radiation Safety, and Andrew Kauffman, Associate Director of the Nuclear Reactor Laboratory.

The inspection examined activities conducted under your license as they relate to safety and compliance with the NRC's rules and regulations and with the conditions of your license. The inspector reviewed selected procedures and records, observed activities, and interviewed personnel. Based on the results of this inspection, no findings of significance were identified.

In accordance with Section 2.390, "Public inspections, exemptions, and requests for withholding," of Title 10 of the *Code of Federal Regulations*, a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Should you have any questions concerning this inspection, please contact Craig Bassett at 404-358-6515.

Sincerely,

*/RA/*

Johnny H. Eads, Jr., Branch Chief  
Research and Test Reactors Branch B  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

Docket No. 50-150  
License No. R-75

Enclosure: NRC Inspection Report No. 50-150/2007-201  
cc w/enclosure: Please see next page

Ohio State University

Docket No. 50-150

cc:

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**ACCESSION NO.: ML071500486**

**TEMPLATE #: NRR-106**

OFFICE	PRTB:RI	PRT:LA	PRTB:BC
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DATE	05/30/2007	05/30/2007	06/01/2007

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

Docket No.: 50-150

License No.: R-75

Report No.: 50-150/2007-201

Licensee: Ohio State University

Facility: Nuclear Reactor Laboratory

Location: Columbus, Ohio

Dates: May 21-24, 2007

Inspector: Craig Bassett

Approved by: Johnny H. Eads, Jr., Branch Chief  
Research and Test Reactors Branch B  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

## EXECUTIVE SUMMARY

Ohio State University  
Nuclear Reactor Laboratory  
Report No: 50-150/2007-201

The primary focus of this routine, announced inspection included onsite review of selected aspects of the licensee's Class II research reactor safety program including organizational structure and staffing, review and audit and design change functions, conduct of operations, procedures, operator requalification, maintenance and surveillance, fuel handling, experiments, and emergency preparedness since the last NRC inspection of these areas. The licensee's programs were acceptably directed toward the protection of public health and safety. No violations or deviations were noted.

### Organization and Staffing

- The licensee's organization and staffing remain in compliance with the requirements specified in Technical Specification Section 6.1.

### Review and Audit and Design Change Functions

- The review and audit program and oversight of reactor operations were being conducted acceptably by the Reactor Operations Committee as stipulated in the Technical Specifications.
- Changes to the facility were being evaluated using the 10 CFR 50.59 criteria and were then reviewed and approved by the Reactor Operations Committee as required.

### Conduct of Operations

- Reactor operations and log maintenance were acceptable and in accordance with Technical Specifications and procedural requirements.

### Procedures

- The procedural control and implementation program satisfied Technical Specification requirements.

### Operator Requalification

- The requirements of the Operator Requalification Plan were being met and the plan was being acceptably implemented.
- Biennial medical examinations were being completed for all operators as required.

### Maintenance and Surveillance

- Maintenance logs, records, reviews, and performance satisfied Technical Specification and procedure requirements.

- The program for tracking and completing surveillance tests, checks, calibrations, and verifications satisfied Technical Specification requirements.

#### Fuel Handling Activities

- Fuel movements and inspections were completed and documented in accordance with the requirements specified by procedure.

#### Experiments

- The license's program for the control of experiments satisfied Technical Specification and procedural requirements.

#### Emergency Preparedness

- The emergency response program was conducted in accordance with the requirements stipulated in the Emergency Plan.
- Emergency drills were conducted annually as required.
- Emergency equipment was being maintained and inventoried annually as required.
- Adequate off-site support was being provided by the University Police Department and the University Hospital.

## REPORT DETAILS

### **Summary of Plant Status**

The Ohio State University Research Reactor (OSURR), a five-hundred kilowatt open pool-type reactor, continued to be operated in support of undergraduate instruction, laboratory experiments, reactor operator training, and various types of irradiation projects. During the inspection, the reactor was started up, operated, and shut down as required and in accordance with applicable procedures to support these ongoing activities.

### **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 the Technical Specification (TS) Section 6.1, as revised by Amendment Number (No.) 18 to the Facility Operating License dated December 22, 2005, were being met:

- organizational structure
- management responsibilities and authorities
- selected OSURR Console Log Book entries for 2006 and 2007
- staffing requirements for safe operation of the research reactor facility
- American National Standards Institute (ANSI/ANS) Standard 15.4-1988, "Standards for Selection and Training of Personnel for Research Reactors," dated June 9, 1988
- Nuclear Reactor Laboratory (NRL) Administrative Procedure AP-13, "Personnel Required for Reactor Operation," Revision (Rev.) 3, dated March 6, 1996

#### b. Observations and Findings

The inspector determined that the organizational structure at the facility had not changed since the previous NRC inspection in October 2005 (refer to NRC Inspection Report No. 50-150/2005-202). The Associate Director continued to be responsible for the day-to-day operation of the Ohio State University Research Reactor and ensured that operations were conducted in a safe manner. He reported to the Director, NRL, who, in turn, reported to the Director of the Engineering Experiment Station (EES). The Director, EES, continued to have overall responsibility for the management of the facility and reported to the Dean of the College of Engineering. The responsibility and authority of these positions remained unchanged. Through discussions with licensee management, the inspector noted that the licensee continued to support the NRL and was committed to its safe operation.

The licensee indicated that there were four Senior Reactor Operators (SROs) working at the facility. This total included one person who worked part-time. There was also one person who was in the training program to become a licensed operator. Through review of various records and discussions with personnel, the inspector determined that the operations staff satisfied the TS qualification requirements. A review of reactor console records confirmed that the staffing requirements during reactor operations were met.

c. Conclusions

The licensee's organization and staffing remain in compliance with the requirements specified in the TS.

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

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 and to verify that any modifications to the facility were consistent with 10 CFR 50.59 and TS Section 6.2.4:

- facility configuration and associated records
- facility design changes and records for the past two years
- Completed "OSURR Modification Request" forms Nos. 43 - 46
- Reactor Operations Committee membership and qualifications
- Reactor Operations Committee meeting minutes for 2006 and 2007
- Audit of the Nuclear Reactor Laboratory Operations for Calendar Year (CY) CY05 (covering the period from November 1, 2004 to November 30, 2005), dated January 10, 2006
- Audit of the Nuclear Reactor Laboratory Operations for CY06 (covering the period from November 30, 2005 to November 30, 2006), dated March 23, 2007
- The Ohio State University Research Reactor Annual Report for FY 2004/2005, submitted September 22, 2005
- The Ohio State University Research Reactor Annual Report for FY 2005/2006, submitted September 25, 2006
- NRL Administrative Procedure AP-08, "NRL Audit," Rev. 3, dated October 1, 2002
- NRL Administrative Procedure AP-14, "OSURR Modification Requests," Rev. 4, dated April 25, 2001

b. Observations and Findings

(1) Review and Audit Functions

The composition and meeting frequency of the Reactor Operations Committee (ROC) satisfied the TS Section 6.2 requirements. The minutes of the meetings demonstrated that the ROC provided the review and oversight required by the TS. Issues brought up by the ROC were resolved in an appropriate time frame and were noted in ROC meeting minutes. Invited visitors participated in meetings to discuss proposed ideas for experiments at the OSURR. All aspects of operations at the facility were discussed and the ROC provided direction for the safe operation of the facility.

Individuals designated by the ROC conducted audits of those items required by the TS and the full ROC reviewed the results. The inspector noted that the audits typically made recommendations but there were no safety significant issues identified. The licensee reviewed the audits and the recommendations and took corrective actions as needed.

(2) Design Change Functions

Facility design changes were controlled and implemented through NRL Administrative Procedure AP-14. The inspector reviewed various 10 CFR 50.59 evaluations and the corresponding design change packages concerning the latest facility changes. From these reviews, the inspector determined that the facility design change evaluations had adequate supporting documentation and information. Additionally, the inspector found that the 10 CFR 50.59 reviews and approvals conducted by the ROC were focused on safety and met TS and OSURR procedural requirements. Post installation verification testing of the changed systems or equipment was thorough and adequately documented when completed. Procedure and drawing changes were included in the change packages and were consistent with the requirements for facility changes. None of the recent changes made at the facility constituted a safety question.

c. Conclusions

Review and oversight functions required by the TS were acceptably completed by the ROC. Changes to the facility were being evaluated using the 10 CFR 50.59 criteria and were then reviewed and approved by the ROC as required. No changes were determined to constitute a safety question.

**3. Conduct of Operations**

a. Inspection Scope (IP 69001)

The inspector reviewed the following to ensure that reactor operations were conducted in accordance with procedure as required by TS Section 6.3 and that records were maintained as required by TS Section 6.7:

- Emergency Scram Log
- ROC meeting minutes for 2006 and 2007
- selected Request for Reactor Operations forms for 2006 and 2007
- selected Pre-Startup and Post-Shutdown forms for 2006 through the present
- selected entries in OSURR Console Log Books:
  - dated December 15, 2005 through August 25, 2006, and containing pages numbered 6403 - 6501
  - dated August 28, 2006 through April 5, 2007, and containing pages numbered 6502 - 6600
  - dated April 6, 2007 to the present, and containing completed pages numbered 6601 - 6634
- The Ohio State University Research Reactor Annual Report for FY 2004/2005, submitted September 22, 2005
- The Ohio State University Research Reactor Annual Report for FY 2005/2006, submitted September 25, 2006
- NRL Administrative Procedure AP-03, "Filing Requests for Reactor Operations," Rev. 5, dated March 27, 1996
- Form AP-03 Attachment D, "Request for Reactor Operation," Rev. 5, dated March 27, 1996

- NRL Administrative Procedure AP-04, "Approval of Requests for Reactor Operations," Rev. 3, dated October 3, 2003
- NRL Administrative Procedure AP-10, "Console Operating Experience Record," Rev. 4, dated December 29, 1995
- NRL Administrative Procedure AP-11, "Record Keeping," Rev. 2, dated March 29, 1996
- NRL Administrative Procedure AP-13, "Personnel Required for Reactor Operation," Rev. 3, dated March 6, 1996
- NRL Administrative Procedure AP-15, "Logging Emergency Scrams," Rev. 2, dated March 6, 1996
- Form AP-15 Attachment A, "Record of 'Emergency' Scrams," Rev. 2, dated March 6, 1996
- NRL Instrumentation Use and Maintenance Procedure IM-03, "OSURR Pre-Start Checkout," Rev. 14, dated May 8, 2007
- NRL Instrumentation Use and Maintenance Procedure IM-04, "Post-Shutdown Checkout," Rev. 11, dated May 8, 2007
- NRL Operations and Maintenance Procedure OM-01, "Reactor Power Changes," Rev. 13, dated November 20, 2006
- NRL Operations and Maintenance Procedure OM-08, "Reactor Operation Logbook Records," Rev. 8, dated May 8, 2007

b. Observations and Findings

The operating logs were complete and provided an acceptable indication of operational activities. The logs and records showed that operational conditions and parameters were consistent with license and TS requirements and that TS operational limits had not been exceeded. Scrams that occurred during reactor operations were recorded on Form AP-15 Attachment A as well as in the reactor Console Log Books. All scrams were resolved before reactor operations were resumed as authorized by, and under the direction of, the SRO on duty.

The inspector reviewed selected OSURR Pre-Start and Post-Shutdown Checkout forms from January 2006 through the date of this inspection. The inspector conducted observations of the reactor staff on May 22, 23, and 24, 2007, and observed the required actions taken for the completion of the OSURR Pre-Start and Post-Shutdown forms. The inspector also observed routine reactor steady-state operations and the completion of the associated records and logs documenting the day's activities as well. The inspector determined that reactor operations were carried out following written procedures as required by TS Section 6.3. The inspector noted that the individual designated as the SRO on duty, and indeed all the operators at the facility, were knowledgeable and competent.

c. Conclusions

Reactor operations and log maintenance were acceptable and in accordance with TS and procedural requirements.

#### 4. Procedures

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

The inspector reviewed the following to ensure that the requirements of TS Section 6.3 were being met concerning written procedures:

- ROC meeting minutes for 2006 and 2007
- The Ohio State University Research Reactor Annual Report for FY 2004/2005, submitted September 22, 2005
- The Ohio State University Research Reactor Annual Report for FY 2005/2006, submitted September 25, 2006
- NRL Administrative Procedure AP-06, "Format for Writing, Revising, and Approving Procedures," Rev. 7, dated March 19, 1996
- NRL Administrative Procedure AP-06 Attachment C, "Procedure Change Sheet," Rev. 7, dated March 21, 1996
- NRL Administrative Procedure AP-07, "Review of Procedures," Rev. 17, dated September 25, 2006
- NRL Administrative Procedure AP-08, "NRL Audit," Rev. 3, dated October 1, 2002
- NRL Operations and Maintenance Procedure OM-01, "Reactor Power Changes," Rev. 13, dated November 20, 2006
- NRL Operations and Maintenance Safety Procedure OM-08, "Reactor Logbook Records," Rev. 8, dated May 8, 2007
- NRL Operations and Maintenance Procedure OM-15, "Process System Checks," Rev. 4, dated January 5, 2007

##### b. Observations and Findings

The inspector determined that written procedures were available for the activities delineated in TS Sections 6.3.1 and 6.3.2 and were approved by the ROC as required. The clarity of the procedures and detail contained therein were acceptable for the nature of the work performed. Attachment A to NRL Administrative Procedure AP-07 provided a routing slip, which was used to circulate revised procedures to the reactor operators and was retained with the original copy as proof of review. The licensee used Attachment C to NRL Administrative Procedure AP-06, "Procedure Change Sheet" to document procedure changes and indicate that the changes had been reviewed and approved by an SRO who did not submit the change. All changes to procedures were also submitted to the ROC for review and approval as noted above.

The inspector verified that all procedures were reviewed on a rotating basis and the ROC was informed of the results of the review. Procedures were reviewed biennially in accordance with NRL Administrative Procedure AP-06 and updated as needed. The last general procedure review was completed in April 2006. Since that date individual procedures have been reviewed, revised, and subsequently approved as required.

c. Conclusions

The procedural control and implementation program satisfied Technical Specification requirements.

**5. Operator Requalification**

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with the requirements in 10 CFR Part 55 and the licensee's NRC approved Requalification Plan:

- status of active operator licenses
- operator physical examination records
- operator training records for 2005 to 2007
- annual written examinations for 2005 and 2006
- logs and records of reactivity manipulations and data for 2005 to the present
- selected entries in OSURR Console Log Books:
  - dated December 15, 2005 through August 25, 2006, and containing pages numbered 6403 - 6501
  - dated August 28, 2006 through April 5, 2007, and containing pages numbered 6502 - 6600
  - dated April 6, 2007 to the present, and containing completed pages numbered 6601 - 6634
- NRL Administrative Procedure AP-07, "Review of Procedures," Rev. 17, dated September 25, 2006
- NRL Administrative Procedure AP-09, "RO/SRO Requalification," Rev. 7 dated September 25, 1996
- NRL Administrative Procedure AP-10, "Console Operating Experience Record," Rev. 4 dated December 29, 1995
- NRL Administrative Procedure AP-10 Attachment A, "OSURR Console Operating Experience," Rev. 4 dated December 29, 1995

b. Observations and Findings

As noted previously, there were four SROs employed at the facility. Three were full-time personnel while the fourth person only worked part-time. One person was in training to become a qualified operator. The inspector verified that the operators' licenses were current.

The inspector noted that the Operator Requalification Program, implemented by NRL Administrative Procedure AP-09, was being maintained up-to-date. Records showed that operators were given written examinations and operations tests as required. Logs indicated that each operator maintained active duty status by operating the reactor the required number of hours each quarter and by taking an annual operating test and a written examination as required. The inspector also verified that the operators were reviewing changes to the facility license, TS, procedures, Emergency Plan, Security Plan, and design changes on a regularly scheduled basis as required by the program.

The inspector determined that physical examinations of the operators were conducted biennially as required. It was noted that one operator was due for a physical during May 2007, the month of this inspection. The licensee was aware of this and was in the process of scheduling the examination. The licensee was informed that scheduling and completion of the physical examination for one facility reactor operator would be tracked by the NRC as an Inspector Follow-up Item (IFI) and would be reviewed during a future inspection (50-150/2007-201-01).

c. Conclusions

Operator requalification was being conducted and completed as required by the Operator Requalification Program.

**6. Maintenance and Surveillance**

a. Inspection Scope (IP 69001)

To determine that surveillance activities and calibrations were being completed as required by TS Sections 2.0, 3.0, and 4.0, the inspector reviewed:

- surveillance tracking log sheets and associated records
- selected entries in OSURR Console Log Books:
  - dated December 15, 2005 through August 25, 2006, and containing pages numbered 6403 - 6501
  - dated August 28, 2006 through April 5, 2007, and containing pages numbered 6502 - 6600
  - dated April 6, 2007 to the present, and containing completed pages numbered 6601 - 6634
- The Ohio State University Research Reactor Annual Report for FY 2004/2005, submitted September 22, 2005
- The Ohio State University Research Reactor Annual Report for FY 2005/2006, submitted September 25, 2006
- Form AP-03 Attachment D, "Request for Reactor Operation," Rev. 5, dated March 27, 1996
- NRL Instrumentation Use and Maintenance Procedure IM-01, "Scram Checks," Rev. 8, dated August 25, 2005
- NRL Instrumentation Use and Maintenance Procedure IM-05, "Core Reactivity Data," Rev. 2, dated May 26, 2004
- NRL Instrumentation Use and Maintenance Procedure IM-07, "Rod Parameter Testing," Rev. 5, dated December 16, 1997
- NRL Instrumentation Use and Maintenance Procedure IM-12, "Reactor Instrumentation Calibration/Checks," Rev. 7, dated October 31, 2002
- NRL Operations and Maintenance Procedure OM-02, "Control Rod Annual Inspection," Rev. 1, dated June 5, 1997
- NRL Operations and Maintenance Safety Procedure OM-11, "Control Rod Magnetic Core Assembly," Rev. 4, dated December 28, 1995
- NRL Operations and Maintenance Procedure OM-15, "Process System Checks," Rev. 4, dated January 5, 2007

- NRL Operations and Maintenance Procedure OM-16, "Power Calibration," Rev. 2, dated November 4, 2002
- Procedure RS-03, "Calibrating Gaseous Effluent Monitor," Rev. 6, dated January 20, 2004

b. Observations and Findings

(1) Maintenance

The inspector reviewed the records regarding scheduled and unscheduled preventive and corrective maintenance activities for 2005 through the present. This review indicated that all maintenance activities were controlled and documented in the maintenance and/or operations log as required. Implementation of changes to equipment, systems, tests or experiments was completed by any of the SROs at the facility. After all maintenance items were completed, system operational checks were performed to ensure that the affected systems functioned properly before returning them to service.

(2) Surveillance

Within the scope of this review, the inspector determined that surveillance checks, tests, and Limiting Conditions for Operation (LCO) verifications and calibrations were completed in accordance with licensee procedures, checklists, or equipment manufacturers recommendations. The records and logs reviewed were complete and were being maintained as required. The inspector noted that the licensee maintained an effective logging system that helped ensure that all required tests, LCO verifications, and calibrations were completed within the specified time frame. All other routine periodic tasks were also recorded in this log, which was located on the outer window of the control room. The log sheets were placed in that location so that they were readily visible to all operators and could be constantly reviewed to ensure that all required surveillances were completed.

The inspector noted that selected daily, monthly, quarterly, semiannual, and annual checks, tests, and/or calibrations for TS-required surveillance and LCO verifications were completed on schedule as stipulated. All the recorded results reviewed by the inspector were within the TS and procedurally prescribed parameters.

c. Conclusions

The maintenance program was being implemented as required and the surveillance program, along with the completed tests, checks, calibrations, and verifications, satisfied TS requirements.

## 7. Fuel Handling

### a. Inspection Scope (IP 69001)

In order to verify adherence to fuel handling and inspection requirements specified in TS Sections 4.1.2, 5.3, 5.4, and 5.5, the inspector reviewed:

- selected operations logs and records
- fuel handling and inspection procedures
- selected entries in OSURR Console Log Books:
  - dated December 15, 2005 through August 25, 2006, and containing pages numbered 6403 - 6501
  - dated August 28, 2006 through April 5, 2007, and containing pages numbered 6502 - 6600
  - dated April 6, 2007 to the present, and containing completed pages numbered 6601 - 6634
- NRL Administrative Procedure AP-05, "SNM Inventory," Rev. 4, dated August 28, 2003
- Form AP-05 Attachment B, "NRL Fuel Element Inspection," Rev. 4, dated December 16, 2003
- NRL Operations and Maintenance Procedure OM-02, "Control Rod Annual Inspections," Rev. 1, dated June 5, 1997
- NRL Operations and Maintenance Procedure OM-07, "Fuel Element Inspections," Rev. 6, dated April 25, 2001

### b. Observations and Findings

The inspector determined that the licensee was maintaining the required records of the various fuel movements that had been completed and verified that the movements were recorded in compliance with procedure. All fuel movements were noted in the appropriate OSURR Console Log Book. The various logs indicated that, generally, one fifth of the fuel elements and all of the shim safety rods were inspected every year. The inspector noted that the latest core loading or configuration, designated as LEU Core #5, had been in place since October 2006.

The inspector reviewed the fuel movement process and verified that fuel was moved according to established procedure. The inspector reviewed the logs documenting fuel movement for 2005 and 2006. It was noted that the fuel was typically only moved for fuel inspection or for transferring fuel from storage to the core. The inspector also compared the location of fuel elements in the reactor core with the information maintained on the Fuel Status Board in the Control Room and the information on the fuel location sheet for the latest core. All fuel was placed or being stored in the designated locations. Also, the fuel handling tools were secured when not in use as required by TS Section 5.5. No problems were noted.

### c. Conclusion

Fuel movements and inspections were being completed and documented in accordance with the requirements specified in the TS and by procedure.

## 8. Experiments

### a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to assure compliance with TS Section 6.4:

- ROC meeting minutes for 2006 and 2007
- selected Request for Reactor Operations forms for 2006 and 2007
- Audit of the Nuclear Reactor Laboratory Operations for CY05 (covering the period from November 1, 2004 to November 30, 2005), dated January 10, 2006
- Audit of the Nuclear Reactor Laboratory Operations for CY06 (covering the period from November 30, 2005 to November 30, 2006), dated March 23, 2007
- The Ohio State University Research Reactor Annual Report for FY 2004/2005, submitted September 22, 2005
- The Ohio State University Research Reactor Annual Report for FY 2005/2006, submitted September 25, 2006
- NRL Administrative Procedure AP-03, "Filing Requests for Reactor Operations," Rev. 5, dated March 27, 1996
- Form AP-03 Attachment D, "Request for Reactor Operation," Rev. 5, dated March 27, 1996
- NRL Administrative Procedure AP-04, "Approval of Requests for Reactor Operations," Rev. 3, dated October 3, 2003

### b. Observations and Findings

#### (1) Approval of Experiments

There were generally four types of experiments conducted at the OSU NRL. These included: 1) neutron activation analyses, 2) materials irradiations, 3) experiments that provided an introduction to nuclear research, and 4) experiments for various classes to measure typical reactor parameters (i.e., approach to critical, control rod calibration by different methods, and temperature coefficient measurements).

Experiments at the OSURR were initiated by the completion of a six-part form called a "Request for Reactor Operation." In most instances the requests were completed by a research consultant (i.e., an SRO) at the NRL with input from the experimenter as needed. NRL Administrative Procedure AP-04, the procedure for approving reactor operations, listed ten items that were reviewed in order for the request to be approved. The procedure also provided a list of approved types of experiments which were experiments that had previously been approved by the ROC. "Routine" or "standard" experiments (ones similar to those that were listed as approved experiments in AP-04) were generally reviewed and approved by an SRO, typically the Associate Director of the facility. Any "new" experiment would have to be reviewed and approved by the ROC.

The inspector noted that the licensee maintained a listing of the Request for Reactor Operation forms generated and approved each year. There were

Request forms dating back to 1992. Many routine experiments or Requests for Reactor Operation in use at the facility had been initiated and approved in the 1996 time frame. It was also noted that approved Request for Reactor Operation forms were seldom terminated.

(2) Conduct of Experiments

During the inspection, the reactor was operated in order to perform testing for one of the facility's industrial clients. The inspector observed this test which consisted of the insertion of a sample (a fission chamber) into the reactor and, after a brief period of time, removal of the sample. This procedure was followed several times during the test evolution. The samples were generally handled as prescribed by procedure and in accordance with proper radiological controls. However, it was noted that no survey meter was used during removal of the irradiated samples from the reactor.

NRL Administrative Procedure AP-03 requires in Section 2.3 that anything removed from the reactor must be surveyed. This same type of action (failure to use a survey meter while removing a sample from the reactor for this same industrial client) had also been noted during an audit conducted during December 2005. When questioned about this protocol, the licensee indicated that this was a routine test and that the experiment had been conducted numerous times over the years. The samples all typically had the same radiation levels (between one and 2 Roentgen per hour) and thus, the only precaution necessary was to hold the samples away from the body to limit dose. Additionally, the staff member indicated that the reactor bridge monitor (an Area Radiation Monitor or ARM) would provide notification if there were significant variations from the expected radiation levels. The staff member further explained that, during the work evolution, the test sample is typically brought to the top of the Center Irradiation Facility and left there for approximately one minute. During that time the worker moves several feet away from the sample to cut some plastic ties that are used to hold the other end of the test set-up in place. This would allow time for the ARM to respond/alarm if there were greatly elevated radiation levels present.

The inspector and the staff member went to the pool area and reviewed the location of the ARM and discussed the hazards of trying to take a radiation reading of the test sample and of having a survey meter on the edge of the reactor pool (where it would be located for ease in completing the survey). It was also noted that the alarm set point for the ARM was set at 100 millirem per hour. After observing the area and the location of the ARM, the inspector agreed that having a survey meter close to the pool edge was probably not a good practice and the ARM would likely provide sufficient indication if the radiation levels on a test sample exceeded those that were typical. However, it was noted that the original Request for Reactor Operation did not stipulate that the ARM would be used for such a purpose and that no other survey was necessary. The licensee agreed to rewrite the Request for Reactor Operation to fully explain the process and the precautions involved.

The licensee was informed that revision of the Request for Reactor Operation for this test concerning irradiating fission chambers to clarify what precautions were required would be identified as an IFI would be reviewed during a future NRC inspection (IFI 50-150/2007-201-02).

c. Conclusions

The license's program for the control of experiments satisfied regulatory and TS requirements.

**9. Emergency Preparedness**

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify the implementation of the Emergency Plan:

- Critiques of drills held November 11, 2005 and November 28, 2006
- Inventory of emergency supplies, dated September 30, 2005 and October 9, 2006
- Emergency Preparedness Plan for the Ohio State University Nuclear Reactor Laboratory, dated September 2004
- Audit of the Nuclear Reactor Laboratory Operations for CY05 (covering the period from November 1, 2004 to November 30, 2005), dated January 10, 2006
- Audit of the Nuclear Reactor Laboratory Operations for CY06 (covering the period from November 30, 2005 to November 30, 2006), dated March 23, 2007
- NRL Emergency Procedure EP-01, "Emergency Procedures," Rev. 20 dated November 8, 2006
- NRL Emergency Procedure EP-03, "Response to Scrams and Alarms," Rev. 0 dated December 27, 1995
- NRL Emergency Procedure EP-04, "Emergency Equipment Inventory," Rev. 6 dated December 22, 2005

b. Observations and Findings

The Emergency Plan (E-Plan) in use at the OSU NRL facility had been updated and was submitted to the NRC with a cover letter dated November 9, 2004. The NRC responded by letter dated October 5, 2005, that the licensee was not required to obtain commission approval for these changes in accordance with 10 CFR 50.54(q), since the changes did not decrease the effectiveness of the plan. The E-Plan was audited and reviewed annually as required. Implementing procedures were reviewed biennially and revised as needed to effectively implement the E-Plan. Emergency facilities, instrumentation, and equipment were being maintained and controlled, and supplies were being inventoried annually as required in the E-Plan.

Emergency drills had been conducted annually as required by the E-Plan. The drill for 2005 was a practical exercise, while the drill in 2006 was a table-top exercise. Drill scenarios were challenging and involved response by most of the support organizations. Critiques were written following the drills to document the strengths and weaknesses identified during the exercises and to develop possible solutions to

any problems noted. The critiques indicated that the E-Plan was being properly implemented. All problems identified during the drills were subsequently corrected.

Emergency preparedness and response training for reactor staff was completed biennially during operator requalification and documented in that program's records. Training for other emergency responders was typically given just prior to each drill.

The inspector noted that response to facility emergencies would be provided by University resources such as campus police and staff at the University Hospital. When asked about formal agreements for support from outside agencies such as the City of Columbus Fire Department and an ambulance service, the licensee indicated that the University maintained such agreements and that separate agreements were not required with the NRL.

The inspector visited the University Hospital and reviewed the medical support the hospital would provide to the licensee. The Nursing Program Manager indicated that the hospital could provide any needed medical support including decontamination and long term care. She also indicated that the drills that the hospital participated in were informative and that training received from the campus Environmental Health and Safety Department, Office of Radiation Safety was very worthwhile. The inspector noted a good working relationship between this support organization and the licensee's staff.

During the inspection, the inspector also accompanied a licensee representative during the completion of an inventory of all facility emergency equipment. This included fire extinguishers, first aid kits and their contents, the decontamination kit and its contents, and various miscellaneous supplies. All the required items were present and in the designated location as stipulated on the appropriate checklists.

c. Conclusions

The emergency response program was conducted in accordance with the requirements stipulated in the Emergency Plan.

**10. Exit Interview**

The inspection scope and results were summarized on May 24, 2007, 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 Personnel

R. Denning	Director, Nuclear Reactor Laboratory
K. Herminghuysen	Research Associate and SRO
A. Kauffman	Associate Director, Nuclear Reactor Laboratory and SRO
R. Myser	Consultant (former Associate Director) and SRO
J. Talnagi	Senior Research Associate and SRO
R. Winningham	Research Associate and Reactor Operator Trainee

### Other Personnel

M. Robinette	Nursing Program Manager, Emergency Department, University Hospital
R. Peterson	Director, Office of Radiation Safety and Radiation Safety Officer

## **INSPECTION PROCEDURES USED**

IP 69001      Class II Non-Power Reactors

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

### Opened

50-150/2007-201-01	IFI	Follow-up to verify that the licensee scheduled a physical examination for one facility reactor operator and that the examination was completed as required by the Operator Requalification Program.
50-150/2007-201-02	IFI	Follow-up to verify that the licensee completed the revision of the Request for Reactor Operation for the test involving irradiation of fission chambers for an industrial client to clarify what precautions were required.

### Closed

None

## **LIST OF ACRONYMS USED**

ADAMS	Agencywide Documents Access and Management System (NRC's system)
AP	Administrative Procedure
CFR	Code of Federal Regulations
E-Plan	Emergency Plan
EES	Engineering Experiment Station
EP	Emergency Procedures
IFI	Inspector Follow-up Item
IM	Instrumentation Use and Maintenance
IP	Inspection Procedure
LCO	Limiting Conditions for Operation

No.	Number
NRC	Nuclear Regulatory Commission
NRL	Nuclear Reactor Laboratory
OM	Operations and Maintenance
OSU	The Ohio State University
OSURR	The Ohio State University Research Reactor
Rev.	Revision
ROC	Reactor Operations Committee
SRO	Senior Reactor Operator
TS	Technical Specifications