April 26, 2012

Mr. Ralph Butler, Director
Research Reactor Center
University of Missouri - Columbia
Research Park
Columbia, MO 65211

SUBJECT: UNIVERSITY OF MISSOURI – COLUMBIA RESEARCH REACTOR – NRC ROUTINE INSPECTION REPORT NO. 50-186/2012-201

Dear Mr. Butler:

On April 9–12, 2012, the U.S. Nuclear Regulatory Commission (NRC, the Commission) completed an inspection at the University of Missouri - Columbia Research Reactor (Inspection Report No. 50-186/2012-201). The enclosed report documents the inspection results, which were discussed on April 12, 2012, with members of your staff.

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

Based on the results of this inspection, the NRC has determined that one Severity Level IV violation of NRC requirements has occurred. The violation is being treated as a Non-Cited Violation (NCV), consistent with Section 2.3.2.b of the Enforcement Policy. The NCV is described in the subject inspection report. If you contest the violation or significance of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

In accordance with Title 10 of the *Code of Federal Regulations* Section 2.390, "Public inspections, exemptions, and requests for withholding," 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 NRC's document system (Agencywide Document 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 301-466-4495 or by electronic mail at Craig.Bassett@nrc.gov.

Sincerely,

/RA/

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

Docket No. 50-186
License No. R-103

Enclosure: NRC Inspection Report No. 50-186/2012-201
cc w/encl: See next page

cc:

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Research Reactor Facility
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Reactor Newsletter
University of Florida
202 Nuclear Sciences Center
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Should you have any questions concerning this inspection, please contact Craig Bassett at 301-466-4495 or by electronic mail at Craig.Bassett@nrc.gov.

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OFFICE	PROB:RI *	PRT:LA	PROB:BC
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DATE	4/23/2012	4/24/2012	

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

Docket No.:	50-186
License No.:	R-103
Report No.:	50-186/2012-201
Licensee:	Curators of the University of Missouri – Columbia
Facility:	University of Missouri – Columbia Research Reactor
Location:	Research Park Columbia, Missouri
Dates:	April 9–12, 2012
Inspector:	Craig Bassett
Accompanied by:	Jonathan Fiske, NSPDP Program Assignee
Approved by:	Johnny H. Eads, Jr., Chief Research and Test Reactors Oversight Branch Division of Policy and Rulemaking Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

University of Missouri – Columbia
University of Missouri – Columbia Research Reactor
Report No.: 50-186/2012-201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the University of Missouri - Columbia (the licensee's) 10 Megawatt Class I research and test reactor safety program including: 1) organizational structure and staffing; 2) review and audit functions; 3) procedures, 4) reactor operations, 5) radiation protection, 6) environmental monitoring; and 7) transportation of radioactive material since the last NRC inspection of these areas. The licensee's program was acceptably directed toward the protection of public health and safety, and in compliance with the U.S. Nuclear Regulatory Commission (NRC) requirements. One non-sited violation was identified.

Organization and Staffing

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

Review and Audit Functions

- Review, audit, and oversight functions required by Technical Specifications Section 6.1 were acceptably completed by the Reactor Advisory Committee.

Procedures

- The procedure review, revision, control, and implementation program satisfied Technical Specifications requirements.

Reactor Operations

- Various daily and weekly meetings were being held to ensure proper planning and preparation.

- The Corrective Action Program implemented by the licensee was functioning as designed.

Radiation Protection

- Surveys were completed and documented as outlined in the Annual Report.

- Postings and notices met regulatory requirements.

- Staff personnel were wearing dosimetry as required and recorded doses were within the regulatory limits.

- Radiation survey and monitoring equipment was being maintained and calibrated as required.

- The Radiation Protection and As Low As Reasonably Achievable Programs satisfied regulatory requirements.

- Annual reviews of the Radiation Protection Program were being completed by the licensee as required by Title 10 of the *Code of Federal Regulations* Part 20.

Effluent and Environmental Monitoring

- Effluent monitoring satisfied license and regulatory requirements.

- Releases were within the specified regulatory and Technical Specifications limits.

Transportation of Radioactive Materials

- Radioactive material was generally being shipped in accordance with the applicable regulations.

REPORT DETAILS

Summary of Plant Status

The University of Missouri - Columbia Research Reactor (MURR, the licensee) continued to be operated in support of isotope production, silicon irradiation, reactor operator training, and various types of research. During the inspection, the reactor was operated continuously following the weekly maintenance shutdown to support laboratory experiments and product irradiation.

1. Organization and Staffing

a. Inspection Scope (Inspection Procedure [IP] 69006)

To verify that the staffing and organizational structure requirements were being met as specified in Technical Specifications (TS), Section 6.1.a, Revision (Rev.) Number (No.) 15, which was implemented through Amendment No. 35 to Facility Operating License No. R-103, dated February 9, 2012, the inspector reviewed:

- Administrative controls and management responsibilities
- Current MURR organizational structure with respect to radiation protection
- Radiation protection (also referred to as health physics) staffing requirements for safe operation of the facility
- MURR Reactor Operations Annual Report for the period from January 1, 2010, through December 31, 2010, issued February 25, 2011
- MURR Reactor Operations Annual Report for the period from January 1, 2011, through December 31, 2011, issued February 27, 2012

b. Observations and Findings

The inspector noted that the organizational structure had not changed since the last inspection in the area of radiation protection (refer to NRC Inspection Report No. 50-186/2011-201). The Reactor Manager continued to report to the Facility Director through the Associate Director for Reactor and Facilities Operations while the Health Physics Manager reported to the Facility Director through the Associate Director for Regulatory Assurance.

The Health Physics (HP) Group was staffed with a Health Physics Manager, a Radioactive Waste Coordinator, a Special Projects Coordinator, and four HP technicians. The Radioactive Waste and Special Projects Coordinators were health physicists and worked mainly in the areas indicated by their respective titles. The HP technicians conducted routine project reviews, provided job coverage, and completed periodic assigned tasks and surveys.

The organizational structure remained in accordance with the requirements of the TS and staffing appeared to be adequate for the current level of operations. Qualifications of the staff members met program requirements. Review of records indicated that management responsibilities were discharged as required by applicable procedures.

c. Conclusion

The licensee's organization and staffing with respect to radiation protection were in compliance with the requirements specified in TS Section 6.1.a.

2. Review and Audit Functions

a. Inspection Scope (IP 69007)

In order to verify that the licensee had established and conducted reviews and audits as required by Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20 and TS Section 6.1, the inspector reviewed:

- 2010 and 20111 Dose to Target Charts
- 2010 and 2011 As Low As Reasonably Achievable (ALARA) Reviews
- Radiation Protection Program/Materials License Audits for 2010 and 2011
- Other selected audits and reviews completed by management and HP personnel
- Selected Subcommittee meeting minutes from January 2011 to the present including the Isotope Use Subcommittee, the Reactor Safety Subcommittee, and the Reactor Procedure Review Subcommittee
- MURR Reactor Advisory Committee meeting minutes, and related documents, from April 2011 to the present
- MURR Administrative Policy, POL-3, “MURR Radiation Protection Program,” Rev. 11, issued October 10, 2011
- MURR Reactor Operations Annual Report for the period from January 1, 2010, through December 31, 2010, issued February 25, 2011
- MURR Reactor Operations Annual Report for the period from January 1, 2011, through December 31, 2011, issued February 27, 2012

b. Observations and Findings

The inspector reviewed the meeting minutes of the Reactor Advisory Committee (RAC) and the meeting minutes of various subcommittees from the January 2011 time frame to the present. The minutes, and associated documents, indicated that the RAC met at the required frequency and that a quorum was present. The topics considered during the committee meetings and during the subcommittee meetings were appropriate and as stipulated in the TS.

The inspector reviewed the 2010 and 2011 audits of the licensee’s Radiation Protection (RP) program. It was noted that the Regulatory Assurance Group (RAG) had developed an internal audit program pertaining to the RP program which consisted of three modules. Members of the RAG conducted audits and reviews of the RP program annually using one of the modules that had been developed. After a three year cycle, generally all aspects of the RP Program were reviewed. Following each audit, the full RAC reviewed the results. No significant issues were identified during the audits but several areas for improvement were noted. The inspector also reviewed the Health Physics Manager’s response to the audit findings to address each of the areas for

improvement. The audits and the responses to the audits appeared to be acceptable.

The inspector also reviewed the Dose to Target Charts and ALARA Reviews for 2010 and 2011. These were prepared by the HP Manager and provided an annual review of the radiation protection program and an overview of the dosimetry results and exposure goals for each separate group working at MURR. The data was also used to establish new exposure goals for the various groups.

c. Conclusion

Review, oversight, and audit functions required by the TS were acceptably completed by the RAC.

3. Procedures

a. Inspection Scope (IP 69008)

To verify compliance with TS Sections 6.1.b and 6.1.c, the inspector reviewed selected portions of the following:

- MURR Procedure AP-HP-105, "Radiation Work Permit," Rev. 10, issued November 23, 2010
- MURR Procedure AP-HP-117, "MURR Initial Radiation Worker Training Program," Rev. 10, issued January 11, 2011
- MURR Procedure AP-RR-015, "Work Control Program," Rev. 15, issued September 14, 2011
- MURR Procedure AP-SH-001, "Administrative Procedure, Radioactive Materials Shipping," Rev. 7, issued March 11, 2011
- MURR Procedure IC-HP-350, "Calibration – Lab Impex Stack Monitor – Iodine Channel," Rev. 1, issued December 9, 2011
- MURR Procedure IC-HP-351, "Calibration – Lab Impex Stack Monitor – Gas Channel," Rev. 1, issued December 9, 2011
- MURR Procedure IC-HP-352, "Calibration – Lab Impex Stack Monitor – Flowrate Meter," Rev. 1, issued March 16, 2011
- MURR Procedure IC-HP-353, "Calibration – Lab Impex Monitor – DP2001," Rev. 0, issued February 16, 2011
- MURR Procedure OP-HP-222, "Air Sampling – Containment Building Ar-41," Rev. 5, issued March 16, 2011
- MURR Administrative Policy, POL-18, "Procedure Writer's Guide," Rev. 7, issued October 5, 2009
- MURR Reactor Operations Annual Report for the period from January 1, 2010, through December 31, 2010, issued February 25, 2011
- MURR Reactor Operations Annual Report for the period from January 1, 2011, through December 31, 2011, issued February 27, 2012

b. Observations and Findings

Technical Specification 6.1.c required that the RAC review procedure changes with safety significance. The Reactor Procedure Review Subcommittee was established and chartered to fulfill this requirement. The inspector verified that the subcommittee was meeting as required to review current procedure revisions and changes. The inspector noted that nearly all of the procedures at MURR had been through a full review and revision process. The procedures reviewed by the inspector had been reviewed during the annual review as required.

The inspector observed various activities during the inspection. The activities were conducted in accordance with the appropriate procedures and no problems were noted. Procedure compliance was acceptable.

c. Conclusion

The procedure review, revision, control, and implementation program satisfied TS requirements.

4. Reactor Operations

a. Inspection Scope (IP 69006)

To verify that the licensee was operating the reactor, communicating plant information, and implementing the Corrective Action Program in accordance with TS Section 3 and procedural requirements, the inspector reviewed selected portions of the following:

- MURR Procedure AP-RO-110, "Conduct of Operations," Rev. 15, issued October 27, 2009
- MURR Administrative Procedure AP-RR-001, "Corrective Action Program," Rev. 11, issued April 26, 2010
- MURR Reactor Operations Annual Report for the period from January 1, 2010 through December 31, 2010, issued February 25, 2011
- MURR Reactor Operations Annual Report for the period from January 1, 2011, through December 31, 2011, issued February 27, 2012

b. Observations and Findings

(1) Staff Communication

During the inspection, the inspector attended the "Plan of the Day" (POD) meeting on Tuesday and Wednesday mornings. The meeting, chaired by the Reactor Manager, was held daily and representatives from all organizations at the facility were in attendance. Safety-significant issues, if any, were discussed and maintenance or operating needs were presented. Any concerns or schedule conflicts were resolved during the meeting. The inspector noted that the POD meeting provided the opportunity for everyone to be made aware of current facility conditions and the scheduled activities for that day.

(2) Corrective Action Program

The inspector reviewed the licensee's Corrective Action Program (CAP) which had been developed to provide staff members with a formal process to identify deficiencies and bring safety issues, as well as other issues of concern, to management's attention for resolution. The program was designed so that anyone could identify a discrepancy, concern, or improvement opportunity and enter the issue into the CAP system via the MURR intranet. When issues were identified, each one was screened for safety significance, evaluated to determine the cause and its contributing factors, and assigned to a responsible manager for resolution. Corrective actions were developed and implemented consistent with the significance of the issue and according to an established schedule. The status of each CAP issue was tracked and staff members could check on the issue of their concern whenever they wanted.

On Tuesday morning, the inspector attended the weekly CAP meeting. There three corrective action items received during the previous week which were reviewed. Each issue was discussed, corrective actions were reviewed, and each item was classified according to the license's criteria established in the governing procedure. It was noted that the events were classified into one of five categories: Reactor/Radiation Safety Issue, Personnel Safety/Regulatory Issue, Current Good Manufacturing Practice (cGMP), Improvement Opportunity Issue, and Trending Issue. Following the discussion, each issue was assigned to a responsible manager so that the needed actions could be taken and the issues could be resolved. One issue, which involved problems with a Type B Shipping cask, was reviewed extensively. For further information concerning this issue refer to Paragraph 7.b.(2) below.

(3) Meeting With a Federal Bureau of Investigation Representative

On Wednesday, the inspector met with a Special Agent from the Federal Bureau of Investigation (FBI) who was visiting from her office in Jefferson City, Missouri. The meeting also included two licensee representatives, the Associate Director of Reactor and Facilities Operations and the Reactor Manager. The discussion was centered around the various roles and responsibilities of each group (I.e., the FBI, the NRC and the licensee) and how better communications and coordination could be established. The meeting was very beneficial and gave everyone a better understanding of how each group would be available to support the other in case of an emergency.

c. Conclusion

Various daily and weekly meetings were being held to ensure proper planning and preparation for the various facility activities. The CAP was functioning as required by procedure.

5. Radiation Protection

a. Inspection Scope (IP 69012)

The inspector reviewed the following to verify compliance with 10 CFR Part 20 and the applicable licensee TS requirements and procedures:

- Radiation protection (Rad Worker) training records for 2011
- MURR dosimetry records for 2010, 2011, and 2012 to date
- Dose Report Review Forms for October 2010 – February 2012
- Selected radiation and contamination survey records for the past year
- Radiological signs and posting in various facility laboratories and in the Beam Port Floor area
- Calibration and periodic check records for selected radiation survey and monitoring instruments for the past two years
- MURR Procedure AP-HP-105, "Radiation Work Permit," Rev. 10, issued November 23, 2010, and the associated form, Form FM-17, "Radiation Work Permit"
- MURR Procedure AP-HP-117, "MURR Initial Radiation Worker Training Program," Rev. 10, issued January 11, 2011, and the associated forms, Form FM-26, "MURR Training Questionnaire," and Form FM-29, "Initial Training Packet"
- MURR Procedure AP-HP-119, "High Radiation Area Access," Rev. 2, issued February 13, 2009
- MURR Procedure AP-HP-123, "Visitor Dosimetry – Reception Desk," Rev. 7 issued February 4, 2010
- MURR Procedure AP-HP-125, "Review of Unplanned Radiation Exposure," Rev. 3, issued November 23, 2010
- MURR Procedure AP-HP-130, "Reactor License Projects Annual Review," Rev.4, issued September 30, 2010
- MURR Procedure IC-HP-300, "Calibration - Radiation Survey Instruments," Rev. 5, issued March 18, 2009, and the associated form, Form FM-62, "Radiation Instrument Certificate of Calibration"
- MURR Procedure OP-HP-220, "Tritium Bioassay," Rev. 6, issued November 23, 2010
- MURR Procedure OP-HP-306, "Daily Facility Checks," Rev. 3, issued September 30, 2010
- MURR Procedure RP-HP-100, "Contamination Monitoring - Performing a Swipe," Rev. 5, issued January 18, 2008
- MURR Procedure RP-HP-120, "Personnel Radioactive Contamination," Rev. 6, issued April 29, 2009, and the associated forms, Form FM-54, "Report of Personnel Contamination," and Form FM-76, "Personnel Contamination Log"
- MURR Procedure SV-HP-119, "Property Release," Rev. 4, issued June 9, 2010
- MURR Administrative Policy, POL-3, "MURR Radiation Protection Program," Rev. 10, issued January 7, 2011
- MURR Administrative Policy, POL-17, "MURR Training Booklet (Security, Emergency, and Health Physics)," Rev. 1, issued July 14, 2010

- MURR Reactor Operations Annual Report for the period from January 1, 2010, through December 31, 2010, issued February 25, 2011
- MURR Reactor Operations Annual Report for the period from January 1, 2011, through December 31, 2011, issued February 27, 2012

The inspector also toured the MURR facility and observed the use of dosimetry and survey meters.

b. Observations and Findings

(1) Surveys

Daily, monthly, and other periodic contamination and radiation surveys, outlined in the licensee's Reactor Operations Annual Report for 2009, were completed by HP staff members. Any contamination detected in concentrations above established action levels was noted and the area or item was decontaminated. Results of the surveys were typically documented on survey maps and posted at the entrances to the various areas surveyed so that facility workers and visitors would be aware of the radiological conditions that existed therein.

NRC personnel accompanied an HP staff member during completion of the daily surveys. This consisted of taking comprehensive swipe surveys of the laboratory facilities, control room, shipping area, and numerous work areas throughout containment. One swipe, taken from a laboratory facility, resulted in an activity above action levels. The measured activity was 203 disintegrations per minute (dpm), just above the 200 dpm action level set by procedure. NRC personnel noted that the HP staff properly identified the contaminated area and informed the laboratory director so that the contamination could be cleaned up. A subsequent survey was to be completed to ensure the decontamination was effective. Also, during an interview with the HP staff member it was noted that the silicon processing area within containment is particularly prone to minor contamination. The licensee and workers are aware of the relatively frequent contamination, and are making reasonable efforts to limit the impact and future occurrences.

(2) Postings and Notices

Copies of current notices to workers were posted in appropriate areas in the facility. The copies of NRC Form-3 noted at the facility were the latest issue, as required by 10 CFR Part 19, and were posted in various areas throughout the facility such as on the main bulletin board, in main hallways, and at the entrance to the Beam Port Floor area. The inspector determined that appropriate radiological signs, as well as current copies of the survey maps noted above, were typically posted at the entrances to controlled areas. Other postings also showed the industrial hygiene hazards that were present in the areas as well.

(3) Dosimetry Use and Results

Through direct observation the inspector determined that dosimetry was acceptably used by facility and contractor personnel. The inspector determined that, last year, the licensee used optically stimulated luminescent (OSL) dosimetry for whole body monitoring and thermoluminescent dosimeters (TLDs) in the form of finger rings and wrist badges for extremity monitoring. Because a new dosimetry vendor had been selected, the licensee was now using TLDs for all monitoring applications. The dosimetry was formerly supplied and processed by Landauer but was now supplied by Mirion Technologies (GDS), Inc. Both were/are National Voluntary Laboratory Accreditation Program accredited vendors.

An examination of the OSL and TLD results indicating radiological exposures at the facility for the past two years showed that the highest occupational doses, as well as doses to the public, were within 10 CFR Part 20 limits. The records showed that approximately half of the facility personnel received occupational exposures of zero to only a few millirem above background. The highest annual whole body exposure received by a single individual for 2010 was 1372 millirem (mr) deep dose equivalent (DDE). The highest annual extremity exposure for 2010 was 4,300 mr shallow dose equivalent (SDE) and the highest skin dose that year was 1503 mr SDE. The highest annual whole body exposure received by a single individual for 2011 was 1253 mr DDE. The highest annual extremity exposure for 2011 was 3209 mr SDE and the highest skin dose was 1330 mr SDE. In 2010, the highest whole body exposure was received by a person in the shipping group. The same was true in 2011. The highest extremity exposure in 2010 was received by a person in the Facility Operations group while the highest extremity exposure in 2011 was received by a person in the shipping group. Review of exposure records also showed that the Reactor Operations Group received approximately 51% of the entire facility's annual dose for 2010 and approximately 46% of the facility's annual dose for 2011.

(4) Urinalysis Results

The facility also collected and analyzed urine samples for Tritium (H-3) bioassay purposes. The highest attributable dose in 2010 from H-3 was approximately 1.9 mr committed effective dose equivalent (CEDE). The highest H-3 attributable dose in 2011 was approximately 0.8 mr CEDE.

(5) Radiation Monitoring Equipment

Examination of selected radiation monitoring equipment indicated that the instruments had the acceptable up-to-date calibration sticker attached. The instrument calibration records indicated that the calibration of swipe counters and portal monitors was typically completed by licensee staff personnel. Other instruments, such as portable survey meters, friskers, and neutron detectors were shipped to vendors for calibration. Calibration

frequency met procedural requirements and records were maintained as required. The inspector noted that Area Radiation Monitors (ARMs), as well as air monitors and stack monitors, were also being calibrated as required. These monitors were typically calibrated by licensee staff personnel.

(6) Radiation Protection Program

As noted in past reports, the licensee's Radiation Protection and As Low As Reasonably Achievable (ALARA) programs continued to be established and described in the MURR Administrative Policy, POL-3, "MURR Radiation Protection Program," and implemented through the various HP procedures that had been reviewed and approved. The programs contained instructions concerning organization, training, monitoring, personnel responsibilities, and audits. The programs, as outlined and established, appeared to be acceptable. The inspector verified that annual reviews of the Radiation Protection Program were being completed by the licensee as required by 10 CFR Part 20. The ALARA program provided instructions and guidance for keeping doses as low as reasonably achievable and was consistent with the guidance in 10 CFR Part 20.

(7) Radiation Work Permit Program

The inspector reviewed selected Radiation Work Permits (RWPs) that had been written, used, and closed out during 2011 and those issued to date in 2012. It was noted that the instructions specified in MURR Procedure AP-HP-105, Attachment 7.1, and those on the associated forms (Form FM-17, "Radiation Work Permit Instructions") had been followed. Appropriate review by management and health physics personnel had been completed. The controls specified in the RWPs were acceptable and applicable for the type of work being done.

(8) Radiation Protection Training

NRC personnel thoroughly reviewed the licensee's Radiation Worker Training Program. It is required that all staff members complete this training on an annual basis. It was verified that the training records were being kept up to date, and that all badged employees had completed the training within the previous year. In addition, new employees are required to complete the training immediately upon hiring. The training material was thoroughly reviewed, and deemed adequate to ensure worker safety.

Additional training was generally conducted for all facility personnel during the later part of each year to review any "current issues" that affected those at the facility. The inspector reviewed the annual "current issues" training given in 2011. The training included aspects of security, emergency actions, as well as radiation protection. It was noted that this training had been completed in November and December of 2011.

(9) Reactor License Projects Annual Review

MURR Procedure AP-HP-130, "Reactor License Projects Annual Review," Rev. 4, issued September 30, 2010, states in Section 1.0 that the purpose of the procedure is to provide instructions for performing an annual review of projects that are authorized under NRC Reactor License, R-103. The procedure goes on to list various items or issues to be reviewed and verified by the HP representative conducting the review including: 1) the list of personnel approved to work on the project (and their training), 2) the list of radioactive materials authorized for use in the project, 3) the work locations, and 4) any special equipment required. The inspector also noted that each project was to be reviewed and approved or re-approved every three years by the Isotope Use Subcommittee (IUS).

The inspector reviewed five projects and their associated reviews during the inspection. They were Project RL-13, "Lanthanide Processing," Project RL-26, "Irradiation, Processing, and Measurement of Semiconductor Materials and Similar High-Purity Materials," Project RL-42, "P-33 Processing," Project RL-73, "^{99}Molybdenum (Mo-99) Production (n-Gamma Production)," and Project RL-74, "Reflector and Bulk Pool Irradiation for Neutron Activation Analysis (NAA)." Verification of the HP project review was required to be documented on MURR Form FM-86, Reactor License Project Review Report.

Upon reviewing the folder for each project and the various FM-86 forms contained in each folder, the inspector noted that, prior to 2008, there had been some lapses in the timely review of the projects. However, after 2008, no problems were noted and all projects had received the annual review within the appropriate time period as allowed by procedure.

(10) MURR ALARA Program

In 2000, the licensee's total cumulative facility dose was 46.7 rem. The Manager of Health Physics and the HP staff, along with other MURR managers and group leaders, recognized that improvements could be made in this area. Consequently, each group established an ALARA goal for the next year and the facility dose was then tracked by group, as well as for each individual. With emphasis placed on achieving the various groups' ALARA goals, the facility dose began to decrease (see Table below). Due to the establishment of aggressive ALARA goals, continued efforts on dose reduction, worker awareness, and engineered improvements, the total cumulative facility was further reduced. In 2005, the facility dose was 30.7 rem. During that year the licensee began extensive planning and preparation for two major projects that were planned for 2006.

In 2006, the licensee successfully completed two major tasks including the replacement of the beryllium reflector and the removal and replacement of two primary reactor heat exchangers. Even though the facility dose increased, the total cumulative dose was held to 33.8 rem.

Since 2006, MURR management and staff have continued their efforts to maintain personal doses ALARA. In 2010, the cumulative facility dose increased somewhat due, in part, to an increase in the amount of product irradiation work performed during the year. In 2011, there was a marked increase in the cumulative dose. The licensee indicated that two factors contributed to the increase. First, approximately twenty-five new people had been hired at the facility and they started working and receiving dose. Second, new projects and research, along with an increase in routine work, had increased the dose received by various groups at the facility.

Year	MURR Total Cumulative Dose in Rem
2000	46.7
2001	42.9
2002	34.0
2003	26.9
2004	27.0
2005	30.7
2006	33.8
2007	33.6
2008	33.7
2009	27.9
2010	28.7
2011	35.1

(11) Facility Tours

On various occasions during the inspection, the inspector toured the Hot Cell area, Beam Port Floor area, and selected support laboratories with licensee representatives. No unmarked radioactive material was noted and no other anomalies were noted. The inspector noted that facility radioactive material storage areas were properly posted. Radiation and High Radiation Areas were posted and properly controlled as required.

c. Conclusion

The inspector determined that the Radiation Protection and ALARA Programs, as implemented by the licensee, satisfied regulatory requirements because: 1) surveys were completed and documented acceptably to permit evaluation of the radiation hazards present; 2) postings met regulatory requirements; 3) personnel dosimetry was being worn as required and recorded doses were within the NRC's regulatory limits; 4) radiation survey and monitoring equipment

was being maintained and calibrated as required; 5) the Radiation Protection Program was acceptable and was being reviewed annually as required; and, 6) personnel were receiving the required rad worker training as required.

6. Effluent and Environmental Monitoring

a. Inspection Scope (IP 69004)

The inspector reviewed the following to verify compliance with the requirements of 10 CFR Part 20 and TS Section 3.7:

- Quarterly Reports of Environmental TLD Results
- Environmental monitoring program outlined through various procedures
- Results of the Analyses of Environmental Vegetation, Soil, and Water Samples
- Selected Monthly ALARA Environmental Review Reports for 2011 and to date in 2012
- Liquid Batch Release Review Forms for 2011 associated with the Monthly ALARA Environmental Review Reports
- MURR Procedure IC-HP-310, “Calibration - Eberline Model PING 1A Stack Monitor - Particulate Channel,” Rev. 6, issued December 9, 2011
- MURR Procedure IC-HP-311, “Calibration - Eberline Model PING 1A Stack Monitor - Iodine Channel,” Rev. 6, issued December 9, 2011
- MURR Procedure IC-HP-312, “Calibration - Eberline Model PING 1A Stack Monitor - Gas Channel,” Rev. 6, issued December 9, 2011
- MURR Procedure OP-HP-200, “Air Sampling - Containment Building Tritium,” Rev. 5, issued January 13, 2012
- MURR Procedure OP-HP-221, “Environmental Sample - Analysis,” Rev. 5, issued June 6, 2007
- MURR Procedure OP-HP-222, “Air Sampling - Containment Building Ar-41,” Rev. 5, issued March 16, 2011
- MURR Procedure OP-HP-353, “Waste Tank Sample - Analysis,” Rev.7, issued June 22, 2011
- MURR Procedure SV-HP-110, “Environmental Sampling,” Rev. 4, issued February 15, 2008
- MURR Procedure SV-HP-115, “Building Exhaust Stack Effluent – Tritium Monitoring,” Rev. 4, issued October 14, 2009
- MURR Procedure SV-HP-121, “Building Exhaust Stack Effluent – Ar-41 Monitoring,” Rev. 4, issued April 21, 2010
- MURR Procedure WM-SH-105, “Radioactive Waste Processing,” Rev. 7, issued December 5, 2011
- MURR Reactor Operations Annual Report for the period from January 1, 2010, through December 31, 2010, issued February 25, 2011
- MURR Reactor Operations Annual Report for the period from January 1, 2011, through December 31, 2011, issued February 27, 2012

b. Observations and Findings

(1) Gaseous and Liquid Releases

The inspector determined that gaseous releases continued to be monitored as required, were acceptably analyzed, and were documented in the annual operating reports. Airborne concentrations of gaseous releases were noted to be within the concentrations stipulated in 10 CFR Part 20, Appendix B, Table 2 and the limits stipulated in the TS. The dose rate to the public, as a result of the gaseous releases, was below the dose constraint specified in 10 CFR 20.1101(d) of 10 mrem per year. COMPLY code results indicated an annual dose to the public of 3.4 mr for 2010 and data for 2011 indicated an annual dose to the public of 2.6 mr.

It was noted that the licensee had determined that the receptor exposed to the highest dose as a result of air effluent from the reactor was located in a building 150 meters to the north north east of MURR. The building was on land owned by the university and was considered to be on-site. The building was occupied eight hours per day, five days per week (8 hrs/day, 5 days/week) which resulted in an occupancy factor of 0.24. Thus, by applying this occupancy factor (0.24) for each year (calculated dose multiplied by the occupancy factor), the resulting annual dose to the public for 2010 was 0.82 mr. Using this same methodology, the annual dose to the public for 2011 was calculated to be 1.1 mr.

The liquid releases from the facility to the sanitary sewer also continued to be monitored as required, were acceptably analyzed, and were documented in the annual reports. The inspector noted that the results indicated that the releases were within the limits specified in 10 CFR Part 20, Appendix B, Table 3.

(2) Environmental Soil, Water, and Vegetation Samples

The inspector reviewed the environmental soil, water, and vegetation samples that were collected, prepared, and analyzed during 2011. These samples had all been collected and analyzed as required and within the time frame established by procedure. No problems were noted.

(3) Environmental Monitoring using TLDs

On-site and off-site gamma radiation monitoring was completed using the reactor facility stack effluent monitor and various environmental TLDs in accordance with the applicable procedures. Review of the data indicated that there were no measurable doses above any regulatory limits.

In 2010, the highest unrestricted area dose was measured in an unoccupied area 65 meters south from the MURR stack and was approximately 75 mr. The highest unrestricted area dose in 2011 was measured in the same area and was approximately 57 mr for all of 2011.

c. Conclusion

Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory and TS limits.

7. Transportation

a. Inspection Scope (IP 86740)

To verify compliance with regulatory and procedural requirements for transferring or shipping licensed radioactive material, the inspector reviewed the following:

- Selected records of various types of radioactive material shipments for 2011 and to date in 2012
- Selected training records for staff personnel authorized to ship hazardous material in accordance with the regulations specified by the Department of Transportation and the International Air Transport Association
- CAP Detail Report, CAP Number 12-0014, "Wrong Size Washer Used During a Type B Shipment," CAP dated April 5, 2012, which referenced:
  - Deviation Form Procedure Report, Report No. DEV-12-001, issue discovered February 29, 2012, and report issued April 6, 2012
  - Deviation Form Procedure Report, Report No. DEV-12-003, issue discovered February 29, 2012, and report issued April 6, 2012
- MURR Policy POL-14, "Shipping Quality Assurance Program for Type B Shipping Casks," Rev. 4, issued April 13, 2009
- MURR Procedure AP-SH-001, "Administrative Procedure, Radioactive Materials Shipping," Rev. 7, issued March 11, 2011
- MURR Procedure BPB-SH-002, "20WC-1 Packaging and Shipment of Type B Non-Waste Radioactive Material," Rev. 10, issued September 29, 2011
- MURR Procedure BPB-SH-005, "DOT 6M Packaging and Shipment of Type B Non-Waste Radioactive Material," Rev. 10, issued March 29, 2012
- MURR Procedure BP-SH-007, "F-327 Packaging and Shipment of Type A Non-Waste Radioactive Material," Rev. 7, issued September 9, 2010
- MURR Procedure BP-SH-010, "Packaging and Shipment of Non-Waste Radioactive Materials in Excepted Packages," Rev. 4, issued December 5, 2011
- MURR Procedure BP-SH-011, "Shipment of Non-Waste DOT 7A Type A (Gemstone) Radioactive Material Package," Rev. 5, issued December 5, 2011
- MURR Procedure BP-SH-013, "Packaging and Shipment of Radioactive Material Using MURR Reusable Type A Package," Rev. 5, issued May 11, 2011
- MURR Procedure BP-SH-014, "Packaging and Shipment of Radioactive Material Using an Overpack," Rev. 4, issued April 6, 2011
- MURR Procedure BP-SH-052, "Radioactive Material Shipment Package Documentation and Labeling," Rev. 7, issued April 22, 2011

- MURR Procedure FB-SH-110, "Type B Shipment of Spent Fuel Using BEA Research Reactor Shipping Container," Rev. 0, issued August 17, 2011
- MURR Procedure QAB-SH-003, "Material Control for Type B Shipping Program," Rev. 2, issued September 29, 2011
- MURR Procedure WM-SH-100, "Radioactive Waste - Preparation and Storage," Rev. 6, issued December 5, 2011
- MURR Procedure WM-SH-300, "MURR Exclusive Use Shipment of LSA or SCO Radioactive Waste," Rev. 9, issued December 5, 2011
- MURR Letter to the NRC, "RE: Certificate of Compliance Number 9341, Docket 71-9341, Package USA/9341/B(U)F-96, BEA Research Reactor (BRR) Package," dated March 23, 2012

b. Observations and Findings

(1) Routine Shipping Operations

During the inspection, NRC personnel closely observed the preparations for the shipment of an antimony isotope. Following irradiation in the reactor, the antimony, which was contained in four small aluminum canisters, was placed in a transfer cask while submerged in the reactor pool. The transfer cask was subsequently removed from the pool and moved to the shipment staging area where the canisters were transferred to a Type B shipping container and processed for shipping. Throughout the transfer process the NRC noted adherence to procedures and attention to maintaining radiation doses ALARA. Shipping personnel reviewed the irradiation records and verified the contents of the package using gamma spectroscopy. Shipping papers were prepared, and reviewed for accuracy and completeness by a second staff member. Consignee information was verified by the licensee (i.e. possession of a license to receive radioactive materials, address, and contact information). Appropriate labels were made and applied to the shipping container. NRC personnel verified that the shipping papers contained all required information and that the appropriate labels were correct and applied to packaging. A health physics technician was present and properly conducted all the necessary surveys throughout the preparation of the package for shipping. Quality assurance checks were also adequate and completed as required. Throughout the shipping process it was noted that MURR staff members where knowledgeable of their duties and conducted a thorough review of all documentation.

During the inspection, the inspector also verified that the licensee maintained on file copies of consignees' licenses to possess radioactive material as required. As noted above, the license of each specific consignee was verified to be current prior to initiating a shipment.

The records of various types of shipments were reviewed, including the records of a shipment of radioactive waste. Through records review and discussions with licensee personnel, the inspector determined that, in addition to medical isotopes and radioactive waste, the licensee had

shipped spent fuel and other types of radioactive material since the previous inspection in this area. The records indicated that the radioisotope types and quantities were calculated and dose rates measured as required. The radioactive material shipment records reviewed by the inspector had been completed in accordance with DOT and NRC regulations.

On Thursday, the inspector observed the receipt and storage of a shipment of new fuel. All the appropriate precautions were taken when the material arrived and the proper surveys and verifications were conducted. The material was placed in the proper storage location as required. No problems were noted.

(2) Corrective Action Program Item – Wrong Size Washer Used During a Type B Shipment

Regulation 10 CFR 71.105 requires that the licensee establish a quality assurance program that complies with the requirements of §§ 71.101 through 71.137. The licensee shall document the quality assurance program by written procedures or instructions and shall carry out the program in accordance with those procedures throughout the period during which the packaging is used.

MURR Policy, POL-14, “Shipping Quality Assurance Program for Type B Shipping Casks,” Rev. 4, issued April 13, 2009, requires in Paragraph 5.1 that administratively controlled, approved, written procedures shall be established for the use, maintenance, repair, and preparation for transport of all Type B packaging,

MURR Procedure QAB-SH-003, “Material Control for Type B Shipping Program,” Rev. 2, issued September 29, 2011, requires in Paragraph 6.1.1 that each replacement part, component, or material will have a Material Specification Sheet reviewed by the appropriate Quality Assurance (QA) supervisor to ensure that appropriate technical requirements are included.

MURR Procedure FB-SH-110, “Type B Shipment of Spent Fuel Using BEA Research Reactor Shipping Container,” Rev. 0, issued August 17, 2011, requires in Paragraph VII.11 that the drain port sealing washer (the one installed prior to arrival of the cask onsite) be removed and replaced with an unused sealing washer.

During the CAP meeting the inspector attended during the week of the inspection, the inspector was made aware of a problem that had been noted by licensee personnel. During the latter part of 2011, a new Type B spent fuel shipping cask was procured by Battelle Energy Alliance (BEA). The cask was known as the BEA Research Reactor (BRR) Cask and was to be used by the University Research Reactor community.

Upon receipt of the new BRR Type B shipping cask at the facility, MURR was furnished with various replacement parts from the manufacturer/ Certificate of Compliance (CoC) holder (AREVA). These consumable spare parts were installed and used during MURR's first two shipments using the cask in the fall of 2011.

Following the fall 2011 shipments, the licensee began the process of developing Materials Specifications Sheets for the cask spare parts in late January 2012. At that point it was determined that there was no official list of user-replaceable parts provided in the cask documentation. Upon request, the CoC holder furnished a list of replacement parts in a memorandum (memo) to the licensee dated January 19, 2012. While comparing the memo's contents with the information contained in the Safety Analysis Report (SAR) for the cask, the licensee discovered that there were inconsistencies concerning part numbering and part specifications in the documentation in their possession.

During that same time frame, the licensee learned through the notification to the NRC by Massachusetts Institute of Technology (MIT) that one of the spare parts was incorrectly specified in the package documentation. At that point MURR determined that the incorrect part had been supplied by the manufacturer. This part was the Drain Port Sealing Washer. The Drain Port Sealing Washer was listed on the As-Built Drawing Number 1910-01-100, Item 9, as part number NAS1523C9N. However, the SAR Drawing Number 1910-01-01, Item 7, showed this part as NAS1523C10N. The incorrect part was made of the same material as the correct part but had a minor dimensional difference.

MURR investigated this situation and determined that, as noted above, on two occasions in the fall of 2011, the cask had been used to ship spent fuel to the Savannah River Site. During each shipment, spare parts provided by the cask CoC holder, including the wrong washer, were installed as directed in the cask documentation available at MURR. However, in each case, even though the wrong drain port sealing washer had been used, the helium leak test required by the CoC was conducted by MURR and in each case the leak test passed and the shipments proceeded.

Following the investigation, MURR initiated various corrective acitons. MURR notified the NRC of this problem by letter dated March 23, 2012, as required by 10 CFR 71.95. MURR also notified the cask owner, BEA of the incident so that BEA could address the issue with the CoC holder. The CoC holder subsequently supplied MURR with a corrected parts list memo and indicated that MURR would receive the correct parts prior to the next spent fuel shipment. In addition, MURR also initiated two deviation reports, one for each shipment that was made using the wrong washer. The Deviation Reports were both issued on April 6, 2012. The reports indicated that the two initial shipments using the BRR Cask were made without documentation or control of materials per POL-14 and QAB-SH-003. Materials Specifications Sheets, receipt, quarantine, testing, and

release requirements had not been completed for materials used in the shipment because the materials were supplied by the manufacturer/CoC holder. MURR staff did not realize that the initial parts transferred from the cask manufacturer needed to be accepted per the Quality Assurance program and procedural requirements which were in place at the facility. At the time of the inspection the licensee was in the process of completing and approving Materials Specification Sheets for the cask related items. Materials will then be controlled per QAB-SH-003.

The inspector reviewed the issue of using the wrong part for a Type B Shipment. As noted, the licensee had identified the problem and taken corrective actions. The inspector reviewed the licensee's corrective actions. These appeared to be appropriate.

The licensee was informed that failure to use the correct size drain port sealing washer during two Type B shipments in 2011 was a violation of 10 CFR 71.105 and the facility Quality Assurance Program. However, since: 1) the wrong washers were supplied by the manufacturer/CoC holder, 2) there was conflicting information available to the licensee concerning the correct part number, and 3) the BRR cask (with the incorrect washer installed) passed the helium leak test on both occasions when it was shipped in 2011, it was determined that there was minimal safety or environmental significance. Therefore, this failure constitutes a non-repetitive minor violation that is not subject to formal enforcement action and is being treated as a violation of minor significance, consistent with Section IV of the NRC Enforcement Policy. This issue is considered closed.

c. Conclusion

Radioactive material was generally being shipped in accordance with the applicable regulations.

8. Follow-up on Previous Identified Items

a. Inspection Scope (IP 92701)

The inspector reviewed the following documents, as well as the licensee's actions taken in response to previously identified items in NRC Inspection Report No. 50-186/2011-201, dated April 14, 2011:

- MURR Procedure IC-HP-310, "Calibration - Eberline Model PING 1A Stack Monitor - Particulate Channel," Rev. 5, issued January 18, 2008; and Rev. 6, issued December 9, 2011
- MURR Procedure IC-HP-311, "Calibration - Eberline Model PING 1A Stack Monitor - Iodine Channel," Rev. 5, issued January 18, 2008; and Rev. 6, issued December 9, 2011
- MURR Procedure IC-HP-312, "Calibration - Eberline Model PING 1A Stack Monitor - Gas Channel," Rev. 5, issued January 18, 2008: and Rev. 6, issued December 9, 2011

- MURR Procedure IC-HP-350, "Calibration – Lab Impex Stack Monitor – Iodine Channel," Rev. 0, issued December 3, 2009; and Rev. 1, issued December 9, 2011
- MURR Procedure IC-HP-351, "Calibration – Lab Impex Stack Monitor – Gas Channel," Rev. 0, issued December 3, 2009; and Rev. 1, issued December 9, 2011
- CAP Detail Report, CAP Number 11-0009, "Loss of Access Control to Very High Radiation Area," CAP dated March 17, 2011

b. Observation and Findings

(1) IFI 50-186/2011-201-01 – Follow-up on the licensee's actions to update HP procedures dealing with: 1) calculations for Particulate, Iodine, Noble Gas (PING) Air Monitor alarm setpoint changes in IP-HP-310, -311 and -312, and 2) correct reference to data record number in IP-HP-350 and -351.

During a detailed review of the facility environmental procedures during an NRC inspection in March 2011, it was noted that procedures IP-HP-310, -311, and -312 contained rather vague wording regarding PING Stack Monitor calibrations and when resultant changes might be needed in the alarm setpoints Also there were no data sheets included with procedures IP-HP-350 and -351 and the references to the data sheets were incorrect.

The licensee was informed that the issue of taking actions to address deficiencies noted in HP procedures (i.e., 1) revise the wording concerning calculations for PING alarm setpoint changes in IP-HP-310, -311 and -312, and 2) correct reference to data record number in IP-HP-350 and -351) would be considered an Inspector Follow-up Item (IFI) and would be reviewed during subsequent inspections (IFI-50-186/2011-201-01).

During this inspection the HP and environmental procedures were again reviewed. It was noted that the licensee had clarified the procedures and developed data sheets for procedures IP-HP-350 and -351. This issue is considered closed.

(2) URI 50-186/2011-201-02 – Review the licensee's actions to correct the problem noted concerning failure to control access to the Hot Cell area which was posted as a Very High Radiation Area.

Regulation 10 CFR 20.1601(a)(3) requires that the licensee shall ensure that each entrance or access point to a high radiation area has --- entryways that are locked, except during periods when access to the areas is required, with positive control over each individual entry.

Regulation 10 CFR 20.1602 requires that, in addition to the requirements in 10 CFR 20.1601, the licensee shall institute additional measures to ensure that an individual is not able to gain unauthorized or inadvertent

access to areas in which radiation levels could be encountered at 500 rads (5 grays) or more in 1 hour at 1 meter from a radiation source or any surface through which the radiation penetrates.

The licensee routinely irradiates various types of samples in the reactor using experimental facilities including reflector region irradiation positions and the center test hole or flux trap. After a designated length of irradiation, these samples are moved from the reactor in a transfer cask to the Hot Cell located in the basement of the building. The Hot Cell is posted as a Very High Radiation Area and the door to the Hot Cell is also posted with a sign stating that Health Physics coverage is needed when using the Hot Cell. Access to the Hot Cell is controlled by the Health Physics group through the use of a key. The key is inserted into a switch which is used to energize the motor and chain system that opens the heavy, shielded, and reinforced concrete door. Inside the Hot Cell, samples are removed from the transfer cask and processed further or moved into a shielded container which is then removed from the Hot Cell and loaded into a shipping cask for shipment to a consumer. It should be noted that access to the Reactor Building is controlled through a key card system and only authorized and trained personnel are given key cards and allowed inside the building. Access to the basement where the Hot Cell is located is also controlled by the key card system and a person needs further training to enter that area.

During an NRC inspection in March 2011, the inspector reviewed Corrective Action Program (CAP) Item Number 11-0009, “Loss of Access Control to Very High Radiation Area.” The CAP Item indicated that, on the night of March 16, 2011, while conducting routine rounds of the facility, a reactor operator found that the key used to open the shielded door to the Hot Cell had been left in the switch. As noted above, the Hot Cell can only be accessed by turning the key and activating a motor and chain system which opens the heavy shielded door. The key is normally maintained locked up in the HP office or under the control of Health Physics Technicians when it is not being used to open the door for ongoing work activities. Leaving the key in the switch on the Hot Cell door could potentially allow an individual to gain unauthorized or inadvertent access to an area in which radiation levels could be encountered at 500 rads (5 grays) or more in 1 hour.

The reactor operator removed the key and temporarily placed it in the Control Room lock box. The issue was then written up in the CAP system. Through an initial review of the issue, the licensee had determined that the issue was not a reportable event under 10 CFR 20.2201, 2202, or 2203. However, since this event had only recently occurred with respect to the NRC inspection in March 2011, the licensee had not been able to formally and fully review the event and take corrective action. Following review by the inspector, the licensee was

informed that, pending the licensee's formal review of the event and completion of corrective actions, this issue would be identified as an Unresolved Item[1] (URI) by the NRC.

During the current inspection, the inspector discussed the self-identified issue with the licensee and interviewed various staff personnel. The event information was reviewed and the inspector verified that the licensee had completed the established corrective actions concerning the control of the Hot Cell - Very High Radiation Area. The key entry system had been made a secondary control. In addition to the key, the licensee had installed a proxy card reader on the Hot Cell door in parallel with the key lock. The proxy card reader was required to be activated by an HP staff member prior to the key lock being opened. Without the proxy card activation, the key lock would not function and the door control motor would not function to open the door. This action was completed in April 2011. In addition, procedure AP-HP-129, "Hot Cell, HC-01 Control," was revised to note the change in the steps required to activate the key lock system with the proxy card. Only HP personnel have proxy cards that activate the key lock system. Leaving the key in the hot cell door lock will not, by itself, allow someone to inadvertently gain entry to the Hot Cell Very High Radiation Area.

The inspector observed as the licensee demonstrated the current operation of the Hot Cell door using the proxy card in addition to the key lock system.

Based on the results of this inspection, the inspector determined that this was a Severity Level IV violation of NRC requirements. However, as indicated above, the inspector determined that the problem had been identified and reviewed by the licensee and reported to the NRC inspector. Corrective actions had been identified and completed as well. As a result, the licensee was informed that this non-repetitive, licensee-identified and corrected violation would be treated as a Non-Cited Violation (NCV), consistent with Section 2.3.2.b of the of the NRC Enforcement Policy (NCV 50-184/2012-201-01). This issue is considered closed.

Because the Unresolved Item (identified as URI 50-186/2011-201-02) noted in NRC Inspection Report No. 50-186/2011-201, which was issued April 14, 2011, resulted in the NCV described above, the URI is considered closed.

[1] An Unresolved Item is a matter about which more information is required to determine whether the issue in question is an acceptable item, a deviation, a nonconformance, or a violation.

c. Conclusion

An Inspector Follow-up Item (IFI) and an Unresolved Item (URI) identified during a previous inspection were reviewed and closed during this inspection. One Non-Cited Violation (NCV) was identified and closed.

9. Exit Interview

The inspection scope and results were summarized on April 12, 2012, with members of licensee management and staff. The inspector described the areas inspected and discussed in detail the inspection findings. The licensee did not identify any of the material provided to or reviewed by the inspector during the inspection as proprietary. No dissenting comments were received from the licensee.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

R. Dobey	Health Physics Manager
R. Dunchan	Vice Chancellor for Research, Office of Research, University of Missouri
J. Ernst	Associate Director, Regulatory Assurance Group
L. Foyto	Associate Director, Reactor and Facilities Operations
J. Fruits	Reactor Manager
A. Gaddy	Compliance Specialist
L. Gunn	Health Physics Technician Specialist
J. Hemphill	Health Physicist, Special Projects Coordinator
C. Herbold	Assistant Reactor Manager – Engineering
N. Hogue	Health Physicist, Radioactive Waste Coordinator
M. Hudson	Health Physics Technician Specialist
B. Jacobi	Assistant Reactor Manager, Operations
L. Juengermann	Shipping Manager
M. Kraus	Safety Associate and CAP Coordinator
K. Kutikkad	Assistant Reactor Manager, Physics; SNM Coordinator; and Security Director
R. Maxey	Health Physics Technician
C. McKibben	Senior Advisor
J. Mitchell	Health Physics Technician II
M. Nichols	Health Physics Technician
D. Nickolaus	Health Physics Technician II
S. Oberhaus	Health Physics Technician Specialist
D. Rathke	Access Control Coordinator
M. Sanford	Associate Director, Products and Services
C. Schnieders	Health Physics Technician
E. Werner	Health Physics Technician
T. Warner	Lead Senior Reactor Operator

Other Personnel

T. Kovac	Special Agent, Federal Bureau of Investigation, Department of Justice

INSPECTION PROCEDURES USED

IP 69004 – Class 1 Research and Test Reactor Effluent and Environmental Monitoring
IP 69006 – Class 1 Research and Test Reactor Organization, Operations, and Maintenance Activities
IP 69007 – Class 1 Research and Test Reactor Review and Audit and Design Change Functions
IP 69012 – Class 1 Research and Test Reactor Radiation Protection
IP 86740 – Inspection of Transportation Activities

ITEMS OPENED, CLOSED, AND/OR DISCUSSED

Opened

50-186/2012-201-01	NCV	Failure to comply with 10 CFR 20.1601(a)(3) in that a High Radiation Area was not properly secured because a key was left in the switch on the Hot Cell door (entrance to a High Radiation Area) which could have potentially allowed an individual to gain unauthorized or inadvertent access to the area.

Closed

50-186/2011-201-01	IFI	Follow-up on the licensee's actions to update HP procedures dealing with: 1) calculations for PING alarm setpoint changes in HP-310, -311 and -312, and 2) correct reference to data record number in HP-350 and -351.
50-186/2011-201-02	URI	Review the licensee's actions to correct the problem noted concerning failure to control access to the Hot Cell area which was posted as a Very High Radiation Area.
50-186/2012-201-01	NCV	Failure to comply with 10 CFR 20.1601(a)(3) in that a High Radiation Area was not properly secured because a key was left in the switch on the Hot Cell door (entrance to a High Radiation Area) which could have potentially allowed an individual to gain unauthorized or inadvertent access to the area.

LIST OF ACRONYMS USED

ARM	Area Radiation Monitor
ALARA	As low as reasonably achievable
BEA	Battelle Energy Alliance
BRR	BEA Research Reactor (shipping cask)
CAP	Corrective Action Program
CEDE	Committed effective dose equivalent
10 CFR	Title 10 of the *Code of Federal Regulations*
CoC	Certificate of Compliance
DDE	Deep dose equivalent
DOT	Department of Transportation
dpm	disintegrations per minute
FBI	Federal Bureau of Investigation
H-3	Tritium (isotope)
HP	Health physics
IFI	Inspector Follow-up Item
IP	Inspection Procedure
IUS	Isotope Use Subcommittee
MIT	Massachusetts Institute of Technology
mrem	Millirem

Mo-99	Molybdenum-99 (isotope)
MURR	University of Missouri - Columbia Research Reactor
NAA	Neutron Activation Analysis
NCV	Non-Cited Violation
No.	Number
NRC	U. S. Nuclear Regulatory Commission
OSL	Optically stimulated luminescent (dosimeter)
PING	Particulate, Iodine, and Noble Gas (air monitor)
POD	Plan of the Day
QA	Quality Assurance
RAC	Reactor Advisory Committee
RAG	Regulatory Assurance Group
Rev.	Revision
RP	Radiation Protection
RWP	Radiation Work Permit
SDE	Shallow dose equivalent
TLD	Thermoluminescent dosimeter
TS	Technical Specification
URI	Unresolved Item