

February 15, 2012

Robert D. Busch, Ph.D, P.E.
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SUBJECT: UNIVERSITY OF NEW MEXICO - NRC ROUTINE INSPECTION REPORT NO.
50-252/2012-201

Dear Dr. Busch:

On January 24-27, 2012, the U.S. Nuclear Regulatory Commission (NRC, the Commission) conducted an inspection at the University of New Mexico (UNM) AGN-201M Research Reactor facility (Inspection Report No. 50-252/2012-201). The enclosed report documents the inspection results, which were discussed on January 26, 2012, with you, Mr. Kenneth Carpenter, Reactor Supervisor, and representatives of the UNM's Department of Safety & Risk Services (SRS), Radiation Safety Division.

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 inspectors reviewed selected procedures and records, observation of activities, and interviews with personnel. Based on the results of this inspection, no findings of significance were identified. No response to this letter is required.

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 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 Greg Schoenebeck at (301) 415-6345 or by electronic mail at Greg.Schoenebeck@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. 50-252
License No. R-102

Enclosure: NRC Inspection Report No. 50-252/2012-201
cc w/encl: See next page

University of New Mexico

Docket No. 50-252

cc:

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Test, Research, and Training
Reactor Newsletter
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

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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 inspectors reviewed selected procedures and records, observation of activities, and interviews with personnel. Based on the results of this inspection, no findings of significance were identified. No response to this letter is required.

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Research and Test Reactors Oversight Branch
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Office of Nuclear Reactor Regulation

Docket No. 50-252
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cc w/encl: See next page

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

Docket No: 50-252

License No: R-102

Report No: 50-252/2012-201

Licensee: University of New Mexico

Facility: AGN-201M Reactor Facility

Location: Albuquerque, New Mexico

Dates: January 24-27, 2012

Inspectors: Gregory M. Schoenebeck
Ossy Font, Inspectors in Training

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 New Mexico
AGN-201M Research Reactor Facility
NRC Inspection Report No.: 50-252/2012-201

The primary focus of this routine, announced inspection included onsite review of selected aspects of the University of New Mexico (UNM, the licensee) Class II research reactor safety program including: 1) Procedures, 2) Requalification Training, 3) Experiments, 4) Health Physics, 5) Design Changes, 6) Committees, Audits, and Reviews, and 7) Transportation activities since the last U.S. Nuclear Regulatory Commission (NRC) inspection. The licensee's program was acceptably directed toward the protection of public health and safety, and in compliance with NRC requirements. No deviations or violations were identified.

Procedures

- Procedural control and implementation satisfied Technical Specification (TS) requirements.

Requalification Training

- The licensee's requalification program was up-to-date and plan requirements were met.

Experiments

- The approval and control of experiments met TS requirements.

Health Physics

- The radiation protection program was being maintained and implemented as required.

Design Changes

- The licensee's design change program was being implemented as required.

Committees, Audits, and Reviews

- Review and oversight functions required by the TS were acceptably completed by the Reactor Safety Advisory Committee.

Transportation of Radioactive Materials

- The licensee did not ship any radioactive material from the facility using the reactor license.

REPORT DETAILS

Summary of Plant Status

The University of New Mexico (UNM, the licensee) Aerojet General Nucleonics-201 Modified (AGN-201M) research reactor was licensed to operate at a maximum steady-state thermal power of 5 Watt (W). The licensee continued to operate the reactor in support of operator training, surveillances, and teaching and classroom experiments/demonstrations. During the inspection, the reactor fuel was handled and the reactor was operated for criticality determinations (i.e., 1/M plotting) during a nuclear engineering laboratory.

1. Procedures

a. Inspection Scope (IP 69001)

The inspectors reviewed the following to ensure that the procedural control requirements of Technical Specifications (TS) Section 6.6 were being met:

- Records of changes to procedures
- NE 413/513L- AGN#1 "Approach to Critical Experiment"
- Reactor Safety Advisory Committee (RSAC) meeting minutes dated October 4, 2011
- Selected procedures from the Reactor Operation and Training Manual (ROTM), revised June 2011

b. Observations and Findings

The facility performed a reactor startup and manipulated power levels in accordance with the newly revised procedures acceptably. The clarity and detail in the procedures was adequate. The inspectors did note that it was unclear if and when the procedures had been approved by looking at the procedures themselves directly; however, they do make note of the most recent revision. From referencing a few of the procedures, it appears that the only location where notation that procedures had been reviewed and approved are in the RSAC meeting minutes. The majority of the experimental procedures had been approved years ago; decades in some cases.

c. Conclusion

Procedural control and implementation satisfied TS requirements.

2. Operator Requalification

a. Inspection Scope (IP 69001)

The inspectors reviewed the following to verify compliance with the requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 55 and the requalification program:

- Operator active license status
- University of New Mexico AGN-201M Reactor Operations Log,” manual revision dated February 2009
- Training requirements stipulated in ANSI/ANS 15.4 – 1977, “Standards for the Selection and Training of Personnel for Research Reactors”

b. Observations and Findings

At the time of the inspection, there were three qualified Senior Reactor Operators (SROs) working at the facility and three newly qualified Reactor Operators (ROs).

The inspectors verified the operating licenses were current for the SROs. It was also noted that annual operating examinations (exams) and biennial written exams had been completed by the operators as required. The inspectors followed-up on the status of enrollment of the new ROs into the requalification program as required and determined that they were slowly integrating into the program.

c. Conclusion

The licensee’s requalification program was up-to-date, and plan requirements were met.

3. Experiments

a. Inspection Scope (IP 69005)

The inspectors reviewed selected aspects of the following to verify compliance with TS Sections 3.8, 4.8, and 6.5:

- Request for Use Authorization (RFU) No. 535, “AGN-1”, dated January 18, 2012

b. Observations and Findings

The UNM AGN-201M reactor was primarily used as a training reactor for undergraduate and graduate students. Experiments that had been performed typically consisted of operations performed for semester coursework, including: sample activation, approach to critical, reactor period and reactivity measurements, control rod calibrations, importance function measurements, and transfer function measurements. During this inspection, the inspectors observed the facility perform a reactor approach to criticality experiment (i.e., AGN-1) for the performance of 1/M plots.

When reviewing the procedure for the AGN-1 laboratory, it was apparent that it clearly provided guidance for fuel movement, startup, operation, and shutdown of the reactor in accordance with TS Section 6.6. It was noted that this procedure

as with the majority of the procedures used for experiments and operations do not clearly identify the instance of if and when the procedure had been approved by the RSAC for any change or modification that required their approval.

During a reactor tour the inspectors observed the staging of equipment and the arrangement of five fuel discs removed from the reactor vessel which was in preparation for the AGN-1 laboratory experiment. The inspectors determined that the fuel arrangement in conjunction with the secure storage location met the requirements of TS 5.2.

The laboratory experiment exercised many facets of reactor and radiation safety operations and protocol. Overall, the facility staff and supporting radiation safety officers ensured that the students conducting the reactor startup/shutdown and handling the fuel discs did the operations in accordance with RSAC approved procedures.

Since the last inspection there had been no new experiment that had been initiated requiring the approval of the Radiological Safety Officer (RSO) and the RSAC.

The inspectors reviewed the approval standard (i.e., RFU) at the facility and noted that the form does not appear to reflect the screening and vetting process as contained within 10 CFR 50.59. The inspectors followed-up on IFI 50-252/2010-202 for a new experiment that had been reviewed and approved by the RSAC, however, it did not appear to adequately address the criteria stipulated in 10 CFR 50.59. Since the facility had not approved a new experiment in recent years, it appears that review process needs to be standardized to better conform to the requirements of 10 CFR 50.59 and as outline in TS 6.4.2. During this inspection it was determined that no other new experiments had been reviewed and approved by the RSAC. This item was again discussed with the facility and they agreed to update their experimental review process. IFI 50-252/2010-201-02 shall remain open until they correct their experimental review procedure to conform to the requirements of 10 CFR 50.59 and TS 6.4.2.

c. Conclusion

The program for reviewing and conducting experiments generally satisfied TS and procedural requirements.

4. Health Physics

a. Inspection Scope (IP 69001)

The inspectors reviewed the following to verify compliance with TS Section 4.4 as well as 10 CFR Part 19 and 10 CFR Part 20 requirements:

- Radiological signs and posting and area control
- Quarterly dosimetry records for the reactor room for 2010 and 2011
- Quarterly dosimetry records for reactor staff and students for 2010 and 2011
- Maintenance and calibration of portable radiation survey instruments, records for 2010 and 2011
- Completed AGN-201 Monthly Non-Operational Radiation Survey forms, which included documentation of an inventory of decontamination equipment, for the period from 2010 to present
- Nuclear Engineering AGN-201 Reactor Radiation Surveys during periods of operation and for laboratory preparation
- Nuclear Engineering AGN-201 Reactor Radiation Survey Large Emergency Kit- Checklist

b. Observations and Findings

The inspectors toured the Nuclear Engineering Laboratory (NE Lab) and observed the use of dosimetry and radiation monitoring equipment. Licensee personnel were interviewed as well. The inspectors also discussed the subjects of surveys, dosimetry, training, and radioactive effluents with UNM Department of Safety & Risk Services (SRS), Radiation Safety Division representatives.

(1) Surveys

The inspectors reviewed monthly radiation and contamination surveys of the licensee's controlled areas completed by the SRS Radiation Safety Division personnel. The surveys had been completed in accordance with procedure and the results were documented on the appropriate forms and evaluated as required. It was noted that the SRS Radiation Safety Division personnel also completed an annual radiation survey of the facility while the reactor was at power in accordance with TS. No readings in excess of those noted in the past were discovered. The inspectors noted that the surveys clearly included the date, survey instrument used with calibration date, reactor power level and the type of survey.

During the reactor operations demonstration, the inspectors determined that the highest radiation reading varied between 150 and 200 mr/hr above the shield plug in the reactor room at 5 W. This reading was consistent with the Area Radiation Monitor Reading display on the reactor console. The radiation levels at the reactor console were less than 1 mr/hr. Both sets of readings were consistent with rad surveys performed by the RSO.

The inspectors reviewed results of a radiation survey performed in areas external to the NE Lab (i.e., the roof). The highest level on top of the roof was a gamma reading of 75 μ R/hr.

(2) Postings and Notices

The inspectors toured the NE Lab and reviewed the postings required by 10 CFR Parts 19 and 20 at the entrances to various controlled areas including the Reactor Facility, the Reactor Room, and radioactive material storage areas. The postings were acceptable and indicated the radiation and contamination hazards present. The facilities' radioactive material storage areas were noted to be properly posted. No unmarked radioactive material was found in the facility. Control of radioactive material and control of access to radiation and high radiation areas were acceptable.

(3) Dosimetry

The inspectors determined that the licensee typically used thermoluminescent dosimeters (TLD) for whole body monitoring of beta and gamma radiation exposure. The TLDs also contained a component to measure neutron radiation. The dosimetry was supplied and processed by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited vendor, MIRION Technologies. An examination of the 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 limitations.

(4) Radiation Monitoring Equipment

The calibration of portable survey meters and friskers was completed either by Radiation Safety Division personnel or by a company that specializes in calibrations. Fixed area radiation monitors were calibrated at the facility by reactor staff personnel using a portable source. The calibration records of portable survey meters and fixed radiation detectors in use at the facility were reviewed. The calibration frequencies of the various instruments examined met the requirements established in TS 4.4.a and records were being maintained as required.

(5) Radiation Protection Program

The licensee's Radiation Protection Program (RPP) was established through the UNM Radiation Safety Manual. The inspectors verified that the RPP was being reviewed annually as required. The review of the program did not identify issues related to radiation protection at the NE Lab.

(6) Training

The Radiation Safety Manual required that all personnel who worked with radioactive materials receive training in radiation protection, policies, procedures, requirements, and the facilities prior to having unescorted access at the facility. UNM SRS Radiation Safety Division personnel were responsible for conducting the training and all of the training was typically conducted by a radiation safety specialist. A test was administered at the end of the training to verify that the individuals understood the material presented. The training covered the topics required to be taught in 10 CFR Part 19 and a review of training materials and tests indicated that reactor staff and student personnel were instructed on the appropriate subjects.

(7) Environmental Monitoring

The licensee complied with NRC regulations for environmental monitoring by ensuring that all doses at the site boundary were less than the dose limits specified in 10 CFR 20.1301. Several TLDs were strategically placed in several locations around the inside perimeter of the facility; there were no abnormal doses noted. There were no liquid or gaseous effluents discharged from the facility since the last inspection.

c. Conclusion

The radiation protection program was being maintained and implemented as required.

5. Design Changes

a. Inspection Scope (IP 69001)

To verify that the licensee was conducting maintenance and completing the required surveillance requirements, the inspectors reviewed the following:

- 2010 Annual Report for the AGN-201M reactor
- Selected "Request For Use" forms from March 2009 to the present
- Completed "Reactor Maintenance Log Sheet – The University of New Mexico AGN-201M Reactor Facility" forms for the period from 2009 to the present

b. Observations and Findings

The inspectors reviewed the records related to requested maintenance since the last inspection. The inspectors determined that there were no new maintenance requests (i.e., design changes) since the last NRC inspection.

The inspectors reviewed the maintenance log sheets to determine if they conformed to the screening and vetting process as described under 10 CFR 50.59. The inspectors concluded that although the forms briefly describe a need to review aspects which could affect the safety of scram operation, scram levels, or scram ability of the reactor, and potential radiological safety concerns, the forms did not clearly mirror the requirements of 10 CFR 50.59. The licensee had indicated that they were drafting a review checklist for design changes in accordance with 10 CFR 50.59. Since this issue is similar in nature to the one previously identified in Section 3 "Experiments" for the RFU, the inspectors will track this issue under IFI 50-252/2010-201-02

c. Conclusion

The licensee's design change program was being generally implemented as required.

6. Committees, Audits, and Reviews

a. Inspection Scope (IP 69001)

To verify that TS requirements were being met since the last inspection, the inspectors reviewed selected aspects of:

- RSAC Meeting Minutes for October 4, 2011
- ROTM, dated 2009

b. Observations and Findings

The functions and responsibilities of the RSAC were defined in the TS. The inspectors verified that the RSAC held semiannual meetings and a quorum was present as required. The inspectors followed up on the RSAC audits required under TS 6.4.3. Typically, the audit findings were noted in the meeting minutes.

The inspectors determined that the RSAC was performing the audits within the periodicity outlined in TS 6.4.3. Audit results and comments were captured within the meeting minutes and during this inspection it was noted that there were no corrective action items needed to be addressed. The inspectors noted that there were no safety significant issues recorded during the audits since the last inspection.

c. Conclusion

Review and oversight functions required by the TS were acceptably completed by the RSAC.

7. **Transportation**

a. Inspection Scope (IP 86740)

To verify compliance with procedural requirements for shipping radioactive material, the inspectors interviewed licensee personnel, Radiation Safety Division personnel, and reviewed operational logs and records.

b. Observations and Findings

Through records review and discussions with licensee and UNM Radiation Safety Division personnel, the inspectors determined that the licensee had not shipped any radioactive material from the reactor facility under the auspices of the reactor license. If the licensee needed to ship radioactive material, it would likely be transferred to the UNM's Broad Scope license and shipped or disposed of under that license.

c. Conclusion

No radioactive material was shipped from the reactor facility under the reactor license.

8. **Follow-up**

a. Inspection Scope (IP 92701)

IFI 50-252/2008-201-01

The inspectors followed-up on IFI 50-252/2008-201-01 to determine the licensee's efforts for investigating the cause of the much higher than expected doses for reactor staff members and students who had worked in the NE Lab during the second and third quarters of 2007.

IFI 50-252/2010-201-01

The inspectors followed-up on IFI 50-252/2010-201-01 to determine the licensee's progress for clearly defining the condition of the reactor in TS and procedures (i.e., shutdown and secured) with the cadmium rod installed into the central irradiation tube, (i.e., "glory hole").

IFI 50-252/2010-201-02

The inspectors followed-up on IFI 50-252/2010-201-02 to determine the licensee's progress for drafting documents for their experimental review and design change process which better conforms to the screening and vetting requirements in 10 CFR 50.59.

b. Observations and Findings

IFI 50-252/2008-201-01

Upon discussion with the RSO staff, they presented a detailed report of their investigation, "Anomalous TLD Badge readings in Q2 and Q3 CY2007 for the Nuclear Engineering Lab". The investigation focused on four reasonable possibilities that included: 1) Processing Errors by Vendor; 2) Transit Exposure; 3) Background Subtraction Error; and 4) Exposure in lab.

The summary of their determinations are as follows:

1) Processing Errors by Vendor

The facility reviewed the processing data from Mirion (vendor) for the batch of badges (i.e., UNM reactor personnel and UNM campus-wide personnel other than those associated with the reactor) and determined that there were no other anomalous readings outside of the personnel associated with the reactor. The UNM RSO investigation reviewed calibration data and the results from the NVLAP dosimetry processing unit(s) indicated acceptable vendor performance. Additionally, the RSO staff followed up the Mirion TLD program manager to confirm that the badges were properly annealed prior to distribution.

2) Transit Exposure

The RSO staff confirmed that anomalous exposure did not occur via source material in transit. As mentioned in #1) above, the dosimetry was sent in a batch where personnel not associated with the reactor did not have anomalous readings. Additionally, by convention, UNM does not ship their dosimetry via FedEx or equivalent shipper to ensure that dosimetry is not aggregated in the same shipment as waste or source material which could add unintentional exposure.

3) Background Subtraction Error

For Q2, the control badges for the NE location were returned early and read separately several months before the remainder of the badges. Whether the early read controls or an administrative background was applied, this could contribute to the unusual readings. However, this could account for a small portion of the higher readings.

4) Exposure in Lab

The RSO reviewed the Mirion dosimetry records for a time period that is consistent with the receipt and use of a Ca-252 source. Although the cause cannot be definitively attributed to the Ca-252 source, Mirion indicated a definite gamma and neutron signal from the suspect badges. From all indications associated with the batch of dosimetry sent to Mirion, it appears that the anomalous exposure occurred with personnel associated with the AGN reactor.

The inspectors determined that the RSO followed-up on the unusual exposure reading for Q2 and Q3 2007 adequately. Although, the anomalous dose levels in 2007 did not reach an established "alert" threshold, the RSO appears to be more conscientious of reviewing inconsistencies in dose reporting where an investigation may be warranted. The inspectors have closed IFI 50-252/2008-201-01.

IFI 50-252/2010-201-01

During a previous inspection, the inspectors performed a review of the emergency procedures for the UNM AGN. During the review, the inspectors cross-referenced the actions for shutting down and securing the reactor in the Emergency Procedure would meet the TS condition for "Reactor Shutdown". During the review, the inspectors did not find a TS definition for said condition nor was there any reactor condition (i.e., Reactor Secured) which made any reference to the cadmium rod's installation in the glory hole which was a step in the emergency procedure. During this inspection, the inspectors noted that the current TS and emergency procedures clearly define the condition of the "Reactor Secured" with the cadmium rod in the glory hole. Additionally, the RSAC procedures and TS had changed with the license renewal. Due to the corrective actions and subsequent changes to the procedures and TS, the inspectors have closed IFI-252/2010-201-01.

IFI 50-252/2010-201-02

As noted in Section 3 "Experiments" and Section 5 "Design Changes", it does not appear that the licensee's review of new experiments and/or facility design changes reflect the screening and vetting process outlined in 10 CFR 50.59. The facility typically does not perform new experiments and has not made any design changes in years. Through discussion, the inspectors determined that the licensee has committed to drafting review documents which adequately addresses the criteria outlined in 10 CFR 50.59 for a new experiment or facility design change. IFI-50-252/2010-201-02 was discussed and will remain open.

c. Conclusion

IFI 50-252/2008-201-01 and IFI 50-252/2010-201-01 are closed. IFI-50-252/2010-201-02 was discussed and will remain open.

9. Exit Meeting

The inspectors presented the inspection results to licensee management at the conclusion of the inspection on January 27, 2012. The inspectors discussed the findings for each area reviewed. The licensee acknowledged the findings and did not identify as proprietary any of the material provided to or reviewed by the inspectors during the inspection.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

R. Busch Chief Reactor Supervisor
K. Carpenter Reactor Supervisor

Other Personnel

J. DeZetter Manager, Radiation Safety, Department of Safety and Risk Services,
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A. Buchanan Radiation Safety Specialist, Department of Safety and Risk Services,
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INSPECTION PROCEDURES USED

IP 69001 Class II Research and Test Reactors

ITEMS OPENED, CLOSED, AND DISCUSSED

OPENED:

None

CLOSED:

50-252/2008-201-01 IFI Follow-up on the licensee's efforts to determine the cause of the
much higher than expected doses for reactor staff members and
students who had worked in the NE Lab during the second and
third quarters of 2007.

50-252/2010-201-01 IFI Follow-up on delineating the reactor condition of shutdown in
procedures and TS. This includes identifying if the cadmium rod
installed into the glory hole is a requirement for either a shutdown
or secured condition.

DISCUSSED:

50-252/2010-201-02 IFI Follow-up on a procedure which standardizes the review process
for new experiments which conforms to the stipulations of
10 CFR 50.59

LIST OF ACRONYMS USED

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ADAMS	Agencywide Document Access and Management System
AGN-201M	Aerojet General Nucleonics-201 Modified (Research Reactor)
ANSI/ANS	American National Standards Institute/American Nuclear Society
CRS	Chief Reactor Supervisor
E-Plan	Emergency Plan
Exam	Examination
IFI	Inspectors Follow-up Item
IP	Inspection Procedure
LOA	Letter of Agreement
NRC	U.S. Nuclear Regulatory Commission
OJT	On-the-Job Training
ROTM	Reactor Operation and Training Manual
RPP	Radiation Protection Program
RS	Reactor Supervisor
RSO	Radiation Safety Officer
RSAC	Reactor Safety Advisory Committee
SRO	Senior Reactor Operator
SRS	Safety and Risk Services
TLD	Thermoluminescent Dosimeter
TS	Technical Specifications
UNM	University of New Mexico