

APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: 50-72/86-01
50-407/86-01

Licenses: R-25
R-126

Dockets: 50-72
50-407

Licensee: University of Utah (UofU)
Salt Lake City, Utah 84112

Facility Name: TRIGA and AGN-201 Reactor Facility

Inspection At: University of Utah, Salt Lake City, Utah

Inspection Conducted: June 9-12, 1986

Inspector:

Blaine Murray
H. D. Chaney, Radiation Specialist, Facilities
Radiological Protection Section

7/14/86
Date

Approved:

Blaine Murray
B. Murray, Chief, Facilities Radiological
Protection Section

7/14/86
Date

Inspection Summary

Inspection Conducted June 9-12, 1986 (Report 50-72/86-01 and 50-407/86-01)

Areas Inspected: Routine, unannounced inspection of the licensee's program for the operation of the AGN-201 and TRIGA reactors including: management controls and organization, reactor operations, surveillances, experiments, radiation protection, emergency preparedness, physical security, radiological environmental monitoring, and operator requalification training.

Results: Within the areas inspected, 11 apparent violations and 2 apparent deviations were identified.

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DETAILSI. Persons ContactedUofU

- *R. E. Turley, Reactor Administrator
- *C. Bryner, Associate Dean for Facilities, College of Engineering
- *G. M. Sandquist, Reactor Supervisor
- *W. D. Shepherd, Director of Public Safety
- *K. C. Crawford, Senior Reactor Operator (SRO)
- *K. J. Schiager, Radiation Safety Officer (RSO)
- D. W. Hoepfner, Chairman, Department of Mechanical and Industrial Engineering
- D. R. Gunnell, Associate Administrator, University of Utah Hospital
- K. M. McKnight, UofU Police Officer
- G. S. Pregman, UofU Police Officer
- R. J. Hoffman, Health Physicist, Radiological Health Department (RHD)
- D. Steinman, Mechanical Machine Shop Foreman
- T. Sandquist, Student
- C. M. Fejer, Radiation Safety Analyst

Others

- *B. Murray, Chief, Facilities Radiation Protection Section, NRC
- R. E. Carter, NRC Office of Nuclear Reactor Regulation (NRR),
Project Manager
- J. L. Bateman, Captain, Salt Lake City Fire Department, Station 15

*Denotes those present at the exit interview on June 12, 1986.

The NRC inspector also interviewed several other licensee employees and personnel associated with the UofU, such as police department dispatchers, students, Salt Lake City Fire Department personnel, plant maintenance, and radiological health.

2. Licensee Action on Previously Identified Inspection Findings

(Open) Violation (50-72/8301-01): Failure to Perform Technical Specification (TS) Surveillances - This item was identified in NRC Inspection Report 50-72/83-01 and involved the licensee's failure to perform certain required annual reactor surveillances on the AGN-201 reactor. The Reactor Safety Committee (RSC) has identified that one of the control instruments for monitoring reactor power is malfunctioning and replacement parts are difficult to obtain. Since this instrument's operation is necessary for reactor start-up, there has been no reactor operation for the last 3 1/2 years. As a result, the NRC inspectors could not verify that the licensee had implemented the required surveillance tests. This item is considered open pending repair of the control instrumentation and return of the reactor to full operating status.

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(Open) Open Item (50-407/8301-01): Reactor Facility Operating Manual Update - This item was identified in NRC Inspection Report 50-407/83-01 and involved out-of-date information in the operating manual concerning assignment of responsibilities and emergency phone numbers. The Reactor Operations Manual was last updated and reviewed by the RSC on March 1, 1984. During this inspection, it was noted that information in the manual does not include current information concerning assigned responsibilities for management of the reactor facility, membership on the RSC (handwritten corrections had been made to some names), and the phone numbers of some key licensee personnel and the NRC Regional Office were in error. This item is considered open pending implementation of a program that will ensure the Reactor Facility Operating Manual is updated at a frequency commensurate with changes in management assignments and facility changes.

3. Inspector Observation

The following are observations the NRC inspectors discussed with the licensee during the exit meeting on June 12, 1986. These observations are neither violations nor unresolved items. These items were recommended for licensee consideration for program improvement, but they have no specific regulatory requirement.

- a. Records Storage - The licensee's records storage facilities at the Nuclear Engineering Laboratory (NEL) do not provide sufficient protection from damage by fire for records required to be kept for the life of the facility. (See paragraph 6)
- b. Documentation of Operations - NEL logs and RSC minutes do not provide sufficient detail of the proposed switch-over to a computer based reactor operating console for the TRIGA reactor. (See paragraph 6)
- c. Housekeeping - The AGN-201 and TRIGA control rooms are not maintained in an orderly fashion with regard to trash and combustible materials. (See paragraph 6)
- d. Technical Specifications - Obsolete reactor Technical Specifications were located at the TRIGA reactor operating console. (See paragraph 8)
- e. 10 CFR Part 19.12 Training - The RHD has established minimum performance criteria for written examinations given in 10 CFR Part 19.12 training. (See paragraph 9)
- f. RHD Involvement - The UofU RHD did not maintain coordination and oversight of radiological activities taking place in the NEL. Also, NEL supervision does not routinely communicate (outside of RSC meetings) with the RHD regarding the radiological aspects of planned maintenance and nonroutine reactor operations. (See paragraph 14)

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- g. NRC Information Notices and Generic Communications - The RHD does not routinely receive NRC Information Notices or applicable NEL correspondence that is sent to the UofU. (See paragraph 14)
- h. Neutron Surveys - Neutron radiation levels have not been established regarding operation of the AGN-201 and TRIGA reactors. (See paragraph 14)
- i. Radiological Controls - Poor radiological controls existed involving the handling of potentially radioactive materials. (See paragraph 14)
- j. Portable Instrumentation - The licensee does not maintain information on the calibration program for the portable radiation dose rate monitoring instruments loaned to the NEL or a program for the identification of instruments that are out of calibration. (See paragraph 14)
- k. Emergency Drill - During the June 12, 1986, NEL emergency response drill, several problems were noted. (See paragraph 16)

4. Management Organization and Controls

The licensee's management organization and controls were inspected to determine compliance with AGN-201 TS 6.1, and TRIGA TS 6.1, 6.2, 6.5.1, 6.5.3, and 6.5.4; and the commitments contained in the Safety Evaluation Report (NUREG-1096).

The licensee's organization and assignment of responsibilities are contained in the NEL Operations Manual. The NRC inspectors compared the existing organization to the requirements in the AGN-201 and TRIGA TS. The membership and procedures for the RSC were reviewed. The NRC inspectors noted that the Reactor Administrator had changed twice since the last NRC inspection (April 22, 1983). The current Reactor Administrator assumed this position in September 1985 and it was noted that he had also held the position prior to 1983. The reactor supervisor was noted to have been on sabbatical leave during the period of January through June 12, 1986. The RSC had approved on December 12, 1986, the assignment of the Senior Reactor Operator as Acting Reactor Supervisor.

The NRC inspectors also reviewed the support given to the NEL by the Director of Public Safety/UofU Police Chief and the RHD. The NRC inspectors noted a lack of involvement and technical support in day-to-day activities at the NEL by the RHD. Furthermore, it was apparent that lack of reactor management oversight and involvement in NEL activities resulted in problems with the Physical Security Plan (PSP) and the radiation protection program. The NRC inspectors noted that the numerous apparent violations identified in this report are an indication of a breakdown in management controls regarding operations at the NEL.

No violations or deviations were identified.

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5. Reviews and Audits

The NRC inspectors inspected the licensee's review and audit programs to determine compliance with the requirements of AGN-201 TS 6.4.2 and 6.4.3, and TRIGA TS 6.5.4 and 6.5.5; and the commitments of the Section 13.4 of the safety evaluation report (SER).

The NRC inspectors determined that the RSC conducted operational and record reviews as required by the TS. Minutes of RSC meetings for the period January 1983 through March 1986 were reviewed as were operational logs, experiment approval forms, changes to operating procedures, and verification of the biennial review of the Emergency Plan (EP) and PSP.

The AGN-201 TS 6.4.3, states, in part, that "Audits of facility activities shall be performed under the cognizance of the RSC . . . These audits shall examine the operating records and encompass . . . The Facility Security Plan and implementing procedures, at least every two years."

In discussions with licensee representatives and the review of records, the NRC inspectors determined on June 11, 1986, that formal audits regarding implementation of the PSP had not been conducted. The failure to conduct required audits is an apparent violation of TS 6.4.3 (50-72/8601-01).

No deviations were identified.

6. Logs and Records

The NRC inspectors reviewed logs and records to determine compliance with the requirements of AGN-201 TS 6.4.5, 6.7, and 6.10, and TRIGA TS 4.3.5, 6.5.6, and 6.9.

The NRC inspectors reviewed reactor operations for the AGN-201 and TRIGA for the period January 1, 1983, through June 9, 1986, regarding maintenance, fuel configurations, personnel exposure and dosimetry logs, experiment records, startup checklists, and instrument response check logs. The NRC inspectors determined that the maintenance history records for the TRIGA reactor were not documented in sufficient detail to provide a clear description/understanding of previous maintenance activities. This was especially evident regarding the maintenance work involving the upper core support grid work performed during December 1985 and January 1986. Also, the NRC inspectors discussed with the licensee the need to update the history and current status concerning the proposed implementation of a computerized operations console for the TRIGA reactor, and to ensure that the NRR Project Manager is kept up-to-date on the planned modifications.

The licensee maintains required facility records and logs in binders or loose leaf files in the TRIGA reactor control room (Room 1001-D) of the Merrill Engineering Building, (see Figure 4.1 of the SER for detailed layout of the NEL). The NRC inspectors determined that these important

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records are not provided adequate protection from fire or water damage. Room 1001-D does not contain smoke or fire alarms; however, Room 1001-D does have an overhead water sprinkler fire suppression system. The system, if activated, would douse many of the logs and records with water. Some files (about 50 percent) were noted to be kept in a metal file cabinet. The NRC inspectors determined that the metal cabinet was not fire/heat rated. The NRC inspectors also noted that the TRIGA control room contained a large amount of combustibles and that general housekeeping conditions needed to be improved. The AGN-201 reactor console was covered with miscellaneous equipment and periodicals.

No violations or deviations were noted.

7. Procedures

The NRC inspectors reviewed procedures to determine compliance with AGN-201 TS 6.4.2 and 6.6, and TRIGA TS 6.6.4 and 6.8; and the commitments of Section 4.7 of the SER.

The following procedures were reviewed:

- ° NEL Operations Manual, RSC Approval dated March 1, 1984
- ° Procedure for Adding Water to the Reactor Tank (no date or approval)
- ° TRIGA Preliminary Check Sheet (no date or approval)
- ° UofU TRIGA Reactor Monthly Inspections, RSC Approved February 1981
- ° Approach to Critical Procedure (no date or approval)
- ° Biennial Control Rod Check, RSC Approved February 20, 1981
- ° Procedure for the Biennial Fuel Rod Inspection, RSC Approved February 20, 1981
- ° Procedure for Changing Filters in the Water Demineralizer Circuit, RSC Approved February 20, 1981

The NRC inspectors noted that the above procedures have not been reviewed since February 20, 1981, and some procedures reference old TS that do not agree with the latest TS. The TRIGA TS issued with the renewal of license R-126, dated April 17, 1985, requires a biennial review of all standard procedures, whereas before no periodic review was required. It was noted that RSC members occasionally perform random reviews of completed procedures.

TRIGA TS 6.8, "Operating Procedures," requires, in part, that "Operating procedures shall be in effect for the following items: . . . (6) performing preventive maintenance and calibration tests on the reactor and associated equipment."

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AGN-201, TS 6.6, "Procedures," requires, in part, that "There shall be written procedures that cover the following activities:

- d. Preventive or corrective maintenance which could affect the safety of the reactor.
- e. Surveillance, testing, and calibration of instruments, components, and systems as specified in Section 4.0 of the Technical Specifications. (Technical Specification 4.4.a, applies to installed and portable radiation monitoring and control systems)."

The NRC inspectors determined on June 12, 1986, that the licensee had performed maintenance on the TRIGA reactor core support components involving removal of stuck fuel elements (caused by chemical corrosion due to a leak of chemicals from the SCRAM magnet), cleaning the upper core support grid by machining, enlargement of the grid fuel element openings by drilling, and the re-anodizing of the support grid. This work was performed by UofU personnel and non-university personnel, during the period of December 15, 1985, through January 25, 1986. This work was originally initiated by the reactor supervisor in December 1985, and completed after January 15, 1986, by the senior reactor operator. The work on the core support grid resulted in several radiological control problems. However, the licensee did not develop any maintenance or radiological control procedures concerning the work activities. The RSC meeting minutes indicated that they (RSC) were not aware of the work until after it was completed on or about January 28, 1986. The failure to develop the necessary maintenance procedures is an apparent violation of TRIGA TS 6.8 (50-407/8601-02).

The NRC inspectors also noted that the licensee calibrates area radiation monitors with a source that has an undetermined radiation output and in geometries that vary depending on who is performing the calibrations. The licensee's records concerning calibration of the airborne radiation monitor ventilation system indicated that during the period of January 1983 through May 1986, the type of source changed from Cesium-137 to Europium-152 and that readings for the Europium source varied by as much as 200 percent on several occasions. The licensee had not developed procedures, other than the monthly inspection checklist, for calibration of the AGN-201 or TRIGA area radiation monitors. The licensee also could not provide information on the calibration program or the sources used to calibrate several of the portable instruments in use in the NEL.

The failure to establish written calibration procedures for radiation monitoring equipment is an apparent violation of AGN-201 TS 6.6.e (50-72/8601-03).

No deviations were identified.

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8. Reactor Operations

The NRC inspectors reviewed operation of the AGN-201 and TRIGA reactors for the period April 1, 1983, through June 11, 1986.

a. AGN-201

The AGN-201 reactor has been placed in long term shutdown since February 18, 1985, when during annual rod drop checks a malfunctioning power range instrument was identified. This instrument cannot be readily repaired because of the unavailability of replacement parts. The NRC inspectors determined that the licensee had not operated the AGN-201 since the last inspection of this facility in April 1983. The licensee maintains a surveillance program over the reactor facilities and critical components.

b. TRIGA

The NRC inspectors reviewed the operations history to determine compliance with the following requirements.

License Condition 2.c.(1),	- <u>Maximum Power Levels</u>
TS 2.1	- <u>Fuel Element Temperature</u>
TS 2.2	- <u>Safety System Settings</u>
TS 3.2	- <u>Reactivity Limitations</u>
TS 3.3.1	- <u>SCRAM Times</u>
TS 3.3.2	- <u>Reactor Control System</u>
TS 3.3.3	- <u>Reactor Safety System</u>
TS 3.5	- <u>Ventilation System</u>
TS 3.8	- <u>Primary Coolant Conditions</u>
TS 5.1	- <u>Reactor Fuel</u>
TS 5.2	- <u>Reactor Core</u>
TS 5.3	- <u>Control Elements</u>
TS 5.4	- <u>Radiation Monitoring System</u>
TS 5.5	- <u>Fuel Storage</u>
TS 5.7	- <u>Reactor Pool Water System</u>

The NRC inspectors determined that the TRIGA reactor was routinely operated approximately 290 hours a year for the last 3 years for the purpose of laboratory teaching, system tests, power measurements, and sample irradiations. The sample irradiations involved routine experiments and production of Gold-198 implant seeds for veterinary medicine application, and activation of ore samples. The licensee's records indicated that approximately 14 inadvertent SCRAMs occurred during both 1984 and 1985. The licensee initiated startup of the TRIGA reactor on June 12, 1986, but sufficient time was not available to complete the reactor startup and operation.

As referenced in paragraph 7 of this report, the licensee had performed the biennial rod and fuel element inspections on the TRIGA during December 1985, through January 1986. The NRC inspectors noted in the

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maintenance log entries that some fuel elements were difficult to remove from the core support structure. The licensee identified in the log that due to a leaking SCRAM magnet housing, lubricants leaked into the reactor pool water and caused a corrosion buildup to form between the upper grid plate and fuel element similar to a weld. The information in the log indicated that seven elements were particularly difficult to remove and they required a back and forth twisting motion with a fuel handling tool in order to remove these elements. The licensee stated that the stuck fuel elements were visually inspected for damage after removal and no damage was identified. The NRC inspectors noted that certain evaluations of this maintenance activity (machining, plating, and retesting of components) were not adequately documented in the log. The NRC inspectors emphasized to the licensee the need to fully document all aspects of the work and perform an evaluation on the effects, if any, on the core grid structure following the modifications and re-anodizing.

The SER and TRIGA TS referenced the installation and use of a high efficiency particulate air (HEPA) filter located in the NEL reactor building ventilation system. This ventilation system is considered an engineered safety feature in the SER. This system is designed, according to Section 6.1 of the SER and TS 3.5 and 5.6(2), to control and filter airborne radioactivity discharge from the reactor facility. The NRC inspectors determined on June 10, 1986, that the primary HEPA filter in the exhaust ventilation leg of the system, as referenced in Figure 6.1 of the SER, would not be able to perform its intended function. The filter was not sealed to its mounting opening which would result in bypass leakage, installed so that the flow of air was in the wrong direction through the filter (manufacturer's flow requirement), and in the wrong orientation to prevent sagging of the filter pleats. The licensee could not locate any documents that would verify that the installation had ever been in-place tested to demonstrate that the system could perform its intended purpose. The above conditions are an apparent deviation to good engineering practices and industry standards (50-407/8601-04).

The NRC inspectors reviewed facility design changes and modifications to determine compliance with 10 CFR Part 50.59. The licensee reported to the NRC in the UofU TRIGA reactor Annual Operating Report for the period July 1, 1984, through June 30, 1985, an RSC approved modification to the TRIGA water tank recirculation system. This modification involved the addition of a 20 kilo-watt heat exchanger. The modification was noted to involve the hard piping of a water supply line from the recirculation system to the Merrill Engineering Building potable water supply and the connection of the recirculation system to a local sanitary drain system in the NEL. The NRC inspectors noted that the connection to the potable water supply involved a two valve isolation, one plastic and one metal, but none of the operating procedures call for verifying these valves are shut or that their capability to isolate the potable water supply from the reactor water tank recirculation system is periodically verified. The two systems (potable water and sanitary system interfaces) had not been surveyed to determine the presence of radioactive contamination. The NRC inspectors determined on June 11, 1986, that the licensee had not

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evaluated the interface of these two systems with the reactor water tank recirculation system as an unreviewed safety question since the release of radioactive effluents via these two pathways were not discussed in the SER, Section 11.2.2 Liquid Wastes, 12.3 Radiation Sources, or 12.6.2 Liquid Effluents. The failure to perform a proper safety analysis is an apparent violation of the requirements of 10 CFR Part 50.59. (50-407/8601-05).

During a review of reference material maintained at the TRIGA reactor console, the NRC inspectors noted that an obsolete copy of the TS was the only copy of this document readily available for operator use.

9. Qualifications and Training

Personnel qualifications and training were reviewed to determine compliance with the requirements of AGN-201 TS 6.2 and 6.3, and TRIGA TS 6.3, 6.4, Appendix A, and 6.5.2; 10 CFR Part 19.12 and 10 CFR Part 55, Appendix A; the recommendations of NRC Regulatory Guides 8.13, 8.27, and 8.29, and industry standard ANSI/ANS-15.4-1977.

The NRC inspectors reviewed qualifications and training records for personnel that support the NEL such as radiation control, emergency response, and students granted access to the NEL for work with radioactive materials on the reactors. Lesson plans and attendance rosters for police and firemen that may have to respond to an emergency at the NEL were inspected. The inspectors noted that the licensee conducts annual familiarization tours of the NEL facility for support personnel.

The NRC inspectors determined that the RHD and the NEL both provided radiological training for personnel that require entry into the restricted areas of the NEL. The RHD training program addressed the NEL in addition to other UofU activities involving radioactive materials. The NRC inspectors discussed with the RSO their concern that the radiation protection training course examination given to personnel was not being used as a feedback mechanism for determining weaknesses in the training program and/or personnel trained. This concern arose from the review of examination results which indicated that a student, which works in the NEL and has been involved with operation of the TRIGA reactor, had received a score of about 45 percent; however, there was no indication of remedial training or counsel being given and the student was noted to be working at the NEL during this inspection.

The NEL staff consists of a Reactor Supervisor (senior reactor operator (SRO)) licensed on the AGN-201 and TRIGA), one TRIGA SRO, and four TRIGA licensed reactor operators (RO). The Reactor Supervisor is the only individual licensed on the AGN-201.

The NRC inspectors reviewed the TRIGA reactor requalification training for compliance with the program approved by the NRC on April 12, 1984. The

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requalification program states, in part, that training will include planned lectures to cover the following areas:

- Nuclear Theory
- Radiation Control and Safety
- Technical Specification and Reactor License
- Reactor Operating Characteristics
- Reactor Control and Safety Systems
- Emergency Operating Normal and Abnormal Procedures
- Changes, Modifications, or Malfunctions Occurring to Reactor Systems or Operational Procedures
- Applicable Portions of Title 10, Chapter I, Code of Federal Regulations
- Operational Characteristics, Use, and Storage Locations of Existing and New Radiation Safety Equipment

The requalification program also requires that annual evaluations of each operator's knowledge and performance will be conducted by written examination, console performance examination, and an oral examination. Furthermore, the requalification program requires that a record will be maintained for each individual and will contain the following information:

- Current copy of either the individual's reactor operator or senior reactor operator license.
- Copies of all written examinations administered to the individual and the correct answers given to the individual during the requalification period.
- The annual evaluations of the individual documented in a memorandum for record.
- The summary of additional training received by the individual documented in a memorandum for record and any additional documentation.

The NRC inspectors determined on June 12, 1986, that the licensee's records for licensed reactor operators (which were all kept in one unorganized file folder) did not contain current copies of the operators' licenses, or annual evaluations for the operators. The NRC inspectors also determined that the licensee had not provided formal classroom lectures or prepared lesson plans for the purported informal lectures given to operators. The failure to implement the TRIGA operator requalification program is an apparent violation of 10 CFR Part 55, Appendix A (50-407/86-06).

No deviations were identified.

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10. Technical Specification Surveillances Requirements

The NRC inspectors reviewed surveillance results to determine compliance with AGN-201 TS 4.0 and TRIGA TS 4.0. The NRC inspectors reviewed representative logs, records, and documentation for the period January 1983 through June 1986.

a. AGN-201

The reactor has been shutdown, except for one attempted startup in February 1985. TS 4.0 does not require surveillances to be performed on the reactor if it is maintained in a shutdown condition. The licensee is performing radiation monitor response checks in accordance with TS 4.4 and routine facility inspections.

b. TRIGA

TS 4.1 "General" states: "Any additions, modifications, or maintenance to the ventilation system, the core and its associated support structure, the pool or its penetrations, the pool coolant system, the control element drive mechanism, or the reactor safety system shall be made and tested in accordance with the specifications to which the systems were originally designed and fabricated or to specifications approved by the Reactor Safety Committee. A system shall not be considered operable until after it has been successfully tested."

The NRC inspectors determined on June 11, 1986, that written documentation was not available to verify that the testing requirements in TS 4.1 were completed following maintenance performed on the upper core structure (see paragraphs 7, 8, and 14 of this report) in January 1986. The failure to verify testing requirements is an apparent violation of TS 4.1 (50-407/86-07).

The licensee's records indicated that other surveillance requirements were completed.

No deviations were identified.

11. Experiments

The licensee's program for the control and conduct of reactor experiments was inspected to determine compliance with the requirements of AGN-201 TS 3.3 and 6.4.2(c), and TRIGA TS 1.2, 3.2, 3.6, and 6.5.4(1); and the recommendations of RG 2.2 and 2.4, and industry standard ANS-15.6/N401-1974.

The NRC inspectors reviewed the licensee's records of experiments conducted in the TRIGA reactor (the AGN-201 has not been used since the last inspection in this area). The TRIGA has been primarily used for the irradiation of ore samples, biological tissue, and the production of

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Gold-198 seeds for veterinary applications. The licensee's review of experiments and procedures were inspected, and it was noted that the RSC and the reactor supervisor reviewed all new experiments.

No violations or deviations were identified.

12. Reactor Fuel Handling

The licensee's program and procedures for the handling and storage of fuel were inspected to determine compliance with the requirements of AGN-201 TS 5.2, and TRIGA TS 4.4 and 5.5.

The NRC inspectors reviewed biennial TRIGA fuel element inspection records, fuel inventory records, and core configuration records. The NRC inspectors noted that the fuel handling tools were kept outside the TRIGA reactor room.

No violations or deviations were identified.

13. Transportation of Radioactive Materials

The licensee's program for the transportation of radioactive materials (RAM) was inspected to determine compliance with AGN-201 and TRIGA reactor license condition requirements, and the requirements of 10 CFR Part 71 and 49 CFR Parts 170 through 189.

The licensee had reported in both the TRIGA and the AGN-201 annual reports that no radioactive wastes have been generated as the result of reactor operations. Most of the licensee's wastes are generated as the result of experiments and transferred to the state of Utah byproduct materials license for disposal.

License condition 2.A for the TRIGA reactor establishes the location of the TRIGA reactor facility as on the campus of the UofU. License condition 2.B.(1) authorizes the licensee to possess, use, and operate the facility at the designated location in Salt Lake City, Utah, in accordance with the procedures and limitations set forth in the license. License condition 2.C states, in part, that "This license shall be deemed to contain and is subject to the conditions specified in Parts 20, 30, 50, . . . of 10 CFR. Chapter I . . . 10 CFR Part 30.34(c) requires, in part, that "Each person licensed by the Commission pursuant to the regulations in this part . . . shall confine his possession and use of the byproduct material to the locations and purposes authorized in the license." The NRC inspectors determined on June 11, 1986, that the licensee had on several occasions in the past (June 1983, January 1984, and January 1986) transferred radioactive TRIGA components (core support grid plates and heavy water tanks) to unlicensed locations off-campus for maintenance work such as welding and anodizing. The transfer of radioactive material to an unauthorized location is considered an apparent violation of license condition 2.A (50-407/8601-08).

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10 CFR Part 30.34(c) requires, in part, that "Preparation for shipment and transport of byproduct material shall be in accordance with the provisions of Part 71 of this Chapter." 10 CFR Part 71.5(a) requires, in part, that "Each licensee who transports licensed material outside of the confines of its plant or other place of use . . . shall comply with the applicable requirements of the regulation appropriate to the mode of transport of DOT in 49 CFR Parts 170 through 189." 49 CFR Part 171.2(a) requires, in part, that "No person may offer or accept a hazardous material for transportation in commerce unless that material is properly classed, described, packaged, marked, labeled, and in condition for shipment as required . . . by this subchapter." 49 CFR Part 171.2(b) requires, in part, that "No person may transport a hazardous material in commerce unless that material is handled and transported in accordance with this subchapter . . ." 49 CFR Part 172.200(a) requires, in part, that "each person who offers a hazardous material for transportation shall describe the hazardous material on the shipping paper in the manner required by this subpart." 49 CFR Part 172.203(d) requires, in part, that "The description for a shipment of radioactive material must include . . . The name of each radionuclide in the . . . material . . . The activity contained in each package . . ." 49 CFR Part 172.403(a) requires, in part, that radioactive material packages must be labeled as provided for in this section. During discussions with licensee personnel, the NRC inspectors determined on June 11, 1986, that a SRO transported the radioactive TRIGA upper core support grid plate from the UofU to a metal plating shop in Salt Lake City, Utah, on or about January 25, 1986, and left it there for anodizing. The SRO knew that the plate was radioactive and that contact dose rates from the plate were in the range of 10 to 50 millirem per hour (mr/hr). Discussions revealed that the SRO had used his own automobile to transport the plate, but had not prepared shipping papers for the shipment, packaged the plate, or labeled the plate to comply with regulatory requirements. The SRO could not provide any survey records of the plate taken prior to transport, which is required by 49 CFR Part 173.475(i). The failure to identify, package, and label the radioactive core support grid is an apparent violation of the requirements of NRC and DOT regulations (50-407/8601-09).

No deviations were identified.

14. Radiation Protection

The licensee's radiation protection program was inspected to determine compliance with the requirements of the AGN-201 TS 3.3(c), 3.4, 4.4, and 6.1.9, and TRIGA TS 3.7, 4.3.3, 4.3.4, and 5.4, and 10 CFR Parts 19 and 20; and the recommendations of industry standard ANSI/ANS-15.11-1977.

The NRC inspectors reviewed monthly radiation and contamination survey records for 1984, 1985, and 1986 regarding surveys performed by both the UofU RHD and NEL personnel. Radiation exposure records for NEL personnel were also reviewed.

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The licensee's TRIGA reactor license renewal application in response to NRC question number 48, which asked the licensee to describe the personnel monitoring program, states, in part, that a radiation history and record would be created for all personnel issued dosimetry. The RHD could not provide a radiation exposure history file for two ROs that had been routinely provided dosimetry at the NEL and had operated the TRIGA reactor. This is an apparent deviation of a commitment to the NRC regarding creation of personnel exposure history and records (50-407/8601-10).

The NRC inspectors further discussed with the licensee the apparent lack of control over personnel dosimetry at the NEL in that NEL access logs show that several individuals used the same temporary (loaner badge) badge during January, February, March, and April of 1986. During January 1986, two loaner badges were each used by up to four different individuals. The licensee stated that each individual also used a self reading pocket dosimeter (SRD) on each entry, and that each person's approximate dose could be computed from these entries. The NRC inspectors informed the licensee that the SRDs used by the licensee appeared to be surplus government SRDs (which are surplus when they can no longer meet RG 8.4 equivalent performance criteria), and since the licensee had not evaluated the SRDs performance as recommended by RG 8.4, the SRD results would be questionable.

The NRC inspectors also performed independent fixed and loose surface contamination and direct radiation dose rate surveys of the NEL facility and adjacent areas. The licensee was notified on June 11, 1986, by the NRC inspectors, that elevated radiation and loose surface contamination levels were identified by the NRC inspectors during surveys of the NEL (restricted area) and the adjacent (unrestricted area) Mechanical Engineering Department Machine Shop (MEMS) both located in the Merrill Engineering Building. The elevated levels had not been previously identified by the licensee during routine and special surveys. The NRC inspectors also noted that the licensee had not initiated radiological surveys of the Merrill Engineering Building potable water system or the sanitary sewer outfall that services the TRIGA reactor pool water recirculating system. The TRIGA reactor pool water system is also discussed in paragraph 8 of this report.

10 CFR Part 20.201(a) states, in part, that "As used in the regulations . . . "survey" means an evaluation of the radiation hazards incident to the . . . use, release, disposal, or presence of radioactive materials or other sources of radiation under a specific set of conditions. When appropriate, such evaluation includes a physical survey of the location of materials and equipment, and measurements of levels of radiation or concentrations of radioactive material present." Part 20.201(b) requires, in part, that "Each licensee shall make or cause to be made such surveys as (1) may be necessary for the licensee to comply with the regulations . . . (2) are reasonable under the circumstances to evaluate the extent of radiation hazards that may be present." During independent NRC surveys of Room 1001-E (AGN-201 and TRIGA reactor

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location), on June 9 and 12, the NRC inspectors identified radioactive components laying adjacent to the AGN-201 reactor that produced general area radiation dose rates of approximately 22 mr/hr at 18 inches, and up to 230 mr/hr on contact, and loose surface radioactivity levels of 3,000 disintegration per minute (dpm)/100cm² beta-gamma contamination on a rubber floor mat above the TRIGA reactor. Discussions with the licensee determined that the components had been received and stored in Room 1001-E since about October 1985. On June 11, 1986, during an independent surveying of the MEMS (Room 1003), it was determined that RAM was present on the floor and several of the machines (two vertical milling machines and one radial arm drilling machine). Survey results indicated that surface contamination levels ranged from several hundred dpm/100 cm² to 100,000 dpm/100 cm². Contact radiation levels of about 1.0 mrad/hr were also identified. The licensee stated that the MEMS was used during January 15, 16, 23, and 24, 1986, to machine and drill the TRIGA reactor upper core support grid. The licensee stated that the MEMS had been surveyed following the January work and no radioactivity was detected.

The general lack of knowledge on the part of the RHD and NEL personnel concerning the presence of contamination within the MEMS indicate that a serious breakdown in radiological controls at the NEL.

Routine monthly surveys performed by both NEL and the RHD routinely identified direct radiation levels within the NEL as less than 0.02 mr/hr and less than 1000 dpm loose surface contamination. The licensee could not provide survey records concerning radiological conditions during the core grid work or post work surveys of the MEMS. Also, the licensee was not able to provide any documentation concerning radiological controls in effect in the MEMS during the core grid maintenance work. MEMS personnel that performed the milling and drilling stated that they were not informed that the equipment they were working on was radioactive and that no special controls were established. The NRC inspectors also noted there was a lack of NEL management control and coordination involving the above referenced work, in that the RHD was not involved in establishing radiological controls for the core grid maintenance activities.

The RHD initiated surveys and decontamination of the MEMS in the afternoon of June 11, 1986. In the late afternoon of June 11, 1986, licensee representatives stated that the MEMS had been decontaminated to background levels. The NRC inspectors performed a follow-up survey and determined that previously identified contamination still existed in the MEMS. Following further decontamination by the RHD, the RSO provided the NRC inspectors a report on the contamination evaluation and cleanup of the MEMS, dated June 12, 1986, which summarized the RHD efforts since being informed of the problem on June 11, 1986. The report and discussions with the licensee indicated that the MEMS had been decontaminated to background levels. The NRC inspectors again performed a survey for fixed and loose surface contamination and determined that one piece of equipment previously identified by the NRC to the licensee on June 11, 1986, had never been decontaminated and still showed loose surface contamination level of approximately 4,500 dpm/100 cm² and the presence of general

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radioactivity levels of 30,000 dpm/100 cm² on the machine's surfaces. The failure to perform adequate surveys is an apparent violation of 10 CFR Part 20.201 (50-407/8601-11).

The NRC inspectors noted that the routine surveys of the NEL conducted by RHD personnel were of such insufficient detail, and contained mistakes as to location of areas actually surveyed, that they provided no practical radiological control use. Furthermore, the NRC inspectors noted that the NEL surveys for October and November 1985 appeared to be the same survey with only a date change on a machine made copy of the October survey.

The licensee's survey program had not included an evaluation of neutron radiation levels with the reactors operating at full power. The NRC inspectors stated that neutron radiation levels are not usually considered to be a problem at AGN-201 and 100kw TRIGA facilities; however, actual surveys should be performed to establish that no significant neutron radiation levels exist.

Discussions with the RSO disclosed that the RHD is not on a routine distribution of NRC literature and relevant documents received by the UofU.

The NRC inspectors noted that a SRO did not use protective clothing (gloves) during handling of potentially radioactively contaminated material that had been in contact with TRIGA reactor pool water.

Several portable radiation survey meters, supplied by the Nevada Office of the Department of Energy, are used as auxiliary radiation monitoring instrumentation to the permanently installed instruments. The NRC inspectors noted that at least two gamma scintillation meters and two beta/gamma ion chamber dose rate meters were available for use at the NEL. The NRC inspectors brought to the attention of the licensee that one of the beta/gamma dose rate meters stored with ready-to-use instruments was out of calibration by approximately 2 years (last calibrated May 19, 1983).

15. Radiological Environmental Monitoring

The licensee's radiological environmental monitoring and protection program was inspected to determine compliance with the requirements of TRIGA TS 3.4 and 3.7, and 10 CFR Part 20.106; and the commitments contained in Section 12.7 of the SER.

The NRC inspectors reviewed the licensee's reports concerning effluent releases and observed environment monitoring equipment at the NEL. The licensee's environmental monitoring program is primarily conducted by the Environmental Protection Agency in conjunction with routine environmental monitoring the UofU.

No violations or deviations were identified.

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16. Emergency Planning and Preparedness

The NRC inspectors reviewed the implementation of the UofU Emergency Plan (EP) for the AGN-201 and TRIGA reactors; the requirements of 10 CFR Parts 50.54(q) and (r); the commitments contained in Section 13.3 of the SER; and the recommendations of RG 2.6 and industry standard ANSI/ANS-15.16-1982.

The NRC inspectors reviewed assignment of responsibilities, emergency facilities and equipment (first aid and medical facilities, communications, rescue and fire, radiation and contamination protection equipment). The NRC inspectors verified that the inventories of emergency equipment and supplies agreed with the EP. The NRC inspectors discussed with the Salt Lake City Fire Department and the UofU Medical Center their roles in the event of a reactor accident or fire at the NEL. The NRC inspectors also observed an emergency drill on June 12, 1986, designed to verify response capabilities of organizations and personnel. The drill involved participation from the Salt Lake City Fire Department and Hazardous Material Control Unit, UofU Police Department, the NEL staff, and the RHD.

The NRC inspectors discussed the following observations:

- ° No one was designated as the emergency response director; all parties performed independently.
- ° The drill scenario was never made clear to participants and did not cause a sufficient degree of realism to be shown by participants. The NRC inspectors recommended the use of the reactor accident scenarios in the SER.
- ° The drill critique should be documented with assignments of corrective actions provided to all participants.

The NRC inspectors noted that the licensee had provided annual indoctrination training on NEL activities and facilities for fire department, police and medical emergency service personnel.

No violations or deviations were identified.

17. Physical Security

The material discussed here contains Safeguards Information as defined by 10 CFR Part 73.21 and is reported in Attachment to this report.

18. Nuclear Materials Safeguards

The NRC inspectors reviewed the nuclear materials safeguards program to determine compliance with AGN-201 and TRIGA license conditions 2.B.(2). The inspectors reviewed accountability procedures and practices, records, and material status reports for the period 1983 through 1986.

No violations or deviations were identified.

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19. Reports and Notifications

The NRC inspectors reviewed reports and notifications to determine compliance with AGN-201 TS 6.9.1 and 6.9.2 and TRIGA TS 6.10.

No violations or deviations were identified.

20. Exit Interview

The NRC inspectors met with the licensee's representatives identified in paragraph 1 of this report at the conclusion of the inspection on June 12, 1986. The NRC inspectors summarized the scope and the results of the inspection. The NRC inspectors emphasized that the numerous apparent violations indicated a serious breakdown of management controls. The licensee stated that a survey was performed on June 11, 1986, at the offsite facility where the core grid support was anodized in January 1986 and no radioactive material was identified.

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