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12 July 1996

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Annual Operating Report.

Dear Sir/Madam:

Enclosed you will find a copy of the Annual Operating Report for the Idaho State University AGN-201M Reactor, License R-110 Docket 50-284, for calendar year 1995. This report fulfills AGN Technical Specification 6.9.1.

If you have any questions concerning the report please contact me at (208) 236-3351 or the Reactor Supervisor, Mr. Ray Noy, at 236-3637.

Sincerely,

John S. Bennion
Reactor Administrator

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**Idaho State University
AGN-201M Reactor Facility
License R-110, Docket No. 50-284
Annual Operating Report for 1995**

1. Narrative Summary

A. Changes in Facility Design, Performance Characteristics, and Operating Procedures:

No changes in facility design or performance characteristics relating to reactor safety occurred during the reporting period. An application to extend the facility's operating license to the year 2016 was submitted to the Nuclear Regulatory Commission on 21 November 1995. As part of the relicensing application, the facility submitted to the NRC for review and approval the following documents: Safety Analysis Report for the operation of the ISU AGN-201 reactor, Revision 6 of the Facility Emergency Plan, and Revision 4 of the Facility Physical Security Plan.

B. Results of Major Surveillance Tests and Inspections:

- (1) Channel tests performed on all safety channels and scram interlocks were found to be satisfactory and within specifications.
- (2) Power and period calibrations were performed with satisfactory results.
- (3) The shield water tank was inspected and no leaks or excessive corrosion were observed.
- (4) The seismic displacement interlock was tested satisfactorily.
- (5) (a) The control rod drive mechanisms were inspected and tested with satisfactory results.
(b) Ejection times were measured for all scrammable rods and found to be less than 120 milliseconds.
(c) The reactivity worths of all safety and control rods, as well as the time required to drive each rod to its fully inserted position, were measured. Reactivity insertion rates were determined to be less than $0.045\% \Delta k/k \text{ s}^{-1}$ (0.061 s^{-1}) for all rods.
(d) The shutdown margin was determined to be greater than $1.49\% \Delta k/k$ (2.01) with the most reactive rod fully inserted.

2. Operating History and Energy Output.

The reactor was operated at power levels up to 5 watts for a total 169.0 hours thereby generating 4.45 watt-days (106.75 watt-hours) of thermal energy during this reporting period. A tabulation of monthly operations is given in Table I.

Table I. Summary of Monthly Reactor Operations
(1 January 1995 through 31 December 1995)

<u>Month</u>	<u>Hours</u>	<u>Energy (W-hr)</u>
January	12.3	1.00
February	12.3	11.87
March	19.3	2.46
April	24.6	20.66
May	5.3	0.10
June	9.4	6.17
July	9.3	14.88
August	6.5	16.85
September	22.8	8.20
October	6.6	9.30
November	26.5	9.51
December	<u>14.1</u>	<u>5.75</u>
Total	169.0 hr	106.75 W-hr

3. A. Unscheduled Shutdowns and Corrective Actions Taken.

3/17/95: Loss of signal to Nuclear Instrument Channel No. 2 during pre-startup checks. Run terminated for corrective maintenance. Reactor was returned to service following repair of broken cold solder joint.

B. Inadvertent Scrams and Action Taken.

1/24/95: Spurious low trip on Nuclear Instrument Channel No. 1. Run terminated.

3/17/95: Low trip on Nuclear Instrument Channel No. 3 because of improper range switching by reactor operator. Reactor restarted.

3/24/95: Scram resulting from improper range switching during power ascension. Reactor restarted.

4/14/95: Low trip on Nuclear Instrument Channel No.1 while Reactor Supervisor was adjusting the dashpot of the Coarse Control Rod at low power (10 milliwatts). Reactor restarted.

5/12/95: Low trip on Nuclear Instrument Channel No. 3 because of improper range switching by reactor operator. Reactor restarted.

10/19/95: Low trip on Nuclear Instrument Channel No. 1 because of low neutron count rate. Reactor restarted.

11/3/95: Low trip on Nuclear Instrument Channel No. 1 during Rossi alpha experiment because of low neutron count rate. Reactor restarted.

4. Safety-Related Corrective Maintenance

1/31/95: Shims added to dashpot of Safety Rod No. 1.

- 2/15/95: Adhesive applied to attach gasket to control rod drive access cover to maintain proper seal.
- 3/17/95: Cold solder joint repaired in Nuclear Instrument Channel No. 2. This problem was identified after troubleshooting the cause of signal loss in Channel No. 2 which caused an unscheduled shutdown earlier the same day.
- 4/6/95: Replaced dashpot on Coarse Control Rod after the internal graphite collar broke.
- 4/11/95: Installed new pneumatic dashpot on the coarse control rod drive assembly.
- 6/12/95: Repaired a cold solder joint between a resistor and the 6Y6 tube in Safety Chassis. This problem was identified after troubleshooting the cause of magnet current failure which led to the cancellation of remaining reactor pre-startup checks and termination of the run on 6/8/95.
- 6/13/95: Replaced the 6CM6 tube in Nuclear Instrument Channel No. 3. This problem was identified after troubleshooting the cause of signal loss in Nuclear Instrument Channel No. 3 which led to the cancellation of remaining reactor pre-startup checks and termination of the run on 6/13/95.
- 6/29/95: Wood shielding plug in Beam Port No. 4 was replaced with a spare plug because of excessive binding during removal from the Beam Port. A small amount of material from the original plug was removed by turning the plug on a lathe. The plug was reinstalled on 7/10/95.
- 6/30/95: Replaced capacitor, cable, and NIM bin in Nuclear Instrument Channel No. 1. This problem was identified after troubleshooting the cause of improper signal response in Nuclear Instrument Channel No. 1 which led to the cancellation of remaining reactor pre-startup checks on 6/29/95 and 6/30/95 and termination of those runs.
- 8/8/95: Replaced two 12AX7 tubes and two 4102 tube sets in Nuclear Instrument Channel No. 2. Replaced 1.4V mercury battery in same channel. These problems were identified after troubleshooting the cause of slightly higher reactor power readings on the Channel No. 2 meter compared to that of Channel No. 3.
- 10/24/95: Exchanged discriminating ratemeter in Nuclear Instrument Channel No. 1 with a spare unit for repair of a sticking indicator needle. The repaired ratemeter was reinstalled on 11/15/95.

5. Modifications.

A. Changes in Facility Design.

There have been no changes to the facility that alter the description of the facility as represented in the application for license.

B. Changes to Procedures.

There were no changes to facility procedures as described in the facility's Technical Specifications.

C. Experiments.

No new or untried experiments or tests were performed during 1995.

D. Reactor Safety Committee.

As of the end of the reporting period, membership of the Reactor Safety Committee (RSC) consisted of the following individuals:

Frank H. Just - Chair
Jay F. Kunze - Dean, College of Engineering
Alan G. Stephens - Reactor Administrator
John S. Bennion - Acting Reactor Supervisor
Thomas F. Gesell - Radiation Safety Officer
Frank J. Harmon
Fredrick M. Cummings
Terry W. Smith
Michael E. Vaughan

6. Summary of Changes Reportable under 10 CFR 50.59.

None.

7. Radioactive Effluents.

A. Liquid Waste - Total Activity Released: Zero.

B. Gaseous Waste - Total Estimated Activity Released: 2.3 μ Ci.

The AGN-201 Reactor was operated for 169.0 hours at power levels up to approximately 5 watts. At this power level argon-41 production is negligible and substantially below maximum permissible concentration (MPC) values for unrestricted areas. The total activity of Ar-41 released was estimated at 2.32 μ Ci. This value is the total activity of all gaseous radioactive effluent from the facility. A monthly summary of gaseous releases is given in Table II.

C. Solid Waste - Total Activity: Zero.

Table II. Summary of Monthly Gaseous Radioactive Effluent
(1 January 1995 through 31 December 1995)

Month	Ar-41 (μ Ci)
January	0.022
February	0.258
March	0.054
April	0.448
May	0.002
June	0.134
July	0.324
August	0.366
September	0.178
October	0.202
November	0.207
<u>December</u>	<u>0.125</u>
Total activity (μ Ci):	2.32

8. Environmental radiation surveys, performed at the facility boundary while the reactor was operating at full licensed power (5 watts), measured a combined neutron and gamma dose equivalent rate of less than 2 mrem hr⁻¹ at the outside walls of the building proximal to the reactor.

9. Radiation Exposures.

Personnel with duties in the reactor laboratory on either a regular or occasional basis have been issued radiation dosimeters by the Idaho State University Technical Safety Office. The duty category and monitoring period of personnel are summarized below:

Name	Monitoring Period	Duty Category
John S. Bennion	1/1/95 - 12/31/95	Regular
Robert D. Boston	1/1/95 - 12/31/95	Regular
Kermit A. Bunde	1/1/95 - 12/31/95	Regular
R. David Clovis	1/1/95 - 12/31/95	Regular
Andrew Johnson	1/1/95 - 12/31/95	Occasional
Michael Jolley	9/1/95 - 12/31/95	Occasional
Jay F. Kunze	8/1/95 - 12/31/95	Regular
Jon D. McWhirter	1/1/95 - 12/31/95	Regular
Raymond R. Noy	1/1/95 - 12/31/95	Occasional
James Sample	9/1/95 - 12/31/95	Occasional

Dose Equivalent summary for Reporting Period:

Measured Doses

1/1/95 - 12/31/95 Doses: <10 mrem for all personnel.
Minimum Detectable Dose per Monthly Badge = 10 mrem.

None of the 214 visitors to the facility in 1995 received a measurable dose. Therefore, the average and maximum doses are all within NRC guidelines. A summary of whole body exposures for facility personnel is presented in Table III.

Table III. Summary of Whole Body Exposures
(1 January 1995 through 31 December 1995)

Estimated whole body exposure range (rem):	Number of individuals in each range:
No Measurable Dose	10
Less than 0.10	0
0.10 to 0.25	0
0.25 to 0.50	0
0.50 to 0.75	0
0.75 to 1.00	0
1.00 to 2.00	0
2.00 to 3.00	0
3.00 to 4.00	0
4.00 to 5.00	0
Greater than 5 rem	0
Total number of individuals reported:	10

Report submitted by:



7/12/96

John S. Bennion
Acting Reactor Supervisor (12/6/95 to 7/8/96)
Reactor Supervisor (7/1/96 to present)