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June 25, 2004

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

Subject: Transmittal of Annual Facility Operating Report for 2004

Dear Madam/Sir:

Enclosed please find a copy of the Annual Operating Report for the Idaho State University AGN-201M Reactor, License No. R-110, Docket No. 50-284, for calendar year 2004. Submission of this report satisfies the requirements of AGN Technical Specification 6.9.1.

Although we understand that all regulatory oversight of our non-power reactor facility has been transferred to the Office of Nuclear Reactor Regulation in Washington, D.C., we are submitting a copy of the Annual Report to the Region IV office in order to comply with the requirements of AGN Technical Specification the Region IV 6.9.1. Please note that we have submitted revision 5 to the Technical Specifications, which will eliminate this requirement, and we will cease submitting this report to the Region IV office once the new Technical Specifications have been approved.

If you have any questions concerning the report, please call me at (208) 282-3351.

Sincerely,


John S. Bennion
Reactor Manager/Supervisor

Cc: Mr. Daniel E. Hughes, Project Manager
Non-Power Reactors and Decommissioning Project Directorate
Operating Reactor Improvements Program
Office of Nuclear Reactor Regulation

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**Idaho State University
AGN-201M Reactor Facility
License R-110, Docket No. 50-284
Annual Operating Report for 2004**

1. Narrative Summary

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

There were no changes in facility design, performance characteristics, and operating procedures relating to reactor safety during the reporting period.

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) Control element capsules (cladding) were inspected and found to be in good condition with no evidence of deterioration since last inspection.
- (b) The control rod drive mechanisms were inspected and tested with satisfactory results.
- (c) Ejection times were measured for all scrammable rods and found to be less than 130 milliseconds.
- (d) The reactivity worths of all safety and control rods were measured, as well as the time required to drive each rod to its fully inserted position. Reactivity insertion rates were determined to be less than $0.033\% \Delta k/k \text{ s}^{-1}$ (0.044 s^{-1}) for all rods.
- (e) The shutdown margin was determined to be greater than $1.39\% \Delta k/k$ (\$1.88) with both the most reactive scrammable rod and the fine control rod fully inserted.
- (f) All surveillances were within the appropriate Technical Specification requirements.

2. Operating History and Energy Output.

The reactor was operated at power levels up to 4 watts for a total 13.0 hours thereby generating 0.09 watt-days (2.12 watt-hours) of thermal energy during this reporting period. A summary of monthly operations for 2004 is given in Table I.

Table I. Summary of Monthly Reactor Operations
(1 January 2004 through 31 December 2004)

| <u>Month</u> | <u>Hours</u> | <u>Energy (W-hr)</u> |
|-----------------|--------------|----------------------|
| January | 0.0 | 0.00 |
| February | 2.7 | 0.40 |
| March | 3.1 | 0.81 |
| April | 2.8 | 0.51 |
| May | 0.0 | 0.00 |
| June | 0.0 | 0.00 |
| July | 0.0 | 0.00 |
| August | 0.0 | 0.00 |
| September | 0.0 | 0.00 |
| October | 4.4 | 0.41 |
| November | 0.0 | 0.00 |
| <u>December</u> | <u>0.0</u> | <u>0.00</u> |
| Total | 13.0 hr | 2.12 W-hr |

3. A. Unscheduled Shutdowns and Corrective Actions Taken.

None.

B. Inadvertent Scrams and Action Taken.

There was only 1 inadvertent scram during this reporting period. Table II summarizes the inadvertent scram, its known cause, and action taken. The scram was the result of an operator error while switching to a higher range during power ascension.

Table II. Summary of Inadvertent Scrams
(1 January 2004 through 31 December 2004)

| Date | Type | Cause | Action |
|---------|-----------------|--------------------------|----------|
| 2/23/04 | Channel 3 - Low | Operator Switching Error | Restart. |

4. Safety-Related Corrective Maintenance

2/23/04: The 1.5-V N reference cell in the Nuclear Instrumentation Channel No. 2 logarithmic amplifier was replaced. The amplifier could then be balanced satisfactorily and was returned to service.

5/25/04: During a routine, scheduled inspection and maintenance of the reactor control rods and control rod drive (CRD) assemblies, we discovered that the weld that attaches the end cap of the cladding to the main cladding capsule of Safety Rod No. 1 (SR-1) had failed, thereby exposing a small portion of the fuel contained within the control rod. This event constituted a Reportable Occurrence prompting notifications of the NRC as required by the Licensee's Technical Specifications. Radiation and contamination surveys were performed immediately following the discovery of the capsule failure showed no significant contamination or radiation doses to personnel.

5/25/04: The GBW4 tube in the Channel No. 2 amplifier was replaced.

8/13/04: The SR-1 control rod capsule was repaired by exchanging the damaged SR-1 control rod with a spare SR-1 control rod that was obtained from Oregon State University in 1997. The difference in reactivity between the ISU and OSU control rods was minimized by exchanging the fuel disks so that the original fuel in the failed SR-1 continued to be used in the reactor.

9/28/04: The control rod inspection and maintenance procedure was completed, and the reactor was ready to resume normal operations pending a comprehensive review of the control rod cladding failure event by the Reactor Safety Committee. Once the RSC had completed its review they would consider a request to resume normal reactor operations.

5. Modifications.

A. Changes in Facility Design.

There were no changes to the facility design to the extent that changed a description of the facility in the application for license and amendments thereto during 2004.

B. Changes to Procedures.

None.

C. Experiments.

No new or untried experiments or tests were performed during 2004.

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
Michael E. Vaughan – Alternate Chair
Jay F. Kunze - Dean, College of Engineering and Reactor Administrator
John S. Bennion - Reactor Supervisor
Thomas F. Gesell - Radiation Safety Officer
Robert Boston
Richard R. Brey
Todd Gansauge
Chad Pope

6. Summary of Changes Reportable under 10 CFR 50.59.

None.

7. Radioactive Effluents.

A. Liquid Waste - Total Activity Released: None.

B. Gaseous Waste - Total Estimated Activity Released: 0.05 μCi .

The AGN-201 Reactor was operated for 13.0 hours at power levels up to approximately 4 watts. At this power level Ar-41 production is negligible and substantially below the effluent concentration limit given in 10 CFR 20 Appendix B, Table 2. The total activity of Ar-41 released to the environment was conservatively estimated at 0.05 μCi . This activity corresponds to the total activity of all gaseous radioactive effluent from the facility. A monthly summary of gaseous releases is given in Table IV.

Table IV. Summary of Monthly Gaseous Radioactive Effluent Releases
(1 January 2004 through 31 December 2004)

| <u>Month</u> | <u>Ar-41 (μCi)</u> |
|-----------------|--|
| January | 0.000 |
| February | 0.009 |
| March | 0.018 |
| April | 0.011 |
| May | 0.000 |
| June | 0.000 |
| July | 0.000 |
| August | 0.000 |
| September | 0.000 |
| October | 0.009 |
| November | 0.000 |
| <u>December</u> | <u>0.000</u> |
| Total activity: | 0.046 μCi |

C. Solid Waste - Total Activity: None.

8. The latest environmental radiation surveys, performed at the facility boundary while the reactor was operating at 50% of full licensed power (2.5 watts), measured a maximum combined neutron and gamma dose equivalent rate of less than 0.5 mrem hr^{-1} at the outside walls of the building proximal to the reactor.

9. Radiation Exposures.

The Radiation Safety Officer reviews personnel radiation exposures quarterly. Annual reports of ionizing radiation doses are provided by the Radiation Safety Officer to all monitored personnel as required under the provisions of 10 CFR 19.

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 in Table V:

Table V. Personnel Monitored for Exposure to Ionizing Radiation

| Name | Monitoring Period | Duty Category |
|-----------------|--------------------|---------------|
| John S. Bennion | 1/1/04 - 12/31/04 | Regular |
| Todd Gansauge | 1/1/04 - 12/31/04 | Regular |
| Jay F. Kunze | 1/1/04 - 12/31/04 | Occasional |
| Kenyon Hart | 1/1/04 - 12/31/04 | Occasional |
| Alan Stephens | 1/1/04 - 9/30/04 | Occasional |
| Bill Skerjanc | 1/1/04 - 12/31/04 | Occasional |
| Scott Lucas | 1/1/04 - 12/31/04 | Occasional |
| Joshua Peterson | 9/1/03 - 12/31/03 | Occasional |
| Ann Havlicak | 10/1/04 - 12/31/04 | Occasional |

Dose Equivalent summary for Reporting Period:

Measured Doses

1/1/2004 - 12/31/2004 Whole-Body Dose Equivalents: less than 10 mrem for most personnel.
 Minimum Detectable Dose Equivalent per Monthly Badge = 10 mrem.

None of the 152 visitors to the facility during 2004 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 VI.

Table VI. Summary of Whole-Body Exposures
 (1 January 2004 through 31 December 2004)

| Estimated whole-body exposure range (rem): | Number of individuals in each range: |
|--|--------------------------------------|
| No Measurable Dose | 8 |
| Less than 0.10 | 1 |
| 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: | 9 |

Report prepared by: John S. Bennion, Reactor Manager/Supervisor
 June 24, 2005