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August 14, 2009

Duane A. Hardesty
Research and Test Reactors
U.S. Nuclear Regulatory Commission
Mail Stop: O-12 D-03
Washington, DC 20555-0001

11555 Rockville Pike
Rockville, MD 20852

SUBJECT: Submission of Annual Report for AGN-201, License R-110

Dear Mr. Hardesty:

Enclosed is the Annual Report for the calendar year 2008, for the AGN-201 Reactor at Idaho State University.

I apologize for this report being over one month late. Our unexpected changes in reactor operational personnel have resulted in delays as the new operations team becomes familiar with the systems and the archived data.

This report is being copied to Greg Schoenebeck, the Research and Test Reactor Inspector. If there are other individuals to whom this report should be sent, I would appreciate your advise and recommendations.

Sincerely,

Jay F. Kunze, PhD, PE, CHP
Reactor Administrator (Professor of Nuclear Engineering)
kunzejay@isu.edu

c: Greg Schoenebeck, Research and Test Reactor Inspector

A020
NRR

Idaho State University
AGN-201M Reactor Facility
License R-110, Docket No. 50-284
Annual Operating Report for 2008 Calendar Year

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 level and period check experiments were performed with satisfactory results.
- (3) The shield water tank was inspected (4/17/08) and no leaks or excessive corrosion were observed.
- (4) The seismic displacement interlock was tested satisfactorily.
- (5)
 - (a) Control element capsules (cladding) were inspected (10/9/08) and found to be in good condition with no evidence of deterioration since the previous inspection.
 - (b) The control rod drive mechanisms were inspected (10/9/08) 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 worth 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 $0.037\% \Delta k/k \text{ s}^{-1}$ ($\$0.050 \text{ s}^{-1}$) for all rods.
 - (e) The shutdown margin was determined to be greater than $1.38\% \Delta k/k$ ($\$1.86$) 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 4.9 watts for a total of 41.7 hours generating 2.26 watt-days (54.29 watt-hours) of thermal energy during this reporting period. A summary of monthly operations for 2008 is given in Table I.

Table I. Summary of Monthly Reactor Operations
(1 January 2008 through 31 December 2008)

<u>Month</u>	<u>Energy (W-hr)</u>
January	0.40
February	1.04
March	12.52
April	10.71
May	0.81
June	0.99
June	0.00
August	15.45
September	1.78
October	4.47
November	3.44
December	2.68
Total	54.29

3. A. Unscheduled Shutdowns and Corrective Actions Taken.

Channel No. 3 Malfunction

4/11/08: During pre-start-up checkout procedure, the Channel No. 3 sensor was reading abnormally high. Cable malfunction was suspected. Checkout aborted. Additional test supported cable malfunction suspicions.

4/17/08: Additional radiation safety precautions were taken and the Channel 3 detector can was removed. Inspection found corrosion on the cable connector, suspected to be from water vapor condensation. The channel was tested with new cabling and returned to normal functionality. The corrosion was treated, additional waterproofing was added, a new rubber gasket cut, and detector can was reassembled.

4/22/08: The new assembly was tested, found satisfactory, and reinstalled into reactor. Startup approved by reactor supervisor.

CCR Drive Switch Malfunction

6/24/08: CCR failed to drive above 23.80 when increasing power to 10 mW, rod could not drive up or down and run was terminated. Drive switched was cleaned and drive response tested. The drive was returned to normal functionality.

B. Inadvertent Scrams and Action Taken.

There were 33 inadvertent scrams during this reporting period. Table II summarizes the inadvertent scrams, known or suspected cause, and action taken. There were eleven scrams from manual range switching error with operator trainees and eleven scrams suspected to be caused by power transients within the engineering laboratory. Channel No. 1 scrambling low is common while below 10 mW and accounts for six scrams. The remaining five scrams were caused by experimental response either from testing the new console or inserting Cadmium into the glory hole.

Table II. Summary of Inadvertent Scrams
 (1 January 2008 through 31 December 2008)

Date	SCRAM Type	Cause	Action	Occurrences
3/3	No Cause Indicated	Suspected Power Transient	Restart	3
3/3	Channel 1	Operator in Training Error	Restart	1
3/3	Channel 3	Operator in Training Error	Restart	1
3/31	No Cause Indicated	Suspected Power Transient	Restart	1
3/31	Channel 1	Operator in Training Error	Restart	1
4/7	Channel 1	Low Counts During Startup	Restart	1
4/7	No Cause Indicated	Suspected Power Transient	Restart	1
4/23	Channel 1	Low Counts During Startup	Restart	1
5/7	No Cause Indicated	Suspected Channel 1 Low	Shut Down	1
6/18	Channel 3	Operator in Training Error	Restart	1
6/24	Channel 1	Low Counts During Startup	Restart	1
8/11	Loss of Power	Temporary Loss of Power	Restart	1
8/13	Channel 1	Low Counts During Startup	Restart	1
8/13	Channel 3	Operator in Training Error	Restart	1
8/14	No Cause Indicated	Suspected Power Transient	Restart	1
8/14	Channel 1	Detector was Raised	Restart	1
9/13	No Cause Indicated	Suspected Power Transient	Restart	1
10/9	Channel 3	Operator in Training Error	Restart	1
10/9	Channel 3	Switching Transient*	Restart	2
10/14	Channel 3	Unknown Cause*	Restart	1
10/14	Channel 1	Suspected Power Transient*	Restart	2
10/14	Channel 3	Unknown Cause*	Shut Down	1
10/28	Channel 3	Operator in Training Error	Shut Down	1
11/3	Channel 1	Operator in Training Error	Shut Down	1
11/7	Channel 3	Operator in Training Error	Shut Down	1
11/10	Channel 3	Operator in Training Error	Restart	1
12/2	Channel 3	Operator in Training Error	Restart	1
12/18	Channel 3	Cadmium in Glory Hole	Restart	1
12/2	Channel 1	Low Counts	Restart	1
Total:			Total:	33

*While testing new console in tandem

4. Safety-Related Corrective Maintenance

8/28/08: A BNC cable was replaced on Channel No. 2.

2/25/08: During MP-1 rod drop checks SR-1 & SR-2 did not respond to signals from the rod drop test box. Malfunction was caused by a broken solder joint and was repaired.

2/27/08: During scheduled rod maintenance procedure MP-1 the down indicator of SR-1 was found to trip too high for the magnet to connect with the rod plate. Once the trip sensor was adjusted SR-1 returned to functioning normally.

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 2008.

B. Changes to Procedures.

None.

C. Experiments.

A rabbit system was constructed and used in the glory hole and beam port for experimental sample insertion and fast transport to the counting lab. The rabbit system used compressed nitrogen to transport samples through a plastic tube.

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 - retired July 2008
Jay F. Kunze - Reactor Administrator
John S. Bennion - Reactor Supervisor
Richard R. Brey - Radiation Safety Officer
Thomas F. Gesell (Emeritus)
Robert Boston
Richard E. McCracken

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: 1.18 μ Ci oh Ar-41.

The AGN-201 Reactor was operated for 41.7 hours at power levels up to approximately 4.9 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 1.18 μ Ci. 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 2008 through 31 December 2008)

Month	Ar-41 (μCi)
January	0.00873
February	0.02279
March	0.27377
April	0.23411
May	0.01765
June	0.02157
June	0.0
August	0.33787
September	0.03899
October	0.09778
November	0.07522
December	0.05856
Total	1.187071

C. Solid Waste - Total Activity: None.

8. The latest environmental radiation surveys, performed at the facility boundary while the reactor was operating at 80% of full licensed power (4.0 watt), measured a maximum combined neutron and gamma dose equivalent rate of less than $0.45 \text{ mrem hr}^{-1}$ at the outside walls of the building proximal to the reactor. The total equivalent dose rate at 100% power at these locations was less than 1 mrem hr^{-1} .

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 whole body exposure for the 2008 monitoring period of personnel are summarized in Table V:

Table V. Personnel Radiation Monitored for 1/1/2008-12/31/2008

Name	Duty Category	Exposure by Type (mrem)		
		Deep	Lens	Shallow
Jason Andrus	Occasional	< 1	< 1	2
Mike Bailey	Occasional	< 1	< 1	< 1
John Bennion	Regular	7	7	3
Kenyon Hart	Regular	3	3	5
Ryan Loveland	Occasional	1	1	< 1
Zachary Miller	Occasional	8	8	11
Surendera Prajapati	Regular	21	19	26
Caleb Robinson	Occasional	< 1	< 1	1
Clinton Wilson	Occasional	4	4	14
Ben Baker	Occasional	< 1	< 1	6
James Cleaver	Occasional	< 1	< 1	< 1
Danielle Perez	Occasional	< 1	< 1	< 1
Troy Reiss	Occasional	< 1	< 1	< 1
George Imel	Occasional	< 1	< 1	< 1
Adam Mallicoat	Occasional	< 1	< 1	< 1
Sean Morrell	Occasional	1	2	9

The 10 CFR 20.1201 occupational dose limits to adults are: total 5 rem, lens of eye 15 rem, shallow 50 rem, and deep 50 rem. The doses received for all reactor laboratory personnel during 2008 are well below the dose limits of 10 CFR 20.1201.

Anytime a member of the public visits the reactor pin dosimeters are issued for the extent of the tour. A minimum of 1 dosimeter to every 5 people is issued for a representative group dose. During the 2008 calendar year there were 192 recorded visitors to the facility. A summary of the public dose exposure is presented in Table VI.

Table VI. Summary Whole-Body Exposures to the Public
(1 January 2008 through 31 December 2008)

Estimated whole-body exposure range (mrem):	Number of individuals in each range:
No Observable Dose	172
1.0 mrem*	20
Greater than 1.0 mrem	0
Total number of individuals reported	192

*Below 1.0 mrem is considered un-measurable

None of the 192 visitors to the facility during 2008 received a measurable dose that would exceed the annual 0.5 rem dose limit of 10 CFR 20.1301.

Therefore, the average and maximum doses received by personnel and the public are within NRC guidelines.

Report prepared by: Adam Mallicoat, Reactor Manager/Supervisor
August 14, 2009