

4 September 2008

U.S. NRC Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Subject: Request to amend Facility License R-110, Docket No. 50-284

Dear Madam/Sir:

The Idaho State University requests that the Technical Specifications to Facility License R-110, Docket No. 50-284, be amended to allow implementation of a new reactor control console. Please find the enclosed request for license amendment, which contains a detailed description of the proposed amendment and justification. Also enclosed is a copy of the replacement page for the amended Technical Specifications, as requested.

We respectfully ask that the review of this request for license amendment be completed as expeditiously as possible to enable the facility to operate the reactor using our new control console as soon as possible.

Should you have any questions or require additional information, please call me at (208) 282-3134, or the Reactor Manager/Supervisor, Dr. John Bennion at (208) 282-3351.

Sincerely,

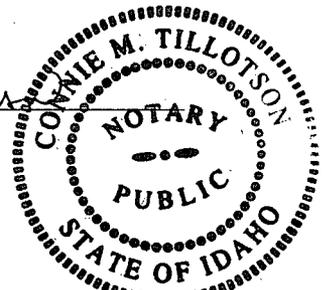
Pamela L. Crowell

Pamela L. Crowell, Ph.D.
Vice President for Research

Affirmation:

I certify under penalty of perjury that the foregoing is true and correct.

Executed on 5 September 2008. Signature *Connie M. Tillotson*



Expires 4-13-2011

Copy w/ enclosures:
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Table 3.1 Reactor control and safety systems set-point specifications.

<u>SAFETY CHANNEL</u>	<u>SET POINT</u>	<u>FUNCTION</u>
Nuclear Safety Channel No. 1 (Startup Count Rate Channel) Low Power	0.5 counts/second	Scram at source levels < 0.5 counts/second
Nuclear Safety Channel No. 2 (Log Power Channel) High Power	6 watts (120% of licensed power)	Scram at power > 6 watts
Nuclear Safety Channel No. 2 (Log Power Channel) Low Power	3.0×10^{-13} amperes	Scram at source levels < 3×10^{-13} amperes
Reactor Period	5 seconds	Scram at periods < 5 seconds
Nuclear Safety Channel No. 3 (Linear Power Channel) High Power	6 watts (120% of licensed power)	Scram at power > 6 watts
Nuclear Safety Channel No. 3 (Linear Power Channel) Low Power	5% Full Scale	Scram at levels < 5% of Full Scale
Manual Scram	----	Scram at operator option
Area Radiation Monitor	≤ 10 mR/hr	Alarm at or below level set to meet requirements of 10 CFR 20

3.3 Limitations on Experiments

Applicability

This specification applies to experiments installed in the reactor and its experimental facilities.

Objective

To prevent damage to the reactor or excessive release of radioactive materials in the event of an experiment failure.

Specification

- a. Experiments containing materials corrosive to reactor components or which contain liquid or gaseous, fissionable materials shall be doubly encapsulated.

Request To Amend ISU AGN-201 Technical Specifications

A comprehensive 10 CFR 50.59 review of the Idaho State University AGN-201 reactor control console upgrade has determined that a minor revision of the Technical Specifications (License No. R-110, Docket No. 50-284) is necessary before the new control console can be implemented. The revision simply replaces the specified set points for one of the three nuclear safety channels with an equivalent value that will be measured and displayed by the new channel. Specifically, the low-level scram set point specification for Channel 1 must be changed. This change simply amounts to changing the current specification of 5% of the full-scale reading to its numerical equivalent of 0.5 cps. A detailed discussion of Channel 1 follows.

Description of Existing Channel 1 (Start-Up Channel):

The current Channel 1 consists of a BF₃ proportional counter, high voltage power supply, preamplifier, and associated signal processing circuits and modules, and signal display meter. The electronic components, excluding the preamplifier, are mounted in a NIM-bin enclosure that has been installed in the left bay of the existing AGN console as shown in Figure 1. The signal from the preamplifier is fed into a Tennelec Model TC 211 Linear Amplifier. Amplified pulses are subsequently fed into a MechTronics Nuclear Corp Model 777 Ratemeter, which displays the Channel 1 output (as counts/second) on an analog meter with a scale that varies from 0 to 1.0. In addition, Channel 1 has two ancillary circuits, one of which is used to check the meter zero (by disconnecting the detector signal from the circuit) and the other to calibrate the channel by inputting a 60-Hz signal.

The rate meter is equipped with a manually controlled range switch that allows detector signals in the form of voltage pulses to be displayed on the meter up to a maximum rate of 10,000 counts/second. The range switch allows the signal to be displayed over four decades extending from 10 to 10,000 counts/minute, with two ranges per decade. The meter displays the neutron count rate as the corresponding fraction of the selected range. Output from the rate meter is fed into the AGN-201 scram chassis, which provides scrambling capability at both the low and high end of each range selected on the rate meter. The high-level scram, which is not required by the Technical Specifications, is set to provide a scram near 100% of the full-scale reading. The low-level scram requirement is 5% of the full-scale reading. This specification corresponds to a minimum count rate of 0.5 counts/second on the lowest or most sensitive range, which has a multiplier of 10.

In addition, the Channel 1 detector is mounted on a buoyant housing that can be moved to a less sensitive position as the maximum reading is approached (which occurs as the reactor power approaches 1 watt), thereby extending the useful range of this channel and enabling operation at 5 watts. The housing is held in the normal position for reactor startup (i.e., the down position) by a lever attached to a solenoid, which is manually released by the reactor operator by pushing an actuator button on the reactor console as the upper range of the channel is approached. The detector then floats approximately 15-inches vertically to a new position, which adds two additional ranges to the Channel. In

its current configuration, the detector gives a reading of about 9,900+ counts/second in the up position at a power of 5 watts.

Description of the New Channel 1:

The new Channel 1 is designed to be a much simpler and more reliable system. It uses the same BF₃ proportional counter for neutron detection (and obviously in the same position relative to the reactor core), but that is the only existing component that will be retained in the new system. The new system incorporates a new preamplifier that is matched to the new Channel 1 signal processing circuit. The processed signal is displayed on the new console by a digital LCD display directly as counts/second. As shown in Figure 2, the new Start-Up Channel is also equipped with a zero check and an internal calibration circuit.

The most conspicuous feature of the new circuit is that it has been designed with a continuous range to eliminate the need for manual range switching. Eliminating manual switching will greatly simplify reactor operation and will significantly decrease the number of inadvertent scrams that the facility will experience due to switching errors made by inexperienced operators and student trainees. Moreover, reducing the number of inadvertent scrams will help reduce the mechanical stresses on the control rods by reducing the number of scram cycles and will help to minimize the possibility of another control rod cladding failure as has been experienced in the past.

Because the new system has a continuous range that extends to well over 250,000 counts/second, the current Technical Specification requirement of scrambling the reactor at 5% of the full-scale reading is clearly inappropriate. Instead, this specification must be revised to provide an equivalent numerical set point to 5% of the reading on the existing Channel 1 rate meter set to lowest range, which is numerically equivalent to 0.5 counts/second. This change is very simple and straightforward.

Proposed revision of the Technical Specifications:

The following revisions to the Technical Specifications are necessary in order to put the new control console into service. Table 3.1 of the Technical Specifications must be revised as follows:

- (1) Nuclear Safety Channel No. 1: change SET POINT (Column 2) from “5% Full Scale” to “0.5 counts/second”.
- (2) Nuclear Safety Channel No. 1: change FUNCTION (Column 3) from “<5% Full Scale” to “<0.5 counts/second”.

The current specification for Channel No. 1 is given in Table 3.1 as follows:

Nuclear Safety Channel No. 1 (Startup Count Rate Channel) Low Power	5% Full Scale	Scram at levels < 5% Full Scale
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This specification must be changed to:

Nuclear Safety Channel No. 1 (Startup Count Rate Channel) Low Power	0.5 counts/second	Scram at source levels < 0.5 counts/second
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We request that upon approval, this change will take effect when the new console is fully implemented. At that time Table 3.1 of the Technical Specifications will be replaced as described above.

In addition, at this time we wish to correct a few typographical errors that appear in Table 3.1. First, the entries for the third row in the Table 3.1 provide the specification for the Low Power set point for Channel 2, but currently indicate that it is for the High Power set point for Channel 2. The current specification is as follows:

Nuclear Safety Channel No. 2 (Log Power Channel) High Power	3.0×10^{-13} amps	Scram at source levels < 3.0×10^{-13} amps
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This should be changed as follows:

Nuclear Safety Channel No. 2 (Log Power Channel) Low Power	3.0×10^{-13} amperes	Scram at source levels < 3.0×10^{-13} amperes
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Second, the specification for the Area Radiation Monitor is currently given as:

Area Radiation Monitor	= 10 mR/hr	Alarm at or below level set to meet requirements of 10 CFR 20
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This should be changed as follows:

Area Radiation Monitor	≤ 10 mR/hr	Alarm at or below level set to meet requirements of 10 CFR 20
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These corrections involve no substantive changes to the technical specifications and should not require further elaboration. The entire corrected Table 3.1 with requested amendment appears below:

Table 3.1 Reactor control and safety systems set-point specifications.

<u>SAFETY CHANNEL</u>	<u>SET POINT</u>	<u>FUNCTION</u>
Nuclear Safety Channel No. 1 (Startup Count Rate Channel) Low Power	0.5 counts/second	Scram at source levels < 0.5 counts/second
Nuclear Safety Channel No. 2 (Log Power Channel) High Power	6 watts (120% of licensed power)	Scram at power > 6 watts
Nuclear Safety Channel No. 2 (Log Power Channel) Low Power	3.0×10^{-13} amperes	Scram at source levels < 3×10^{-13} amperes
Reactor Period	5 seconds	Scram at periods < 5 seconds
Nuclear Safety Channel No. 3 (Linear Power Channel) High Power	6 watts (120% of licensed power)	Scram at power > 6 watts
Nuclear Safety Channel No. 3 (Linear Power Channel) Low Power	5% Full Scale	Scram at levels < 5% of Full Scale
Manual Scram	-----	Scram at operator option
Area Radiation Monitor	≤ 10 mR/hr	Alarm at or below level set to meet requirements of 10 CFR 20