THE UNIVERSITY OF NEW MEXICO

Department of Nuclear Engineering

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Narrative of Event at the University of New Mexico's AGN-201M Nuclear Reactor
License R-102, Docket 50-252

Around 1:30 pm on Tuesday, February 25, 2020, a pre-operational checkout was being performed on the reactor. As a normal part of that checkout, there are two steps to be done to confirm that the rod interlock is operating and then the reactor shall be scrammed to confirm the operability of the scram system and the control rods.

The interlock check involves:

1. Check Safety Rod #2 and the Coarse Control Rod are not operable without Safety Rod #1 fully inserted.
2. Fully insert Safety Rod #1. Then check to make sure the Coarse Control Rod is not operable unless Safety Rod #2 is fully inserted.
3. Fully insert Safety Rod #2. Then insert the Coarse Control Rod at least 5 cm to verify operability with the full insertion of Safety Rods #1 and #2.

The interlock check was done and all requirements fulfilled.

Then the manual scram check is to be performed by pressing the manual scram button.
At this point, Safety Rods #1 and #2 and the Coarse Control Rod should scram. However, it was determined that only Safety Rod #2 and the Coarse Control Rod scrammed. Safety Rod #1 was still "attached" to the magnet and was being driven out along with the drive motor.
At this point, we were not in compliance with the Limiting Conditions for Operations, 3.2 Reactor Control and Safety Systems, part a. The fine control rod, coarse control rod, and the two safety rods shall be operable and the carriage position of the fine and coarse control rods shall be displayed at the console whenever any rod is above its lower limit.

Assuming that one of the conditions of "operable" for the Safety Rods is that they scram when requested, then Safety Rod #1 was not operable.

To evaluate the situation, Safety Rod #1 was driven in and then subjected to a couple of Manual Scram signals. In all of these tests, Safety Rod #1 did not scram (The fuel bearing rod and control plate did not separate from the electro magnet). At this point, the rod was removed from the reactor and put on the test bench. A series of tests were performed to determine the cause of the problem. The current to the magnet was being removed upon initiation of a scram, the Safety Rod #1 associated scram electronic components were checked and found to be in working order.

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Finally, it was determined that the rod and plate were "sticking" to the magnet, but could be separated when the rod was subjected to some downward force. The plate and bottom of the magnet were cleaned as much as possible. The rod scrammed the first time, but not subsequently. Then scotch tape was placed on the plate to break any potential air seal and provide a 0.05 mm offset. After this was done, the rod performed as expected; scramming each time the manual scram was pushed. After a series of tests to assure correct operation, the scram time was measured three times. The results were; between 345 and 350 milliseconds for the three tests. Thus, Safety Rod #1 was returned to its operable condition. The rod was reinstalled in the reactor and test to assure that it would scram in its operational configuration.

After consultation with our Reactor Safety Advisory Committee (RSAC), we were given the go ahead to restart. We will continue to do the pre-op check outs and keep a sharp eye on the behavior of Safety Rod #1. The issue with Safety Rod #1 did not affect the shutdown margin of the reactor, and at no time was the reactor operated when Safety Rod #1 was not in operable condition. We plan to do follow up maintenance and problem identification the week f March 9th. We have a simple gauss meter that will allow us to determine if either the plate or the magnet has residual magnetism. This will be checked for all three scrammable rods (Safety Rod #1, Safety Rod #2, and the Coarse Control Rod). If there is residual magnetism, then we will use a demagnetizer on the affected areas.

Previous Event – Found out that a similar issue occurred many years ago at Idaho State University's AGN-210. According to Dave Clovis, who was there at the time:
"The armature eventually becomes magnetic. We put a capacitor in the circuit for each magnet. This dissipates the magnetic field quickly."

We have checked our current circuitry and found both capacitors and diodes on each magnet. These were included in the console redesign of 1970 for the specific purpose indicated. We did a check on the diodes and all appeared to be operational.

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