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Re: Information only, Docket No 50-113, Facility License R-52.

On the afternoon of April 5, 1994, at 14:36, while operating the reactor at a power of 1 Watt and approximately 8 minutes after starting from a shutdown condition, H. Doane (Reactor Supervisor), who was performing the duties of RO, observed that the percent power trip light for the Right Safety Channel was illuminated, though the reactor was not in a scrammed condition and the SCRAM light was not lit. He pointed out this condition to the SRO on duty, J. Williams (Reactor Laboratory Director), who was present in the control room. The SRO asked the RO to manually SCRAM the reactor. The RO did so, after first being given permission to reset the percent power trip indication, which did reset without causing a SCRAM.

The Reactor Laboratory Director dismissed the students who were present to conduct a laboratory exercise, advising them that the reactor could not be operated until the observed behavior of the trip indication was understood.

As a result of tests carried out immediately (with the reactor shut down) by the Reactor Supervisor and Electronics Technician, the following were determined:

1) The observed condition could be reproduced by applying a trip test voltage to the Right Safety Channel at a level just below the trip setting (108 percent), and then changing the position of the Mode switch from pulse to manual mode. This can cause the trip indication light to operate without operation of the SCRAM circuit.

2) With the trip light in this condition, increasing the trip test voltage to its trip setting of 108 percent causes the SCRAM circuit to operate, interrupting power to the control rod drive magnets and illuminating the SCRAM light.

3) All SCRAM safety function checked out normally when tested in the usual manner.

Prior to operating the reactor on the afternoon of April 5, the RO had carried out a channel test of the pulse mode high power channel, which is connected to the Right Safety Channel in pulse mode. This was done to test the setting of

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the full scale indication (100 percent). This was done with the mode switch in pulse high mode. Before turning down the trip test voltage to zero, the RO switched to manual mode while preparing to start up the reactor. He thus created the condition described above, but did not notice the illumination of the trip indication. Since the SCRAM circuit had not been activated, he was able to start up the reactor in this condition, and did not notice the percent power trip indication light until several minutes later.

A designer of the system at General Atomics of San Diego, CA, was consulted by telephone on the afternoon of April 5. He informed Dr Williams that a similar indication had been reported to him once previously, by a TRIGA reactor in Japan. The condition is unlikely to occur in practice, but is not an indication of a system or component malfunction. The GA engineer suggested that a feedback resistor and a capacitor, designed to filter fast spikes from the trip circuit should be checked. The reason that the indication light circuit can latch without the SCRAM function occurring is that the latter is actuated by a relay, but the indication light is actuated by an electronic bistable (silicon controlled rectifier).

Checks of the circuit performed by Mr Doane and Mr Lohmaier (Electronics Technician) confirmed that all components were operating normally and that a voltage transient shorter than 2 ms could trip the indication light, but not the SCRAM relay. They concluded that no faults were present in the system.

CONCLUSIONS

The RO and SRO on duty acted correctly in shutting down the reactor so that the indications could be diagnosed. This was necessary since neither could understand how it was possible for the trip indication to be illuminated without the SCRAM function being triggered.

Reconstruction of the condition showed that in fact the SCRAM circuit was capable of performing its intended function: it was not inoperable. The function of the percent power trip indication lamp is to assist the operator in identifying the source of a reactor SCRAM initiation. The lamp circuit is not part of the SCRAM circuit, but is supposed to be triggered at the same voltage to provide diagnostic information. Examination of the circuit design and testing of its function confirm that it is possible for a small, rapid voltage transient to trigger the indication without triggering the SCRAM circuit, even though the latter is operating normally.

The indication light circuit for the percent power trip is not a reactor safety system as defined in technical specifications for the license R-52. Its intended function is to provide diagnostic information to the operator after operation of the SCRAM circuit. No component or system was found to have malfunctioned. The SCRAM circuit, which is a reactor safety system, was found to be operating correctly, and was capable of performing its intended function at all times when the reactor was in operation.



J. G. Williams, Reactor Laboratory Director

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