From: John Bennion <jbennion@isu.edu>
To: <deh3@nrc.gov>, <hoo1@nrc.gov>
Date: Wed, May 26, 2004 3:43 PM
Subject: Written Confirmation of Reportable Occurrence at Idaho StateUniversity (50-284, R-110)

Gentlemen:

The information contained in the attached document provides electronic notification of the reportable occurrence event that took place yesterday, May 25th, 2004, at the Idaho State University AGN-201 reactor facility. The event involved the discovery of the abnormal degradation of a primary fission-product barrier. Required telephonic notifications to applicable NRC offices were made yesterday and today as documented in the attachment.

This information is being provided by the next business day following the incident as required by the technical specifications of the facility operating license (R-110, Docket No. 50-284).

A follow-up report shall be submitted within two weeks.

Please do not hesitate to contact me if you require additional information.

Respectfully,

John Bennion
Reactor Manager/Supervisor

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Notification of Reportable Occurrence:
Abnormal degradation of a primary fission-product barrier at Idaho State University
Docket No. 50-284
License No. R-110

This is to provide written notification of a reportable occurrence at the Idaho State University AGN-201 nuclear reactor facility, Docket No. 50-284, License No. R-110. The following individuals and offices have already been notified of the event by telephone: Daniel Hughes, Program Manager, NRC Office of Nuclear Reactor Regulation (notified 5/25/04 at approximately 12:55 local time); Region IV Administrator's Office (notified 5/26/04 at approximately 7:20 local time); and NRC Operations Center (notified 5/26/04 at 7:27 local time). In addition, the INEEL Oversight Program, the state office that monitors activities at the Idaho National Engineering and Environmental Laboratory, was notified of the event by the ISU Technical Safety Office (TSO).

The event occurred May 25, 2004, during a routine, scheduled inspection and maintenance of the reactor control rods and control rod drive (CRD) assemblies, in which it was discovered that the cladding of Safety Rod No. 1 (SR-1) had failed, thereby exposing a small portion of the fuel contained within the control rod. (Note: the AGN-201 reactor is a low-power research and training reactor (maximum thermal power is 5 W) with control rods that contain fuel material within an aluminum capsule. This capsule serves as a primary fission-product barrier. SR-1 is one of the four control rods in the AGN reactor. The fuel material consists of 20%-enriched UO_2 homogeneously dispersed in a polyethylene matrix. Each of the three scrammable control rods contains 4 fuel disks approximately 4.5 cm in diameter [1.75 in] and 3.8 cm in height [1.5 in] with a combined U-235 mass of about 15.9 g.) This event is reportable under the facility operating license as required by Technical Specification 6.9.2.a(3) (Amendment 4, dated April 22, 1988), which addresses abnormal degradation discovered in a fission-product barrier.

The cladding failure was discovered as the SR-1 control rod was being removed from the CRD assembly, when it was observed that a fuel disk appeared to be protruding from the end of the CR capsule. Upon recognizing this abnormal circumstance, the capsule was carefully removed from the CRD, which revealed the end cap had detached from the SR-1 cladding capsule and was resting on the armature plate of the CRD assembly. Approximately 1.5 cm of the 3.8-cm fuel disk protruded from the end of the cladding capsule.

The rod was carefully secured in place while a radiation contamination survey was performed. A wipe taken of the end region of the SR-1 capsule near the protruding fuel disk indicated removable contamination nearly 1.5 times above background levels. No fuel material actually separated from the control rod, but merely protruded out of the end of the control rod through the missing end cap. At this point the Radiation Safety Officer was informed of the event. Analysts from the Technical Safety Office (TSO, the radiation safety organization for the ISU campus) were sent to the facility to help survey for radioactive contamination and to take air samples near the base of the reactor where the control rod drive assemblies are located.

A preliminary assessment of the radiological consequences of this event indicates there has been a negligible release of radioactive materials to the environment and negligible radiation

exposures to facility personnel and the public. The maximum radiation doses (beta and gamma) were measured at 22 mrem/h on contact with the control rod and 0.9 mrem/h at 30 cm away. Contamination surveys showed removable contamination approximately 50% over background levels near the breach, but no removable contamination was found on SR-1 at distances greater than a few inches away from the breach or on surfaces of the SR-1 CRD assembly or interior surfaces of the reactor structure in the area where the control rods are installed. Preliminary analysis of air samples taken following discovery of the breach did not show any indication of airborne fission products. Iodine-131 concentrations, if present at all, were below the minimum detectable activity of 10^{-12} μCi/ml. The low radiation levels are to be expected because of the low power level of the reactor (5 W maximum thermal power) and the extended shutdown period between the last operation and the control rod maintenance activity. The last operation occurred April 23, 2004, more than a month before the inspection. This operation consisted of a demonstration sample irradiation at 40% power (2 W) for 10 minutes, generating approximately 0.35 W-h of energy.

A similar event occurred in July 1997 when the weld of the end cap for SR-2 failed as a result of a failed dashpot. The radiological consequences of that event were determined to be negligible. Actions taken to prevent reoccurrence included the fabrication of new dashpots, which were installed on all scrammable control rods, and increasing the frequency of control rod inspections for early detection of component degradation and failure. Inspections subsequent to the 1997 event have not shown any indication of component degradation, and recent operations have not provided any indication of any problems with the SR-1 control rod.

The root cause of this event is under investigation, but is tentatively believed to be a consequence of the aged aluminum capsule.

A written follow-up report shall be submitted within two weeks as required by the operating license. Please contact the facility if additional information is required.

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