UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
WASHINGTON, D.C. 20555

July 29, 2008

NRC INFORMATION NOTICE 2008-14: CRITICALITY SAFETY-RELATED EVENTS RESULTING FROM FISSILE MATERIAL OPERATIONS UNDER PROCEDURES NOT REVIEWED BY CRITICALITY SAFETY STAFF

ADDRESSEES

All licensees authorized to possess critical mass of special nuclear material.

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice (IN) to alert addressees to a concern arising from events at fuel cycle facilities where fissile material operations were conducted under procedures that were not reviewed by criticality safety staff. It is expected that recipients will review the information for applicability to their facilities and consider actions to avoid similar problems. However, suggestions contained in this IN are not new NRC requirements. Therefore, no specific action or written response is needed.

DESCRIPTION OF CIRCUMSTANCES

Licensees processing, storing, or handling critical masses of fissile material at fuel cycle facilities commit in their licenses or certificates to conduct operations in accordance with 10 CFR Part 70 or 76. These written commitments include performing operations in accordance with approved written procedures which have been reviewed by applicable safety staff.

A fuel cycle licensee, engaged in the manufacture of light-water-reactor fuel, used quality assurance procedures to perform tests on finished fuel rods which included performing helium leak tests on the finished rods in a pressure chamber. In order to perform the helium leak tests, newly fabricated fuel rods were staged near the helium leak chamber which was in a part of the facility that was not covered by the criticality alarm system detectors. An exemption in the facility license allowed up to 10 fuel rods to be outside the coverage of the criticality alarm system at any time in order to accomplish the testing. Movement of the finished fuel rods from the fabrication area to the vicinity of the pressure chamber was accomplished using the quality assurance procedures. Because the quality assurance procedures did not ordinarily involve process operations, they were not reviewed by criticality safety staff. Licensee staff adapted the practice of using the quality assurance procedures to move the finished fuel rods because no other procedures were involved in the leak testing. At the time the issue was identified, over 100 rods were being staged for testing outside the coverage of the criticality alarm system in violation of the facility license.

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Another fuel cycle licensee, engaged in the manufacture of light-water-reactor fuel, performed maintenance, on fissile material processing equipment and systems, using special maintenance procedures. These maintenance procedures were not reviewed by criticality safety because no fissile material was expected to be present in equipment during maintenance operations. During maintenance to replace and test a criticality safety-significant valve in process equipment used to convert uranium hexafluoride into uranium dioxide (UO_2) powder, maintenance staff did not understand equipment boundaries defined in criticality analysis and failed to ensure that equipment was free of fissile material before beginning work. During the maintenance, licensee staff installed the valve incorrectly so that during testing, it was possible for steam to enter a mass of UO_2 powder. Licensee staff evaluating alarms that had occurred during the valve maintenance and testing became aware that fissile material was in the equipment and concluded that steam had actually entered the fissile material, in violation of the facility license.

Another fuel cycle licensee, engaged in the manufacture of highly enriched uranium components, used raschig ring filled vacuum cleaners to collect floor-mopping solution in areas that processed concentrated highly enriched uranium solutions. The raschig ring filled vacuum cleaners were occasionally moved to other areas of the facility using instructions in a radiological control procedure, and in accordance with operator expectations that the vacuum cleaners were empty. Licensee staff who operated the vacuum cleaners were aware of their status as full or empty. Licensee staff who moved the vacuum cleaners were in a different organization from the operators and were not aware of the vacuum cleaner contents. Radiological control procedures were not reviewed by criticality safety staff because these procedures were not used to conduct process operations. A raschig ring filled vacuum nearly full of highly enriched uranium solution at low uranium concentration was double-wrapped in plastic and was being moved in accordance with the radiological control procedure. During this move, the vacuum cleaner was dropped and part of the fissile solution entered into the space between the plastic wrapping, separate from the raschig rings, in violation of the facility license.

DISCUSSION

In the three events described above, fissile material operations were performed at NRC licensed fuel cycle facilities in accordance with procedures that criticality safety staff had not reviewed. The above events had other significant root causes and the importance of and basis for the failure of criticality safety staff to detect and correct the errors is clearer when the events are reviewed together. Work practices at these facilities had evolved, outside the scrutiny of safety staff, until they violated the license. NRC expects fuel cycle licensee criticality safety staff members to be familiar with the conduct of process and ancillary operations and maintenance. In particular, licensee criticality safety staff should understand how such procedures might affect fissile material operations and criticality safety controls.

The failure to review or otherwise be familiar with in-plant procedures and the condition and status of equipment during all phases of operations can result in the failure to establish necessary criticality safety controls or the compromise of established criticality safety controls. NRC criticality safety inspections routinely review licensee facility operations, to ensure that credible accident sequences have been identified, analyzed, and controlled. NRC criticality safety inspections include review of licensee criticality safety analyses and related controls, to ensure that analytical assumptions are adequate and not compromised after implementation.

CONTACT

This information notice requires no specific action nor written response. If you have any questions about the information in this notice, please contact the technical contact listed below.

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