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

August 13, 2010

NRC INFORMATION NOTICE 2010-15: FUEL CYCLE FACILITY CONFIGURATION MANAGEMENT ERRORS

ADDRESSEES

All licensees authorized to possess critical mass of special nuclear material and engaged in enrichment processing, fuel fabrication, and mixed-oxide fuel fabrication.

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice (IN) to alert addressees to a concern arising from recent configuration management errors at fuel cycle facilities. The configuration management errors relate to verification of specifications for safety related items and items relied on for safety (IROFS) which can result in failure to establish necessary controls or compromise of established controls. NRC expects that recipients will review the information for applicability to their facilities and consider actions to avoid similar problems. Suggestions contained in this IN are not new NRC requirements; therefore, no specific action or written response is needed.

DESCRIPTION OF CIRCUMSTANCES

Babcock and Wilcox Nuclear Operations Group (B&W NOG) – Lynchburg, VA, Facility
Loss of Configuration Control Due to Inadequate Control of an Engineering Change

B&W NOG manufactures highly enriched uranium components using processes that lead to waste streams with low concentrations of uranium such as sludges, filter solids, filters, and rags. The licensee recovers the uranium by leaching or dissolving the uranium from the waste material in open trays and then processing the resulting solution through filters and a solvent extraction system. The dissolver trays are consumable items which wear out from corrosion during normal operations and are frequently replaced. Tray depth is important to the criticality safety of the operation and is designated as an item relied on for safety (IROFS).

In 1998, the licensee changed the chemical parameters of the waste dissolution process which required a criticality safety review of the procedures and equipment. At that time, criticality safety staff determined that the depth of the trays needed to be reduced. The trays had previously been allowed an *inside height* of 2.75 inches. This criticality safety parameter was changed by the new analysis to an *overall height* of 2.5 inches. During implementation of this and other changes to the dissolution process, the licensee engineering change process was not completed and the procurement specifications for the trays were not updated. The dissolver trays continued to be procured from an off-site vendor at the previous dimension. In 2008, during a licensee technical review in support of planned equipment upgrades, the existing tray

dimensions were compared to the integrated safety analysis (ISA) which had the correct dimensions from the criticality analysis. At that time, the trays were determined to be deeper than allowed and in violation of the limiting condition of operation for the facility (k_{eff} <0.92 with one control failed).

The licensee determined that required changes to the as-built drawing, the procurement specification sheet, and the tray dissolver operating procedure did not occur during implementation of the new criticality safety analysis. Because of the way the previous and new specifications were worded, the incorrect dimension was not easily detected and the error was not noted during extensive reviews of IROFS that occurred in support of ISA implementation. The licensee nuclear safety review process for changes typically set pre-operational procedures to verify important parameters prior to releasing a changed system for use. For changes involving equipment that came in contact with product or cost more than $25,000, a nuclear safety review was required by procedure (procurement procedure #1). When changed equipment would not contact product or cost less than $25,000 or for changes involving tooling or fixtures, no safety review was required by procedure (procurement procedure #2).

The licensee was unable to locate documentation of the original engineering change package due to the amount of time that had passed and was unable to definitively establish a root cause for the error. The licensee did establish that the failure to set uniform requirements for nuclear safety review of changes to equipment, tooling and fixtures was a significant weakness in change control. Licensee corrective actions included:

- Requiring safety review of any change to a drawing involving an IROFS
- Requiring that drawings be marked to indicate attributes that are IROFS
- Revised the two procurement procedures so to require a safety review of changed equipment, tooling or fixtures that is an IROFS
- Requiring proof of implementation of pre-operational requirements before release of changed equipment, tooling, or fixtures for use
- Review the effectiveness of procedures associated with IROFS implementation

Limitation of the dissolver tray dimension was based on analysis of critical slab height. Because of the significance of the slab height parameter to this application, NRC is concerned that management controls intended to verify implementation of engineered changes were inadequate to detect the incorrect dimension either during change processing or subsequent to installation of the trays. Although the error occurred before ISA implementation, NRC is concerned that the licensee did not increase scrutiny of IROFS-related components on the basis of their safety function.

Additional information regarding criticality controls based on slab height may be obtained in Information Notice 2007-32.

U.S. Enrichment Corporation Portsmouth Gaseous Diffusion Plant – Piketon, OH, Facility
Loss of Configuration Control Due to a Repair Part with Incorrect Material Composition

Uranium enrichment activities at the Portsmouth Gaseous Diffusion Plant have been halted for several years; however, the facility continues to engage in limited projects such as recovery of

uranium from stored material. The facility maintains minimal operations throughout the site including the cascade and autoclave buildings, laboratory operations, and maintenance, decontamination, and uranium recovery operations. The facility holds a certificate rather than a license but is otherwise regulated in a manner similar to other major fuel cycle facilities.
In 2009, a block valve on a uranyl nitrate hexahydrate (UNH) line in the Portsmouth uranium recovery process area failed abruptly when exposed to UNH solution resulting in approximately 25 liters of 5% enriched UNH spilling to the floor of the facility. The failed valve was below a UNH storage column and functioned as the block valve for the storage column's feed line to the uranium recovery area calciners. The piping configuration in the area did not allow the valve to be isolated. During the leak event, operators determined that it was unsafe to enter the area to catch the spraying solution and the UNH was allowed to leak to the floor. The event was risk significant because the UNH storage column in this situation could hold 100 liters of solution and was analyzed for 100% enriched uranium at high concentration (i.e., > 300 grams U/liter).

The certificate holder's uranium recovery process concentrated UNH solution in an evaporator after extraction and sent the concentrated solution to the 100 liter storage column when the appropriate density was reached. Operators described observing a leak shortly after sending solution to the storage column. The leak turned into a jet approximately 30 minutes after flow became steady and the room became unsafe to enter. The certificate holder determined that the root cause of the event was the replacement of a stainless steel plug with a Monel plug in the stainless steel valve body during maintenance. Monel is soluble in nitric acid, and the improperly installed plug began to dissolve when exposed to the UNH, with dissolution becoming more rapid once the plug was penetrated.

The certificate holder determined that, although the quality level for the stainless steel valve was augmented quality-nuclear criticality safety (AQ-NCS), the quality level for the replacement plug was non-safety related (NS). The AQ-NCS level of the valve was based on a criticality safety limit on the valve diameter. The NS level of the replacement valve stem was established because the valve stem did not affect the diameter of the valve body. Composition of the replacement valve stem was not considered important to the safety function of the valve.

Both Monel and stainless steel plugs were included in valve repair kits procured by the certificate holder and were visually indistinguishable from one another. The Monel plug was determined to have been in stores for at least ten years and was in a distributor package labeled as a stainless steel plug. Because of the amount of time that had passed, the certificate holder was unable to determine whether the improper labeling had been caused by the part supplier or had occurred during storage. Certificate holder corrective actions included:

- Performing an investigation including a critique and an extent of condition review.
- Testing all stainless steel valve plugs in UNH service for correct composition. An additional Monel plug was identified in a UNH line and replaced with a stainless steel plug.
- Testing all stainless steel valve plugs in storage for correct composition. Seven Monel plugs were found in stores identified as stainless steel.
- Changed maintenance work package templates to require testing of plugs for composition before installation (code inspection).

- Changed post maintenance test for X-705 Building piping, valves, and pumps to verify code inspection and have the testing performed if not already done.
- The certificate holder is evaluating other corrective actions such as changes to receipt inspection procedures and making the quality level of replacement parts consistent with the component in which the part is installed.

Because of the resulting event, NRC has several concerns about the error:

- Inadequate receipt inspection (i.e., no material testing) allowed introduction of Monel valve stems into safety related UNH service instead of corrosion resistant stainless steel.
- Failure to impose appropriate procurement requirements for valve repair kits resulted in repair of safety related stainless steel valves with Monel plugs.
- Lower quality level for a repair part than the repaired component in a safety related application resulted in the use of Monel in UNH service.

DISCUSSION

Inspectors have observed differences between the procedures used by fuel cycle licensees to procure, maintain and modify safety related items and IROFS. While one licensee may specifically address safety related items or IROFS in their engineering change procedures, another licensee may not. While one licensee will have special receipt inspection procedures for safety related items or IROFS, another licensee may not. More rigorous configuration management may have identified the above errors before the events occurred. NRC is concerned about the rigor of management measures applied to the procurement, storage and installation of spare parts and expendable items in applications such as safety related items or IROFS. NRC expects that licensee management measures will distinguish between safety related items or IROFS and non- safety related items or non-IROFS when processing engineering changes and that a level of scrutiny commensurate with each item's importance to safety will be applied throughout the change process, from the evaluation and planning stage of the change to implementation.

NRC requires management measures at fuel cycle licensees to maintain consistency between design requirements, the physical configuration, and the facility documentation. Failure to adequately verify specifications for safety related items or IROFS prior to procurement of equipment can result in failure to establish necessary controls or compromise of established controls. NRC safety inspections routinely review licensee management measures to determine how well they ensure the availability and reliability of safety related items or IROFS. These inspections include review of licensee change management procedures to ensure that analytical assumptions are not compromised during or 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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