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December 2, 2005
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U.S. Nuclear Regulatory Commission
Director, Office of Nuclear Material
Safety and Safeguards
Attn: Document Control Desk
Washington, D.C. 20555

Gentlemen:

Subject: **Thirty-day Follow-up Report to November 3, 2005 Incident Reported Under 10 CFR 70 Appendix A; Framatome ANP, Inc. Richland Facility; License No. SNM-1227; Docket No. 70-1257**

On November 4, 2005 Framatome ANP, Inc. (FANP) notified the NRC Operations Center of a November 3, 2005 incident at its Richland fuel fabrication facility involving a container-to-container transfer of low-enriched uranium powder in violation of a criticality safety operating limit. The incident met the 24-hour reporting criterion in 10 CFR 70 Appendix A, paragraph (b)(1) in that the applicable Integrated Safety Analysis (ISA) failed to address all powder types potentially subject to the transfer operation. This 30-day follow-up report is being submitted in accordance with 10 CFR 70.50(c)(2).

Caller Identification

This incident was reported to the NRC Operations Center by R.E. Link, Manager, Environmental, Health, Safety and Licensing on November 4, 2005.

Date, Time, and Exact Location of Incident

The incident occurred on November 3, 2005 at approximately 1400 hours local time. The powder transfer operation was being conducted within the Blended Low Enriched Uranium (BLEU) facility on the Richland site. The BLEU facility is located within the central portion of the site's restricted area.

Incident Description

On day shift November 3, 2005, a process operator vacuum transferred urania powder enriched to 3.0 wt% ^{235}U from a 45-gallon drum with a neutron absorbing insert to a 55-gallon drum without any neutron absorbing insert in the BLEU facility at the Richland site. This transfer was performed according to an approved standard operating procedure (SOP). This was the first such transfer under a recently approved nuclear criticality safety analysis (NCSA).

When the operator was preparing the newly filled 55-gallon drum for transfer to and storage in the warehouse, the Nuclear Inventory Management System (NIMS) would not print a label for

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the drum. NIMS would not print a label because the NCS specialist had requested the IS Engineer who programmed the NIMS checking routine to limit the allowed source material to BBD (BLEU material from the ADU calciner). The material transferred to the 55-gallon drum had been prepared for pressing which includes the addition of small amounts of hydrogenous additives and was no longer designated as BBD.

When operations personnel could not obtain a container label, they contacted an NCS specialist about this issue. While troubleshooting this problem, the NCS specialist discovered that the urania powder contained hydrogenous additives. He recognized that the Richland site ISA did not implement IROFS to prevent transfer of powder containing hydrogenous additives from 45-gallon to 55-gallon drums.

At this point, the drum was sampled and locked in place pending further evaluation. The 45-gallon to 55-gallon transfer process was also placed out of service pending further evaluation.

Safety Significance of the Incident

The safety significance of this incident is low. The urania powder transferred to the 55-gallon drum was known in advance to contain less than 0.5 wt% moisture and approximately 0.35 wt% moisture equivalent approved additives. The operating limit on the total moisture equivalent content is 0.5 wt%.

A single 55-gallon drum filled with urania powder (931 kg), enriched to 5.0 wt% ^{235}U with a bulk density of 4 g/cm^3 and containing 6.25 wt% moisture, that is fully reflected by water has a k_{eff} of 0.95 (normal condition k_{eff} limit) . A moisture value of 7.3 wt% is required in such a drum to reach a k_{eff} of 1.0.

The drum involved in this incident actually contained 115.4 kg of urania powder enriched to 3.0 wt% ^{235}U with a bulk density of 2.2 g/cm^3 and containing 0.53 wt% total moisture equivalence (moisture and moisture equivalent approved additives determined by follow up laboratory analysis). Based on total moisture equivalent content alone, the material in the drum would have to have more than 14 times the operating limit (0.5 wt%) and more than 13 times the actual amount (0.53 wt%) before criticality could occur in a single drum. The actual enrichment and bulk density of the material involved in this incident provide additional margin compared to the values required for criticality discussed in the previous paragraph.

Additionally, NIMS did verify that the powder contained ≤ 1.2 wt% AZB and ≤ 0.3 wt% ALS, which is ≤ 0.733 wt% moisture equivalent approved additives, and ≤ 0.5 wt% moisture. Exceeding a total of 1.233 wt% total moisture equivalence would have caused the NIMS interface with the process control system to prevent the transfer. This IROFS (IROFS 6002) is a protection provided for the blender which is filled from the same transfer location. Approximately 5 times the maximum amount that would have been permitted to be transferred (6.25 wt% total moisture equivalence) is required to approach a k_{eff} value of 0.95 (normal condition k_{eff} limit) in a single drum.

It is also noted that IROFS 4704, an in-line moisture monitor, is used in this operation and prevents powder exceeding 0.5 wt.% moisture from being transferred to a 55-gallon drum. This IROFS combined with those associated with powder additive addition to blenders (IROFS 1123, 1124, 1124.01, 6008, 6009 and 6010) and powder additive addition to 45-gallon drums (IROFS 1125, 1126, 1127, 1128, and 1129) ensure that the amount of additive in a 45 gallon drum will not exceed 1.0 wt.% moisture equivalent. Actual limits to meet production quality requirements are much less than 1.0 wt.% moisture equivalent. The combination of these sets of IROFS also ensure that the powder transferred from a 45-gallon drum to any 55-gallon drum would not exceed 1.5 wt.% total moisture equivalent.

If all of the 960 storage locations in the adjacent drum storage warehouse were filled with drums containing less than 837.8 kg UOx powder (a 453.5 kg limit is an NCS imposed mass limit to ensure structural integrity during seismic activity although 837.8 kg is supportable on a neutronics basis), containing 2.0 wt% total moisture equivalence, and optimum interspersed moderator, the resulting k_{eff} value would not exceed 0.97 (abnormal condition k_{eff} limit).

Incident Response Actions

A number of actions were taken in direct response to this incident, as follows:

- After discovering the deficiency, the drum was sampled and locked in a safe storage location pending further evaluation.
- The 45-gallon to 55-gallon transfer process was placed out of service pending further evaluation.
- After sample results were obtained, the material that had been transferred to the 55-gallon drum was transferred back into a 45-gallon drum with a neutron absorbing insert and placed into an approved storage location.
- As previously noted, the NRC Operations Center was appropriately notified of this incident on November 4, 2005. No other regulatory agencies were notified nor was a press release issued. The incident did not precipitate activation of the site's emergency response organization or meet the criteria for a declared emergency classification.

Interim Corrective Actions

A number of interim corrective actions have been taken to assure safe operation of the 45-gallon to 55-gallon drum powder transfer station, as follows:

- The ISA team was re-convened to re-evaluate the accident sequences associated with this recently initiated powder transfer activity.
- The ISA team also addressed the potential for other oversights that may have occurred during their initial review.

- Two additional IROFS were established to protect against the transfer of powder containing additive to 55-gallon drums:

  - IROFS 4728 - The Nuclear Inventory Management System (NIMS) verifies the powder has ≤ 0.5 wt. % moisture content and no moisture equivalent additives before it permits the transfer valve to open.

  - IROFS 4729 - A technician places a tamper-proof seal on the lid locking mechanism of each 45-gallon drum destined to be transferred to 55-gallon drums after it is initially filled. Prior to removing the 45-gallon drum lid, a supervisor or specially trained operator verifies that the seal is still intact, indicating that the drum lid was not removed since the drum was initially filled.

Incident Cause

This incident was entered into, and investigated in accordance with, FANP's corrective action program. The cause of this incident was determined to be a lack of sufficient rigor in the application of the ISA process, particularly in the hazards/initiating event phase of the analysis. This in turn was caused by failure of FANP's written ISA guidance to adequately capture and direct all key aspects of the process as well as by the fact that the team leaders had not received adequate refresher training since the initial ISA campaign.

Corrective Actions to Prevent Recurrence

This incident has been reviewed and discussed with members of the original ISA team as well as with other trained and experienced Richland ISA team leaders. Based on those interactions, the following corrective actions are being pursued in an effort to prevent recurrences of this deficiency in the ISA process:

- Establishment of a work practice guide dealing exclusively with accident scenario identification and evaluation. This activity is currently covered in a guide dealing with the entire ISA process. The focused work practice will require, among other things:

  - a walk-through of the area/activity under review by the entire team prior to conduct of the initial meeting;

  - completion of the Hazards/Initiating Event identification steps for the process system under evaluation before proceeding to the IROFS identification step;

  - conduct of a final walk-through of the process area to look for oversights/omissions prior to finalizing the accident evaluation activities; and

  - utilization of a checklist in the work practice that is aimed at error proofing/oversight elimination in the ISA process.

- Establishment of refresher training for ISA team leaders relative to hazards evaluation techniques; and
- Assurance that the peer reviewer of the analysis independently walks down the process are and places emphasis on identification of potential oversights.

Other actions may result from further review.

If you have questions about this incident or FANP's associated response, please contact me on 509-375-8409.

Very truly yours,

Calvin D Manning for

R. E. Link, Manager
Environmental, Health, Safety, & Licensing

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