March 11, 2004

MEMORANDUM TO: Gary Janosko, Chief
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Office of Nuclear Material Safety
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THRU: John Lubinski, Chief **/RA/**
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SUBJECT: IN-OFFICE VERTICAL SLICE REVIEW OF NUCLEAR FUEL SERVICES (NFS) INTEGRATED SAFETY ANALYSIS (ISA) SUMMARY FOR OXIDE CONVERSION BUILDING (OCB) AND EFFLUENT PROCESS BUILDING (EPB) ON FEBRUARY 10 - 11, 2004

On February 10 and 11, 2004, the Nuclear Regulatory Commission (NRC) ISA review team for the NFS OCB/EPB Amendment performed a vertical slice review of radiological and chemical accident sequences from the NFS ISA summary at the Rockville offices of NFS. NRC reviewers in attendance were Michael Lamastra, Kevin Ramsey, Bill Gleeves, Norma Garcia-Santos, Fred Burrows and Rex Wescott. Licensee staff in attendance were Jennifer Wheeler, Scott Kirk, David Hopson, Sonya Sanders, and Richard Montgomery of NFS; and Cliff Yeager, Jerald Zito, Len Newman, Brett Lewis, and John Flaherty of Framatome.

As a preparation for the review, the NRC review team selected five accident sequences that appeared to have possible deficiencies and transmitted these to NFS. At the meeting NFS walked the team through the logic of the sequences, starting with the initiators and explaining how these sequences were mitigated or prevented. These five sequences were:

38.7.1.2 Overflow from tank (TK) -70 resulting in release of chemical fumes and soluble uranium toxicity hazards.

43.1.3.1 High liquid level in V-77 plugging dissolver off-gas vent inlet resulting in release of chemical fumes through tank overflow lines.

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40.11.1.1.A Damage to equipment downstream of TK-76A resulting in release of chemical fumes.

40.3.2.4 Plugging in dissolver lines resulting in release of acid and chemical fumes into the room through the TK-76R overflow line.

5.1.5.2 High moisture content in the feed causing over-pressurization of the calciner resulting in release of off-gas to room.

Based on the NFS presentations and discussions, the staff planned to select one or more of these sequences for an independent vertical slice review using the appropriate parts of the ISA.

Sequence 38.7.1.2, which is also a potential criticality sequence, is initiated by the inadvertent addition of a drum of enriched scrap material into the natural uranyl nitrate (NUN) dissolver hopper. This results in a potential overflow from TK-70 resulting in release of chemical fumes and soluble uranium. The credited items relied on for safety (IROFS) for preventing this sequence are administrative controls on NUN dissolver feed material and an active engineered control. The active engineered control is an enrichment monitor interlock that will disable the operation of the overhead crane to prevent the transportation of enriched material to the NUN dissolver hopper. The staff determined the explanation provided for the sequence to be acceptable, however, the staff questioned the index value of -2 that was assigned to the initiating event. The applicant replied that NFS would document the bases for or re-evaluate all initiators that were assigned an index value of -2 and determine if the defense-in-depth controls justify the assumed low likelihood.

Sequence 43.1.3.1 is initiated by the inadvertent isolation of the V-77 bottoms line resulting in a high liquid level in V-77, plugging the dissolver off-gas vent inlet resulting in the release of chemical fumes through the tank overflow lines. The credited IROFS for preventing this sequence are an active engineered control which consists of the V-77 high vent header pressure switch interlock which closes the dissolver feed isolation valves, and an enhanced administrative control which consists of a high level alarm on the V-77 tank which will alert operators in the central control system (CCS). The staff determined that the explanation provided for the sequence is acceptable, however, the staff questioned the index value of -2 that was assigned to the initiating event. The applicant replied that, as with sequence 38.7.1.2, NFS would re-evaluate all initiators that were assigned an index value of -2 and determine if the defense-in-depth controls justified that low likelihood. NFS is reasonably certain that a tamper tag is placed on the valve for this sequence.

Sequence 40.3.2.4 is initiated by a high powder feed rate in the dissolver resulting in potential plugging in dissolver lines which results in the release of acid and chemical fumes into the room through TK-76R overflow line. The credited IROFS were an active engineered control which consists of a dissolver high level switch interlock (on tank 76A) which closes the feed isolation valves and de-energizes the auger, and an enhanced administrative control that alarms in the CCS upon high level dissolver level (on tank 76R). NFS committed to re-write the description of this scenario to provide greater detail. The staff questioned whether the bounding accident in the chemical consequence analysis was really bounding because the NOx generation was based on a normal powder feed rate. With the higher powder feed rate assumed in the accident sequence, it was unclear whether the environmental consequences would still be low.

NFS noted that there is no safety concern because IROFS are already identified for the high occupational consequences. However, NFS agreed to recalculate the NOx generated using the highest possible powder feed rate, and confirm the environmental consequences.

Sequence 5.1.5.2 is initiated by plugging in the dryer off-gas line which results in high moisture content in the feed potentially causing over-pressurization of the calciner resulting in release of off-gas to the room. The credited IROFS were an enhanced administrative control which was the calciner high pressure alarm in the CCS and an active engineered control which was the calciner high pressure interlock which shuts down the calciner. The staff noted that this sequence was one of more than 20 sequences which relied on the operation of the same two IROFS to prevent a calciner over-pressurization event. NFS stated that this had been discussed internally at NFS and that NFS recognizes that the large number of events reduces the apparent safety margin. NFS stated that they will re-evaluate the various controls that provide defense- in-depth and provide arguments which will demonstrate compliance with 10 CFR 70.61.

After the presentations and discussions, the NRC team selected sequences 40.3.2.4 and 5.1.5.2 for an independent and more detailed vertical slice evaluation. NFS provided the team with the appropriate hazard and operability (HAZOP) analysis results, consequence analysis, and P&ID drawings.

For the vertical slice review of sequence 40.3.2.4, the staff used drawings 520-DISS-210, sheets 2 & 3 to identify IROFS and the path of progression of the potential accident. The staff's primary concern was that the HAZOP only identified potential plugging of the TK-76A overflow line and not all other lines. This could result in the rupture or a leak through the motor shaft seal on the TK-76A mixer and the release of acid and chemical fumes. Also, this event would occur completely upstream of one of the IROFS (TK 76R level indicator) and therefore not meet the performance requirements of 10 CFR 70.61. In the discussion with NFS following this vertical slice, NRC staff questioned NFS regarding their general HAZOP methodology and this scenario in particular. NFS explained that the scenario postulated by the staff was not a credible event because the normal working pressures in the system would be low in comparison to the working pressure for the seals. If all lines plug, NFS argued, the pressure buildup in the system will be enough to unplug the vent pipeline, thus preventing the system from reaching the failure pressure of the motor shaft seals. The staff agreed that the determination of "not credible" for the staff identified sequence was reasonable in this case.

For the 5.1.5.2 vertical slice, the staff reviewed drawing 520-DLC- 210, sheet 12. The staff's primary concern was identification of IROFS and assurance of independence. In the discussion with NRC following the vertical slice, NFS identified the IROFS on the drawing and the staff concluded that they were independent. The staff had no further questions on the vertical slice.

After the vertical slice review, the staff questioned NFS about external events at the facility and NFS committed to better define some of these events including the rail car, outside hydrogen tanks, and possible events involving the natural gas boiler.

NFS also committed to rewrite some scenario descriptions to reflect discussions and updates in designs. The NRC staff informed NFS that a site visit would probably take place in early May of this year.

During the office visit, NFS also discussed tentative responses to questions submitted in ISA and chemical engineering. NFS will provide written responses to those questions in about two weeks.

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