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AIRBORNE EXPRESS

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Director
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

References:
1) Docket No. 70-143; SNM License 124
2) Letter from B.M. Moore to NRC, License Amendment Request for the Oxide Conversion Building and Effluent Processing Building at the BLEU Complex, dated October 23, 2003 (21G-03-0277)
3) NRC Licensing Review to Support License Amendment Request for Oxide Conversion Building and Effluent Processing Building, conducted on January 13, 2004

Subject: Commitment Letter to Address NRC Licensing Review Questions Pertaining to Nuclear Criticality Safety at the OCB and EPB

Dear Sir:

Nuclear Fuel Services, Inc. (NFS) hereby submits responses to questions raised during the referenced licensing review conducted at Framatome-ANP's facility located in Richland, Washington. As noted in the attached responses, internal procedures and safety basis documents supporting this licensing review for the Oxide Conversion Building (OCB) and Effluent Processing Building (EPB) will be updated. As such, this submittal contains commitments that shall be incorporated in the ISA Summary for the OCB and EPB located at the BLEU Complex.

NMSS01

If you or your staff have any questions, require additional information, or wish to discuss this, please contact me, or Mr. Rik Droke, Licensing and Compliance Director at (423) 743-1741. Please reference our unique document identification number (21G-04-0022) in any correspondence concerning this letter.

Sincerely,

NUCLEAR FUEL SERVICES, INC.

B. Marie Moore

B. Marie Moore
Vice President
Safety and Regulatory

JSK/lsn
Attachment

cc:
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Attachment

Commitment Letter to Address NRC Licensing Review Questions Pertaining to Nuclear Criticality Safety at the OCB and EPB

Question 1.

On page 46 of the ISA Summary, NFS states that "If the boiler's burner management system is listed by a nationally recognized testing agency and if the natural gas supply is installed in accordance with NFPA54,..., a fire or explosion hazard...is highly unlikely". At NFS, do the OCB's boiler management system and natural gas supply meet these requirements? If not, are there other compensatory measures in place to render this hazard highly unlikely and what is the likelihood of a fire or explosion from these systems?

NFS Response:

This boiler supports operations associated with the Effluent Processing Building (EPB). The boiler meets ASME Section I requirements, being registered with the National Board, and is approved and listed as a package by UL. The natural gas supply will be installed in accordance with NFPA54.

Question 2.

Describe the location, dimensions, and contents of the Dissolver UN Receiver Tank TK-76R.

NFS Response:

The Dissolver UN Receiver Tank TK-76R is located along the north wall of room 520-1-2 along with the stage 1 and stage 2 dissolvers (Tanks TK-76A and TK-76B). Room 520-1-2 (per drawing 520-OCB-100) is the main UO_2 powder processing area located on the first floor of the OCB and contains the UO_2 Powder Fill Station, UO_2 Add Back Station, Transfer Station, and the Concentrate Receiver Tanks (TK-40A and TK-40B). The Dissolver UN Receiver Tank TK-76R has a nominal [redacted] gallon capacity. It is fabricated from safe (for optimum-moderated, fully-reflected UO_2) geometry 8-inch schedule 40 piping, with an approximate inner diameter of 8.4-inches and a height of 60 inches. The Dissolver UN Receiver Tank TK-76R may contain the UN acidic solution from tanks TK-76A and TK-76B (with a maximum concentration of 283 g U/l), de-ionized water and dilute nitric acid solution from the Scrubber Solution Recirculation Tank (TK-78). Under off-normal conditions, the receiver tank may contain small amounts of undissolved U_3O_8 or UO_2 powder.

Question 3.

Describe how the use of sprinklers were considered in the NCSEs for the OCB.

NFS Response:

For areas in which sprinklers are installed (maintenance area, dissolver room, tank gallery and truck loading area), the NCSE considers a full range of interspersed moderation between fissile units. Fissile units are also modeled with the most reactive contents for

the contained material type. Sprinkler water from these areas will not enter the adjacent moderation controlled areas (ModCon). A raised floor (7-inches, 1st floor conversion area relative to the tank gallery floor), walls, berms, dikes and doors protect the ModCon area and preclude the entry of water from the adjacent sprinkler systems.

Question 4.

Clarify whether the mass given in Section 3.2.2.1 of the ISA summary is subcritical or it is the minimum critical mass. Also give the maximum enrichment and density of the material considered and whether or not any water reflection was considered for this scenario. Provide justification for not considering reflection from sprinkler water since during a fire equipment integrity is not credited and material could spill to the floor during sprinkler activation.

NFS Response:

The mass identified in Section 3.2.2.1 of the ISA Summary is the safe subcritical mass associated with a 50/50 Volume mixture of UO_2 and water that has the ability to flow due to the large excess of water. The enrichment and modeled density are 5.0 wt% ^{235}U and 5.47 gUO_2/cc, respectively. The modeled geometry consists of a hemisphere resting on a 12-inch thick concrete pad (floor) with 1-inch water reflection within a 500-cm square cuboid region filled with moist air at a water volume fraction of 0.0001. There are no sprinklers installed in the dryer/calciner area such that additional water reflection due to sprinkler system activation is not credible. Close fitting personnel reflection greater than the modeled 1-inch is not anticipated since the spill cleanup operation uses a vacuum transfer system to remove powder from the floor with storage in a favorable geometry container located at the vacuum transfer station. However, the 1-inch close-filling water reflection is bounding of the close proximity (directly adjacent or contiguous to the hemisphere) of an operator during the actual spill cleanup.

Question 5.

Describe how the administrative control of a posting outside the MODCON area that prohibits the use of water during a fire will survive a fire.

NFS Response:

The posting is not likely to survive a fire. However, the moderation control program and the training associated with the program constitute the controls to preclude the introduction of liquid moderator to the ModCon area. The posting outside the ModCon areas serves as a reminder to area operations to prohibit the use of water within the area. There are additional postings within the ModCon area for specific moderation control equipment, such as the blender. NFS will revise the NCSE for the Oxide Blending System to require that, if the location of the fire may involve Special Nuclear Material (SNM), the Emergency Control Director (ECD), or designated alternate, will be contacted for authorization prior to using water (or similar materials) during fire fighting. The NCSE will also specify that guidelines will also be provided (in an appropriate

procedure) for approval of water in fire fighting to prevent a criticality accident. These guidelines are used for training purposes to assist emergency response organizations regarding firefighting in moderation-controlled areas of the NFS site. These requirements will then be implemented in the appropriate NFS procedures.

Question 6.

Describe the controls in place to ensure that the fork truck does not contain more than [redacted] gallons of propane fuel or why greater than 43 gallons is not a concern.

NFS Response:

The fork truck was modeled with a [redacted] gallon tank of propane to conservatively bound the anticipated volume of any tanks currently available. The fork truck propane tank hold volume will be verified on receipt prior to use. It is anticipated that the propane tank will be a standard [redacted] gallon tank.

Question 7.

In the NCSE for the OCB dryer/calciner system, justify the assumptions that the spills will be in areas as described; min floor space of 30 ft2 for spills from the dryer and calciner, 3.6 ft2 for spills from the addback station, and 6.4 ft2 for the central vacuum system. Also justify why 0.5 hours is the maximum amount of time that any spill could occur.

NFS Response:

The NCSE for the Dryer/Calciner evaluates spills of both dry and wet materials. Dry spills are relatively confined since the material is not free flowing. For dry spills, the spill surface area is governed by the geometry of a hemisphere that is used to represent the spilled material. Wet spills are free flowing and unless restricted will conform to the entire processing area which exceeds 2,500 ft^2. For the wet spill scenario involving a dryer/calciner breech, a 30 ft^2 surface area was conservatively selected. However, since a wet spill in this area would not be confined, a much larger spill area could have been used. A wet spill from a dryer/calciner breech could potentially occupy the entire 2nd level of the conversion area (although at a very thin depth) prior to flowing to the tank gallery room where it is interned to favorable geometry columns. Both the 2nd level conversion area and tank gallery room have floor surface areas significantly greater than 30 ft^2. Therefore, the use of this floor surface area in the representation of a wet spill from the dryer/calciner is very conservative.

The dimensions of the enclosures for the addback station and the central vacuum system limit spill surface areas at these stations. The floor surface areas of the addback station and the central vacuum system, enclosures are greater than 3.6 ft^2 and 6.4 ft^2, respectively, and are therefore conservatively modeled. For wet spills in the addback station and the central vacuum system, the material is assumed to occupy the full extent of the surface areas bound by each enclosure. The enclosure dimensions for each station will be verified prior to startup as Configuration Controlled Equipment (CCE) to ensure

that the model conditions are valid and conservative. Additional controls (IROFS) are provided to ensure that containers are properly connected (container in place and with transfer seal inflated) prior to activation of the rotary discharge valve to fill the station container.

The 0.5 hour spill duration, after spillage of the entire contents of the dryer/calciner as a result of a postulated breech, is a conservative assumption. Note that this spill duration is not applicable to the addback station or the central vacuum system since there is no routine feeds to each and the entire contents are further assumed to spill within the enclosure. For the dryer/calciner, a breech is not likely to occur since the vessels are constructed of steel and are not pressurized. Also, during a breech the entire contents will not immediately flow to the floor. Secondly, a breach will indicate calciner pressure problems and further activate area hydrogen detectors, which will initiate automatic safe shutdown.

For this spill, the dryer/calciner was assumed to be full of fissile material. Normally, each is only partially filled to promote conversion, off gassing and material flow through the system. The 0.5 hour duration assumes maximum design material flows. However, an operator or the control room operator, performing normal duties within the facility, can respond immediately to stop process flows in a matter of minutes. For example, the centrifuge and dryer feeds can be stopped which instantaneously terminates respective feeds to the dryer/calciner within minutes. Therefore, the 0.5 hour continued spill duration coupled with immediate spillage of the entire vessel's contents for the dryer/calciner breech or spill scenario is conservative and provides a large margin of safety to minimize the effects of a spill.

Question 8.

In the NCSE for the OCB dryer/calciner system, justify using different material densities in the different spill scenarios rather than always assuming the maximum credible density of 4 g/cc, particularly for the dry spills.

NFS Response:

Different material densities were selected for each spill scenario dependent on the materials involved (e.g., UN solutions, ADU or UO_2). For dry UO_2 spills, the 4.0 g/cc density is the most reactive. However, a wet UO_2 spill consisting of a 2.0 g/cc density is more reactive since it will support a higher degree of moderation. Also, densities specific to UN solutions and ADU were considered since these materials have densities much less than 2.0 and 3.0 g/cc, respectively.

As noted during the NCS Focus group meeting (01/13/04) held at the Framatome-ANP facility in Richland, the density associated with an ADU spill from the calciner (NCSE for the OCB Dryer/Calciner System, page 14, 54T-03-0048, Rev. 0) originally assumed at 2 g/cc will be increased to 3 g/cc for consistency with the spill scenario for the dryer (page 13 of the same NCSE). The density for the spill from the calciner can be increased from 2 g/cc to 3 g/cc and still remain within the safe basis (e.g., spill depth into a 30 ft2 surface area will not exceed that of the safe subcritical infinite slab depth of 4.23 inches).

The Dryer/Calciner System NCSE will be revised to increase the spill density from 2 g/cc to 3 g/cc for this scenario.

Question 9.

In the NCSE for the OCB dryer/calciner system, state whether or not the flow rates used are the maximum possible flow rates and how these are controlled. It appears that these are relied on to assure safety.

NFS Response:

The quoted flow rates are the maximum possible flow rates based on the design. These will be verified during initial testing with natural uranium materials.

Question 10.

In the NCSE for the OCB dryer/calciner system, spill scenario 6 describe whether or not an unfavorable geometry container could be used.

NFS Response:

An unfavorable geometry container cannot be connected to the Central Vacuum System. A passive engineered container fabricated from 8-inch diameter piping is specifically designed to fit the discharge of the vacuum system. As noted in the NCSE, an active engineered control consisting of a proximity switch indicates that the correct container is properly positioned allowing the discharge rotary valve to operate. A second active engineered control involves a "lid down" sensor that ensures that the container lid is sealed onto the container and the rotary valve such that powder can be transferred into the container. This sensor is interlocked to the blower to prevent transfer of powder into the receiver vessel if the correct container is not sealed to the transfer line. Material cannot be transferred into or from the vacuum system if the correct container is not properly positioned and detected by two independent interlocks. Double contingency is provided to preclude the use of any container other than the engineered container, which further precludes the use of unfavorable geometry containers.

During the NCS Focus group meeting (01/13/04) held at the Framatome-ANP facility in Richland, an issue was identified by NRC concerning the location of 55-gallon drums for trash collection in the adjacent maintenance room within the OCB. These drums are to be used specifically for trash collection and are not intended to be used in processing areas of the OCB. The passive engineered container and independent interlocks as discussed above prevent the use of 55-gallon drums for the collection of material from the vacuum system. However, as discussed during the above focus group session, the vacuum system enclosure will be passively engineered to prevent entry of a 55-gallon drum to further preclude its use in the system. The Dryer/Calciner System NCSE will be revised to include this requirement.

Question 11.

In the NCSEs for the OCB dryer/calciner system and the oxide blending, justify why favorable geometry equipment are not designated as IROFS. Since geometry is a controlled parameter, these items should be IROFS.

NFS Response:

There is certain equipment (e.g., columns) for which no established failure mode leads to a high consequence event, but that if improperly modified or replaced, could allow such an accident to occur. Such equipment is generically classified as IROFS. This equipment will not be individually listed in the ISA Summary. Instead, it will be maintained using the configuration control system management measures. NFS/Framatome-ANP will handle this equipment consistent with the current practices being employed for BPF CCE. They will be listed individually in the NCSE with a generic statement in the ISA Summary IROFS table (e.g., structures, systems, components such as favorable geometry columns, dikes, floors, and piping that require configuration control).

Question 12.

In the NCSE for the OCB oxide blending system, describe the process which allows a container other than the vacuum transfer vessel to be used in the transfer station and the controls that prevent an unfavorable geometry container in the transfer station.

NFS Response:

An unfavorable geometry container cannot be connected to the transfer station. The design of this system is similar to the design of the Vacuum Transfer System discussed in the response to Question 10. First, a passive engineered container fabricated from 8-inch diameter piping is specifically designed to fit the discharge of the transfer system. As noted in the NCSE, an active engineered control consisting of a proximity switch indicates that the correct container is properly positioned allowing the discharge rotary valve to operate.

During the NCS Focus group meeting (01/13/04) held at the Framatome-ANP facility in Richland, an issue was identified by NRC concerning the location of 55-gallon drums for trash collection in the adjacent maintenance room within the OCB. These drums are to be used specifically for trash collection and are not intended to be used in processing areas of the OCB. The passive engineered container and interlock as discussed above prevent the use of 55-gallon drums for the collection of material at the transfer station. However, as discussed during the above focus group session, the transfer system enclosure will be passively engineered to prevent entry of a 55-gallon drum to further preclude its use in the system. The OCB Oxide Blending System NCSE will be revised to include this requirement.

Question 13.

In the NCSE for the OCB oxide blending system section 4.2.1, describe why only 12.5 kg of water would be the maximum expected normally and why the maximum of 15.8 kg bounds any credible off normal scenario.

NFS Response:

The basis for the 12.5 kg of water moderation is discussed on page 22 of the OCB NCSE. The moderation is assured by dual verifications (IROFS) to be less than 5,000 ppm (0.5 wt%). With a corresponding mass (controlled by IROFS) of [redacted]kg, the total moderation within the blender that is homogeneously distributed is [redacted]g. [redacted]kg water was determined to be safely subcritical in the blender and hopper assuming migration to the center of the blend while being further surrounded by dry UO_2. Based on the design of the blending system, moderator migration is not likely to occur (dry purge and mixing) and could be considered not credible in the context of the modeled geometry.

On page 23 of the OCB NCSE, at the maximum allowed moisture content, the blender will not exceed the water limit of 15.8 kg unless it is inadvertently over-filled to a mass of approximately 3,160 kg (in excess of 560 kg) of powder. A conservative model of the blender completely filled with UO_2 powder at a density of 4.0 g/cc (approximately [redacted]kg), and with 5,000 ppm water uniformly distributed throughout the powder yields a calculated system k_{eff} of less than 0.80. Subcriticality is maintained until the uniformly distributed moisture content is increased to approximately 27,500 ppm (2.7 wt%).

The moderation limit of [redacted]kg as applied is very conservative since double contingency controls exist to limit the amount of moderation. The moderator cannot further migrate to the center of the blend. Therefore, the [redacted]kg water limit bounds credible off normal scenarios.

Question 14.

Describe how IROFS OBS-1, the detection instrumentation between the double roof above the MODCON area, works such that its effectiveness can be evaluated.

NFS Response:

The moderation detection instrumentation (management measure) between the double roofs (IROFS OBS-1) above the ModCon area consists of a conductivity probe identical in design to the system currently employed within the UNB sump for spill detection. The conductivity instrument consists of a probe with two small protruding wires, which allows for current flow with detection of flow in the presence of a conducting media such as rainwater.

Question 15.

Describe in detail the features of the oxide blending system that are considered to be IROFS OBS-5 such that its effectiveness in preventing water from entering the system can be evaluated.

NFS Response:

The physical integrity and/or features of the oxide blending system involve a closed system designed to process and transport uranium oxide powders ([redacted] As such, the system is essentially airtight in order to prevent the leakage of powder from the system, and the associated radiological contamination of the surrounding area. The stainless steel pipes, vessels, and valves that comprise the system are connected by way of welds, bolted flanges, and inflatable seals. The air intake line for the receiver vessels and transfer stations is oriented and located in such a way as to preclude the ingress of water from below (as a result of a liquid spill). The intake is also equipped with a protective feature to prevent ingress of water from a horizontal spray, or leak from above (as a result of a ceiling leak). Inflatable nitrogen-filled seals connect the vacuum transfer vessel or the favorable geometry collection container to the discharge of the receiver hoppers. The discharge lines from all three of these vessels are downfacing, and isolated by way of a rotary discharge valve. These features reasonably prevent the ingress, even in the instance when the vacuum transfer vessel, collection container or product pails are disconnected from the vessel discharge line.

Question 16.

Describe in detail the features of the oxide blending system that are considered to be IROFS OBS-2 such that its effectiveness in preventing water from entering the system can be evaluated.

NFS Response:

[redacted] and [redacted] consist of the building construction and/or features designed to prevent the entry of moderation from external sources. [redacted]s the double roofs, only. [redacted]s the additional features including the raised floor (7-inches, 1st floor conversion area relative to the tank gallery floor) with respect to the surrounding areas, surrounding walls, berms, trenches, dikes, drains and doors that protect the ModCon area and preclude the entry of water. Specifically, for the 1st floor conversion area, items involve surrounding walls, closed personnel and product entry doors, raised floor elevation, ceiling and 2nd floor berms surrounding the receiver hoppers and equipment access area, and a trench at the entry stairwell with drain to divert liquids to the tank gallery. For the 2nd floor conversion area (blending area only), items involve the surrounding walls, closed personnel entry door, floor, and double roofs. In both areas, liquid moderation lines are also prohibited.

Question 17.

Justify why IROFS [redacted] combustible loading limit, and the initiating event of a fire are considered independent.

NFS Response:

The combustible trash loading limit and the initiating event related to a fire are independent. Chemicals (such as nitric acid or peroxide), which may be incompatible with oils and solvents, are not used in the ModCon area such that all combustible trash within this area is inherently dry. The only oil present in the blending area consists of the halocarbon type materials used as blender lubricants. Since a fire cannot physically initiate from the combustible trash loading (due to the lack of chemicals and oils) the initiating event of a fire and the corresponding load limit should be considered independent. The combustible trash loading limit serves to minimize the magnitude of a fire as stated in the NCSE.

Question 18.

In the NCSE for the OCB precipitation system section 4.1.1.2, NFS states that if the high level interlock fails, then the overflow lines will keep the solution from back flowing, but then states that the overflow lines are unlikely to plug because the high level interlock terminates flow. With this type of logic, the IROFS are not independent. Also, describe in detail the difference between the level control system and the high level switch interlock for TK-20 (IROFS [redacted]). Also explain why pressure has to be overcome if the overflow line is blocked before the solution could reach the feed lines.

NFS Response:

In the NCSE for the OCB Precipitation System, section 4.1.1.2, two process upsets are required to allow uranium solution to backflow into the UN storage tanks. First, if the liquid level in TK-20 reaches the high-high level switch, isolation valves terminating process feed to TK-20 are closed and the DI water line is closed at the main header. Second, if the high-high level interlock fails, the overflow line on TK-20, O-20, will spill uranium solution onto the floor prior to reaching the elevation of the UN feed lines. Both UN feed lines are routed at an elevation above the TK-20 tank overflow line. If the uranium solution reaches the overflow line level in TK-20, it will discharge to the floor rather than enter the UN feed lines. It is further stated in the NCSE that the overflow lines are unlikely to plug because the high-high level interlock terminates flow. However, the intent of this discussion was to suggest that since the high-high level interlock terminates all flows to TK-20, the overflow will never be challenged in that solution will never flow through it unless the high-high level interlock fails first. The overflow is constructed of translucent material and sized based on the maximum flow to the tank. Therefore, the overflow is unlikely to fail even with solution flowing through it as a result of the high-high level interlock failure. If the overflow is plugged or partially obstructed, then it will be observed as such by a simple visual inspection.

The level control system on TK-20 consists of a pressure backflow monitoring device that correlates the measured pressure to the liquid height in the tank. This device indicates the actual solution level within the tank. The high-high level interlock is independent of the level control system and consists of a level switch to identify that the solution has attained a certain height within the column. The switch is positioned at a fixed location on the tank side at a height that prevents solution from exiting the overflow, by closing the tank feed valves in sufficient time, to minimize any chemical exposure concerns.

The tank feed lines from the UN Storage Tanks are elevated above the overflow line on TK-20. If the overflow line is blocked and if the high-high level interlock fails to terminate the feeds to TK-20 (from both the UN Storage Tanks and TK-76R), then due to the feed line elevation, the solution can only backflow to the UN Storage Tanks if it can overcome the pressure differential attributed to the elevation of the feed lines from the UN Storage Tanks.