From: <rod.krich@exeloncorp.com>
To: <bws1@nrc.gov>
Date: 8/3/04 11:16AM
Subject: FW: IROFS Comparison - SAR Rev 1 to Rev 2

Brian,

As discussed, I'm forwarding this e-mail that was sent to Tim.

Rod Krich

-----Original Message-----
From: dggreen01@mchsi.com [mailto:dggreen01@mchsi.com]
Sent: Monday, August 02, 2004 7:07 AM
To: tcj@nrc.gov
Cc: rod.krich@exeloncorp.com
Subject: IROFS Comparision - SAR Rev 1 to Rev 2

Tim,

You should be receiving the revision to the License Application this morning.
It was sent out on Friday afternoon for delivery this morning.

To assist the LES reviewers of the reformatted and revised IROFS, a comparison
of the IROFS reflected in SAR Revision 1 to the IROFS reflected in SAR Revision
2 was put together. We thought this comparison might also be useful to the NRC
reviewers. As such, I have attached a copy of this comparison for your information and use.

If you have any questions, please do not hesitate to contact Rod Krich or myself.

Thanks,
Dan Green.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS1	TT2-1 UF2-1 PT2-1 PB2-1	Chemical	High Temperature Trip of Defrost Heater – Hardwired temperature switch for automatic, fail-safe, high temperature trip of cold box defrost heaters and fans at Tails Low Temperature Take-off Stations, Feed Purification Low Temperature Take-off Stations, Product Low Temperature Take-off Stations, and Product Blending Receiver Stations.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS1	TT2-1 UF2-1 PT2-1 PB2-1	Chemical	Automatic trip of defrost heater and fan on high air return temperature to ensure cylinder integrity. This is implemented with a hardwired temperature sensor for automatic, fail-safe, high air return temperature trip of defrost heaters and fans at Tails Low Temperature Take-off Stations, Feed Purification Low Temperature Take-off Stations, Product Low Temperature Take-off Stations, and Product Blending Receiver Stations. Setpoint conservative with respect to assuring cylinder integrity.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS2	TT2-1 UF2-1 PT2-1 PB2-1	Chemical	Redundant High Temperature Trip of Defrost Heater - Temperature switch for automatic, fail-safe, high temperature trip of cold box defrost heaters and fans at Tails Low Temperature Take-off Stations, Feed Purification Low Temperature Take-off Stations, Product Low Temperature Take-off Stations and Product Blending Receiver Stations. These trips to be independent and diverse, (e.g., capillary sensor) from IROFS1.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS2	TT2-1 UF2-1 PT2-1 PB2-1	Chemical	Automatic trip of defrost heater and fan on high station internal air temperature to ensure cylinder integrity. This is implemented with a capillary temperature sensor for automatic, hardwired, fail-safe, high station internal air temperature trip (independent and diverse from IROFS1) of defrost heaters and fans at Tails Low Temperature Take-off Stations, Feed Purification Low Temperature Take-off Stations, Product Low Temperature Take-off Stations and Product Blending Receiver Stations. Setpoint conservative with respect to assuring cylinder integrity.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS3	TT3-1 UF3-1 PB3-3 CP1-4 EC4-1 PT3-2 VR1-5 DC1-5 DC1-6 DC1-7 DC1-8	Chemical	Evacuation Skid Carbon Trap Weight Trip – Automatic trip of the vacuum pump on high weight of the carbon trap (single train) in the Tails Evacuation System, Feed Purification Subsystem, Product Vent Subsystem, Blending and Sampling Vent Subsystem, Ventilated Room, Cylinder Preparation, Cascade Sampling Rig and Contingency Dump System evacuation skids.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS3	TT3-1 UF3-1 PB3-3 CP1-4 EC4-1 PT3-2 VR1-5 DC1-5 DC1-6 DC1-7 DC1-8	Chemical	Automatic trip of the vacuum pump on carbon trap high weight to ensure the carbon trap does not become saturated with UF_6. This is implemented with an automatic hardwired, fail-safe, trip of the vacuum pump on high weight of the evacuation skid carbon trap in the Tails Evacuation System, Feed Purification Subsystem, Product Vent Subsystem, Blending and Sampling Vent Subsystem, Ventilated Room Cylinder Pressure Test & Pump Out Rig, Cylinder Preparation Vacuum Pump and Trap Set System, Cascade Sampling Rig, Centrifuge Test Facility Vent Subsystem and Contingency Dump System. Setpoint conservative with respect to saturated carbon trap weight.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS3	DC1-1 DC1-2 DC1-3 DC1-4 TP8-2	Chemical	Evacuation Skid Carbon Trap Weight Trip – Automatic trip of the vacuum pump on high weight of the carbon trap (single train) in the Contingency Dump System and Centrifuge Test Facility Vent Subsystem.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS3	DC1-1 DC1-2 DC1-3 DC1-4 TP8-2	Chemical	Automatic trip of the vacuum pump on carbon trap high weight to ensure the carbon trap does not become saturated with UF_6. This is implemented with an automatic hardwired, fail-safe, trip of the vacuum pump on high weight of the evacuation skid carbon trap in the Contingency Dump System. Setpoint conservative with respect to saturated carbon trap weight.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS3	PB2-3 PB3-1 VR1-1 CP1-1 EC4-2 PT3-1 PB3-1 DC1-9	Criticality	Evacuation Skid Carbon Trap Weight Trip – Automatic trip of the vacuum pump on high weight of the Carbon trap (single train) in the Product Vent Subsystem, Blending and Sampling Vent Subsystem, Ventilated Room, Cylinder Preparation Room, Cascade Sampling Rig and Contingency Dump evacuation skids.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS3	PB2-3 PB3-1 VR1-1 CP1-1 EC4-2 PT3-1 DC1-9	Criticality	Automatic trip of the vacuum pump on carbon trap high weight to ensure the carbon trap does not become saturated with UF_6. This is implemented with an automatic hardwired, fail-safe, trip of the vacuum pump on high weight of the evacuation skid carbon trap in the Product Vent Subsystem, Blending and Sampling Vent Subsystem, Ventilated Room Cylinder Pressure Test & Pump Out Rig, Cylinder Preparation Vacuum Pump and Trap Set System, Cascade Sampling Rig and Contingency Dump. Setpoint conservative with respect to saturated carbon trap weight.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS4	UF1-1 PB1-1	Chemical	High Temperature Trip of Feed Station Heaters – Hardwired temperature switch for automatic, fail-safe, high temperature trip of Feed Station and Blending Donor Station heaters.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS4	UF1-1 PB1-1	Chemical	Automatic trip of station heaters on high cylinder temperature to ensure cylinder integrity. This is implemented with a hardwired temperature sensor for automatic, fail-safe, trip on high cylinder temperature of Solid Feed Station and Blending Donor Station heaters. Setpoint conservative with respect to assuring cylinder integrity.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS5	UF1-1 PB1-1	Chemical	Redundant High Temperature Trip of Feed Station Heaters - Temperature switch for automatic, fail-safe, high temperature trip of Feed Station and Blending Donor Station heaters. These trips to be independent and diverse, (e.g., capillary sensor) from IROFS4.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS5	UF1-1 PB1-1	Chemical	Automatic trip of station heaters on high station internal air temperature to ensure cylinder integrity. This is implemented with a capillary temperature sensor for automatic, fail-safe, trip (independent and diverse from IROFS4) on high internal air temperature of Solid Feed Station and Blending Donor Station heaters. Setpoint conservative with respect to assuring cylinder integrity.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS6	N/A	Criticality	Administrative controls through the use of procedures and operator training ensure product cylinders are not processed as feed cylinder. This includes cylinder marking/identification, cylinder management system and sampling of feed material in the feed station before placing feed cylinder on line.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS6a	PT2-2	Criticality	Administrative verification of distinguishing visual markings/ identification of 48X and 48Y cylinders within the UF_6 area to ensure that cylinders containing product are not placed on-line to the cascade. Each 48X and 48Y cylinder will have distinguishing feature(s) that identifies product cylinders as not feed cylinders.
IROFS6b	PT2-2	Criticality	Administrative verification of ^{235}U concentration in feed cylinders to ensure that product material is not used as feed material. This is implemented by sampling and assay analysis of feed cylinder contents for uranic enrichment and verification that it is not a product cylinder before being placed on-line to the cascade consistent with the assumptions in the Nuclear Criticality Safety Analyses.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS7	PT2-2	Criticality	Use of passive engineered design control to physically prevent a product cylinder from being placed in a Solid Feed station.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS7	PT2-2	Criticality	Design feature to physically prevent product cylinder within the UF_6 area from being placed in a Solid Feed station. This is implemented by design features unique to feed cylinders and unique to product cylinders to preclude inter-changing feed and product cylinders.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS8	PT3-1 PT3-3 PB2-3 PB3-1 PB3-2 PB4-5 EC4-2	Criticality	A ^{235}U selective gamma monitor system which monitors the Separations Building GEVS filters and electrostatic precipitator. Upon detection of Hi-Hi gamma levels in the SB GEVS filters, this system trips the operating Separations Building GEVS train and automatically starts the standby SB GEVS filter train. Upon detection of Hi-Hi gamma levels in the SB GEVS precipitator, the system bypasses and isolates the electrostatic precipitator.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS8a	PT3-1 PT3-3 PB2-3 PB3-1 PB3-2 EC4-2	Criticality	Automatic trip on ^{235}U selective high-high gamma to ensure no more than a subcritical mass deposited on the SB GEVS filter or precipitator. Upon detection of ^{235}U selective high-high gamma levels in the SB GEVS filter by hardwired, fail-safe, instrumentation, the operating SB GEVS train trips. Upon detection of high-high gamma levels in the SB GEVS precipitator, the trip realigns dampers to bypass and isolate the electrostatic precipitator. Setpoint conservative with respect to assuring subcritical mass as determined from Nuclear Criticality Safety Analyses.
IROFS8b	PB4-5	Criticality	Automatic trip on ^{235}U selective high-high gamma to ensure no more than a subcritical mass deposited on the SB GEVS filter. Upon detection of ^{235}U selective high-high gamma levels in the SB GEVS filter by hardwired, fail-safe, instrumentation, the operating SB GEVS train trips. Setpoint conservative with respect to assuring subcritical mass as determined from Nuclear Criticality Safety Analyses.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS9	PT3-3 PB3-2	Criticality	Product Vent Subsystem Carbon Trap Temperature Alarm - A high carbon trap temperature alarm in the control room, resulting in a operator response to isolate the Product Vent Subsystem and Blending and Sampling Vent Subsystem from the GEVS.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS9	PT3-3 PB3-2	Criticality	Automatic trip of the vacuum pump on carbon trap high temperature to ensure the carbon trap does not pass excessive UF_6. This is implemented with a hardwired, fail-safe, temperature sensor for automatic trip of the Product Vent Subsystem and Blending and Sampling Vent Subsystem vacuum pumps on carbon trap high temperature. Setpoint conservative with respect to temperatures that reflect excessive UF_6 flowrate.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS10	PB4-1 PB4-3	Chemical	Product Liquid Sampling Autoclave Integrity – Product Liquid Sampling Autoclave vessel assembly pressure boundary integrity.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS10	PB4-1 PB4-3	Chemical	Design feature to maintain Product Liquid Sampling Autoclave leak tight integrity. Total autoclave leakage is limited to that assumed in the consequence analyses.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS10	PB4-4	Chemical	Product Liquid Sampling Autoclave Integrity – Product Liquid Sampling Autoclave vessel assembly pressure boundary integrity.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS10	PB4-4	Chemical	Design feature to maintain Product Liquid Sampling Autoclave leak tight integrity. Total autoclave leakage is limited to that assumed in the consequence analyses.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS11	PB4-2	Chemical	A fail-safe hard-wired independent Product Liquid Sampling Autoclave high temperature heater and fan trip.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS11	PB4-2	Chemical	Automatic trip of the autoclave heater and fan on autoclave high internal air temperature to ensure Product Liquid Sampling Autoclave integrity. This is implemented with an automatic fail-safe hardwired temperature sensor for trip (independent from IROFS12) of the heater and fan on high internal air temperature for the Product Liquid Sampling Autoclave integrity. Setpoint conservative with respect to assuring cylinder and autoclave integrity.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS12	PB4-2	Chemical	A diverse, independent, Product Liquid Sampling Autoclave high air pressure trip of Product Liquid Sampling Autoclave heater and fan.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS12	PB4-2	Chemical	Automatic trip of the autoclave heater and fan on autoclave high internal air pressure to ensure Product Liquid Sampling Autoclave integrity. This is implemented with an automatic fail-safe hardwired pressure sensor for trip (independent of IROFS11) of the heater and fan on high air pressure for the Product Liquid Sampling Autoclave integrity. Setpoint conservative with respect to assuring autoclave integrity.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS13	PB4-5	Criticality	Product Liquid Sampling Autoclave HF Detector Trip – On HF release into the product liquid sampling autoclave, this trip will inhibit retraction of the shotbolt which prevents opening the GEVS vent valve.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS13	PB4-5	Criticality	Automatic inhibit prevents opening of GEVS vent valve on high-high HF in the autoclave to ensure no more than a subcritical mass deposited on SB GEVS filter. This is implemented with a hardwired, fail-safe, HF sensor to automatically inhibit retraction of the shotbolt in the Product Liquid Sampling Autoclave (preventing opening the GEVS vent valve) on high-high HF. Setpoint conservative with respect to assuring subcritical mass as determined from Nuclear Criticality Safety Analyses.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS14	{various}	Criticality	Passive engineered control to ensure physical separation of the component from other sources of enriched uranium while in transit, that maintains, by geometry, the specified requirements for criticality safety.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS14a IROFS14b (Ind. Verify)	PT1-1 PT3-4 VR2-3 VR2-4 VR2-5 VR2-6 FR1-1 FR1-2 <others>	Criticality	Administratively restrict proximity of vessels in non-designed locations containing enriched uranic material to ensure subcritical configuration. This is implemented by (in order of preference) use of passive engineered devices (e.g., an IROFS17[x] safe-by-design transfer frame or storage array), temporary physical barriers or visual markings. IROFS14a and IROFS14b are required to be independent verifications. The proximity limit is based on assumptions in the Nuclear Criticality Safety Analyses.
Previous IROFS14			*> IROFS14 (a and b) now related to "use of" the design feature* *> Refer to IROFS17 for the passive engineered feature designs considered within the boundary for applicable sequences that rely on IROFS14a/b*

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS15	N/A	Criticality	Administrative control and associated training of personnel on the movement/ interaction of components containing fissile material and the criticality safety concerns associated with the movement.
IROFS40	{various}	Criticality	Administrative control through the use of procedures and training of storage or interaction of components containing uranium with an independent verification of the storage or interaction.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS15a IROFS15b (Ind. Verify)	PT1-1 PT3-5 VR2-3 VR2-4 VR2-5 VR2-6 FR1-1 FR1-2 <others>	Criticality	Administratively restrict an independent parameter of the criticality sequence to ensure subcritical configuration. IROFS15a and IRFOS15b are required to be independent verifications. This will be implemented by also requiring independence from other IROFS credited with preventative measures in applicable accident sequences. This second independence will consist of verifying absence of independent criticality sequence parameter(s) such as (with preference for passive engineered controls), verifying appropriate use of passive design features (e.g., IROFS18[x] safe-by-design vessel), absence of excessive uranic content, verifying non-enriched material, or verifying the allowance of a specific component in an area to be entered.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS16	PT2-3 PB1-2 PB2-2 CP1-2	Criticality	Administrative control through the use of procedures and training for moderator control program including visual inspection of cylinders, weighing of product cylinders, vacuum testing of cylinders to verify no water content, heel declaration of cylinders from certified vendors, venting control and tracking of individual cylinders, and enhanced training program for cylinder handling.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS16a IROFS16b (Ind. Verify)	PB2-2 CP1-2	Criticality	Administratively limit moderator mass (oil and water) in cylinders containing enriched uranic material to ensure subcriticality. This is implemented by allowing no visible oil and by limiting vapor pressure (IROFS16a and IROFS16b are required to be independent verifications) prior to introducing product, which is based on moderator limitations in the Nuclear Criticality Safety Analyses for product and receiver cylinders.
IROFS16c IROFS16d (Ind. Verify)	PT2-3 PB2-5	Criticality	Administratively limit addition of moderator from system venting to ensure cylinder subcriticality. This is implemented by monitoring instrumentation that provides indication of system vent operations and the operator limiting the total vent-count (IROFS16c and IROFS16d are required to be independent verifications) based on moderator limitations in the Nuclear Criticality Safety Analyses for product and receiver cylinders.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS17	N/A	Criticality	Passive engineered control, i.e., storage array, to ensure physical separation of components that maintains, by geometry, the specified requirements for criticality safety. Design of passive array precludes submergence.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS17a	PT1-1, PT3-4 PT4-1 PB3-4 VR2-4, VR2-6 FR1-1, FR2-1 DS1-1, DS2-1 DS3-1 SW1-1 LW1-2	Criticality	Design of transfer frame such that safe-by-design spacing is maintained to ensure a subcritical configuration. This is implemented by appropriate design considerations for safe spacing, and materials of construction to assure there are no credible means to effect a change in spacing that could result in a non-safe spacing. The safe-design spacing is based on Nuclear Criticality Safety Analyses.
IROFS17b	VR2-3	Criticality	Design of chemical trap storage array such that safe-by-design spacing is maintained to ensure a subcritical configuration. This is implemented by appropriate design considerations for safe spacing and precluding submergence. Baseline design criteria are applied as appropriate to assure there are no credible means to effect a change that could result in a non-safe spacing or submergence of vessels containing enriched uranic material. The safe-design spacing and moderation control is based on Nuclear Criticality Safety Analyses.
IROFS17c	FR1-2 FR2-2 DS1-2 DS2-2 DS3-2 SW1-2 LW1-3	Criticality	Design of waste container storage array such that safe-by-design spacing is maintained to ensure a subcritical configuration. This is implemented by appropriate design considerations for safe spacing and precluding submergence. Baseline design criteria are applied as appropriate to assure there are no credible means to effect a change that could result in a non-safe spacing or submergence of vessels containing enriched uranic material. The safe-design spacing and moderation control is based on Nuclear Criticality Safety Analyses.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS18	N/A	Criticality	Administrative control and associated training of personnel on the storage/interaction of components containing fissile material and the criticality safety concerns associated with storage or interaction.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
			> Refer to IROFS15a/b for admin "use of" storage and interaction *> Reused IROFS18 number for the design requirements for the Passive Engineered Feature (PEC) of "safe-by-design" containers/vessels, which are considered within the boundary of IROFS25.*

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS18a	PT3-5 EC3-1	Criticality	Design of Citric Acid Tank in the Flexible Hose Decontamination System such that safe-by-design geometry is maintained to ensure a subcritical configuration. This is implemented by appropriate design considerations for safe geometry. Baseline design criteria are applied as appropriate to assure there are no credible means to effect a change in geometry that could result in a non-safe geometry (e.g., expansion, deformation, corrosion, breach of confinement and subsequent accumulation of material as a result of a credible event). The safe-design geometrical configuration is based on Nuclear Criticality Safety Analyses.
IROFS18b	PT3-5 EC3-1	Criticality	Design of flexible hose cleaning and washing loop such that safe-by-design volume is maintained to ensure a subcritical configuration. This is implemented by appropriate design considerations for safe volume. Baseline design criteria are applied as appropriate to assure there are no credible means to effect a change in volume that could result in a non-safe volume (e.g., expansion, deformation, corrosion). The safe-design volume is based on Nuclear Criticality Safety Analyses.
IROFS18c	PT3-5 EC3-1	Criticality	Design of sample bottle cleaning and washing loops such that safe-by-design volume is maintained to ensure a subcritical configuration. This is implemented by appropriate design considerations for safe volume. Baseline design criteria are applied as appropriate to assure there are no credible means to effect a change in volume that could result in a non-safe volume (e.g., expansion, deformation, corrosion). The safe-design volume is based on Nuclear Criticality Safety Analyses.
IROFS18d	PT3-5 EC3-1	Criticality	Design of product pump oil waste containers, used during initial draining operations, such that safe-by-design volume or geometry is maintained to ensure a subcritical configuration. This is implemented by appropriate design considerations for safe volume or geometry. Baseline design criteria are applied as appropriate to assure there are no credible means to effect a change in volume/geometry that could result in a non-safe container (e.g., expansion, deformation, corrosion). The safe-design volume and geometry is based on Nuclear Criticality Safety Analyses.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS19	DS1-3 DS2-3 LW1-1 LW2-1 LW3-1 LW5-1	Criticality	Administrative control for criticality mass control including tank sampling, visual inspection of the tank after emptying, batch limits on processing with double batching allowance, limiting the number of product pumps processed per batch and operator training program for the storage/interaction of materials containing fissile material.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS19a IROFS19b (Ind. Verify)	DS1-3 DS2-3 LW1-1 LW2-1 LW3-1 LW5-1	Criticality	Administratively limit the calculated tank uranic mass inventory to ensure a subcritical mass. This is implemented by bookkeeping procedures to limit calculated uranic mass (IROFS19a and IROFS19b are required to be independent verifications) to that assumed in the Nuclear Criticality Safety Analyses for the following Equipment Decontamination and Liquid Effluent Collection and Treatment Systems tanks: degreaser, citric acid, rinse water (2), spent citric acid, degreaser water collection, miscellaneous effluent collection, and the precipitation treatment.
IROFS19c IROFS19d (Ind. Verify)	DS1-3 DS2-3 LW1-1 LW2-1 LW3-1 LW5-1	Criticality	Administratively limit measured uranic mass inventory to ensure a subcritical mass. This is implemented by sampling and measurement to limit tank uranic mass (IROFS19c and IROFS19d are required to be independent verifications) to that assumed in the Nuclear Criticality Safety Analyses for the following Equipment Decontamination and Liquid Effluent Collection and Treatment Systems tanks: degreaser, citric acid, rinse water (2), spent citric acid, degreaser water collection, miscellaneous effluent collection, and the precipitation treatment.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS20	CL3-1	Criticality	Cold trap high temperature interlock for Cold Trap No. 2, Valve. Upon high temperature, this interlock will close this valve, which is in line to the Sub-sampling rig vacuum pump. This will prevent potential flow of UF_6 to the Technical Services Building GEVS in the event that the associated UF_6 cold trap is above an adequate desublimation temperature.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS20	CL3-1	Criticality	Automatic isolation of cold trap on cold trap high temperature to ensure no more than a subcritical mass deposited on the TSB GEVS filter. This is implemented with an automatic hardwired, fail-safe, high temperature sensor that will close the Cold Trap No. 2 Valve, which is in line to the sub-sampling rig vacuum pump. This will prevent potential flow of UF_6 product to the TSB GEVS in the event that the associated UF_6 cold trap is above a conservative desublimation temperature. Setpoint conservative with respect to assuring desublimation temperature.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS21	VR1-1 VR1-2 CL3-1 CP1-1	Criticality	Gamma Monitor Technical Services Building GEVS - ^{235}U selective gamma monitoring system to monitor TSB GEVS filters. Signal automatically trips TSB GEVS fan.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS21	VR1-1 VR1-2 CL3-1 CP1-1	Criticality	Automatic trip of the TSB GEVS on ^{235}U selective high-high gamma to ensure no more than a subcritical mass deposited on the filter. Upon detection of ^{235}U selective high-high gamma levels in the TSB GEVS filter by hardwired, fail-safe, instrumentation, the TSB GEVS trips. Setpoint conservative with respect to assuring critical mass as determined from Nuclear Criticality Safety Analyses.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS22	VR1-2	Criticality	Ventilated Room Vacuum System Carbon Trap Temperature Trip – Automatic trip of the vacuum pump on high temperature of the carbon trap (single train) in Ventilated Room vacuum system.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS22	VR1-2	Criticality	Automatic trip of the vacuum pump on carbon trap high temperature to ensure the carbon trap does not pass excessive UF_6. This is implemented with an automatic hardwired, fail-safe, trip of the Ventilated Room evacuation skid vacuum pump on carbon trap high temperature. Setpoint conservative with respect to temperatures that reflect excessive UF_6 flowrate.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS23	VR1-3 VR2-1	Chemical	Personnel Respiratory Protection – Administrative controls through the use of procedures and training requiring that personnel wear respiratory protection when (1) handling carbon trap material containing SNM, (2) performing positive pressure testing of UF_6 cylinder after repair/replacement of a leaking cylinder component.
IROFS23	VR2-2	Chemical	Personnel Respiratory Protection – Administrative controls through the use of procedures and training requiring that personnel wear respiratory protection when handling sodium fluoride trap material containing Uranic material.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS23a	VR1-3	Chemical	Administrative use of personal respiratory protection to ensure that inhalation of uranic material and HF consequences are low. This is implemented through the use of personal respiratory protection when performing positive pressure testing of UF_6 cylinder after repair/replacement of a leaking cylinder component such that assumptions of the consequence analysis are maintained.
IROFS23b	VR2-1	Chemical	Administrative use of personal respiratory protection to ensure that inhalation of uranic material consequence is low. This is implemented through the use of personal respiratory protection when handling carbon trap material containing uranic material, such that assumptions in the consequence analyses are maintained.
IROFS23b	VR2-2	Chemical	Administrative use of personal respiratory protection to ensure that inhalation of uranic material consequence is low. This is implemented through the use of personal respiratory protection when handling sodium fluoride trap material containing Uranic material such that assumptions in the consequence analyses are maintained.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS24	CL3-3 VR2-2 CL3-2	Chemical	Technical Services Building GEVS Operation – Administrative controls through the use of procedures and training requiring that (1) the Technical Services Building GEVS be connected to an assembly used to remove airborne sodium fluoride fines shall be operating during the handling of chemical dump trap material containing SNM and (2) the TSB GEVS connected to Chemical Lab Hood when UF_6 Sub-sampling Unit is operated.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS24a	VR2-2	Chemical	Administrative establishment of airflow away from the worker to ensure inhalation of uranic material consequences are low. This is implemented through the use of the Technical Services Building GEVS connected to the assembly when handling sodium fluoride trap material containing uranic material. The TSB GEVS shall be operating during this operation, consistent with assumption of the consequence calculation.
IROFS24b	CL3-3	Chemical	Administrative establishment of airflow away from the worker to ensure inhalation of uranic material and HF consequences are low. This is implemented through TSB GEVS connected to Chemical Lab Hood when UF_6 Sub-sampling Unit is operated. The TSB GEVS shall be operating during this operation, consistent with assumption of the consequence calculation.
IROFS24b	CL3-2	Chemical	Administrative establishment of airflow away from the worker to ensure inhalation of uranic material and HF consequences are low. This is implemented through TSB GEVS connected to Chemical Lab Hood when UF_6 Sub-sampling Unit is operated. The TSB GEVS shall be operating during this operation, consistent with assumption of the consequence calculation.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS25	N/A	Criticality	Passive design of Citric Acid Tank in the Flexible Hose Decontamination System, i.e., shape/geometry, to maintain the specified requirements for criticality safety.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS25	PT3-5	Criticality	Administratively control decontamination and waste disposal activities such that the initial transfer of enriched uranic material is made only into safe-by-design containers to ensure subcriticality. This is implemented by restricting initial transfer (i.e., activities that occur prior to bulk solid storage or batch liquid decontamination operations) of enriched uranic material into only "safe-by-design" vessels defined by IROFS18[x], which meet criteria based on the Nuclear Criticality Safety Analyses. These safe-by-design vessels (IROFS18[x]) are also considered within the "boundary" of assuring this IROFS safety function of transferring to a "safe-by-design" container.
Previous IROFS25			*Refer to IROFS18a for passive design requirements of the Citric Acid Tank in the Flexible Hose Decontamination System. "Safe-by-design" containers/vessels (such as this system) are considered within the boundary of IROFS25. See IROFS25 and associated sequences*

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS26	SEISMIC-1 SEISMIC-2 SEISMIC-3	Chemical	Building HVAC system trip following a seismic event. Need to stop HVAC flow from UF_6 Area, Cascade Halls and Product Blending & Sampling Area to outside environment to mitigate consequences.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS26	SEISMIC-1 SEISMIC-2 SEISMIC-3	Chemical	Automatic Building HVAC system trip on detection of seismic event to ensure offsite exposures from building out flow maintain consequences low. This is implemented with an automatic hardwired, fail-safe, seismic trip of the HVAC Systems in the following areas: Process Services Area, Link Corridor Area, Above Cascade Area, UF_6 Handling Area, and Blending and Liquid Sampling Area, consistent with assumptions of the consequence calculation.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS27	SEISMIC-1 SEISMIC-2 SEISMIC-3 TORNADO SNOW Local Precip	Chemical	Building design bases for seismic, tornado, tornado missile, high wind, roof snow load, roof ponding due to local intense precipitation and site flooding due to local intense precipitation. The Uranium Byproduct Cylinders Storage Pad is designed to accommodate the flooding due to local intense precipitation.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS27a IROFS27b	LP-BLD (CR)	Criticality	Design feature of buildings containing enriched uranic material for roof ponding and site flooding due to local intense precipitation, to ensure associated building area subcriticality. This is implemented by designing the building structures (IROFS27a and IROFS27b are required to be independent passive design features) to withstand the effects of local intense precipitation, thus ensuring lack of moderation consistent with the assumptions in the Nuclear Criticality Analyses.
IROFS27c	SEISMIC-1 SEISMIC-2 SEISMIC-3 TORNADO SNOW LP-BLD (T)	Chemical	Design feature of buildings containing UF_6 process systems for seismic, tornado, tornado missile, high wind, roof snow load, and for roof ponding and site flooding due to local intense precipitation, to ensure UF_6 process systems integrity. This is implemented by designing the building structures to withstand the effects of seismic, tornado, tornado missile, high wind, roof snow load, and local intense precipitation, consistent with the assumptions in the bases for the consequence calculations.
IROFS27d	LP-PAD	Chemical	Design feature of the uranium byproduct cylinders (UBC) storage pad for site flooding due to local intense precipitation, to ensure UBC integrity. This is implemented by designing the UBC storage pad to protect the UBCs from the effects of local intense precipitation, consistent with the assumptions in the bases for the consequence calculations.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS28	SEISMIC-5	Chemical	Seismic design basis for Product Liquid Sampling Autoclave.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS28	SEISMIC-5	Chemical	Design feature to maintain Product Liquid Sampling Autoclave leak tight integrity. This is implemented by providing a seismic design of the Product Liquid Sampling Autoclave such that post-event total autoclave leakage is limited to that assumed in the consequence analyses.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS29	N/A	Criticality	Administrative control through the use of procedures and training to control the type of trap media chemicals that are used in the chemical traps.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
{DELETED}	{Various}	Criticality	Portion of the RAI REPLY to NRC: "Upon completion of the design of each of the IROFS, the IROFS boundaries will be defined. In defining the boundaries for each IROFS, LES procedure DP-ISA-1.1, "IROFS Boundary Definition," will be used. This procedure requires the identification of each of the components necessary to ensure the IROFS is capable of performing its specified safety function, including support systems and components." {not stated in RAI Reply:} For the chemical trap weight trip (i.e., IROFS3), maintenance practices to assure assumed material and constituency will be identified as part of that IROFS boundary. As such, Rev 1 IROFS29 will be captured by the DP-ISA-1.1, "IROFS Boundary Definition," process.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS30	N/A	Criticality	Administrative control through the use of procedures and training to control the type of oil used in process vacuum pumps.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS30a	PT2-5 PB2-6	Criticality	Administratively limit hydrocarbon oil (moderator mass) in enriched uranium product to ensure moderation control assumptions are maintained. This is implemented by controlling the type of oil used in all process vacuum pumps to only perfluorinated polyether (PFPE) oil, consistent with moderation assumptions in the Nuclear Criticality Safety Analyses.
IROFS30b	PT2-5 PB2-6	Criticality	Administratively limit hydrocarbon oil (moderator mass) in enriched uranium product to ensure moderation control assumptions are maintained. This is implemented by testing the oil prior to addition to any process vacuum pump to verify not hydrocarbon oil, consistent with moderation assumptions in the Nuclear Criticality Safety Analyses.
IFOFS30c	PT2-5 PB2-6	Criticality	Administratively limit hydrocarbon oil (moderator mass) in enriched uranium product to ensure moderation control assumptions are maintained. This is implemented by testing the oil in all process vacuum pumps for hydrocarbons after bench testing, but before placing vacuum pumps in process systems to verify lack of hydrocarbon oil. This assures operation consistent with moderation assumptions in the Nuclear Criticality Safety Analyses.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS31	N/A	Criticality	Administrative control through the use of procedures and training to require sampling of spent trap contents for total uranium before trap material is transferred and bulk stored in waste containers. Sampling will confirm subcriticality of waste container.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS31a IROFS31b (Ind. Verify)	VR2-7	Criticality	Administratively limit ^{235}U mass in non-safe-by-design solid waste containers to ensure subcriticality. This is implemented by sampling and assay analysis of waste container contents for ^{235}U mass (IROFS31a and IROFS31b are required to be independent verifications) and limiting mass to that assumed in the Nuclear Criticality Safety Analyses before enriched uranic material is transferred and bulk stored in solid waste containers.
IROFS31c IROFS31d (Ind. Verify)	VR2-7	Criticality	Administratively limit ^{235}U mass in non-safe-by-design solid waste containers to ensure subcriticality. This is implemented by bookkeeping procedures to limit calculated uranic mass in bulk solid waste containers (IROFS31c and IROFS31d are required to be independent verifications) to that assumed in the Nuclear Criticality Safety Analyses for solid waste bulking operations.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS32	N/A	Criticality	Use of passive engineered design of the flexible cleaning and washing loops, i.e., shape/geometry, to maintain specified requirements for criticality safety.
IROFS33	N/A	Criticality	Use of passive engineered design of the sample bottle cleaning and washing loops, i.e., shape/geometry, to maintain specified requirements for criticality safety.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
(move to) IROFS25 & IROFS18b & IROFS18c			{ Refer to IROFS25 for "use of" ...} { Refer to IROFS18 for "passive engineered design" }

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS34	N/A	Criticality	Administrative controls through the use of procedures and training to require emptying of pump oil into safe geometry waste containers meeting criticality safety requirements.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
Moved to IROFS25 & IROFS18d			{ Refer to IROFS25 for requirement to use safe geometry container } { Refer to IROFS18d for design requirements on containers }

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS35	FF1-1 FF6-1 FF8-1 FF11-1 FF15-1 FF21-1 FF23-1 FF24-1 FF38-1	Chemical	Fire Barriers prevent propagation of fires into/out of areas containing uranic material.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS35	FF1-1 FF6-1 FF8-1 FF11-1 FF15-1 FF21-1 FF23-1 FF24-1 FF38-1	Chemical	Automatic closure of fire-rated barrier opening protectives (e.g., doors, dampers, penetration seals) to ensure the integrity of area fire barriers prevents fires from propagating into areas containing uranic material. Barriers and protectives will be closed or self-closing (e.g., utilizing fusible links).

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS36	FF1-2 FF5-1 FF6-2 FF7-1 FF8-2 FF11-2 FF16-1 FF16-2 FF21-2 FF23-2 FF25-1 FF25-2 FF38-2 FF42-1 FF43-1 FF43-2 FF44-1	Chemical	Administrative controls through the use of procedures and training associated with preventing severe fire exposures to systems or components of concern. Fire Safety Program: (1) Program bars entry of any bulk flammable fuel/fueling vehicles on-site. This does not include diesel fuel deliveries which will be required to refill the diesel generator fuel tanks. Diesel fuel delivery vehicles will be prohibited from entering the UBC Storage Pad perimeter road, (2) Program to maintain clear cutting of vegetation onsite, (3) Program to control/minimize transient combustible loading in all radiation/ uranium areas, (4) Program to control fire ignition sources (hot work, welding, cutting, grinding, etc.) in all plant areas, (5) Program to limit on-site cylinder movement vehicles to electric drive or diesel-powered with a diesel fuel capacity limit of < 280 L (74 gal), (6) Program limits uranic material liquid and solid waste transfer and packing containers to metal (non-combustible) only. This does not apply to packaging within these containers (e.g., plastic liners), to bags for transporting laundry and similar non- or low-contamination solids, or to laboratory size sample containers (required for maintaining sample purity), (7) Provides a minimum 1 m (3 ft) setback from the CRDB loading dock, (8) Program limits the design of cabling to IEEE-383 fire resistant cabling for all uranic material system power, instrumentation, and control circuits, (9) Limits vehicles allowed onto the UBC Storage Pad area to cylinder movers and other essential vehicles with a fuel capacity limit of < 280 L (74 gal), (10) The sample bottle storage room/vault in the TSB will have no combustibles present in the room, (11) The thermal enclosure surrounding each assay shall be constructed of and insulated with non-combustible materials.

Refer to Revision 2 IROFS36a through IROFS36g in the following Comparison Tables.
Each Rev 1 IROFS36 numbered item (above) will be addressed separately in the following Table comparisons.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS36	FF43-2	Chemical	Administrative controls through the use of procedures and training associated with preventing severe fire exposures to systems or components of concern. Fire Safety Program: (1) Program bars entry of any bulk flammable fuel/fueling vehicles on-site. This does not include diesel fuel deliveries which will be required to refill the diesel generator fuel tanks. Diesel fuel delivery vehicles will be prohibited from entering the UBC Storage Pad perimeter road,

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS36f	FF43-2	Chemical	Administratively limit designated routes for bulk fueling vehicles onsite to ensure UBC cylinder integrity. This is implemented by limiting diesel fuel deliveries to designated routes. Diesel fuel delivery vehicles will be prohibited from entering the UBC Storage Pad perimeter road.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS36	FF44-1	Chemical	Administrative controls through the use of procedures and training associated with preventing severe fire exposures to systems or components of concern. Fire Safety Program: (2) Program to maintain clear cutting of vegetation onsite,

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS36g	FF44-1	Chemical	Administratively limit onsite vegetation fire sources to ensure integrity of important targets. This is implemented by requiring clear cutting of vegetation onsite proximate to buildings and cylinders containing uranic material.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS36	FF1-2 FF6-2 FF8-2 FF11-2 FF16-1 FF16-2 FF38-2	Chemical	Administrative controls through the use of procedures and training associated with preventing severe fire exposures to systems or components of concern. Fire Safety Program: (3) Program to control/minimize transient combustible loading in all radiation/ uranium areas, (10) The sample bottle storage room/vault in the TSB will have no combustibles present in the room,

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS36a	FF1-2 FF6-2 FF8-2 FF11-2 FF16-1 FF16-2 FF38-2	Chemical	Administratively limit transient combustible loading in areas containing uranic material to ensure integrity of uranic material components/containers and limit the quantity of uranic material at risk to ensure consequences to the public are low. Transients will be controlled to limit aggregate combustible load (transient and in-situ) in the area of concern.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS36	ALL	Chemical	Administrative controls through the use of procedures and training associated with preventing severe fire exposures to systems or components of concern. Fire Safety Program: (4) Program to control fire ignition sources (hot work, welding, cutting, grinding, etc.) in all plant areas,

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
{DELETED}			Control of maintenance activities, including implementation of hot-work permits, are part of the high quality management measures supporting the likelihood of fire ignition in a given area, which is assigned as 1 E-2 (e.g., no fire events in 30-years of facility history). Since these management measures are not explicitly assigned to individual fire sequences, and are not credited as preventative measures, assignment as an IROFS is not applicable.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS36	FF7-1 FF42-1	Chemical	Administrative controls through the use of procedures and training associated with preventing severe fire exposures to systems or components of concern. Fire Safety Program: (5) Program to limit on-site cylinder movement vehicles to electric drive or diesel-powered with a diesel fuel capacity limit of < 280 L (74 gal),

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS36c	FF7-1 FF42-1	Chemical	Administratively limit onsite UF_6 cylinder transporters/movers to ensure only use of electric drive or diesel powered with a fuel capacity of less than 280 L (74 gal).

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS36	FF21-2 FF23-2 FF25-1 FF25-2	Chemical	Administrative controls through the use of procedures and training associated with preventing severe fire exposures to systems or components of concern. Fire Safety Program: (6) Program limits uranic material liquid and solid waste transfer and packing containers to metal (non-combustible) only. This does not apply to packaging within these containers (e.g., plastic liners), to bags for transporting laundry and similar non- or low-contamination solids, or to laboratory size sample containers (required for maintaining sample purity),

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS36d	FF21-2 FF23-2 FF25-1 FF25-2	Chemical	Administratively limit transient combustible loading in areas containing uranic material to ensure integrity of uranic material components/containers and limit the quantity of uranic material at risk to ensure consequences to the public are low. Transients will be controlled to limit aggregate combustible load (transient and in-situ) in the area of concern. Liquid and solid waste transfer and packing containers (except as noted below) are limited to metal only. Transfer and packing container restriction does not apply to packaging within these containers (e.g., plastic liners), to bags for transporting laundry and similar non- or low-contamination solids, or to laboratory size sample containers (required for maintaining sample purity).

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS36	FF5-1	Chemical	Administrative controls through the use of procedures and training associated with preventing severe fire exposures to systems or components of concern. Fire Safety Program: (7) Provides a minimum 1 m (3 ft) setback from the CRDB loading dock,

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS36b	FF5-1	Chemical	Administratively limit storage of UF_6 cylinders in the CRDB to ensure $\geq$ 1 m (3 ft) setback from the edge of the loading dock.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS36	(ALL)	Chemical	Administrative controls through the use of procedures and training associated with preventing severe fire exposures to systems or components of concern. Fire Safety Program: (8) Program limits the design of cabling to IEEE-383 fire resistant cabling for all uranic material system power, instrumentation, and control circuits, (11) The thermal enclosure surrounding each assay shall be constructed of and insulated with non-combustible materials.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
{DELETED}		Chemical	>> Design commitment to IEEE-383 added to SAR 3.1.7.C, Baseline Design Criteria, Fire Protection. In-situ fire loading impacts are adequately captured by the IROFS Boundary Definition process that will be implemented for all IROFS, including IROFS related to fire barrier and uranic material component/container integrity. >> Design commitment to thermal enclosure surrounding each assay (centrifuge) shall be constructed of and insulated with non-combustible materials to be added to SAR 3.3.1.1 (and is considered a fire barrier addressed by IROFS35).

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS36	FF43-1	Chemical	Administrative controls through the use of procedures and training associated with preventing severe fire exposures to systems or components of concern. Fire Safety Program: (9) Limits vehicles allowed onto the UBC Storage Pad area to cylinder movers and other essential vehicles with a fuel capacity limit of < 280 L (74 gal),

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS36e	FF43-1	Chemical	Administratively limit transient combustible loading on the UBC Storage Pad to ensure cylinder integrity. This is implemented by limiting vehicles allowed onto the pad to cylinder movers and essential vehicles with a fuel capacity limit of less than 280 L (74 gal) and maintaining storage pad drain-off to ensure no excessive fuel pooling.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS37	FF25-2	Chemical	Fire detection and alarm system with ventilation shutoff interlock and limited building leakage.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS37	FF25-2	Chemical	Automatic hardwired, fail-safe, trip of the Ventilated Room HVAC and isolation from TSB GEVS on smoke detection and Ventilated Room design leakage limited to ensure offsite exposure from building out flow maintains consequences to the public low.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS38	TT2-2 UF2-2 PT2-4 PB2-4	Chemical	Cylinder Over fill Administrative Control– Through the use of procedures and training, administratively control cylinder over fill by verifying that cylinder weight is within specified limits once per shift.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS38a IROFS38b (Ind. Verify)	TT2-2 UF2-2 PT2-4 PB2-4	Chemical	Administratively limit the cylinder fill mass to ensure cylinder integrity. This is implemented at Tails Low Temperature Take-off Stations, Feed Purification Low Temperature Take-off Stations, Product Low Temperature Take-off Stations, and Product Blending Receiver Stations by verifying that cylinder weight is within specified trending limits (IROFS38a and IROFS38b are required to be independent verifications). Weight limit conservative with respect to assuring cylinder integrity.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS41	SEISMIC-1 SEISMIC-2 SEISMIC-3	Chemical	Limitation on building leakage to outside environment following HVAC trip (IROFS26).

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS41	SEISMIC-1 SEISMIC-2 SEISMIC-3	Chemical	Design features to ensure building leak integrity. This is implemented by design considerations applied to the UF_6 Area, Cascade Halls and Blending & Liquid Sampling Area that require building integrity during a seismic event (IROFS27) and limiting building leakage to outside areas (in conjunction with IROFS26 HVAC trip) to ensure offsite exposure from building outflow maintains consequences to the public low.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS42	PB4-4	Chemical	Administrative control through use of procedures to require product cylinders to be weighed in the blending and sampling area before placement into the Product Liquid Sampling Autoclave. This allows determination that there is no overfill condition before heating.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS42	PB4-4	Chemical	Administratively limit the cylinder fill mass to ensure cylinder integrity. This is implemented by determining the weight of product cylinders before placement and heating in the Product Liquid Sampling Autoclave. Weight limit conservative with respect to assuring cylinder integrity.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS43	CL3-3	Chemical	High Temperature Trip of Hot Box Heater – Temperature switch for automatic, fail-safe, high temperature trip of hot box heaters at UF_6 Sub-sampling Unit.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS43	CL3-3	Chemical	Automatic trip of UF_6 sub-sampling unit hotbox heater on high hotbox internal temperature to ensure sample bottle integrity. This is implemented with a temperature switch for automatic, hardwired, fail-safe, high temperature trip of hotbox heater at UF_6 sub-sampling unit. Setpoint conservative with respect to assuring sample bottle integrity.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS44	INTERNAL FLOODING FROM ON-SITE TANKS AND WATER IMPOUND-MENTS	Chemical / Criticality	Design bases for above ground liquid storage tanks and water impoundments not to pose a flooding risk that could damage critical structures and/or systems under an assumed catastrophic failure and release of full contents.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS44a IROFS44b (Ind. Verify)	INTERNAL FLOODING FROM ON-SITE TANKS AND WATER IMPOUND-MENTS (CR)	Criticality	Design features protecting building areas containing enriched uranic material from internal flooding due to failure of on-site tanks and water impoundments to ensure associated building area subcriticality. This is implemented by passive designed features to assure tanks and water impoundments are designed (IROFS44a and IROFS44b are required to be independent passive design features) to not result in internal flooding of building areas containing enriched uranic material, consistent with the assumptions in the Nuclear Criticality Analyses.
IROFS44c IROFS44d (Ind. Verify)	INTERNAL FLOODING FROM ON-SITE TANKS AND WATER IMPOUND-MENTS (T)	Chemical	Design features protecting areas containing UF_6 process systems from internal flooding damage due to failure of on-site tanks and water impoundments to ensure UF_6 process systems integrity. This is implemented by passive designed features to assure tanks and water impoundments are designed (IROFS44c and IROFS44d are required to be independent passive design features) to not result in internal flooding damage to UF_6 process systems (which includes the UBCs), consistent with the assumptions in the bases for the consequence calculations.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFS45	N/A	Criticality	Administrative control through the use of procedures and training for the storage of product cylinders in those areas where product is produced, transported or stored with an independent verification of the storage.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFS45a IROFS45b (Ind. Verify)	PB1-3 RD1-1	Criticality	Administratively store cylinders containing enriched uranium only in horizontal, co-planar (i.e., non-stacked), condition to ensure subcritical geometry. Physical separation as assumed in the Nuclear Criticality Safety Analyses is implemented by only storing Product cylinders in a horizontal co-planer (i.e., one high) array (IROFS45a and IROFS45b are required to be independent verifications).
IROFS45c IROFS45d (Ind. Verify)	PB1-3 RD1-1	Criticality	Administratively limit movement from a designed location of only one cylinder containing enriched uranium at any time in the CRDB and Blending and Liquid Sampling Area (one concurrent lift in each area allowed) to ensure subcritical geometry. Maintaining conditions such that only one cylinder could be inadvertently placed on horizontal storage array of other product cylinders (IROFS45c and IROFS45d are required to be independent verifications) provides a subcritical geometry as assumed in the Nuclear Criticality Safety Analyses (which analyses one stacked cylinder as a subcritical array). This is implemented by restriction of movement and storage of product cylinder such that no more than one product cylinder could be inadvertently or accidentally stacked.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFSC1	DC1-1 DC1-2 DC1-3 DC1-4 DC1-9	Chemical/ Criticality	Administrative control through the use of procedures and training to control and independently verify proper filling of NaF traps.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFSC1b	DC1-1 DC1-2 DC1-3 DC1-4	Chemical	Administratively maintain contingency dump NaF trap fill and use to ensure carbon trap does not saturate on operation of contingency dump. This is implemented by maintaining appropriate fill of NaF in the traps and replacement of the NaF trap prior to becoming spent due to excessive dump operation to limit the accumulation of UF_6 in the contingency dump carbon trap such that assumptions in the consequence analyses are maintained.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFSC1	DC1-1 DC1-2 DC1-3 DC1-4 DC1-9	Chemical/ Criticality	Administrative control through the use of procedures and training to control and independently verify proper filling of NaF traps.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFSC1a IROFSC1c (Ind. Verify)	DC1-9	Criticality	Administratively maintain contingency dump NaF trap fill to ensure no more than a subcritical mass accumulation during contingency dump. This is implemented by maintaining appropriate fill of NaF in the traps (IROFSC1a and IROFSC1c are required to be independent verifications) to limit the accumulated mass of UF_6 in the contingency dump NaF trap consistent with assumptions in the Nuclear Criticality Safety Analyses.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFSC6	EC3-1	Criticality	Administrative controls with independent verification to ensure the cascade enrichment control device setting calculation is correctly calculated and implemented.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFSC6a IROFSC6b (Ind. Verify)	EC3-1	Criticality	Administratively calculate and set the cascade enrichment control device to ensure ^{235}U enrichment $\leq 5\ ^{w}/_{0}$ to ensure subcriticality within the designed process and analyzed activities. This is implemented by ensuring the calculation performed accurately, and the associated cascade enrichment control device setting is appropriately implemented (IROFSC6a and IROFSC6b are required to be independent verifications). The $5\ ^{w}/_{0}$ limit is based on the NEF Materials License limit and consistent with the Nuclear Criticality Safety Analyses to ensure subcriticality within the designed process and analyzed activities.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFSC7	EC3-1	Criticality	Administrative controls for verification of cascade enrichment through assay enrichment sampling.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFSC7	EC3-1	Criticality	Administratively verify ^{235}U enrichment is limited to $\leq 5\ ^{w}/_{0}$ to ensure subcriticality in within the designed process and analyzed activities. This is implemented by periodic assay enrichment sampling. The $5\ ^{w}/_{0}$ limit is based on the NEF Materials License limit and consistent with the Nuclear Criticality Safety Analyses to ensure subcriticality within the designed process and analysed activities.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFSC14	TP7-4	Criticality	Enhanced admin controls on weight of centrifuge prior to post mortem.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFSC14a IROFSC14b (Ind. Verify)	TP7-4	Criticality	Administratively limit the uranic mass (weight of post-mortem centrifuge machine) to ensure subcritical mass upon transfer to an unsafe geometry container. This is implemented by weighing the post-mortem centrifuge machine to determine uranic mass content (IROFSC14a and IROFSC14b are required to be independent verifications) to ensure subcritical mass prior to transfer to a container not safe-by-geometry. Mass limit conservative with respect to subcritical mass determined from Nuclear Criticality Safety Analyses.

Existing IROFS from Revision 1

Rev 1 IROFS	Accident Sequence(s)	Type of Accident	Description of Safety Function
IROFSC15	TP8-1	Chemical	Feed/take-off vessel capillary over-temperature trip isolates heat tracing.
IROFSC16	TP8-1	Chemical	Feed/take-off vessel high temperature trip isolates heat tracing.

Revised IROFS Proposed for Revision 2

Rev 2 IROFS	Accident Sequence(s)	Type of Accident	IROFS Safety Function / IROFS Description
IROFSC15	TP8-1	Chemical	Automatic trip of the Centrifuge Test Facility feed/take-off vessel heat tracing on high temperature to ensure feed/take-off vessel integrity. This is implemented with a capillary temperature sensor for automatic, hardwired, fail-safe, high temperature trip of the Centrifuge Test Facility feed/take-off vessel heat trace. Setpoint based on centrifuge integrity calculation.
IROFSC16	TP8-1	Chemical	Automatic trip of the Centrifuge Test Facility feed/take-off vessel heat tracing on high temperature to ensure feed/take-off vessel integrity. This is implemented with a temperature sensor for automatic, hardwired, fail-safe, high temperature trip of the Centrifuge Test Facility feed/take-off vessel heat trace. Setpoint conservative with respect to assuring feed/take-off vessel integrity.