

**Table 1 – Relationship Between Criticality IROFS and Parameter-Safe Values/Safety Criteria/Nuclear Criticality Safety (NCS) Supporting Analyses**

Criticality IROFS	IROFS Description	Control Parameter/ Reference	Comment
IROFS3	Automatic trip of the vacuum pump on carbon trap high weight to ensure the carbon trap does not become saturated with UF <sub>6</sub> .	Uranium Mass/ SAR Table 5.1-1	Trip of vacuum pump prevents a source of uranium to the GEVS from the carbon trap due to UF <sub>6</sub> saturation preventing a criticality in the GEVS.
IROFS6a	Administrative verification of distinguishing visual markings/ identification of 48X and 48Y cylinders within the UF <sub>6</sub> area to ensure that cylinders containing product are not placed on-line to the cascade.	5 % Enrichment (6 % enrichment used in NCS Supporting Analyses)/ SAR Table 5.1-2	IROFS prevents re-enrichment of product. Product material is prevented from being used as feed material.  Ensures maximum enrichment assumption of the NCS Supporting Analyses is not exceeded.
IROFS6b	Administrative verification of <sup>235</sup> U concentration in feed cylinders to ensure that product material is not used as feed material by sampling and assay analysis.	5 % Enrichment (6 % enrichment used in NCS Supporting Analyses)/ SAR Table 5.1-2	IROFS prevents re-enrichment of product. Product material is prevented from being used as feed material.  Ensures maximum enrichment assumption of the NCS Supporting Analyses is not exceeded.
IROFS7	Design feature to physically prevent product cylinder within the UF <sub>6</sub> area from being placed in a Solid Feed station.	5 % Enrichment (6 % enrichment used in NCS Supporting Analyses)/ SAR Table 5.1-2	IROFS prevents re-enrichment of product. Product material is prevented from being used as feed material.  Ensures maximum enrichment assumption of the NCS Supporting Analyses is not exceeded.
IROFS8a	Automatic trip on <sup>235</sup> U selective high-high gamma to ensure no more than a subcritical mass deposited on the SB GEVS filter or precipitator.	Uranium Mass/ SAR Table 5.1-1	
IROFS8b	Automatic trip on <sup>235</sup> U selective high-high gamma to ensure no more than a subcritical mass	Uranium Mass/	

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	deposited on the SB GEVS filter.	SAR Table 5.1-1	
IROFS9	Automatic trip of the vacuum pump on carbon trap high temperature to ensure the carbon trap does not pass excessive UF <sub>6</sub> .	Uranium Mass/ SAR Table 5.1-1	High carbon trap temperature could cause release of UF <sub>6</sub> to the GEVS. Trip of vacuum pump prevents a source of uranium to the GEVS from the carbon trap preventing a criticality in the GEVS.
IROFS13	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.	Uranium Mass/ SAR Table 5.1-1	IROFS prevents a source of uranium to the GEVS from the autoclave if a product cylinder were to release UF <sub>6</sub> .
IROFS14a	Administratively restrict proximity of vessels in non-designed locations containing enriched uranic material to ensure subcritical configuration.	Physical Separation/NCS Supporting Analyses described in ISA Summary Sections 3.5.13.2.4, 3.5.14.5, 3.5.15.4	Ensures physical separation assumptions of the NCS Supporting Analyses remain bounding.
IROFS14b	Administratively restrict proximity of vessels in non-designed locations containing enriched uranic material to ensure subcritical configuration.	Physical Separation/ NCS Supporting Analyses described in ISA Summary Sections 3.5.13.2.4, 3.5.14.5, 3.5.15.4	Ensures physical separation assumptions of the NCS Supporting Analyses remain bounding.
IROFS15	Administratively restrict an independent parameter of the criticality sequence to ensure subcritical configuration by preventing additional transfer of enriched uranic material to another container if that container contains enriched uranic material	Volume/ SAR Table 5.1-1	IROFS restricts the transfer of enriched uranic material into non-safe-by-design containers. The safe-by-design containers control mechanism is by volume.

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	and is a non-safe-by-design container.		
IROFS16a	Administratively limit moderator mass (oil and water) in cylinders containing enriched uranic material to ensure subcriticality by allowing no visible oil and by limiting cylinder vapor pressure.	Moderator/ SAR Table 5.1-2	IROFS limits a portion of the total allowable mass of hydrogen, which can be present in a product cylinder stored in arrays of cylinders under dry conditions. This portion consists of the hydrogenous material and/or free water contained in the cylinder heel.  Ensures moderation assumptions of the NCS Supporting Analysis are not exceeded.
IROFS16c	Administratively limit addition of moderator from system venting to ensure cylinder subcriticality using an independent means of monitoring system venting from that used for IROFS16d.	Moderator/ SAR Table 5.1-2	IROFS limits a portion of the total allowable mass of hydrogen, which can be present in a product cylinder stored in arrays of cylinders under dry conditions. This portion consists of the gaseous HF entering the cylinder from the cascades and water vapor due to process system air in-leakage.  Ensures moderation assumptions of the NCS Supporting Analysis are not exceeded.
IROFS16d	Administratively limit addition of moderator from system venting to ensure cylinder subcriticality using an independent means of monitoring system venting from that used for IROFS16c.	Moderator/ SAR Table 5.1-2	IROFS limits a portion of the total allowable mass of hydrogen, which can be present in a product cylinder stored in arrays of cylinders under dry conditions. This portion consists of the gaseous HF entering the cylinder from the cascades and water vapor due to process system air in-leakage.  Ensures moderation assumptions of the NCS Supporting Analysis are not exceeded.

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<b>Criticality IROFS</b>	<b>IROFS Description</b>	<b>Control Parameter/ Reference</b>	<b>Comment</b>
IROFS19a	Administratively limit the calculated tank uranic mass inventory to ensure a subcritical mass using bookkeeping procedures.	Uranium Mass/ SAR Table 5.1-1	
IROFS19c	Administratively limit measured tank uranic mass inventory to ensure a subcritical mass by performing independent sampling and measurement.	Uranium Mass/ SAR Table 5.1-1	
IROFS19d	Administratively limit measured tank uranic mass inventory to ensure a subcritical mass by performing independent sampling and measurement.	Uranium Mass/ SAR Table 5.1-1	
IROFS20	Automatic isolation of cold trap on cold trap high temperature to ensure no more than a subcritical mass deposited on the TSB GEVS filter.	Uranium Mass/ SAR Table 5.1-1	High cold trap temperature could cause release of UF <sub>6</sub> to the TSB GEVS since the cold trap would not be sublimating the gaseous UF <sub>6</sub> in the process stream. Automatic isolation of cold trap prevents a source of uranium to the TSB GEVS from the cold trap preventing a criticality in the TSB GEVS.
IROFS21	Automatic trip of the TSB GEVS on <sup>235</sup> U selective high-high gamma to ensure no more than a subcritical mass deposited on the filter.	Uranium Mass/ SAR Table 5.1-1	
IROFS22	Automatic trip of the vacuum pump on carbon trap high temperature to ensure the carbon trap does not pass excessive UF <sub>6</sub> .	Uranium Mass/ SAR Table 5.1-1	High carbon trap temperature could cause release of UF <sub>6</sub> to the TSB GEVS. Trip of vacuum pump prevents a source of uranium to the TSB GEVS from the carbon trap preventing a criticality in the TSB GEVS.

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IROFS27a IROFS27b	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.	Reflection and Moderator/ See Comment	Ensures reflection and moderation assumptions of each NCS Supporting Analysis are not exceeded.
IROFS30a	Administratively limit hydrocarbon oil (moderator mass) in enriched uranium product to ensure moderation control assumptions are maintained by controlling the type of oil used in process vacuum pumps.	Moderator/ SAR Table 5.1-2	<p>IROFS limits a portion of the total allowable mass of hydrogen, which can be present in a product cylinder stored in arrays of cylinders under dry conditions. This portion consists of the hydrocarbon oil in the cylinder due to oil ingress from the process vacuum pumps through the use of only fully fluorinated oil in the process vacuum pumps.</p> <p>Ensures moderation assumptions of the NCS Supporting Analyses are not exceeded.</p>
IROFS30b	Administratively limit hydrocarbon oil (moderator mass) in enriched uranium product to ensure moderation control assumptions are maintained by verifying, through test prior to addition of oil, that process vacuum pump oil is not hydrocarbon oil.	Moderator/ SAR Table 5.1-2	<p>IROFS limits a portion of the total allowable mass of hydrogen, which can be present in a product cylinder stored in arrays of cylinders under dry conditions. This portion consists of the hydrocarbon oil in the cylinder due to oil ingress from the process vacuum pumps through the use of only fully fluorinated oil in the process vacuum pumps.</p> <p>Ensures moderation assumptions of the NCS Supporting Analyses are not exceeded.</p>

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IROFS30c	Administratively limit hydrocarbon oil (moderator mass) in enriched uranium product to ensure moderation control assumptions are maintained by verifying, through test (after oil addition) prior to placing vacuum pumps in process system, that process vacuum pump oil is not hydrocarbon oil.	Moderator/ SAR Table 5.1-2	IROFS limits a portion of the total allowable mass of hydrogen, which can be present in a product cylinder stored in arrays of cylinders under dry conditions. This portion consists of the hydrocarbon oil in the cylinder due to oil ingress from the process vacuum pumps through the use of only fully fluorinated oil in the process vacuum pumps.  Ensures moderation assumptions of the NCS Supporting Analyses are not exceeded.
IROFS31a	Administratively limit <sup>235</sup> U mass in non-safe-by-design solid waste containers to ensure subcriticality by performing independent sampling and assay analysis.	Uranium Mass/ SAR Table 5.1-1	
IROFS31b	Administratively limit <sup>235</sup> U mass in non-safe-by-design solid waste containers to ensure subcriticality by performing independent sampling and assay analysis.	Uranium Mass/ SAR Table 5.1-1	
IROFS31c	Administratively limit <sup>235</sup> U mass in non-safe-by-design solid waste containers to ensure subcriticality using bookkeeping procedures.	Uranium Mass/ SAR Table 5.1-1	

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IROFS45	To ensure subcritical geometry, prior to moving a cylinder containing enriched uranium in the CRDB or the Blending and Liquid Sampling Area, verify that the stored cylinders containing enriched uranium in these areas are in a horizontal, coplanar (i.e., non-stacked), condition and that no other cylinder containing enriched uranium is in movement in the associated area	Physical Separation and Configuration/ NCS Supporting Analysis described in ISA Summary Section 3.4.4.8.1	Ensures physical separation and configuration assumptions of the NCS Supporting Analysis are satisfied.
IROFSC6	Administratively calculate and set the cascade enrichment control device in accordance with the calculation to ensure $^{235}\text{U}$ enrichment $\leq 5\%$ to ensure subcriticality within the designed process and analyzed activities.	5% Enrichment (6% enrichment used in NCS Supporting Analyses)/ SAR Table 5.1-2	Ensures maximum enrichment assumption of the NCS Supporting Analyses is not exceeded.