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Disclaimer:

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Accelerated Basin De-Inventory Maximum Fissile Estimate

The Accelerated Basin De-inventory (ABD) program increases processing of Spent Nuclear Fuel (SNF) in H-Canyon to accelerate the closure of L Basin. The dissolved SNF will be dispositioned to Sludge Batches that will be processing in the Defense Waste Processing Facility and converted to glass. The fissile glass loading directly impacts the amount of glass canisters made. This memorandum provides an estimated maximum quantity of total fissile expected to be transferred to a Sludge Batch to support increasing the fissile glass loading and thus reducing the number of canisters created across the lifetime of the ABD mission.

Discussion

H-Canyon plans to process 18 6.4D equivalents per year that will be discarded every 18 months to a Sludge Batch. HFIR, 1CU, and FCA solution have the highest concentration of fissile material in the ABD program.

Though FCA is a limited campaign and 1CU is discrete material that is not expected to be generated under ABD, if H-Canyon was to process 20 6.4D HFIR batches in a year then ≈700 kg of fissile would be generated. As sludge batches are expected to occur every 18 months, a total of 30 6.4D HFIR batches, equivalent to ≈ 1,048 kgs, would be generated. To account for an unplanned condition, like missing a Sludge Batch window, that could result in a greater quantity of material being sent to a later sludge batch, the estimates of the total fissile mass was increased by a factor of 1.5. The addition of the 1.5 uncertainty factor would result in **≈1,572 kg of fissile**.

It is not likely that only HFIR would be processed under ABD. Therefore, the FCA, 1CU, HFIR and MTR discard to Sludge Batch 12 was considered. Based on the expected processing and discard limitations it is expected that only one-half of the 1CU and FCA material would be transferred to any one sludge batch. SRNS-E1121-2023-00006, Rev. 0 (Ref. 1) and SRNS-E1121-2023-00005 (Ref. 2) document the concentrations and volumes of FCA, 1CU, HFIR and MTR solutions which could be transferred to the Tank Farm during Sludge Batch 12. This would result in 1,025 kg of total fissile to be transferred to the Sludge Batch.

References

1. J. R. Mellon, "Waste Projections for ABD Solution to be Discarded to Sludge Batch 12," Savannah River Nuclear Solutions, Aiken, SC, SRNS-E1121-2023-00006, Rev. 0, 2023

2. J. R. Mellon, "Fast Critical Assembly Waste Projections for H-Canyon Disposal to Sludge Batch 12 and 13," Savannah River Nuclear Solutions, Aiken, SC, SRNS-E1121-2023-00005, Rev. 0, 2023