Waste Minimization Efforts at the H-Canyon Nuclear Materials Processing Facility Located at the Savannah River Site - 15535

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ABSTRACT

During the last decade, the H-Canyon at the Savannah River Site (SRS) has employed various means to minimize liquid waste generation and/or to segregate liquid waste that favors generation of low level vs high level wastes. The primary drivers were cost reduction and support of SRS liquid waste tank farm feed to the SRS's Defense Waste Processing Facility. Recent High Level Waste (HLW) volume restrictions (transfers of liquid waste from the H-Canyon to the SRS's Liquid Waste System) imposed on H-Canyon have renewed waste minimization efforts. For the next several years, H-Canyon is faced with a HLW transfer reduction of approximately 65% (reduced from approximately 300,000 gallons to 100,000 gallons). This comes at a time when H-Canyon (and a companion facility named HB-Line) are about to begin executing two high profile missions.

INTRODUCTION

A combination of safety basis changes, synergy with other missions and physical modifications have been employed that will enable Spent Nuclear Fuel (aka Used Nuclear Fuel) and Pu Disposition activities to continue.

The H-Canyon is a large heavily shielded remotely operated facility that generates various solid and liquid waste streams. Its companion facility, known as HB-Line, is a contact-handled facility whereby materials are processed in glove-boxes. The HB-Line also generates various solid and liquid waste streams but is dependent on the H-Canyon to properly disposition it's liquid waste streams.

The H-Canyon and HB-Line have two high profile missions that have been in the preparation stages for several years. The HB-Line mission will produce plutonium oxide meeting the MOX Fuel Form Fabrication (MFFF) fuel specification. This will accomplish two goals (1 disposition DOE Environmental Management plutonium and 2) provide early plutonium feed for the MFFF). The H-Canyon is preparing to resume the HEU Blend Down Program, whereby Highly Enriched Uranium (HEU) (derived from spent nuclear fuel stored on-site at the L-Basin) is blended with Natural Uranium (NU) to produce Low Enriched Uranium that is then provided to the Tennessee Valley Authority (TVA) for the production of commercial reactor fuel. This will be the second blend-down campaign conducted by the H-Canyon.

Previous waste minimization methods employed by the Canyon primarily resulted in the "re-plumbing" of the various unit operations that make up the H-Canyon processes. The Canyon is highly reconfigurable and is well suited for making rerouting changes. These changes were primarily focused on segregating liquid waste to favor generation of low level vs high level wastes. The changes were primarily low-tech, but did involve "flowsheet" changes that required investigation and documentation by the Savannah River National Laboratory (SRNL). Current and future changes will involve even more engineering and Savannah River Nuclear Solutions (SRNS – the primary operating contractor at SRS) and SRNL resources (the "Laboratory" which is an extension of the primary contractor SRNS).

Of the changes to be investigated and presented to the audience, one is particularly interesting since it will take advantage of the synergy between H-Canyon and HB-Line campaigns. H-Canyon will attempt to recycle a nitric acid resin column raffinate stream from HB-Line as chemical make-up for the dissolution of spent fuel. A major challenge is the presence of plutonium losses (from HB-Line) in the raffinate material; this additional plutonium (if not properly protected against in the Documented Safety Analysis) could cause a reflux condition within the H-Canyon mixer-settler banks leading to a criticality condition. Other changes to be investigated in the H-Canyon and presented (as time permits) to the audience are detailed later.

Using photos and other media, the presenter will illustrate the methods employed and the lessons learned during implementation of the waste minimization efforts. Anyone working with chemical processing facilities that are facing waste restrictions or need to reduce costs will find this discussion informative and useful.

DESCRIPTION

This paper describes projected liquid waste volumes, improvement actions that are credited in the volume projections for each year, and the improvement actions that are needed in preparation for succeeding years.

The liquid waste volume limit for transfers to the Liquid Waste Tanks in FY15 have been recently established at 150,000 gallons (Reference 3). The limits for FY16 through FY19 are projected at 105,000 gallons per year and are expected to increase to 300,000 gallons for FY20 and beyond. H-Canyon and HB-Line have established a planning case (Reference 4) that projects PuO_2 processing rates for HB-Line sufficient to total 3,700 kg of plutonium processed by the end of FY22 and Spent Fuel Dissolving rates sufficient to complete 87 dissolver batches by the middle of FY24. Actual end dates are predicated on several factors including actual processing rates, funding and available liquid waste volume limits.

This paper presents the timing and implementation of the improvements to ensure the H-Area Tank Farm (HTF) liquid waste volume limits are met while supporting the planning case for PuO_2 production and SNF dissolutions. The liquid waste volumes forecast in this plan depend on successful on-schedule implementation of specified liquid waste minimization improvements.

Other initiatives have been identified to further minimize liquid waste generation. These include scrubbing alpha emitters from the HB-Line Column Waste such that it can be sent to Saltstone (grouting facility) as Low Level Waste (LLW), qualifying the Low Activity Waste (LAW) stream as LLW, recycle of HB-Line Filtrates to the HB-Line feed, use of an alternate reductant in H-Canyon solvent extraction processing, and denitration of H-Canyon waste streams. If H-

Canyon and HB-Line production remains restrained by operational and funding restrictions, these may not be needed. However with the desire to increase production rates if funding allows and the always present potential for operational difficulties in the Tank Farm that could result in further liquid waste volume limitations, it would be prudent to invest resources to study the feasibility and potential benefit of some of these initiatives.

Planning cases for PuO_2 production and Spent Nuclear Fuel (SNF) dissolving, along with the projected liquid waste volumes, are shown in the following charts.

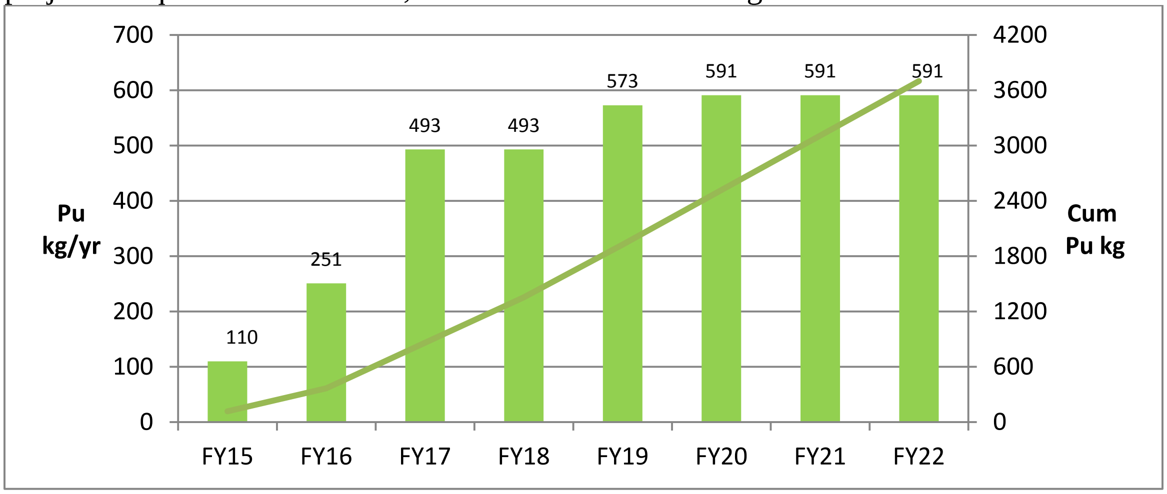

Figure 1. AFS-2 Plutonium Oxide Production in HB-Line

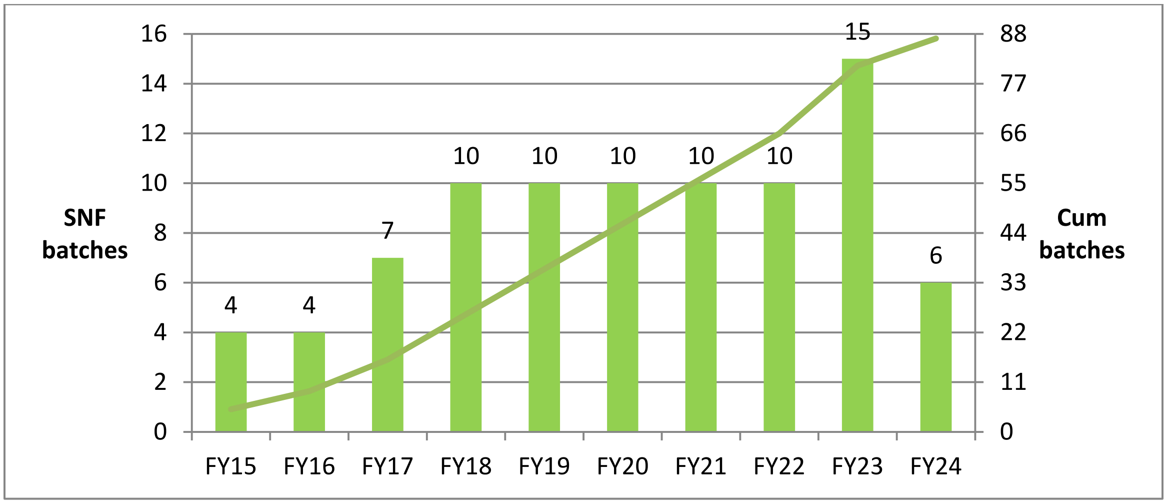

Figure 2. Spent Fuel Dissolver Batches in H-Canyon

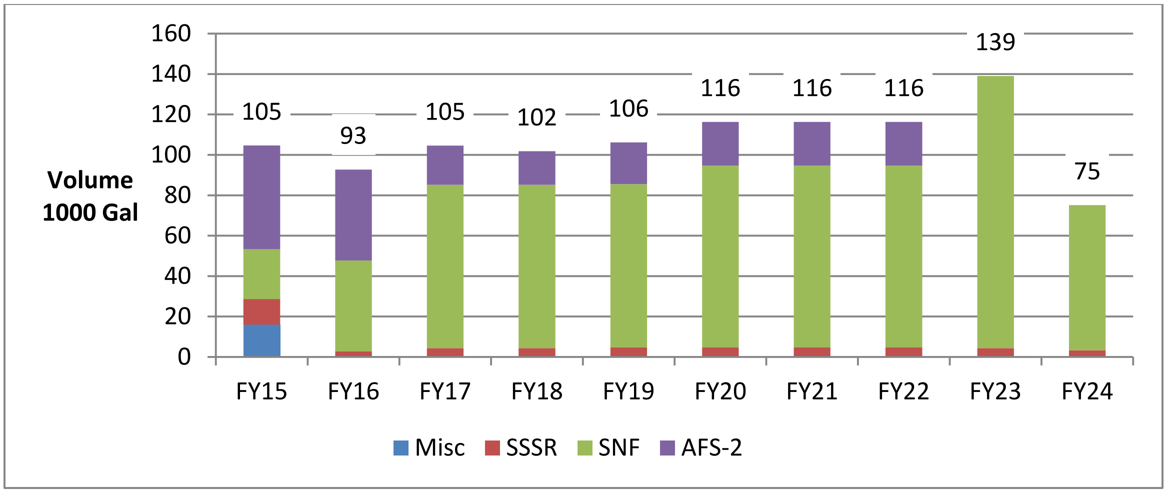

Figure 3. Liquid Waste Volume Sent to HTF Tank 39

FY14 – Year End Projection

H-Canyon SNF Dissolving:	1 Dissolver Batches, 0 First Cycle Runs
HB-Line PuO_2 Production:	3 kg of Pu
Liquid Waste Volume Limit:	50,000 gallons
Liquid Waste Volume Forecast:	32,000 gallons

Implemented improvements that contributed to achieving forecast volume

- Improved gram tracking in Canyon sumps
- Procedures to temporarily suspend operation of the ammonia scrubber

Actions that generated or will generate liquid waste to HTF Tank 39 in FY14

- Processing SSSR material – about 23,000 gallons of neutralized waste.
- Flush of WC PVV Filter (9,000 gallons)

In addition to the improvements credited above, the key action initiated in FY14 and to be completed in FY15 is the effort to return the Acid Recovery Unit (ARU) to service. This is necessary to enable effective acid stripping of many of the liquid streams in FY15 (typically from sump flushes, solvent washes and liquid sample returns from lab analyses) and several other waste streams in FY16 and beyond. This will result in neutralized waste volume savings of about 20,000 gallons in FY15, more than 60,000 gallons in FY16, and over 100,000 per year in FY17 and afterward.

The Warm Canyon (WC) Process Vessel Vent (PVV) Filter was flushed in late FY14 and resulted in about 9,000 gallons of neutralized waste. This was done ahead of the actual need to take advantage of the available liquid waste volume in FY14. The WC PVV filter collects Ammonium Nitrate (AN) generated during the waste neutralization process (waste “neutralization” produces a waste stream that contains excess Sodium Hydroxide for waste tank compatibility prior to sending the waste to the HTF).

The temporary suspension of use of the ammonia scrubber was implemented in FY14. Since the WC PVV Filter flush was completed, the scrubber should be operated during any neutralizations in the WC going forward. The same is true for the HC PVV Filter and the HC, especially after the HC PVV is flushed in FY15 or later. The temporary suspension of use of the ammonia scrubber may be of some limited benefit sometime in the future but will not be needed throughout FY15. It will be more important to minimize accumulation of ammonium nitrate on the PVV Filters to extend the time before the next PVV Filter flushes are due until after FY19. Not using the scrubber results in near waste generation; using the scrubber accumulates AN – which when flushed from the filter generates waste at that time – a "pay me now" or "pay me now" trade-off).

FY15

H-Canyon SNF Dissolving:	4 Dissolver Batches, 2 First Cycle Runs
HB-Line PuO_2 Production:	110 kg of Pu
Liquid Waste Volume Limit:	150,000 gallons
Liquid Waste Volume Forecast:	105,000 gallons

Improvements credited to achieve forecast volume

- Implementation of improved gram tracking in Canyon sumps
- Return ARU to service for concentration of evaporator overheads resulting from acid stripping of waste streams by 3/31/15. The Facility Self Assessment for ARU Start-up is currently scheduled to complete 2/23/15.
- Implement effective acid stripping of Sumps, Spent Solvent Wash, Sample Returns (SSSR) solutions by 3/31/15. Equipment and piping is in place, process optimization is needed.

Actions that generate liquid waste to HTF Tank 39 and that are planned for FY15

- Dissolve and process SNF in H-Canyon
    - 4 SNF dissolver batches
    - 2 solvent extraction cycle runs that result in about 25,000 gallons of neutralized waste.
- Process 110 kg Pu in HB-Line
    - Column Waste (CW) to tank 11.1 that results in about 27,000 gallons of neutralized waste
    - Filtrate Waste to tank 9.6 that results in about 24,000 gallons of neutralized waste
- Process tank B3-1 Material through the 2nd uranium cycle in lieu of Proficiency Runs (5,000 gallons)
- Processing SSSR (<u>sump</u> flushes, <u>solvent</u> washes and liquid <u>sample returns</u> from lab analyses) – about 13,000 gallons of neutralized waste
- Flush of Hot Canyon (HC) PVV Filter (11,000 gallons)
- Consider running 1 or 2 additional SNF dissolver batches through First Cycle if possible (12,500 – 25,000 gallons)

The following actions need to occur in FY15 in preparation for FY16 and beyond. With the improvements below, processing in H-Canyon and HB-Line as described in Reference 4 will result in liquid waste volume transfers to HTF Tank 39 within the 105,000 gallon limit for FY16.

- Implement effective acid stripping of LAW streams. No equipment changes are required. Minor revision to operating procedures will be needed
- Make progress on preparations for recycle of HB-Line CW to SNF dissolving in 6.4D and processing through the solvent extraction cycles. Piping routes are needed for this operation. Tank 10.1 must be established as lag storage of CW from 11.1. From 10.1, material can be sent to 6.4D for use in dissolving SNF or sent to 11.2. To meet the waste volume projections in this plan, recycle of HB-Line CW must be implemented no later than 12/31/15.
- Make progress on preparations for oxalate destruction of HB-Line Filtrates in HB-Line. To meet the waste volume projections in this plan, oxalate destruction of HB-Line Filtrates must be implemented no later than 12/31/15.
- Make progress on start-up of the 11.3E evaporator for use in acid stripping of HB-Line Filtrates and excess HB-Line CW material that cannot be used in SNF dissolving. Equipment and piping routes are needed for these operations. Excess CW material that cannot be used in SNF dissolving will be sent to 11.2 and fed to 11.3E for acid stripping. Filtrate solution will be transferred from 9.6 to 8.5. A route is then needed to transfer this material to tank 11.2. From 11.2, it will be fed to 11.3E for acid stripping as will the CW. To meet the waste volume projections in this plan, effective acid stripping of HB-Line Filtrates and CW must be implemented no later than 3/31/16.
- Further develop the strategy and required criticality controls to implement an alternate HB-Line Filtrate strategy if needed for high throughput rates. This approach will be needed if high production rates (above 300 kg/yr) of PuO_2 cannot be achieved when performing the oxalate destruction on individual Filtrate runs in HB-Line. The alternate strategy would be to make transfers of the HB-Line Filtrates to H-Canyon without performing the oxalate destruction on each Filtrate run. The plutonium oxalate solids would be retained in the Filtrate tanks by decanting and filtration with the resulting clarified solution transferred to H-Canyon. The oxalate destruction in HB-Line would only be performed when significant solids had been accumulated in precipitator holdup and in the Filtrate tanks. SRNL studies in FY14 provided information on the effectiveness of decanting and the appropriate pore size needed for effective filtration. Analysis of this information is needed to determine if it is sufficient to develop adequate criticality controls or if additional information is needed. If throughput rates up to about 600 kg/yr cannot be obtained when performing the oxalate destruction on each filtration batch in HB-Line, an alternate strategy must be implemented by FY17.

The plan for FY15 is to maximize liquid waste that can be processed and transferred to HTF before the end of the fiscal year. This is not to generate excess waste, but rather to generate and transfer waste that must eventually be transferred to allow for as much processing as possible beyond FY15. This includes some infrequent or one-time operations.

The material in B3-1 has been identified as material that will be processed and be used in lieu of required proficiency runs. It was not possible to complete these processing runs in FY14, Therefore, they will be conducted early in FY15, resulting in about 5,000 gallons of waste from solvent extraction in FY15.

The HC PVV Filter would normally be scheduled to be flushed sometime beyond FY15, and probably beyond FY16 or FY17. This plan allows for a flush of the HC PVV Filter in FY15, which would result in up to about 11,000 gallons of liquid waste.

H-Canyon plans to complete 4 SNF dissolver batches during FY15, but only expects to be able to run the dissolved material from 2 of those batches through the solvent extraction cycles. However, if possible, it would be advantageous to run the cycles for at least 1 of those batches. Each dissolver batch is estimated to produce about 12,500 gallons of neutralized liquid waste. Since the liquid waste generated from all other sources is projected to be less than 105,000 gallons in FY15, there is room for both additional batches of solvent extraction cycle waste.

If the liquid waste volume sent to HTF Tank 39 in FY15 is significantly less than the 150,000 gallon limit for FY15, there may be an opportunity to request roll over of the unused volume into FY16.

FY16

H-Canyon SNF Dissolving:	4 Dissolver Batches, 5 First Cycle Runs
HB-Line PuO_2 Production:	251 kg Pu
Liquid Waste Volume Limit:	105,000 gallons
Liquid Waste Volume Forecast:	93,000 gallons

Improvements credited to achieve forecast volume

- Implementation of improved gram tracking in Canyon sumps
- Effective acid stripping of SSSR solutions
- Recycle of CW to SNF dissolving in tank 6.4D
- Elimination of tank 9.6 heel by oxalate destruction of each Filtrate run in HB-Line
- Effective acid stripping of HB-Line Filtrates, excess CW, and LAW streams

Actions that generate liquid waste to HTF Tank 39 and that are planned for FY16

- Dissolve and process SNF in H-Canyon
  - 4 SNF dissolver batches
  - 5 solvent extraction cycle runs that results in up to 45,000 gallons of neutralized waste.
- Process 251 kg Pu in HB-Line
  - Column Waste (CW) to tank 11.1 that results in about 29,000 gallons of neutralized waste
  - Filtrate Waste to tank 9.6 that results in about 16,000 gallons of neutralized waste
- Processing SSSR material – About 3,000 gallons of neutralized waste

The following actions need to occur in FY16 to meet the goals for FY16 and in preparation for in FY17 and beyond. With the improvements below, processing in H-Canyon and HB-Line as described in Reference 4 will result in liquid waste volume transfers to HTF Tank 39 within the 105,000 gallon limit for FY17.

- Complete preparations for and implement recycle of HB-Line CW to SNF dissolving in tank 6.4D and processing through the solvent extraction cycles. To meet the waste volume projections in this plan, recycle of HB-Line CW must be implemented no later than 12/31/15. Implementation of CW recycle is currently scheduled for 8/3/15.
- Complete preparations for and implement oxalate destruction of HB-Line Filtrates in HB-Line. To meet the waste volume projections in this plan, oxalate destruction of HB-Line Filtrates must be implemented no later than 12/31/15. Implementation of oxalate destruction in HB-Line is currently scheduled for 11/23/15.
- Complete preparations for start-up of the 11.3E evaporator for use in acid stripping of HB-Line Filtrates and excess HB-Line CW material that cannot be used in SNF dissolving. To meet the waste volume projections in this plan, effective acid stripping of HB-Line Filtrates and CW must be implemented no later than 3/31/16. The SRNS Readiness Assessment for start-up of the 11.3E evaporator is currently scheduled to complete 8/20/15.
- Complete HB-Line facility preparations, including some facility modifications, to implement the alternate HB-Line Filtrate strategy if needed. This approach will not achieve any additional liquid waste volume reductions, but will maintain the reductions achieved when the oxalate destruction of Filtrates was implemented in HB-Line in FY16. If throughput rates up to about 600 kg/yr cannot be obtained when performing the oxalate destruction on each filtrate batch in HB-Line, an alternate strategy must be implemented by FY17.

The mission objectives for FY16 call for a significant increase in PuO_2 production rates in HB-Line, but the same level of SNF dissolving in H-Canyon. It will be very important to effectively implement the waste minimization initiatives listed above on schedule during FY16. Early implementation of these initiatives may result in a liquid waste volume well within the 105,000 gallon limit. This could present another opportunity to request roll over of the unused waste volume from FY16 to FY17, when production rates for both facilities are projected to increase significantly.

HB-Line is projected to process 251 kg of Pu in FY16. This will result in CW and Filtrate drops to tanks 11.1 and 9.6 respectively. Even though 9.6 may not be approaching its fill level at the time HB-Line is ready to implement the oxalate destruction, the contents of 9.6 would need to be transferred out of the tank, neutralized and transferred to HTF before the transition. This will need to be coordinated closely as that time approaches.

<u>FY17</u>

H-Canyon SNF Dissolving:	7 Dissolver Batches, 9 First Cycle Runs
HB-Line PuO_2 Production:	493 kg Pu
Liquid Waste Volume Limit:	105,000 gallons
Liquid Waste Volume Forecast:	105,000 gallons

Improvements credited to achieve forecast volume

- Implementation of improved gram tracking in Canyon sumps
- Effective acid stripping of SSSR solutions
- Recycle of CW to SNF dissolving in 6.4D
- Elimination of 9.6 heel by oxalate destruction of each Filtrate run in HB-Line
- Effective acid stripping of HB-Line Filtrates, excess CW, and LAW streams
- Implementation of the alternate Filtrate strategy if needed

Actions that generate liquid waste to HTF Tank 39 and that are planned for FY17

- Dissolve and process SNF in H-Canyon
    - 7 SNF dissolver batches
    - 9 solvent extraction cycle runs that results in up to 81,000 gallons of neutralized waste

- Process 493 kg Pu in HB-Line
    - Excess CW to 11.1 that results in about up to 18,000 gallons of acid stripped, neutralized waste
    - Filtrate Waste to 9.6 that results in up to 2,000 gallons of acid stripped, neutralized waste
- SSSR processing – expected to result in up to 4,000 gallons of acid stripped, neutralized waste

No additional actions need to occur in FY17 in preparation for processing in FY18 to meet the objectives outlined in Reference 4.

The mission objectives for FY17 call for an increased level of SNF dissolving in H-Canyon and an increase in production rate for HB-Line. The liquid waste generated in FY17 will come from operation of H-Canyon to process spent fuel and HB-Line to produce PuO_2.

<u>FY18</u>

H-Canyon SNF Dissolving:	10 Dissolver Batches, 9 First Cycle Runs
HB-Line PuO_2 Production:	493 kg
Liquid Waste Volume Limit:	105,000 gallons
Liquid Waste Volume Forecast:	102,000 gallons

Improvements credited to achieve forecast volume

- Implementation of improved gram tracking in Canyon sumps
- Effective acid stripping of SSSR solutions
- Recycle of CW to SNF dissolving in 6.4D
- Elimination of 9.6 heel by oxalate destruction of each Filtrate run in HB-Line
- Effective acid stripping of HB-Line Filtrates, excess CW, and LAW streams
- Continuation of the alternate Filtrate strategy if needed

Actions that generate liquid waste to HTF Tank 39 and that are planned for FY18

- Dissolve and process SNF in H-Canyon

    - 10 SNF dissolver batches
    - 9 solvent extraction cycle runs that results in up to 81,000 gallons of neutralized waste
- Process 493 kg Pu in HB-Line
    - Excess CW to 11.1 that results in up to 15,000 gallons of acid stripped, neutralized waste
    - Filtrate Waste to 9.6 that results in up to 2,000 gallons of acid stripped, neutralized waste
- SSSR processing – expected to result in up to 4,000 gallons of acid stripped, neutralized waste

No additional actions need to occur in FY18 in preparation for processing in FY19 to meet the objectives outlined in Reference 4.

The mission objectives for FY18 call for increasing the number of SNF dissolvings in H-Canyon and maintaining the same production rate for HB-Line. The liquid waste generated in FY18 will come from operation of H-Canyon to process spent fuel and HB-Line to produce PuO_2.

FY19

H-Canyon SNF Dissolving:	10 Dissolver Batches, 9 First Cycle Runs
HB-Line PuO_2 Production:	573 kg
Liquid Waste Volume Limit:	105,000 gallons
Liquid Waste Volume Forecast:	106,000 gallons

Improvements credited to achieve forecast volume

- Same as previous year.

Actions that generate liquid waste to HTF Tank 39 and that are planned for FY19

- Dissolve and process SNF in H-Canyon
    - 10 SNF dissolver batches
    - 9 solvent extraction cycle runs that results in up to 81,000 gallons of neutralized waste
- Process 493 kg Pu in HB-Line
    - Excess CW to 11.1 that results in up to 18,000 gallons of acid stripped, neutralized waste
    - Filtrate Waste to 9.6 that results in up to 2,000 gallons of acid stripped, neutralized waste
- SSSR processing – expected to result in up to 5,000 gallons of acid stripped, neutralized waste

As long as the projected liquid waste volume limit of 300,000 gallons/yr for FY20 and beyond does not change, no additional actions need to occur in FY19 in preparation for processing in FY20 and beyond to meet the objectives outlined in Reference 4.

The mission objectives for FY19 call for the same level of SNF dissolving in H-Canyon and some increase in the production rate for HB-Line. The liquid waste generated in FY19 will come from operation of H-Canyon to process spent fuel and HB-Line to produce PuO_2.

FY20-FY22

H-Canyon SNF Dissolving:	10 Dissolver Batches, 10 First Cycle Runs
HB-Line PuO_2 Production:	591 kg
Liquid Waste Volume Limit:	300,000 gallons
Liquid Waste Volume Forecast:	116,000 gallons

Improvements credited to achieve forecast volume

- Same as previous year.

Actions that generate liquid waste to HTF Tank 39 and that are planned for FY20-22

- Dissolve and process SNF in H-Canyon
    - 10 SNF dissolver batches
    - 10 solvent extraction cycle runs that results in up to 90,000 gallons of neutralized waste
- Process 591 kg Pu in HB-Line
    - Excess CW to 11.1 that results in up to 19,000 gallons of acid stripped, neutralized waste
    - Filtrate Waste to 9.6 that results in up to 2,000 gallons of acid stripped, neutralized waste
- SSSR processing – expected to result in up to 5,000 gallons of acid stripped, neutralized waste

No additional actions need to occur in FY19 in preparation for processing in FY20 to meet the objectives outlined in Reference 4.

The mission objectives for FY20-FY22 call for the same level of SNF dissolving in H-Canyon as FY19 and a small increase in the production rate for HB-Line. The liquid waste generated in FY20-FY22 will come from operation of H-Canyon to process spent fuel and HB-Line to produce PuO_2. HB-Line will complete the AFS-2 mission in FY22.

FY23-FY24

H-Canyon SNF Dissolving:	21 Total Dissolver Batches, 23 Total First Cycle Runs
Liquid Waste Volume Limit:	300,000 gallons
Liquid Waste Volume Forecast:	214,000 gallons (total for both years)

Improvements credited to achieve forecast volume

- Same as previous year.

Actions that generate liquid waste to HTF Tank 39 and that are planned for FY23-24

- Dissolve and process SNF in H-Canyon
    - 21 SNF dissolver batches over 2 years
    - 23 solvent extraction cycle runs over 2 years that result in up to 207,000 gallons of neutralized waste
- SSSR processing – expected to result in about 7,000 gallons over 2 years of acid stripped, neutralized waste

The mission objectives for FY23 and FY24 will be to increase the level of SNF dissolving in H-Canyon and to complete the SNF dissolving campaign. The liquid waste generated in FY23 and FY24 will come from operation of H-Canyon to process spent fuel unless either of the PVV Filters must be flushed.

Additional Waste Minimization Initiatives

Other waste minimization improvements could be needed if the liquid waste volume restrictions become tighter, the restrictions are not relaxed as expected in FY20, or current bottlenecks/limitations to increasing production rates are removed. Additional improvements, such as recycle of HB-Line Filtrates to the HB-Line feed, use of alternate reductants in H-Canyon solvent extraction processing, or denitration of H-Canyon waste streams could be pursued in those cases.

Another very significant, but impactive, improvement could be pursued if needed in the future. This would be developing and implementing a process to successfully scrub the alpha contaminants (americium and plutonium) from CW such that the CW stream can be sent to HTF tank 50 as LLW. This is a high technical risk proposal that will require significant investment to carry out. SRNL has done some simple scoping experiments that have identified a potential resin that could be used for this purpose. However, actual resin selection, qualification, and flowsheet development research would have to begin in FY15 in order to make implementation by the beginning of FY17 a possibility. Additional up front work will also be needed to identify and design necessary HB-Line facility modifications and to begin planning for the safety basis changes and regulatory approvals needed in HB-Line, H-Canyon and H Tank Farm to support this new process.

In addition to transfer of the CW stream to HTF Tank 50 as LLW, some if not all of the LAW stream could also be transferred to tank 50. While the 1BP and 1DW LAW streams are currently being transferred to HTF tank 39, these streams could potentially be characterized as LLW and transferred to Saltstone. The rerouting of some if not all of the LAW stream to tank 50 will require safety basis document changes along with regulatory review and approvals, as appropriate.

Finally, SRNL has proposed an innovative technique for denitration via nanoparticles and UV light. This approach has the advantage of destroying waste volume generating nitrates without the addition of chemicals.

In light of the uncertainties in program needs, funding, and unanticipated events that are always present in the DOE Complex, it would be prudent to make selected investments in further developing some of these initiatives. Modeling to narrow down the possibilities for denitration in conjunction with effective acid stripping and further developing the nanoparticle/UV approach appear to offer the most promise for the least investment. Since development of a process for scrubbing the alpha contaminants from the HB-Line CW is a long term effort, early work to advance this approach should also be considered.

CONCLUSION

The near-term and long term waste minimization "tools" are varied where implementation time, implementation cost, safety implication, mission length and waste reduction "payback" are all factors. This paper has discussed various options that are available and are by no means complete. Other options may avail themselves in the future for example either due to development of new technologies by SRNL or experience gained from discussion with other entities. However, with the given missions, waste minimization methods will need to employed for those missions to be successful with the expected waste limitations that will be in place.

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