Defense Waste Processing Facility
Recycle Diversion
Programs Update
CAB Recommendation #369

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September 27, 2022

PURPOSE

UPDATE RECOMMENDATION #369

- **BACKGROUND**
  - DWPF operations generates 1.3 gallons of recycle for 1 gal of waste
  -- Due to off-gas scrubber condensates
  - Return material is directed to Tank Farm and not an evaporator
  -- Evaporator can handle precipitants and reduce volume

RECOMMENDATION

The Savannah River Site Citizens Advisory Board recommends that DOE conduct a study of the benefits of installing a separate designated evaporator, or equally effective and cost-efficient alternative technology, at the DWPF to support the reduction of liquid generated at DWPF so that the volume of liquid returned back to the tank farms is reduced.

DWPF Recycle and Beneficial Reuse

- **Generated during off-gassing of DWPF operations**
  - off-gas steam currently flows through various lines for evaporation
  - condensed vapor returned to H-Tank Farm (HTF)
  - particulates are transferred to salt/sludge batch

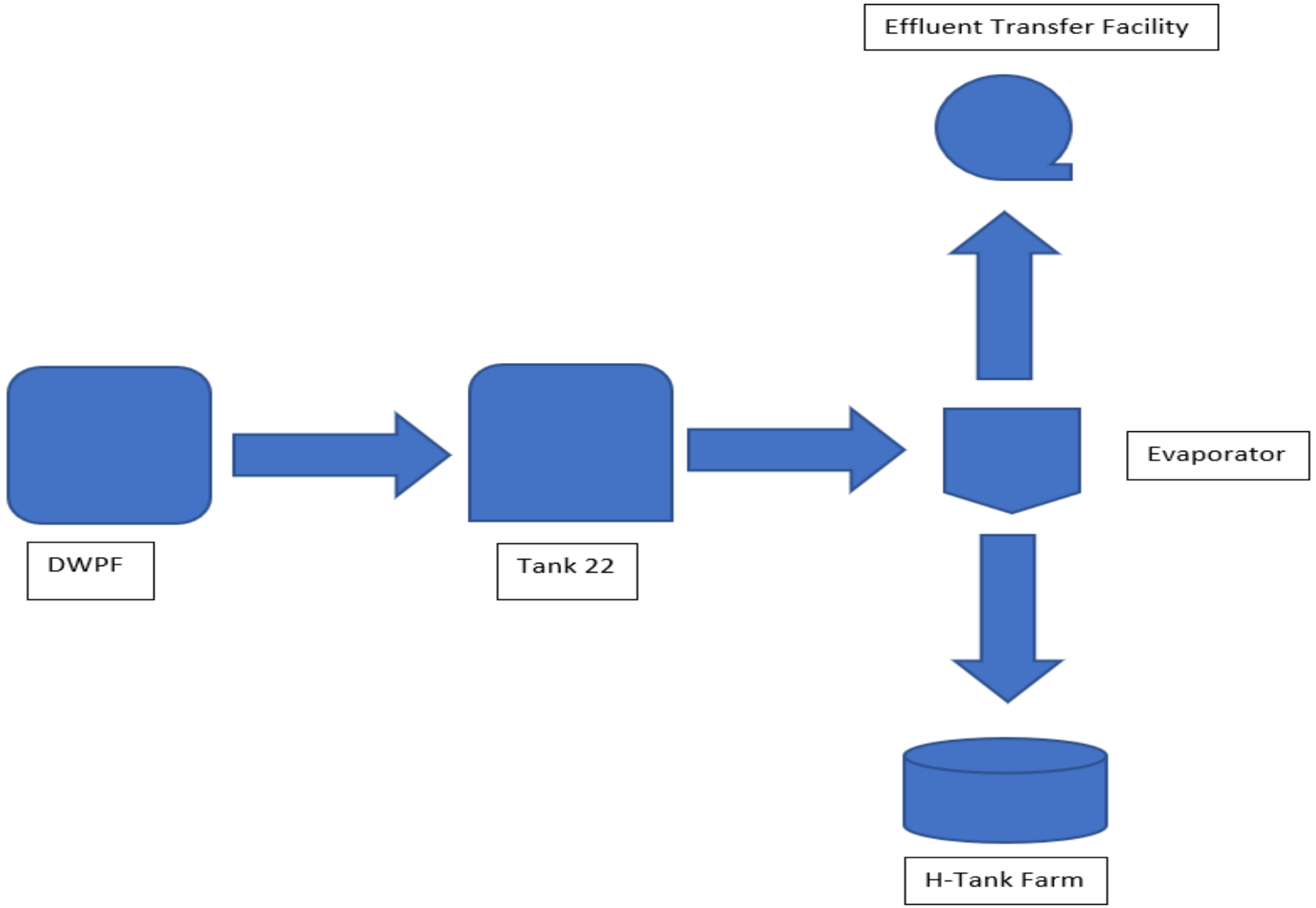
- **Opportunity to divert DWPF recycle from HTF or reuse as needed**
  -Supports salt/sludge batch preparation reducing water additions

Project Introduction

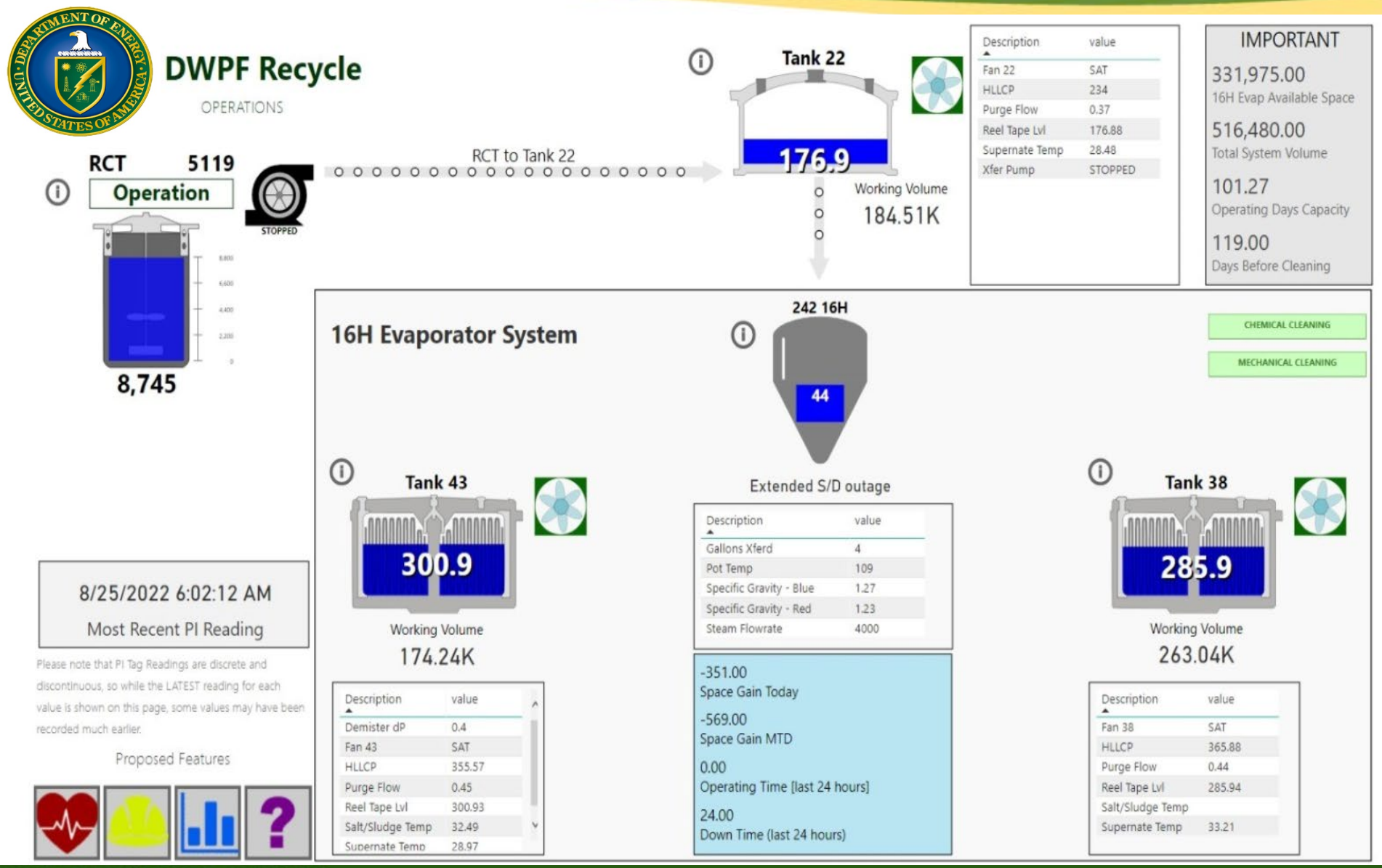
- **DWPF recycle diversion was proposed due to potential benefits to the Liquid Waste Operations strategy**
  - Potentially early Sludge removal and closure
  - Potentially early retirement of 3H Evaporator
  - Reduces frequency of cleaning 2H Evaporator
  - Beneficial reuse of recycle for sludge/salt batching
- **To realize all or some of these benefits DWPF recycle diversion needed to be implemented by end of FY26**
- **Contractor performed alternative study and developed costs estimates and schedules to determine a preferred option**

F & H Tank Farms

Recycle Process Diagram



Recycle Process Diagram



Recycle Diversion Requirements & Approaches

- **Process shall be capable of processing 3 Mgals/year of DWPF recycle per year**
- **Implementation Driver**
  - Enable sludge removal from 3H Evaporator System tanks in 3Q FY27
  - Recycle diversion required delivery by end of FY26
    - Allows time for tank modifications to support sludge removal
- **Project Team considered many different alternative approaches and evaluated cost & schedule during project pre-planning before proceeding with conceptual design activities:**
  - Evaluated acquisition approaches: renovating/new facilities vs modular systems
  - Engaged the supplier community with our needs and allowed the supplier market to provide solutions resulting in multiple proposed technologies including both evaporation and ion exchange
  - Evaluated direct hire (Make) vs subcontract (Buy) approaches

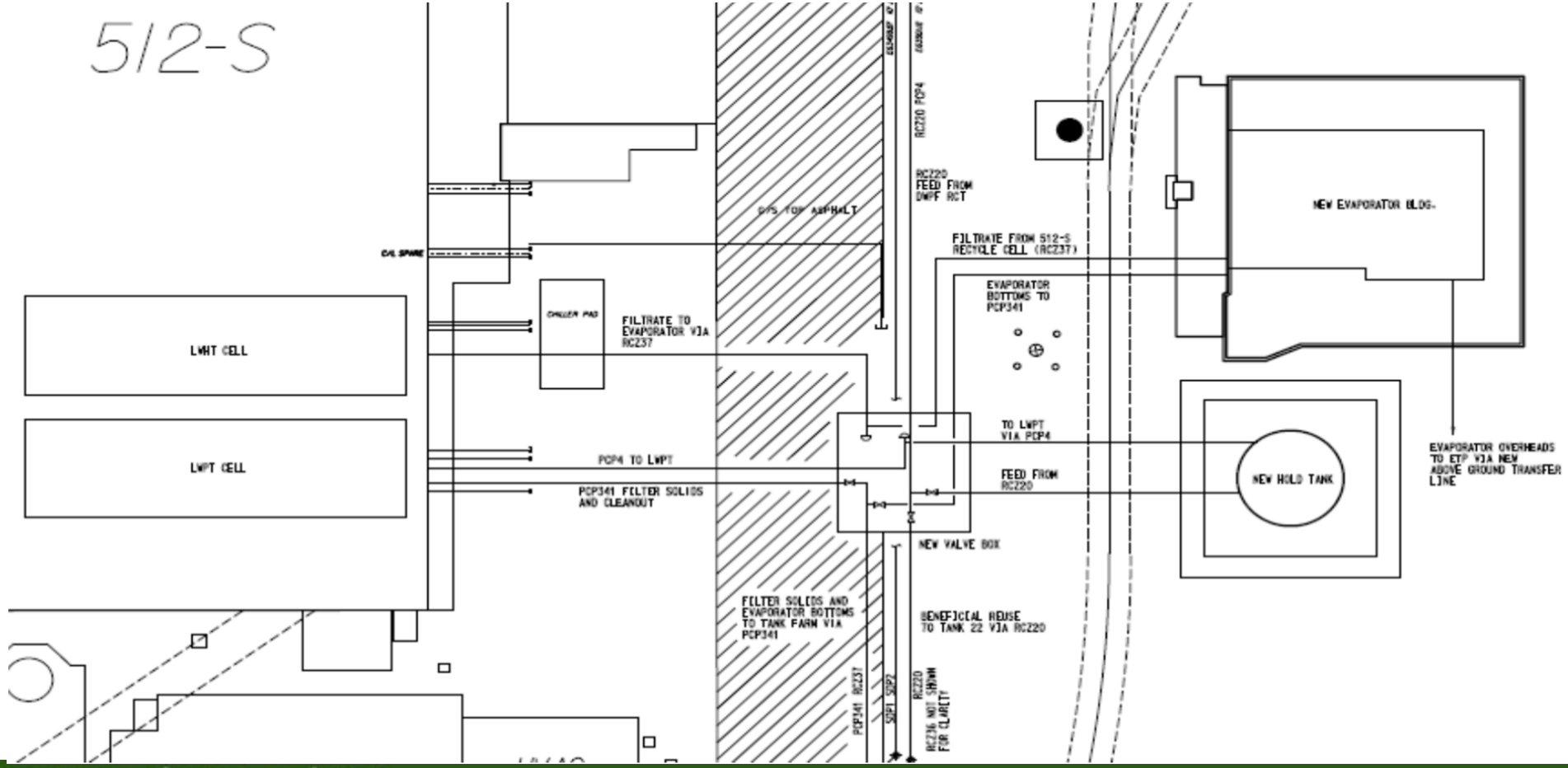
Project Pre-Planning

- **Systems Engineering Evaluation (SEE) considered:**
  - Filtration for sludge/solids removal
  - Evaporation (wiped film or reduced pressure) for Cs removal
  - Overheads polishing at ETP **Pre-planning provided a more definitive picture on feasibility of Recycle Diversion**
  - Conceptual block flow diagram
  - Conceptual process flow diagram & supporting technical documentation
    - Performed computational modeling (CoreSim) to better determine options
    - Performed alternative analysis to optimize conceptual flowsheet
  - Siting study which included preliminary equipment layout drawings
  - Technology development roadmap activities
    - Sampled & analyzed contents of DWPF process vessels to better understand constituents
    - Evaluation of potential flow rates, actinide solubility, evaporator corrosion & volatility

Siting Evaluation Results

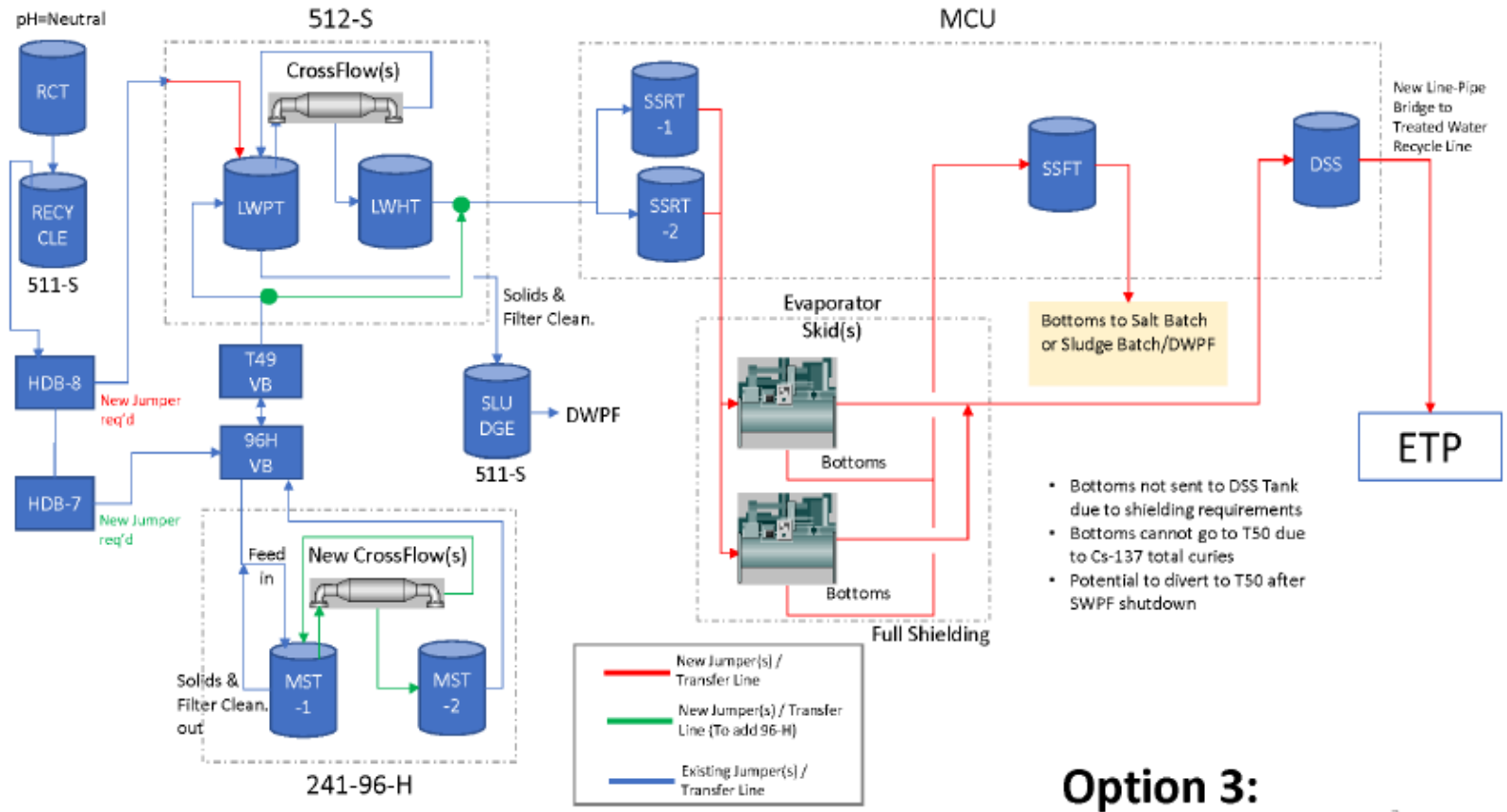
- **3 flowsheet options (3A, 3B, 3C) considered: Selected 3C option**
  - Cost (3C ~20% cheaper)
  - Complexity of Operations
  - Complexity of Maintenance
  - Complexity of Construction
  - Complexity of Design Safety Analysis
  - Complexity of Design
  - Schedule

Option 3C Conceptual Layout (New Hold Tank, 2 Wiped Film Evaporators & new Valve Box at 512-S)



Option 3C Process Flow

Wiped Film Evaporator Flow



Project Pre-Planning Results

- **Project pre-planning determined we could not achieve acceptable cost & schedule outcomes to realize benefits**
  - Could not be implemented in timely fashion to support system plan objectives (FY26)
  - Infrastructure needed is too costly
  - Would be a capital project
- **Upon realizing the risk of not being able to implement the DWPF Recycle Diversion as initially scoped, drove to develop a workable and affordable alternative**
- **The contractor recommend pausing further technical maturation and project planning efforts on early DWPF Recycle Diversion**

Project Pre-Planning Evaluated Options

Detailed modeling revealed 3M/year target was driving complexity & cost to support 9 Mgals/year rate of salt processing

- **Salt Processing Target Total**
  - 9Mgals Salt/year
- **Recycling Total**
  - 2.8 Mgals/year
- **Beneficial Reuse Total**
  - 1.35 Mgals to 1.8 Mgals/year
- **Remaining Recycle to Process**
  - 1 Mgals/year to 1.45 Mgals/year

- **Cost being driven by the need for new front end lag storage (tanks) and transfer lines coupled with the cost of new evaporators**
- **Efforts to scale back size (3M/year to ~1.3M/year) and maximize Beneficial Reuse did not result in acceptable cost & schedule outcomes**
- **Further evaluated a "minimal scope" option to show proof of principle coupled with future mods to increase capacity**
  - Did not meet timeline required to realize benefits

Comparison of Recycle Diversion Cost & Duration

- **Project pre-planning & technical maturation determined:**
  - **Infrastructure needed costly**
  - **Would be a capital project**
  - **2-3 years to obtain capital funding + 6-year project duration**
  - **Could not be implemented in timely fashion to support system plan objectives**

Description	Cost	Throughput per year	Design/ Construction Duration	Capital Project
Original SEE Approach	$140-185M	1.3 Mgal/yr	6 years	Yes
Updated SEE with Vendor Evaporator Skid	$70-100M	1.3 Mgal/yr	6 years	Yes
Minimum Scope Approach with Vendor Evaporator Skid	$60-90M	~200 kgal/yr	6 years	Yes

Alternate Approach for Recycle

- **Recycle diversion alternatives required a significant infrastructure investment for a filtration system & Cs removal system with supporting tankage/transfer lines**

- **Alternate Approach for DWPF Recycle**
  - Process recycle through SWPF utilize the existing investment (minimize new infrastructure costs)
  - Minimal infrastructure to divert DWPF recycle to SWPF (Re-jumper 511-S)
  - Minimal infrastructure to divert clean stream from SWPF to ETF later like polyvinyl chloride piping/hoses for dissolved salt solution routing to tank farm or effluent transfer facility

- **Adjust timing of recycle diversion towards end of mission**
  - Maximize beneficial reuse while processing salt
  - Fully divert recycle to SWPF near end of salt processing

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QUESTIONS

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BACKUP

Three (3) Options Explored

- **3A: Transfer Line at 512-S & 96-H**
  - Jumper line for 512-S
    - Jumper HDB-8 with HBD-7 option
    - Add jumper(s) at 512-S from LWHT cell to LWPT
    - Add jumper at 511-S
  - Jumper line for 96-H
  - Overheads polishing at ETP (with supplemental Hg treatment if required)

- **3B: CrossFlow Filter Line at 512-S & 96-H, CS IX Skids, Evaporation**
  - Jumper line for 512-S
    - Jumper HDB-8 with HBD-7 option
    - Add jumper(s) at 512-S from LWHT cell to LWPT
    - Add jumper at 511-S
  - Jumper line for 96-H
  - Overheads polishing at ETP (with supplemental Hg treatment if required)
  - Clarified recycle goes to IX at MCU
  - Evaporator receives streams to send to ETP and Tank 50 (Salstone)