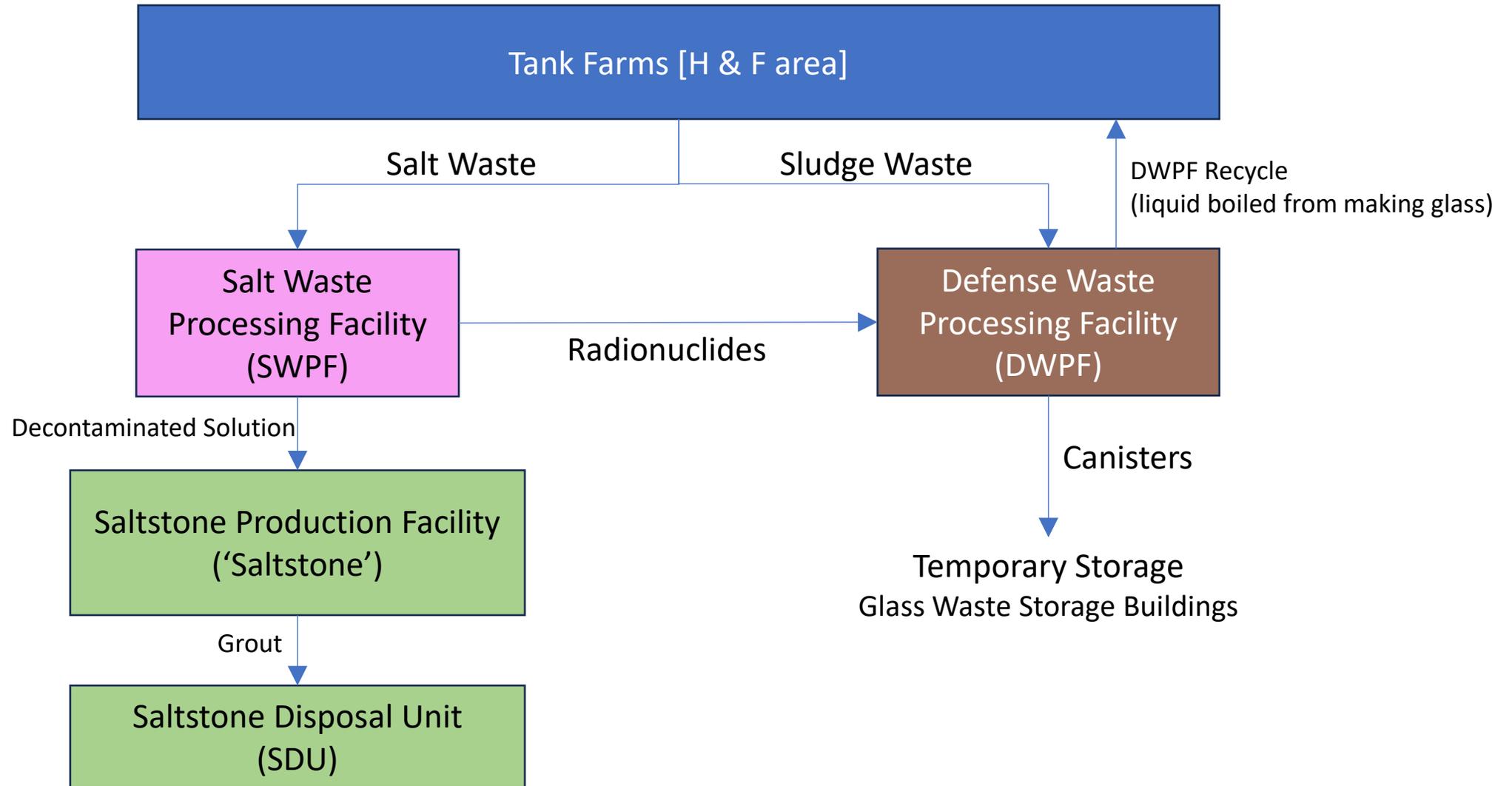# Contents

- **Purpose of Modeling**

- **Liquid Waste Lifecycle Model Overview**

- **Types of Costs in the Model**

- **How Cost Control is applied in the Model**

- **Next Steps**

Modeling – Digital Twin

- **Create a representation of a complex process to;**
  - *Consolidate constants, variables, and constraints*
  - *Evaluate the aggregate effects*
  - *Simulate 'what-if' scenarios*

- **Simulate & Anticipate 'Emergent' behaviors**
  - *Details that are relevant as a whole system, rather than looking at each part*
  - *Not necessarily always the sum of their parts*
    - e.g. Vibrations in the main device can cause screws in the handle attachment to come loose.

- **Liquid Waste Operation involves multiple complex facilities each with unique safety controls that send/receive feed between them.**

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Liquid Waste Overview

Tank Farms [H & F area]

Salt Waste → Salt Waste Processing Facility (SWPF)

Sludge Waste → Defense Waste Processing Facility (DWPF)

DWPF Recycle (liquid boiled from making glass)

SWPF → Radionuclides → DWPF

Decontaminated Solution → Saltstone Production Facility ('Saltstone')

Grout → Saltstone Disposal Unit (SDU)

DWPF → Canisters → Temporary Storage — Glass Waste Storage Buildings

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Liquid Waste Lifecycle Model

- **Combination of <u>Logistical</u> and <u>Chemical</u> controls**

- **Brings together;**
    - *Waste Removal Priorities (Water Table, F-Tank Farm)*
    - *Engineering Controls (Waste Acceptance Criteria, Safety Programs)*
    - *Engineering Improvements (SWPF Filters, DWPF Batch Additions)*
    - *Operational Strategies (Salt & Sludge Batching)*

- **Used in the LW System Plan**
    - *Developed with DBD (SRMC Subcontractor)*

Liquid Waste Lifecycle Model
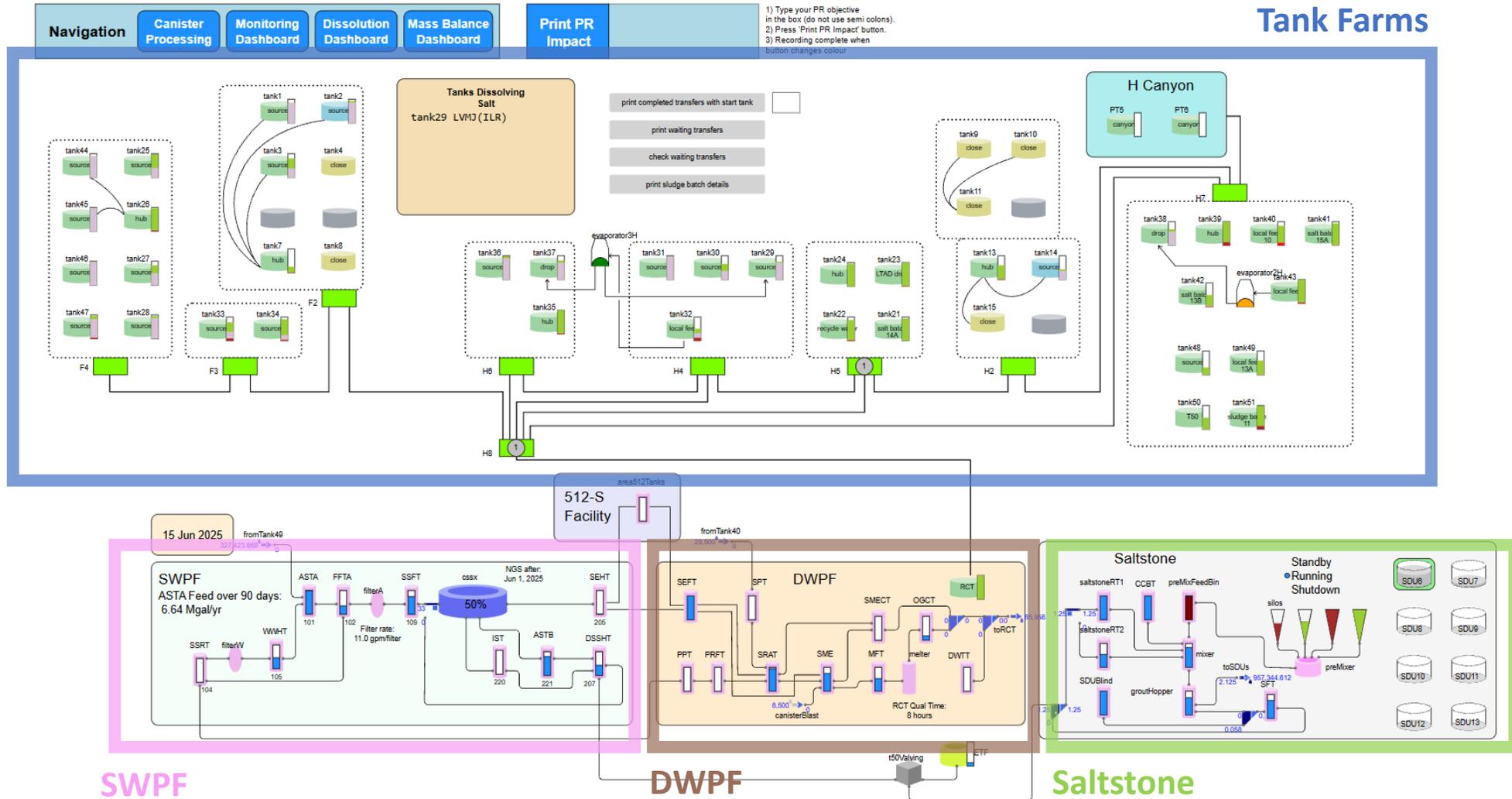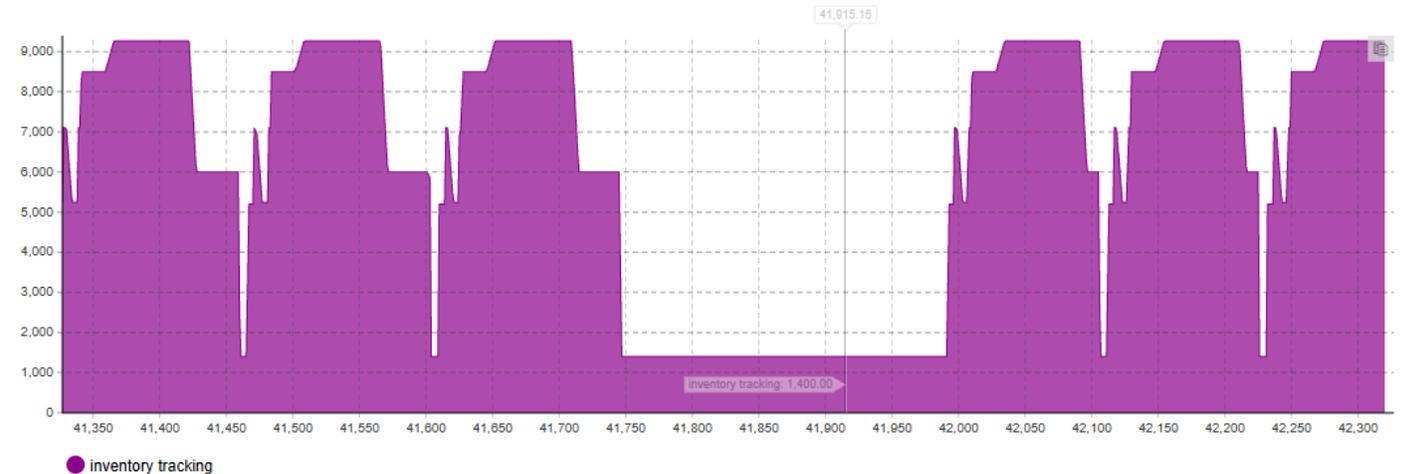
Liquid Waste Lifecycle Model
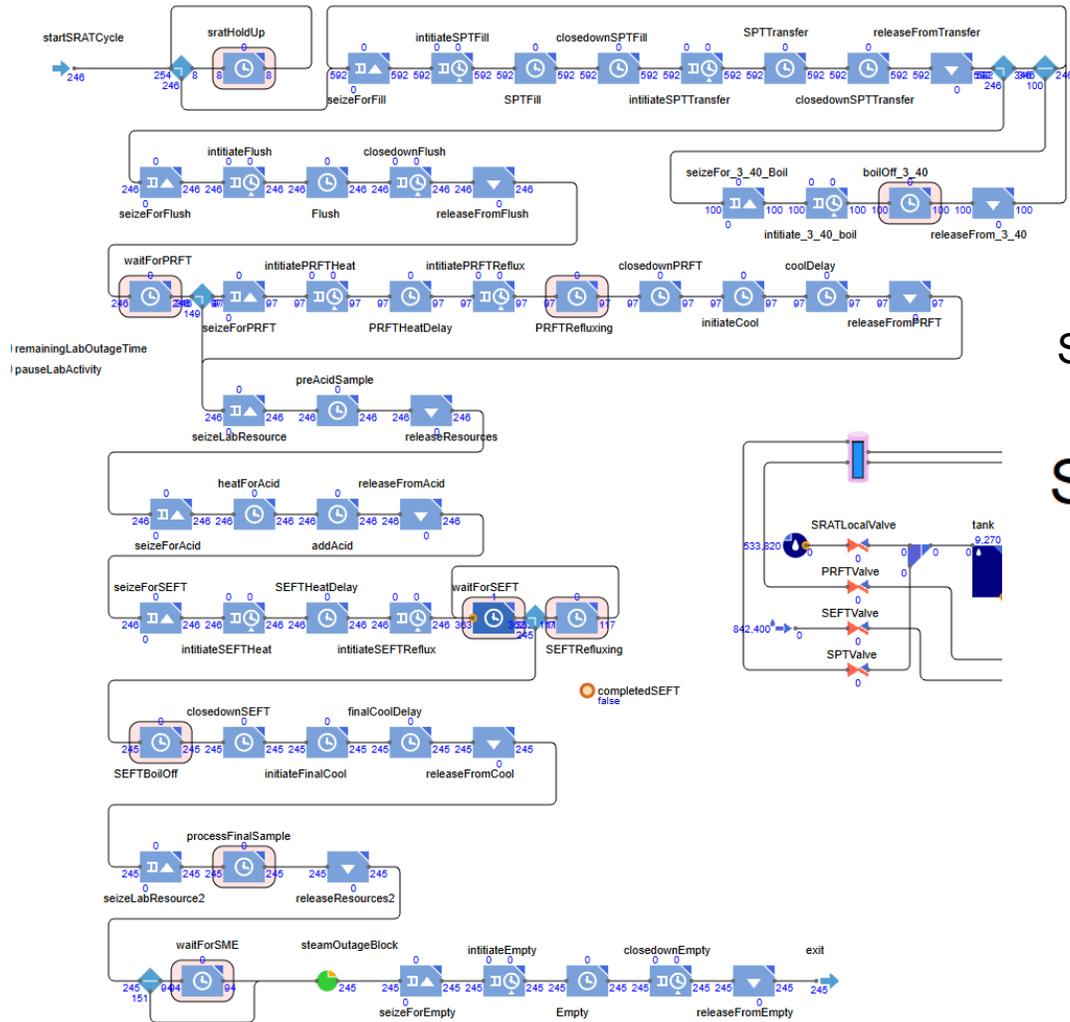
- **Macro-behavior emerges from building up each processing step**

Sludge Receipt and Adjustment Tank (SRAT) Processing Vessel inside DWPF
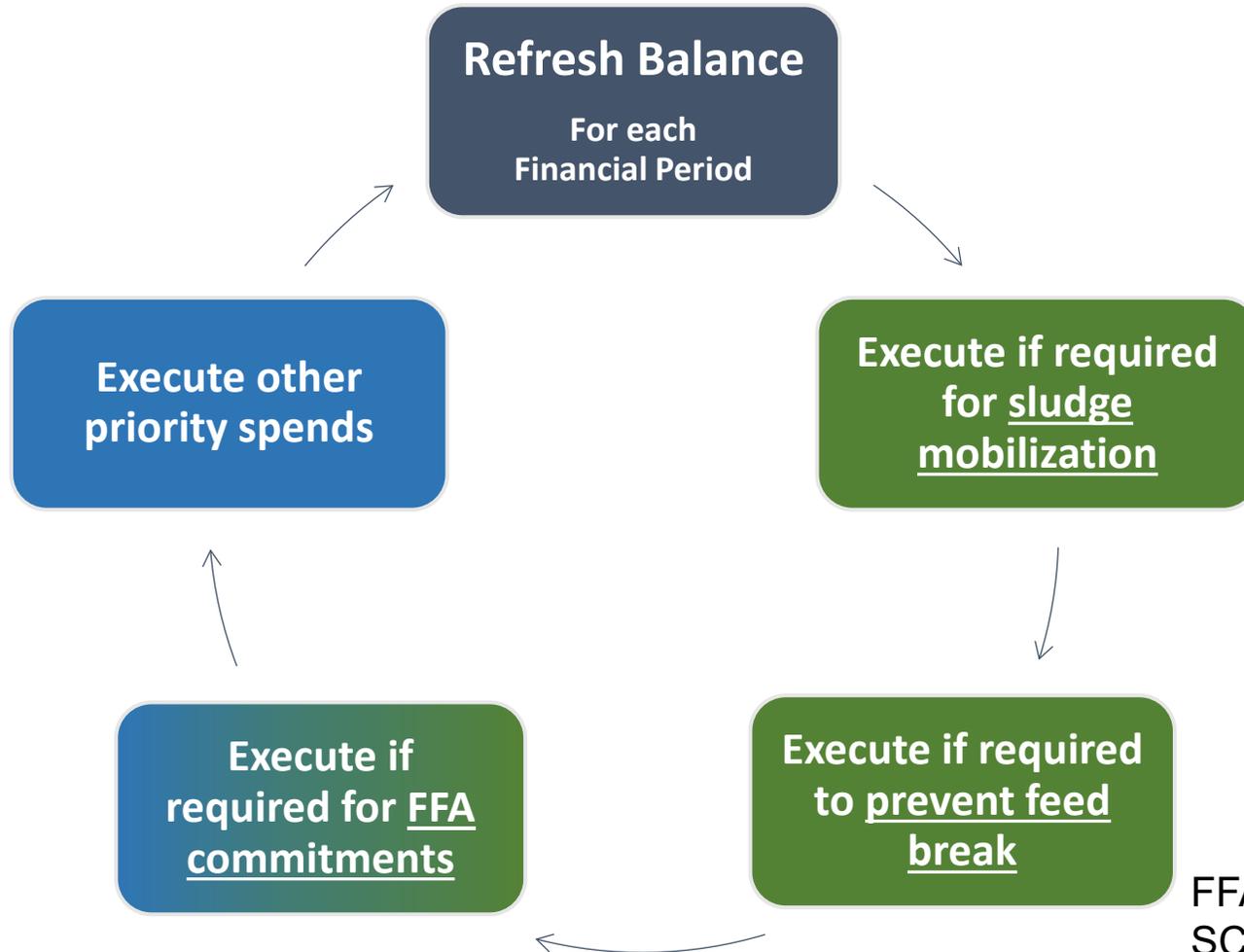
SRAT Dashboard

Liquid Waste Lifecycle Model

- **Allows for strategic evaluation of;**
  - *Operational Priorities*
  - *Engineering Innovation*
  - *Changes of External Factors (e.g. Pricing Profile)*

- **Quantifiable comparison of the lifecycle timeline**
  - *Transfers Subject Matter Expert process knowledge onto data & model outputs*

Types of Costs in the Model

- **Recurring Costs** **(Processing Facilities)**
  - *Accounts for facilities, regardless of waste processing or maintenance*
  - *DWPF, SWPF, Saltstone, Tank Farm (baseline upkeep)*

- **Intermittent Costs** **(Waste Removal, Closure Campaigns)**
  - *Accounts for installations & one-time costs*
  - *Waste Tank Mixing Device Installations, Closure Sampling, Grouting*

- **Model Prioritizes Recurring Costs over Intermittent Costs**
  - *Ensures processing outlet - prevents waste 'gridlock'*
  - *Recurring Costs adjusted through maintenance times*
    - Spare part availability

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CAB

How the Model Executes Installations with Cost

Refresh Balance
For each Financial Period

Execute if required for sludge mobilization

Execute other priority spends

Execute if required to prevent feed break

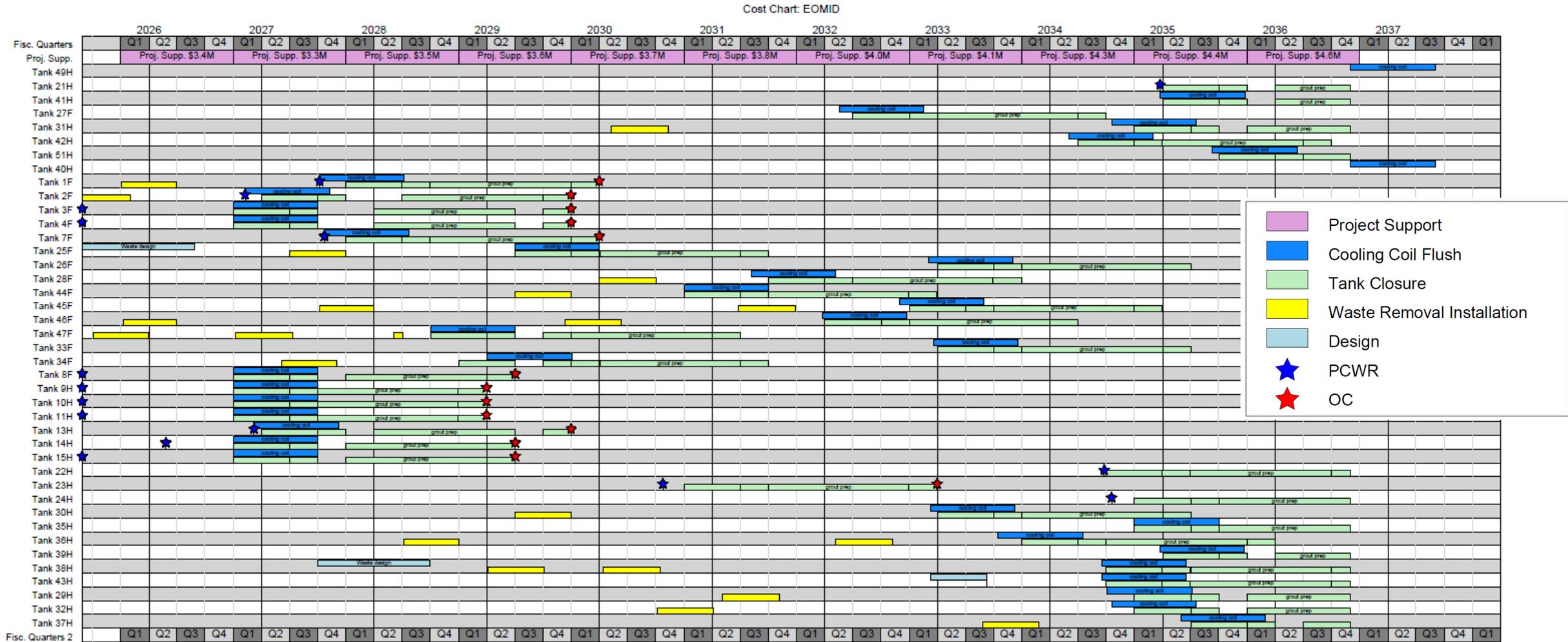**Execute if required for FFA commitments**

- **Reflects Risk Reduction Priority**

  - *In agreement with SCDES and EPA, Risk Reduction from **waste processing** has priority over **tank closures** post waste removal*
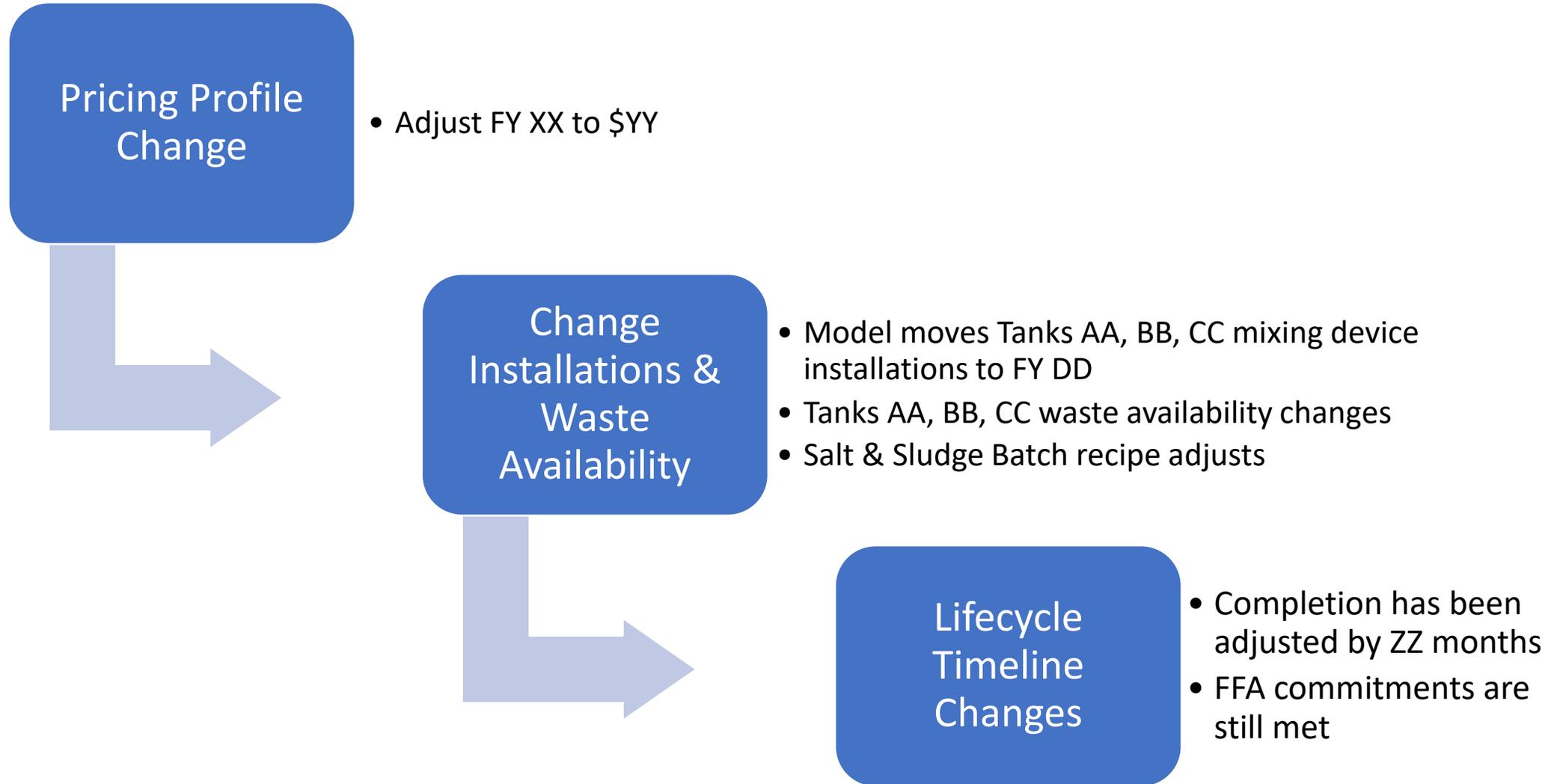
FFA: Federal Funding Agreement
SCDES: South Carolina Department of Environmental Services
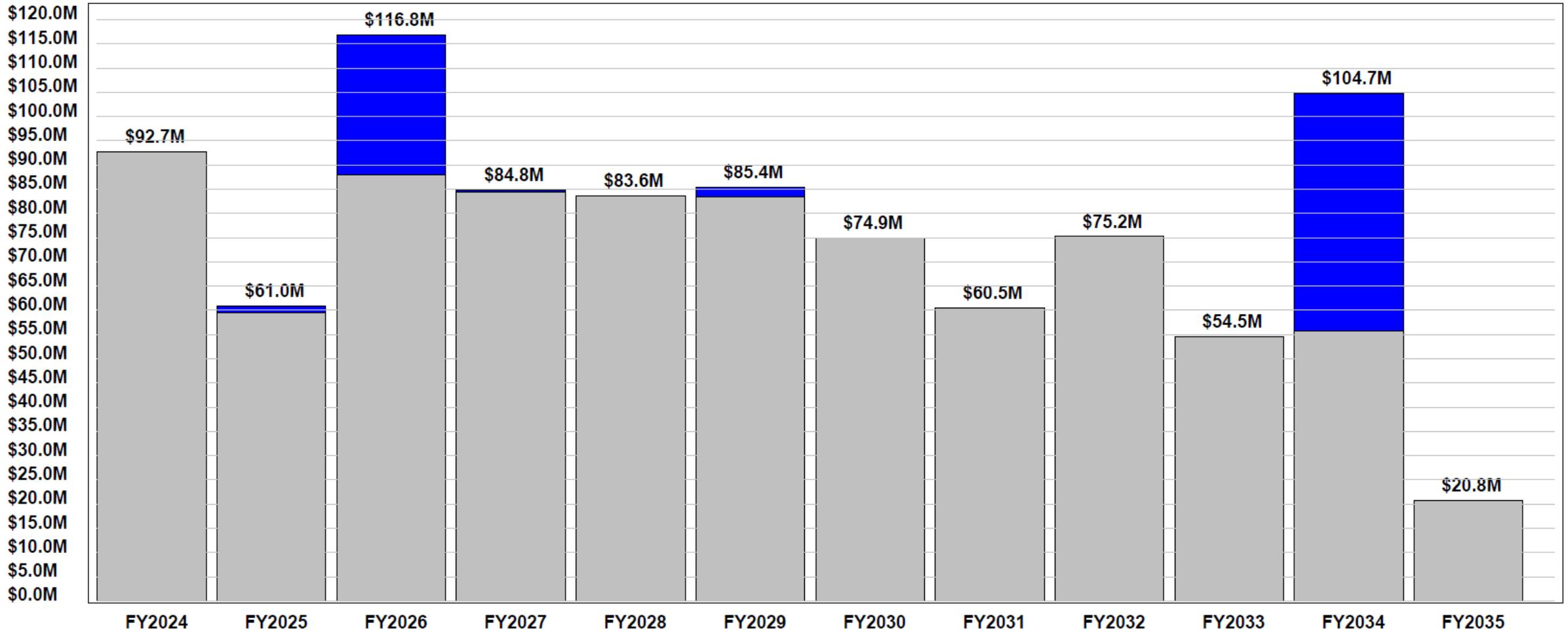EPA: Environmental Protection Agency

Cost Chart Example

Example demonstrating modeling capability

How Cost Control is applied in the Model

Pricing Profile Change

- Adjust FY XX to $YY

Change Installations & Waste Availability

- Model moves Tanks AA, BB, CC mixing device installations to FY DD
- Tanks AA, BB, CC waste availability changes
- Salt & Sludge Batch recipe adjusts

Lifecycle Timeline Changes

- Completion has been adjusted by ZZ months
- FFA commitments are still met

Cost Chart Example

Example demonstrating modeling capability

Costing Model Next Steps

- **Increased detail on Preventative Maintenance**
  - *Detailed differentiation between critical and support spares*

- **Deterministic Model → Probabilistic Model**
  - *Allows for 'hurricane charts' with Confidence Intervals*
  - *Greater magnitudes of runs (computing resources, analysis)*

- **Priority 'Goal Seeking'**
  - *Iterative model run strategy would allow for cost/sequencing optimization*
  - *Balancing cost benefit vs closure risk*

Conclusion

- **Cost modeling allows for a nuanced view combining;**
  - *Changes of External Factors (e.g. Pricing Profile)*
  - *Operational Strategies*
  - *Engineering Improvements*

- **When price profile changes, model prioritizes waste processing**
  - *Aligns with FFA agreed priorities between DOE, SCDES, and EPA.*
  - *Bulk Waste Removal reduces majority of risk*

- **Effective communication tool relating pricing profile & processing consequences**