



Maximizing the Value of Biosolids from THP at the Piscataway WRRF Bio-Energy Project

Northeast Residuals &
Biosolids Conference
November 1-2, 2022

Presenters:

- Joe Uglevich
- Justin Motta





Agenda

- 01** Project Team
- 02** Project Overview and Background
- 03** Combined Heat and Power
- 04** Energy Efficiency and Grants
- 05** Gas Conditioning System – rNG





WSSC Bioenergy Project Team

Owner

WSSC Water

Design Builder

PC Construction

Designer

Stantec

Subs

Hazen and 12 SLMBE firms

Owner's Program Manager

HDR and Brown and Caldwell



Project Timeline

Design/Preconstruction

June 2017

Phase 1 Enabling Project

November 2018

Phase 2 GMP Agreement

March 2020

(just as COVID shut-downs began)

NTP

June 2020

Scheduled Completion

December 2024

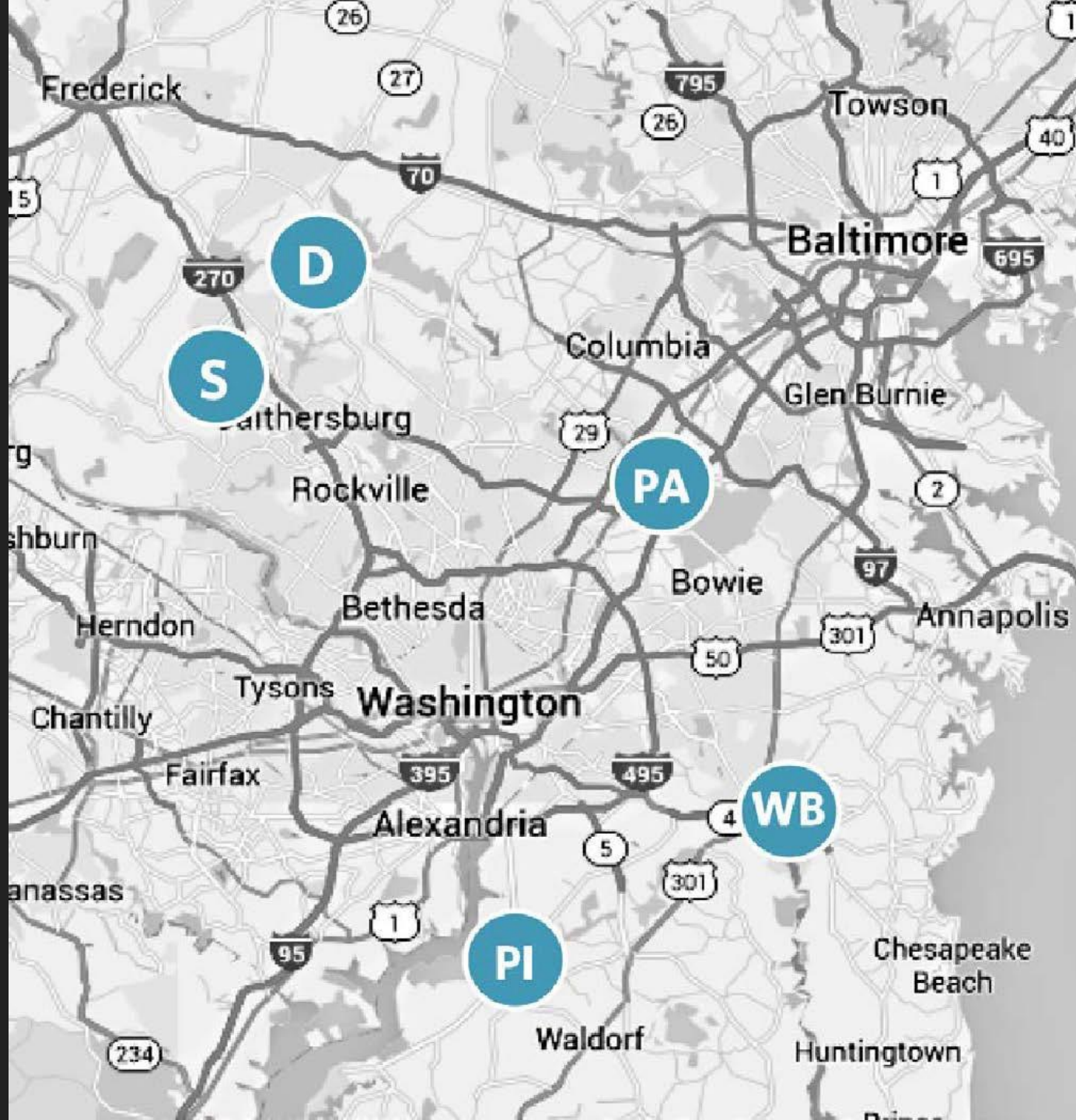
(on schedule)



WSSC Bio-energy Project

Key Features:

- \$271M Project to create a Regional Biosolids Facility
- Progressive Design Build delivery
- Cambi B6-4 THP with Redundant Module
- Cake Receiving and Storage (2 – 450 yd³ vessels)
- Two new 1.5M gallon Anaerobic Digesters
- Deammonification sidestream treatment
- CHP System
- Gas Conditioning rNG system



Centralized Biosolids at Piscataway

Seneca

26 MGD (19.7 dtpd)

Damascus

1.5 MGD (0.93 dtpd)

Parkway

7.5 MGD (5.3 dtpd)

Western Branch

30 MGD (23.4 dtpd)

Piscataway WWTP

30 MGD (23.5 dtpd)

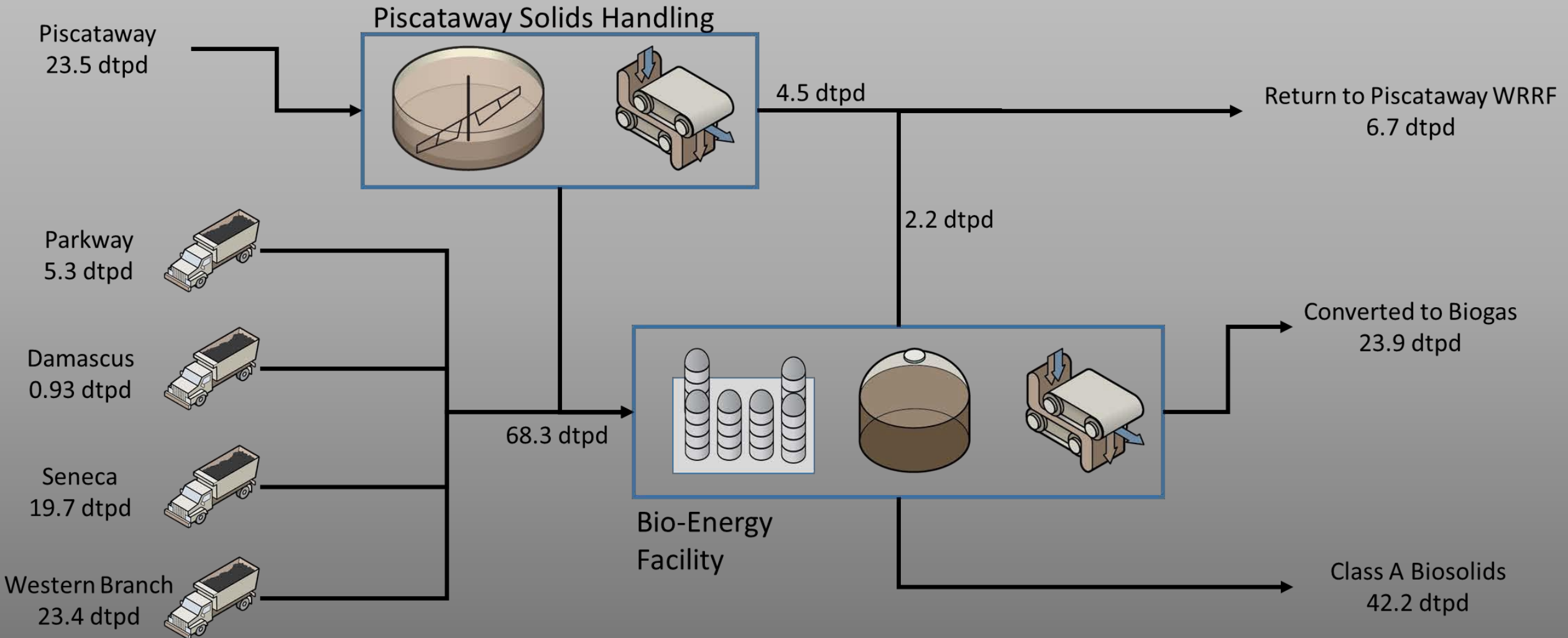
Total Imported Biosolids

49 dtpd (2022)

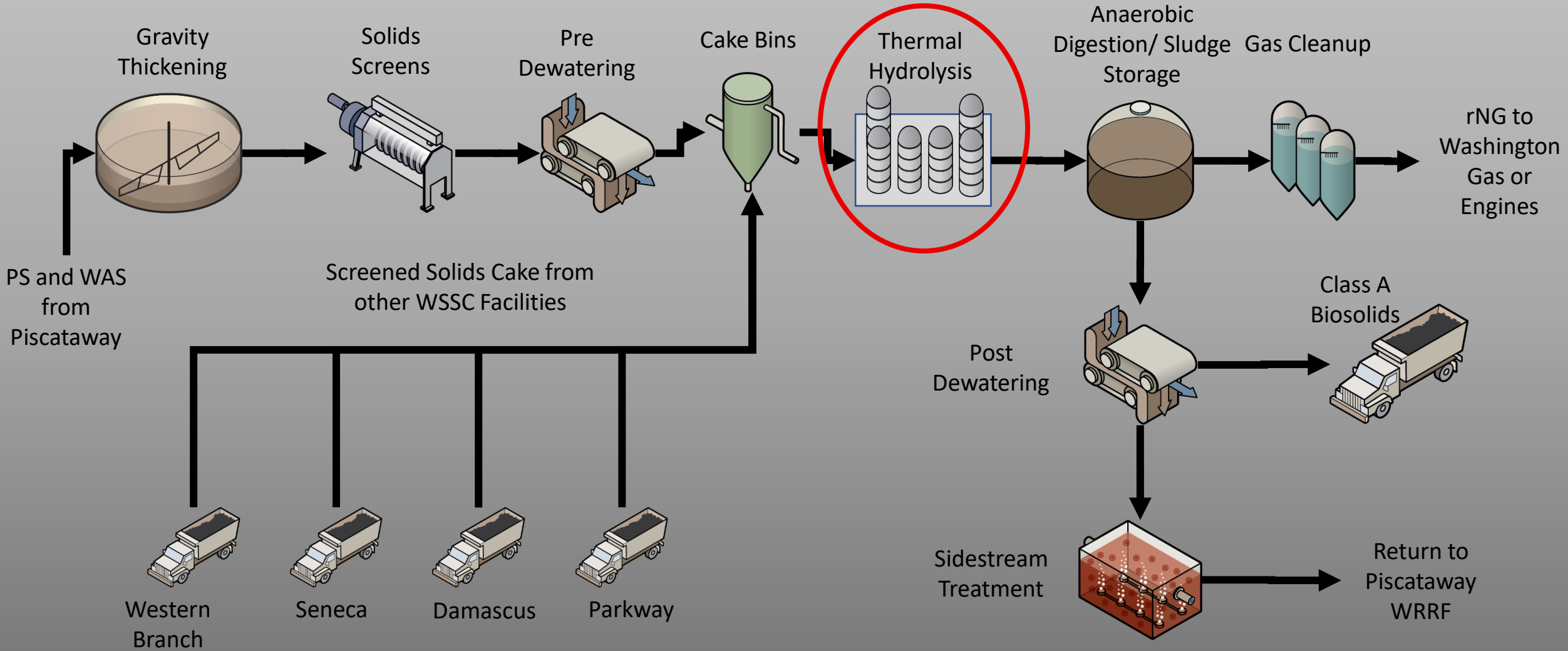
Total Biosolids

73 dtpd (2040)

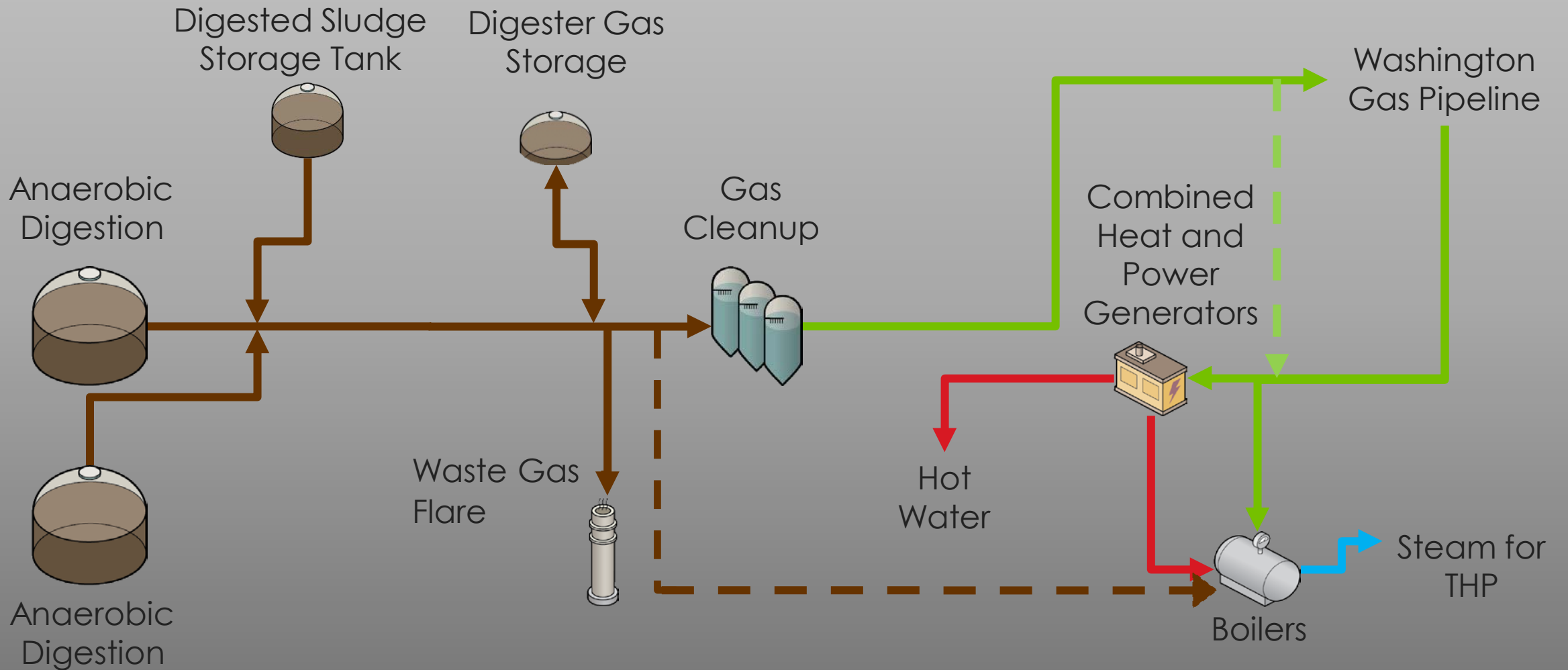
Solids Mass Balance (2040 Annual Average)



Solids Process Flow Diagram



Gas Process Diagram

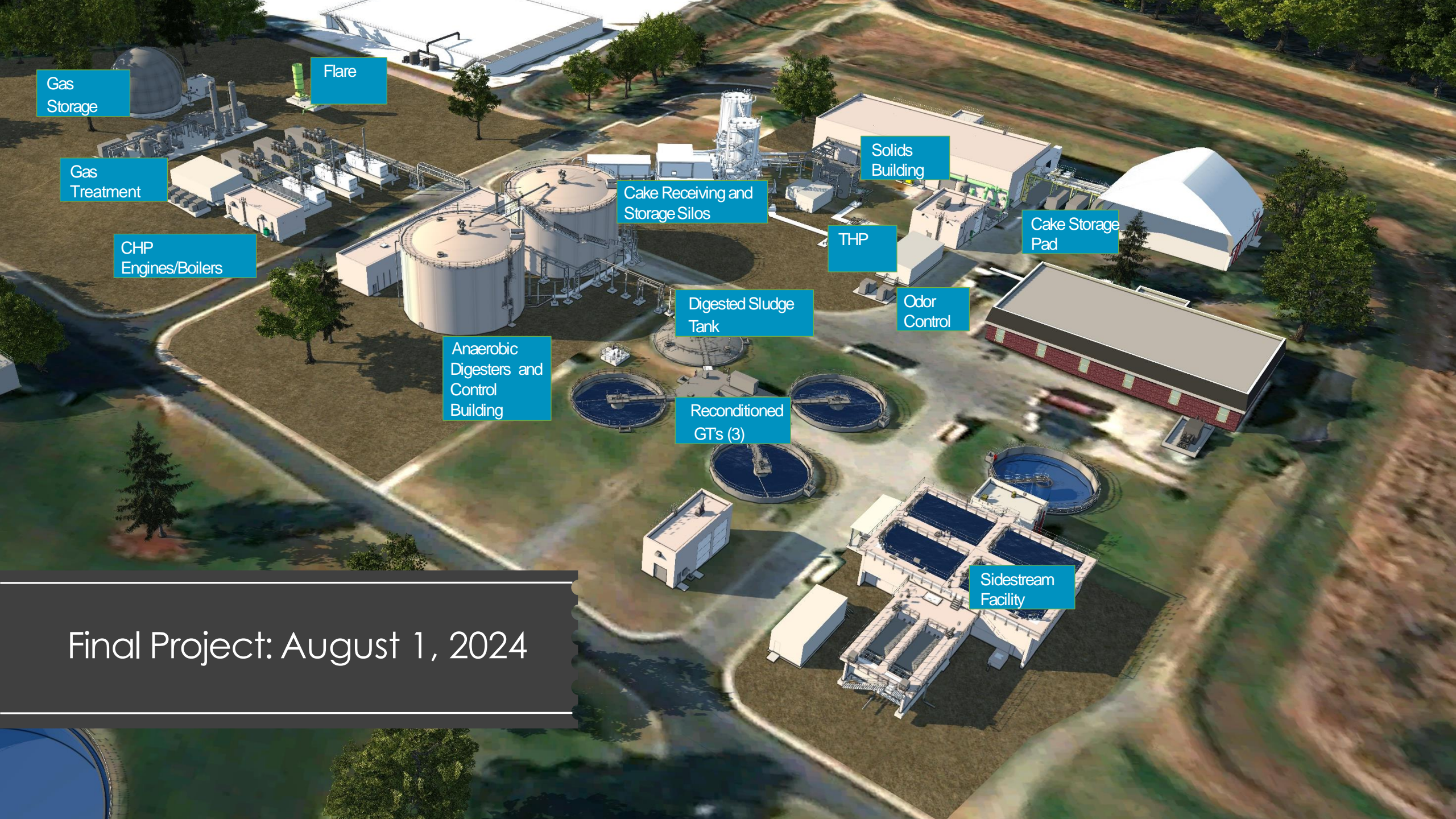




Progress Photo: January 4, 2021



Progress Photo: May 2, 2022



Gas Storage

Flare

Gas Treatment

CHP Engines/Boilers

Cake Receiving and Storage Silos

Solids Building

THP

Cake Storage Pad

Anaerobic Digesters and Control Building

Digested Sludge Tank

Odor Control

Reconditioned GTs (3)

Sidestream Facility

Final Project: August 1, 2024



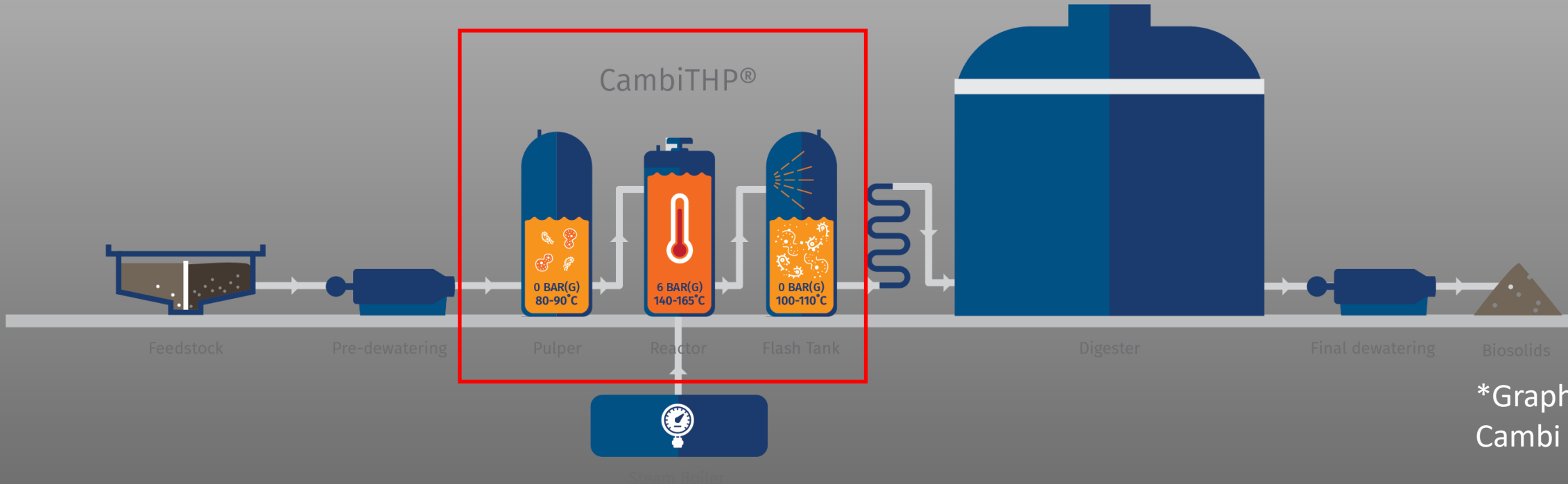
THP Overview

Single Cambi B6-4 skid rated for 92 dtpd

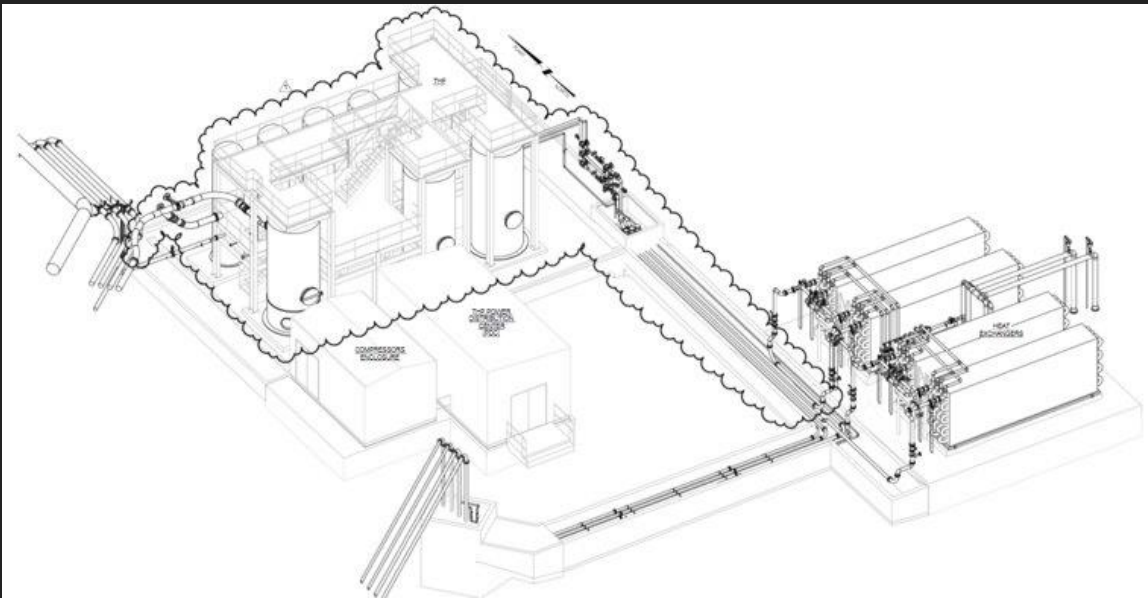
- Achieve Class A Biosolids
- Improves biodegradability of activated sludge
- Increase VSR and biogas production
- Increase digester capacity (9% solids feed)
- Reduction in downstream processing
- Reduction in hauling costs

Major System Components:

- THP feed pumps (not shown)
- Pulpers
- Reactors
- Flash tanks
- Internal THP pump skid
- Other considerations – fat spot for sludge upstream of THP, steam generation, post THP heat exchanger



*Graphic from Cambi website



THP Operational Flexibility

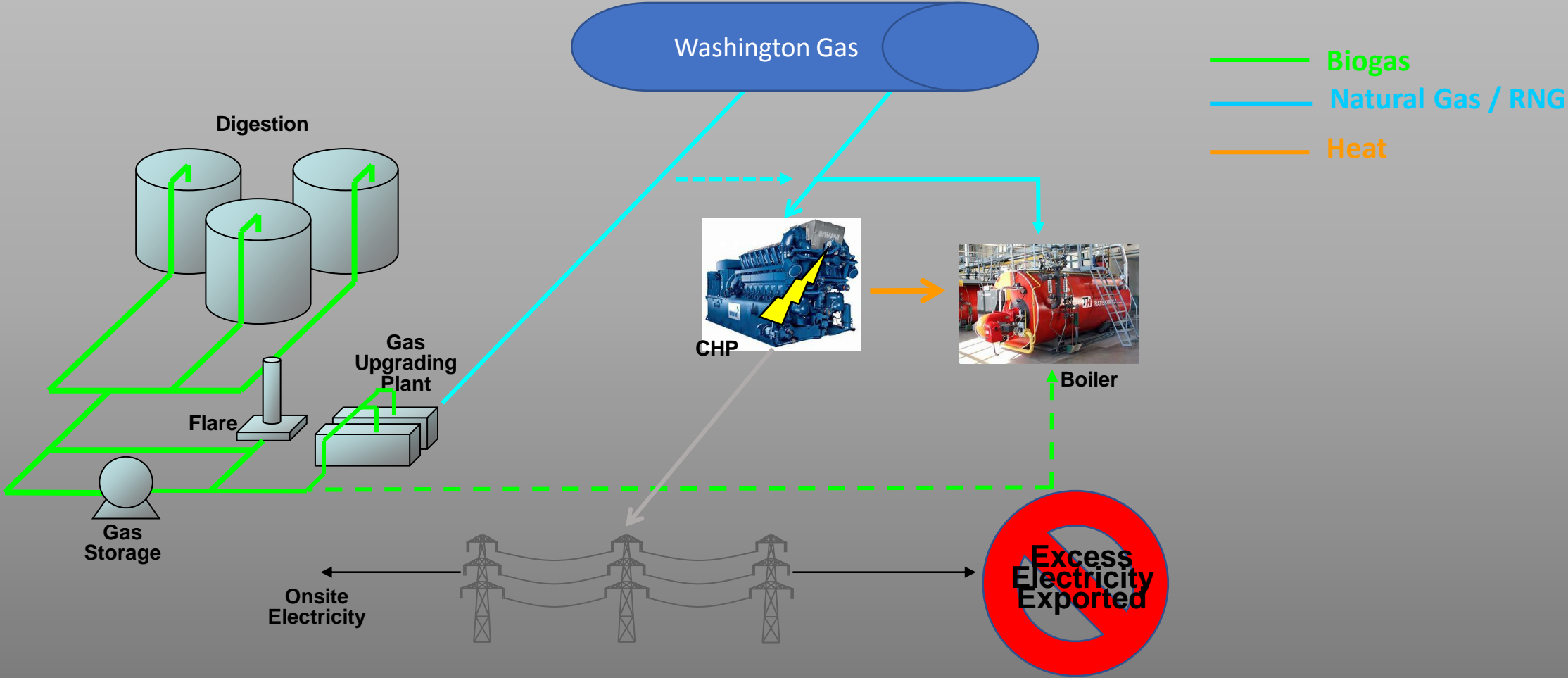
- 7 – 10 day shut down per year for maintenance of pressure vessels, critical piping and valves
- Solution – mid-construction installed redundant module, first in the world application
- Redundant module components:
 - Extra pulper
 - Extra Flash tank
 - Extra pump skid
 - Minor piping and support mods
- Purchase price of \$1.7M versus >\$5M for complete redundant B6-4 skid.



Maximizing the Value of Biosolids

1. Combined Heat and Power (CHP)
2. Gas Conditioning System - rNG
3. Energy Efficiency and Grants

Overview of BioEnergy System





Combined Heat and Power (CHP)

CHP capacity:

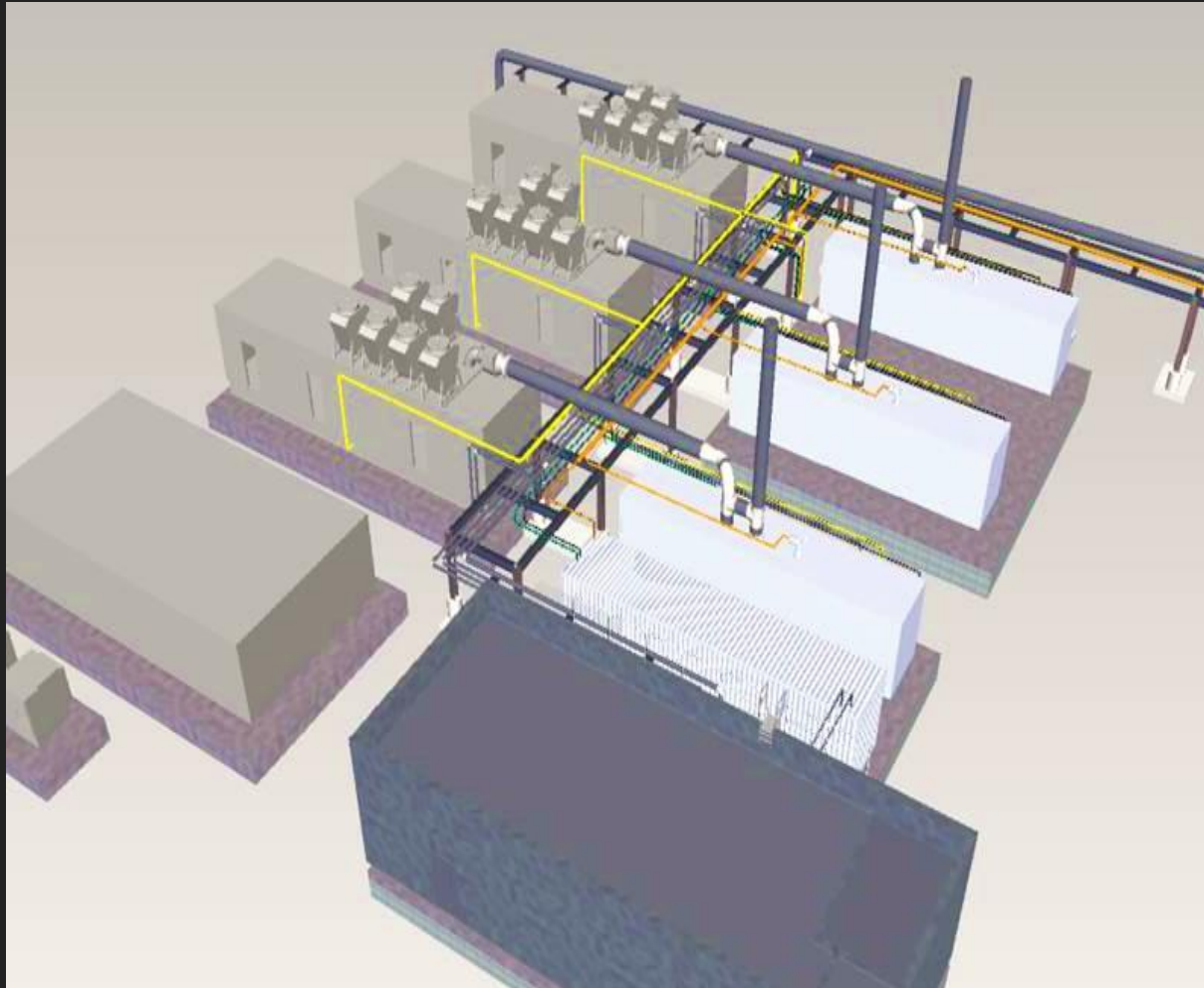
- 3 – 1.5 MW engines, balance generation with need

CHP thermal energy:

- The preheating of the Sidestream feed.
- Preheating of the BFW (boiler feed water).
- Preheating of utility water used for cake dilution and BLI (Boundary Layer Injection) in the feed to THP

Other options considered:

- An absorption chiller in lieu of the standard chiller for biogas water wash.
- Dewatering of final cake through the use of warm air or a warm pad



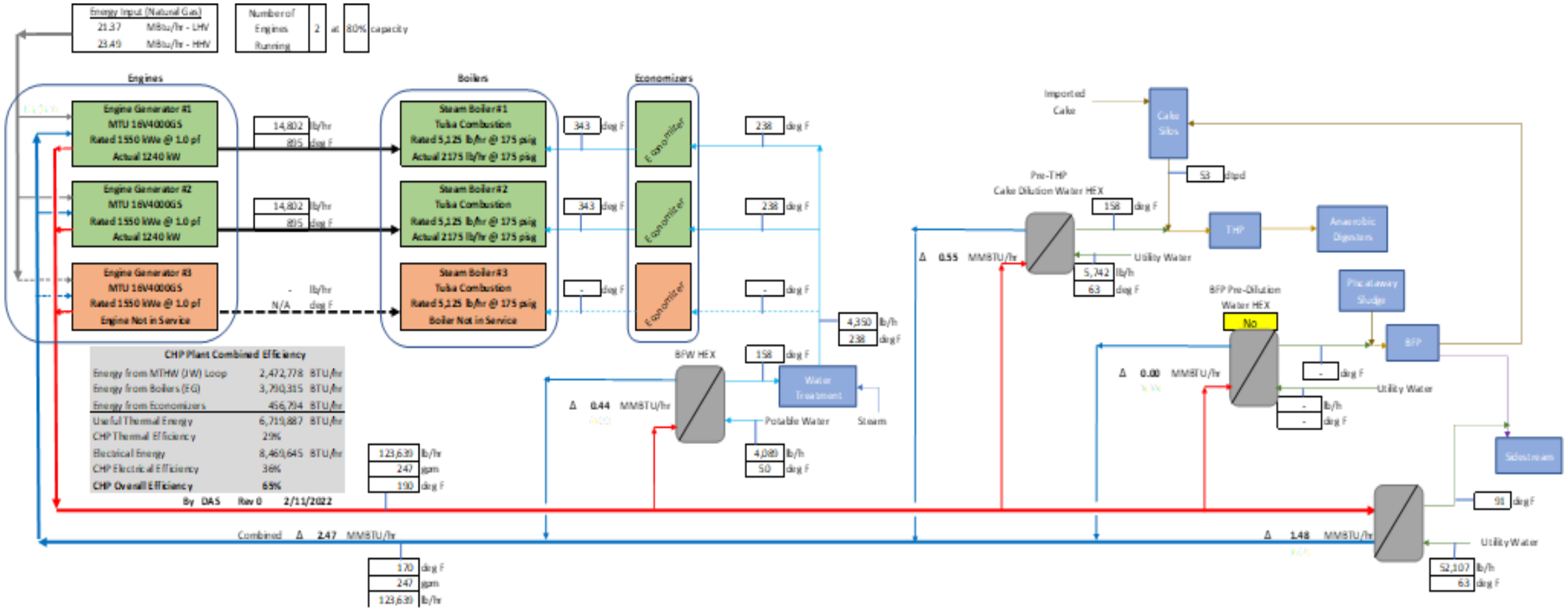
Energy Efficiency Considerations

Energy recovery 'balance sheet' – 65% thermal efficiency goal

CHP Plant Combined Efficiency		
Energy from MTHW (JW) Loop	2,472,778	BTU/hr
Energy from Boilers (EG)	3,918,906	BTU/hr
Energy from Economizers	552,503	BTU/hr
Useful Thermal Energy	6,944,187	BTU/hr
CHP Thermal Efficiency	29%	
Electrical Energy	8,475,109	BTU/hr
CHP Electrical Efficiency	36%	
CHP Overall Efficiency	65%	



Mass and Energy Balance Model

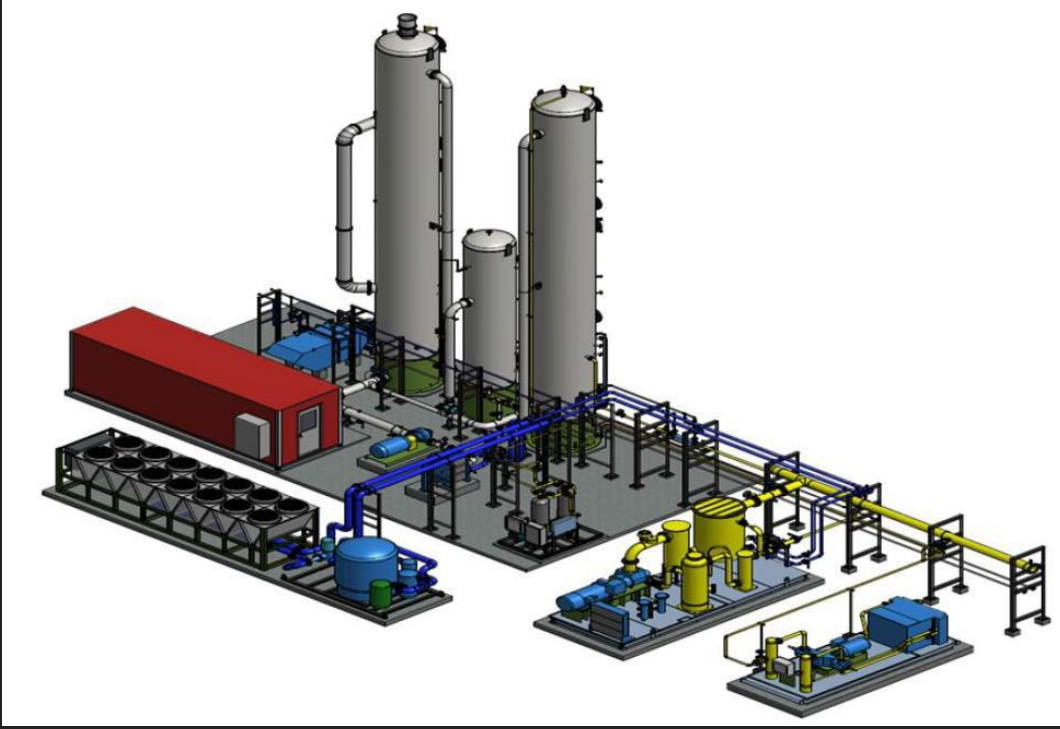




Energy Efficiency and Grants

A project that went beyond these obvious benefits:

- Local construction grant tied to minimum 60% thermal efficiency from MDE
- Additional grant from South Maryland Electrical Cooperative (SMECO) with 65% thermal efficiency



Gas Conditioning rNG

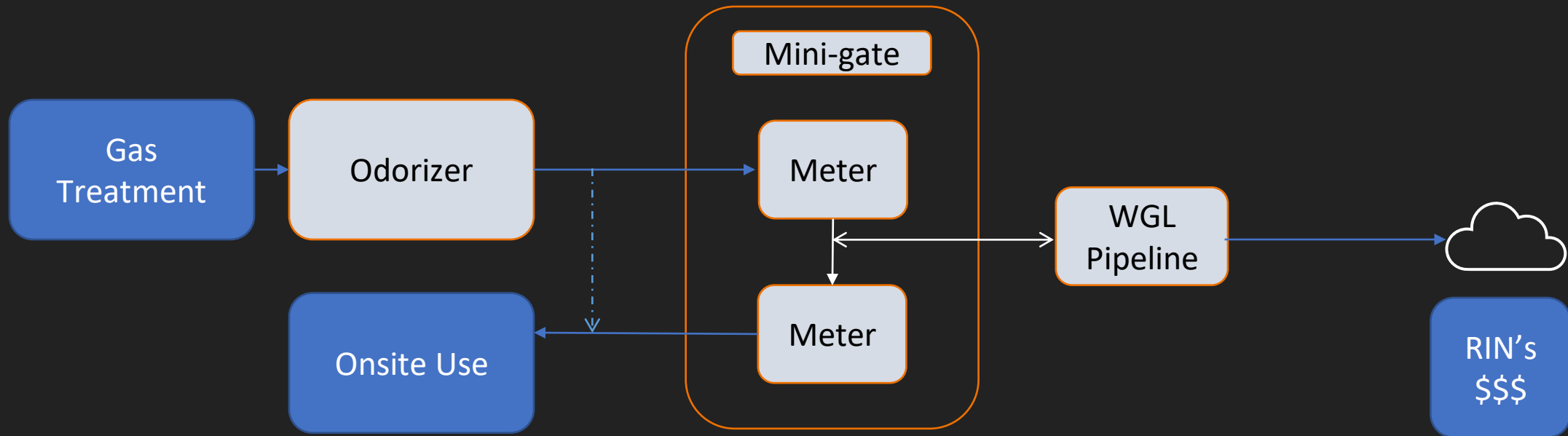
750 cfm rating, approx. \$5.2M capital comprised of:

- Biogas Compressor
- H₂S Removal
- Wash Water Scrubber
- Gas Dryer
- Siloxane Removal
- rNG Compressor



The "MINI" Gate

- WGL Owned & Maintained
- rNG custody transfer
- Two output pressures from gas treatment: 75 psig & 300 psig
- Lots of monitoring and interaction with WGL





Stantec

Final Thoughts and Questions

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