Waste & Energy Recovery Leads to Sustainability at Clearwater WWTF

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NEW ENGLAND WATER ENVIRONMENT ASSOCIATION
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WORKING FOR WATER QUALITY

Agenda

1. DTMA Overview
2. Resource Recovery
   Energy Savings and Energy & Materials Recovery
3. Striving for Energy Neutrality “Net Zero”
4. Energy Enhancements Project
5. Leveraging New System Capacity for HSOW and Cogeneration
6. Construction Phase - "Lessons" Learned
7. Conclude and Questions

Who is *DTMA*?

- Operating Authority formed in 1972
- Home of the world's largest Kiss
- Current Staff of 40
- Serves 6 Municipalities
- Two Wastewater Treatment Facilities
  - Clearwater Road WWTF – 5.02 MGD
  - Southwest WWTF – 0.6 MGD
- Collection & Conveyance System
  - 17 Pumping Stations
  - 160+ Miles of Sanitary Sewer
- Hauled-in Waste Program
  - "Business Venture" (est. 1991)
- Resource Recovery
  - Biogas Utilization / Cogeneration
  - Biosolids Land Application

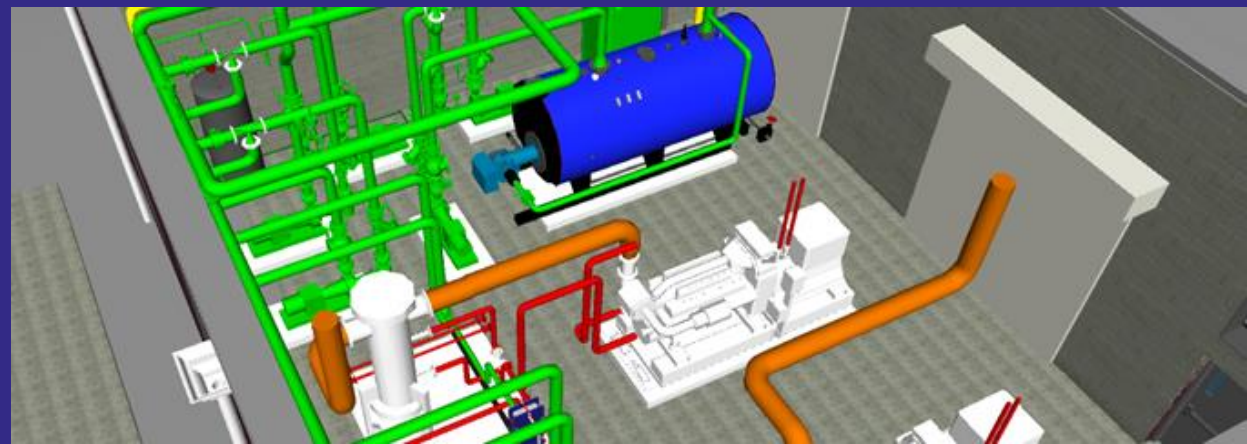
Providing a cost-effective public service to protect and enhance the water, environment, and quality of life for our local and regional community.

Clearwater WWTF

Resource Recovery at a WWTF

What is Resource Recovery?

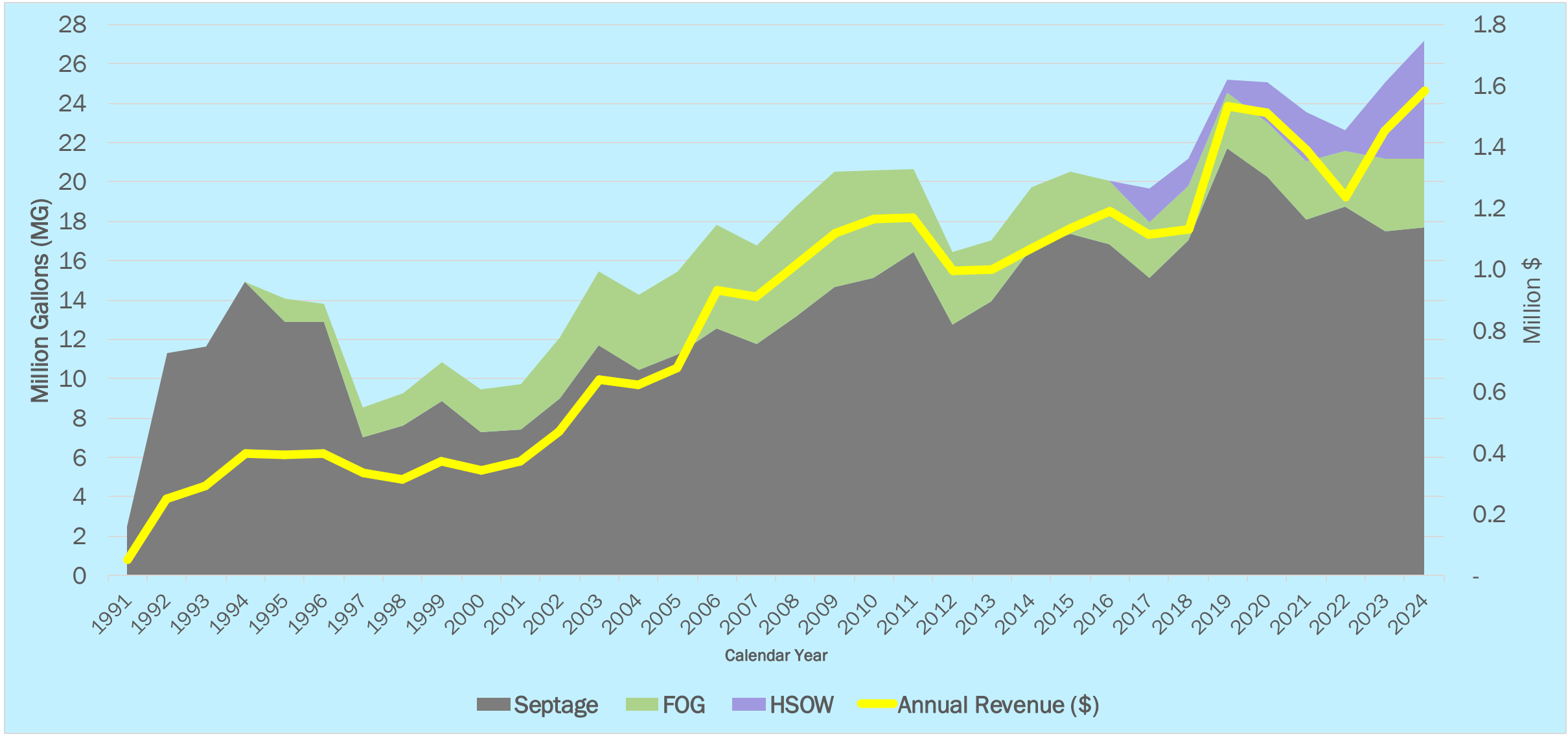
- ✓ Produce Clean Water
- ✓ Organics and Nutrient Recycling
- ✓ Biosolids Land Application
- ✓ Energy Recovery and Utilization



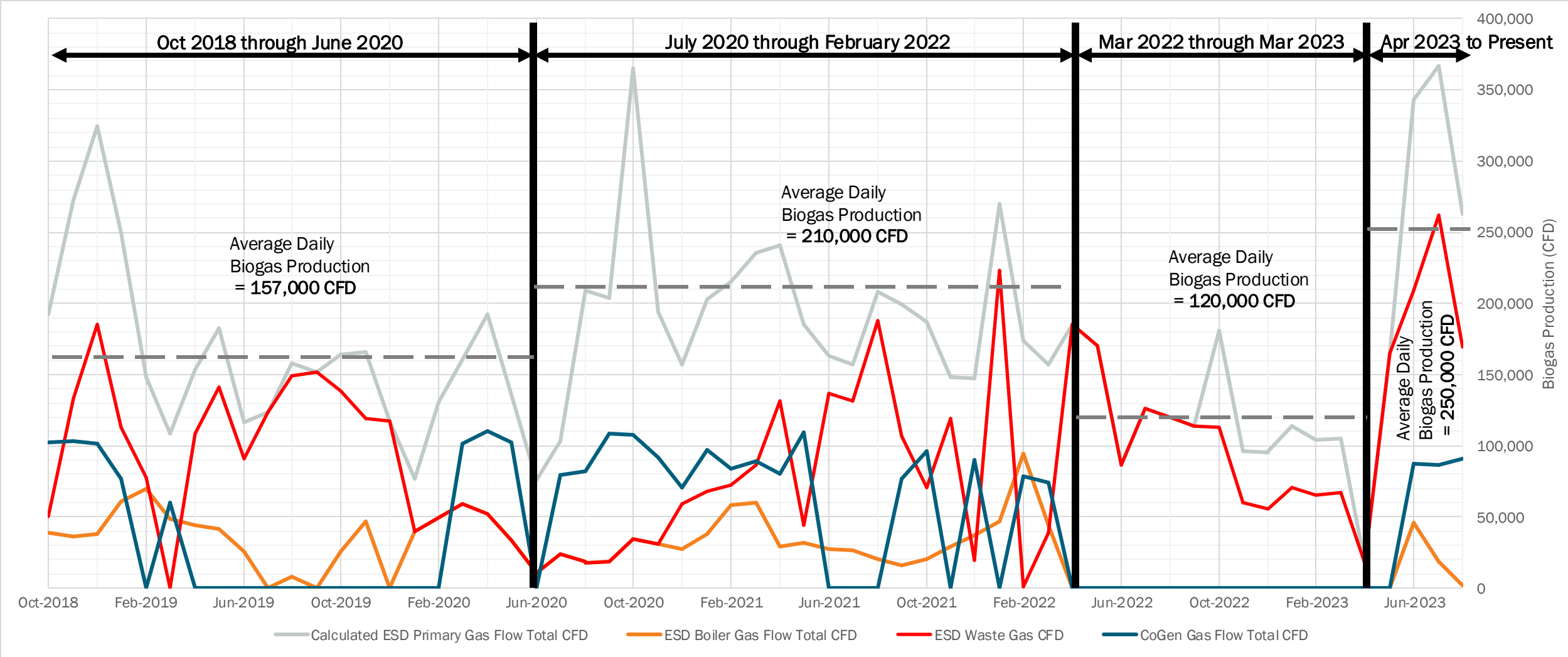
Energy Recovery & Utilization at *DTMA*

- **2001 – ESD Heating**
  - Fuel hot water boiler for heating digester contents
- **2008 – Thermal Dryer**
  - Steam boiler fueled by biogas, dryer heat source
  - *Decommissioned as of July 2018*
- **2010 – 280 kW Cogen & Gas Conditioning (300 SCFM)**
  - Annual Electric Savings – Offsets an average of 25% of total WWTP electric consumption per year
  - Engine Heat Recovery: Heat three (3) WWTP buildings during cold weather season
  - *Decommissioned as of March 2024*
- **2020 – 2024**
  - Energy Enhancements project
- **2022 – Current**
  - Biosolids Facilities improvements project

Septage/ FOG/ Food Waste – Annual Receiving Total

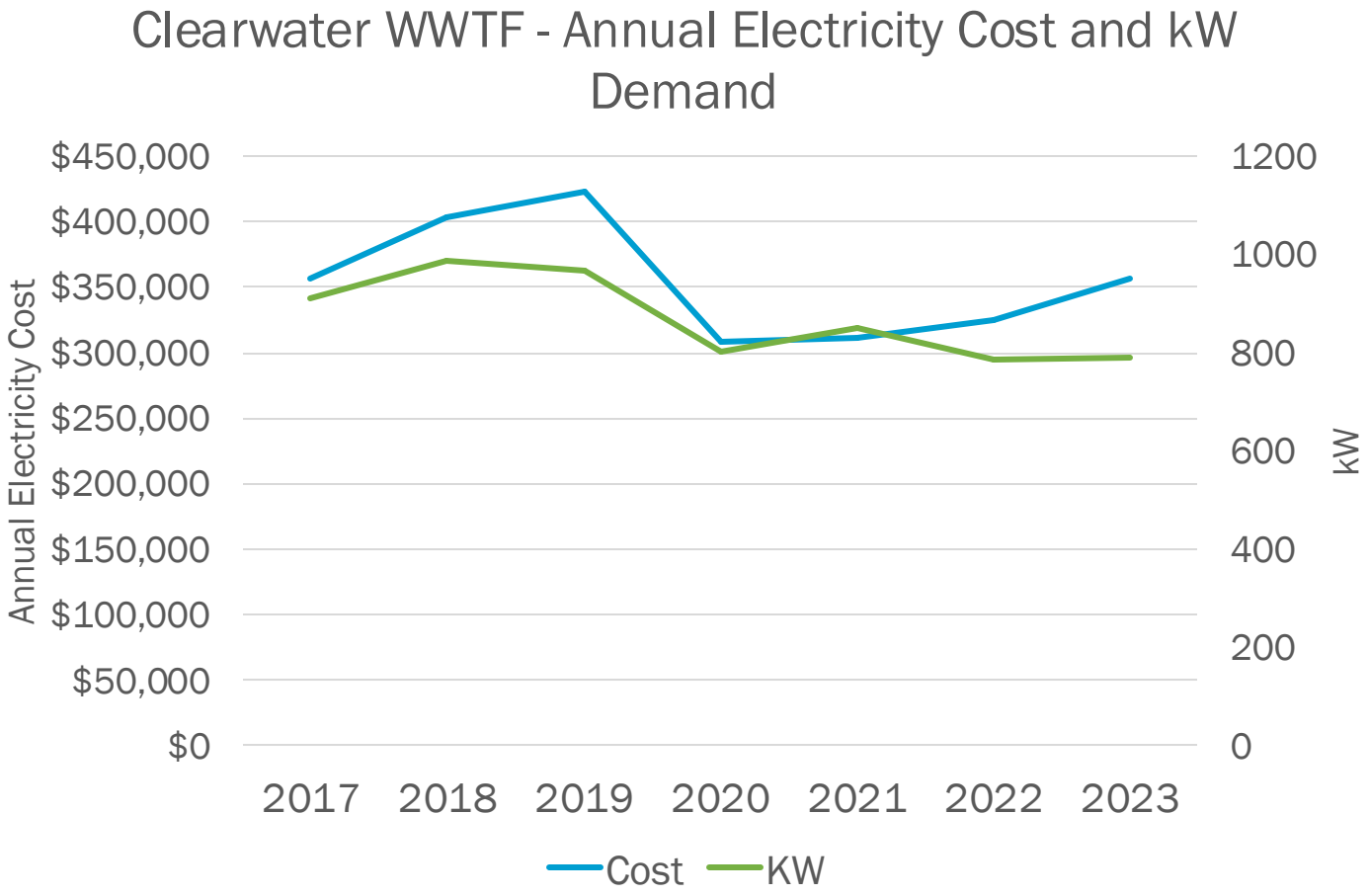


BIOGAS ON-SITE UTILIZATION



- Oct 2018 - June 2020: 14,000 gallons (or 3 Truck Loads) per week of HSOW
- July 2020 - Feb 2022: 55,000 gallons (or 10-14 Truck Loads) per week of HSOW
- Mar 2022 - Mar 2023: Secondary Digester / Gas Conditioning Shutdown for Energy Enhancement Project; Minimal HSOW Acceptance
- April 2023 – Present: Completion of the Energy Enhancement Project; 95,000 gallons (or 14-23 Truck Loads) per Week of HSOW

Current Energy Usage/ Cost



Energy Source	Annual Cost (average)
Electricity – WWTF	$325,800
Electricity – 3 Pumping Stations	$36,600
Natural Gas - WWTF	$25,700
Fuel Oil - WWTF	$20,100
Total	**$408,200**

Striving for Energy Neutrality “Net Zero”

What Does “Net Zero” Mean to DTMA?

- **Monetary**
  - Net Zero can be defined as a monetary value.
  - “ We spent $ in fuel and electricity last year and would like to generate $ in produced energy.”
- **kWh / BTU / Ccf / Gallon**
  - Net Zero can be defined as a combination of consumed fuel units.
  - “We utilized XXX kWh last year and would like to generate XXX kWh.”

As defined by DTMA…

A simple energy balance of kWh consumed to kWh produced

What was holding DTMA back?

Undersized biogas management system and gas utilization equipment

Average and Maximum Daily Flow, Digester Gas

Area/Process	Max:Avg ratio	Avg Daily Value, scfd	Avg Flow per Minute, scfm	Resultant Max Daily Flow, scfd
Hauled waste	2:1	1,032,000	717	2,064,000
Municipal sludge	3.0:1	190,000	132	570,000
Total	-	1,222,000	849	2,634,000

The Future is….Efficient

Committing to “Net Zero”

- Embarked on $18.6 MM *Energy Enhancements* project to upgrade and improve:
  - Biogas storage, conveyance, and conditioning
  - CHP Building with two (2) 1,000-kW CHP systems
    - *Utilize excess biogas generated from Co-Digestion of HSOW*
  - Interconnection and Net Metering with PP&L
  - Plant-wide heating systems and controls
- Plant’s current energy demand is less than 1,000-kW
  - Redundant engine
- Commissioning began in June 2023
- Interconnect agreement signed January 2024

Energy Enhancements Project

ESD & Secondary Digester Upgrades

CHP Building

Biogas Management & Conditioning System

New Waste Gas Burner

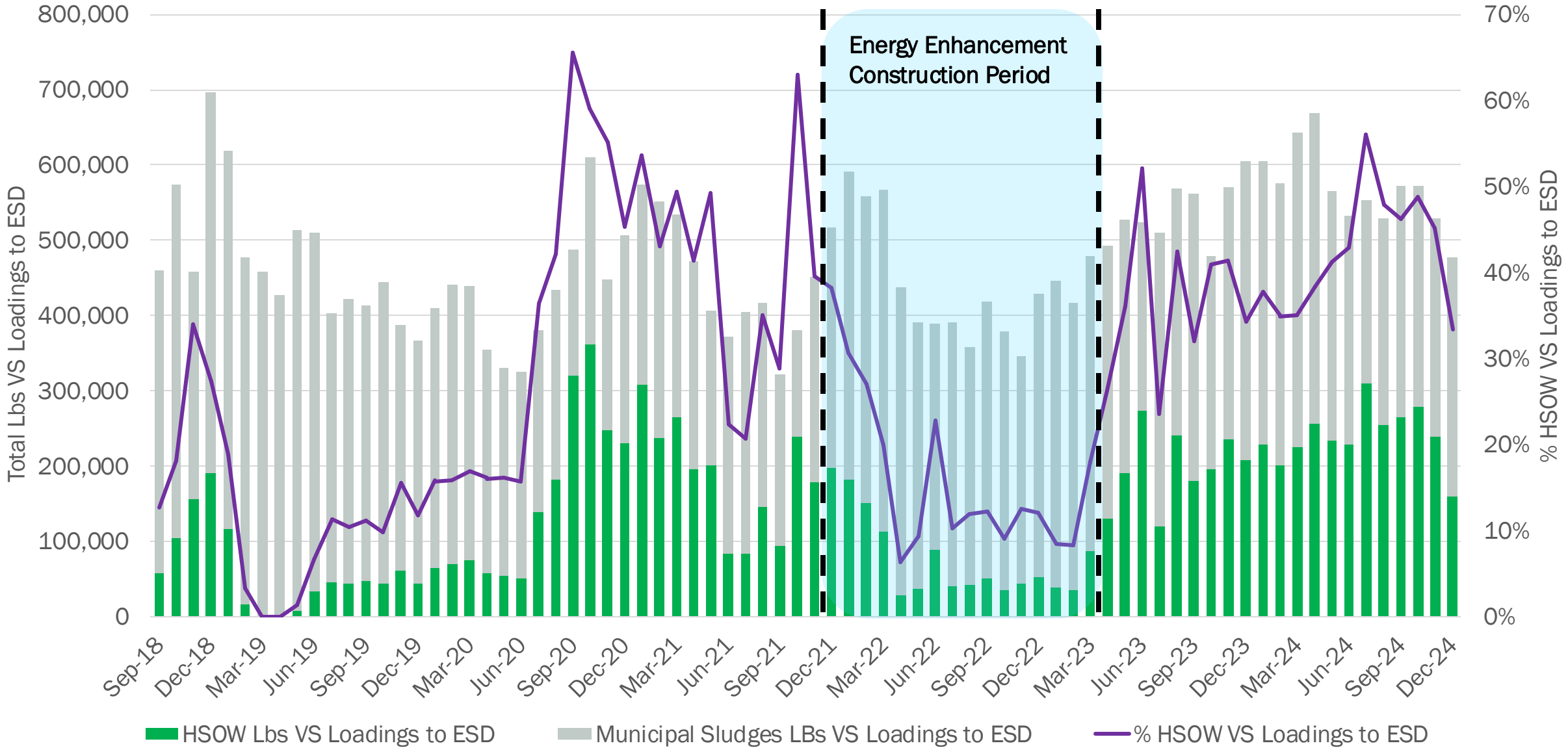
Cogeneration System

HSOW Equalization

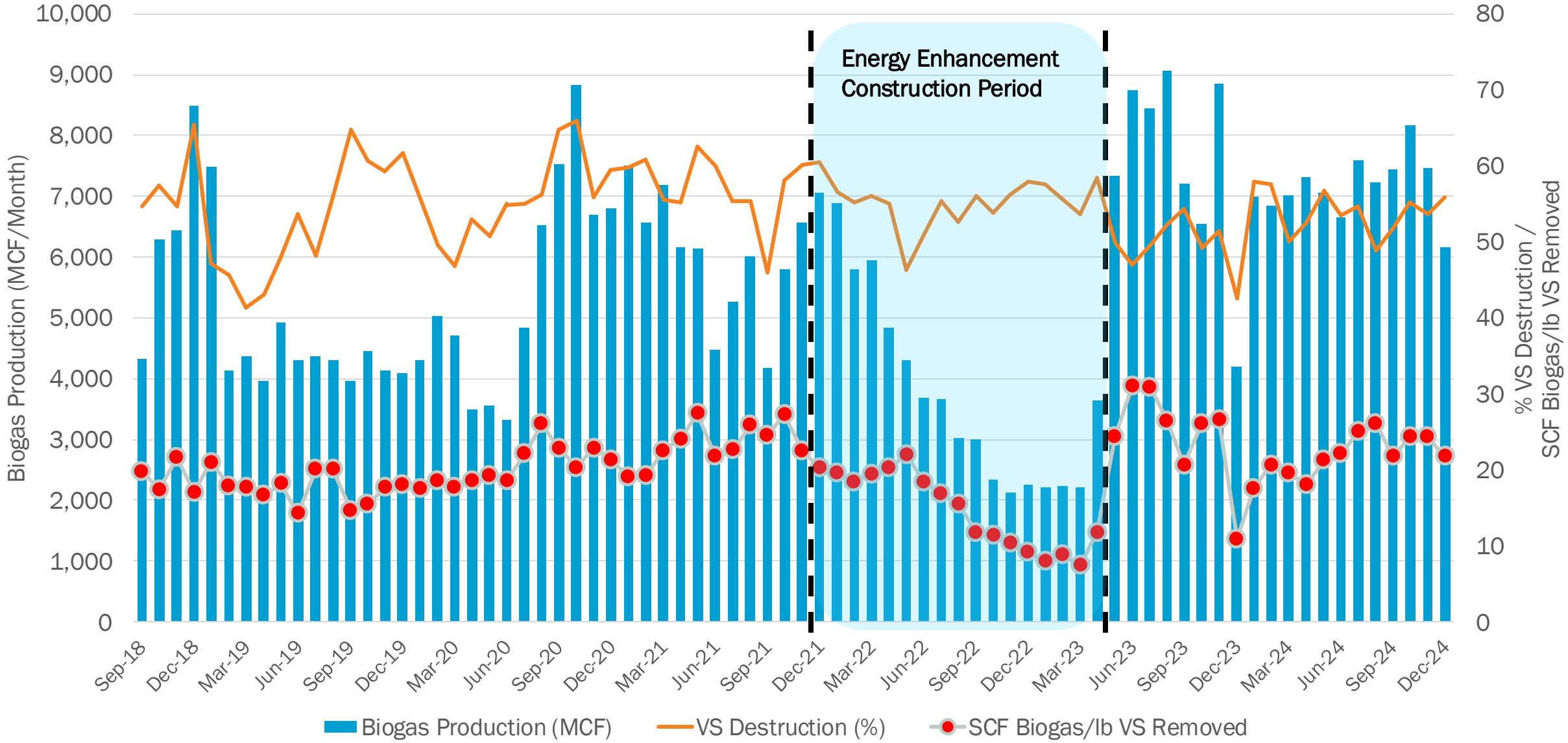
- Equalize HSOW feedings over the weekend
- Reduce operational challenges (overloading, rapid rise, foaming)
- Normalize digester head pressure and gas flow

Leveraging New System Capacity for HSOW and Cogeneration

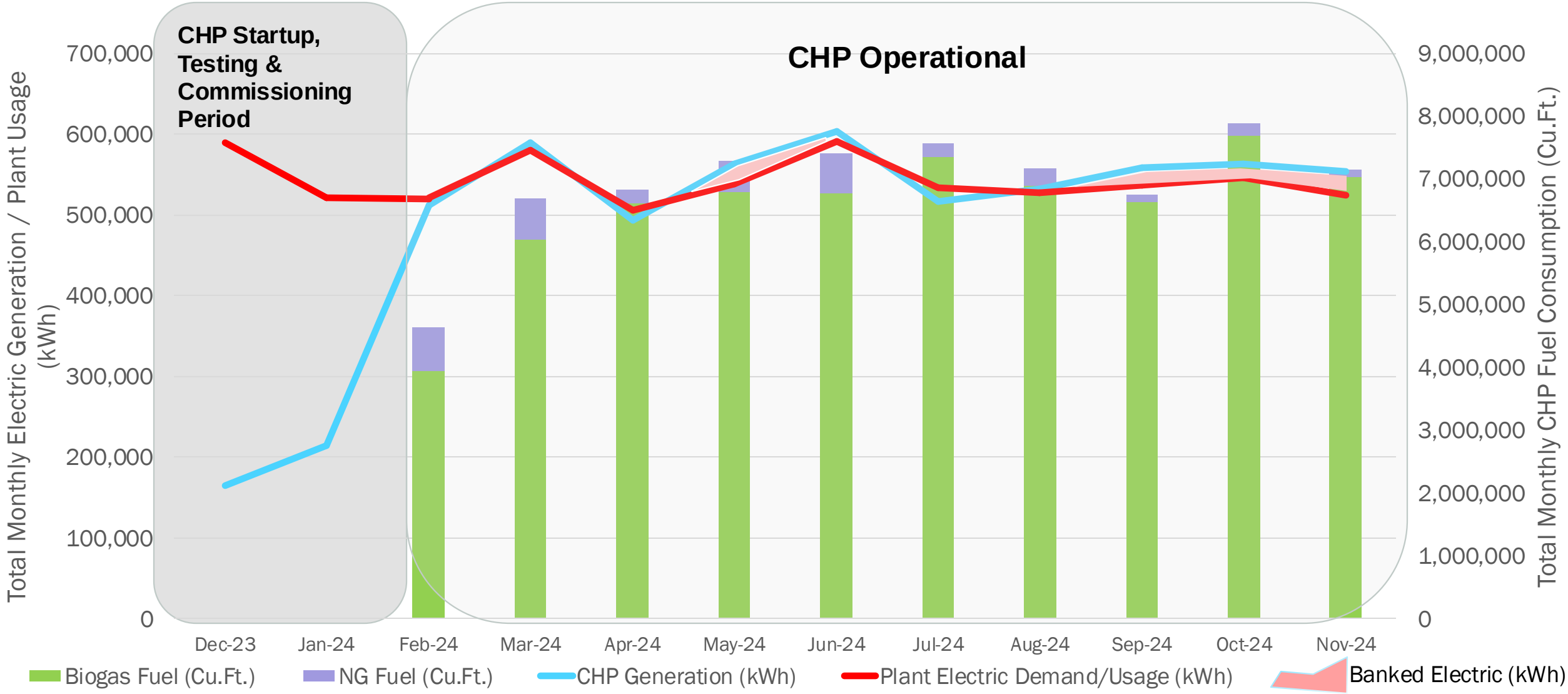
Digester VS Loading: Total vs HSOW



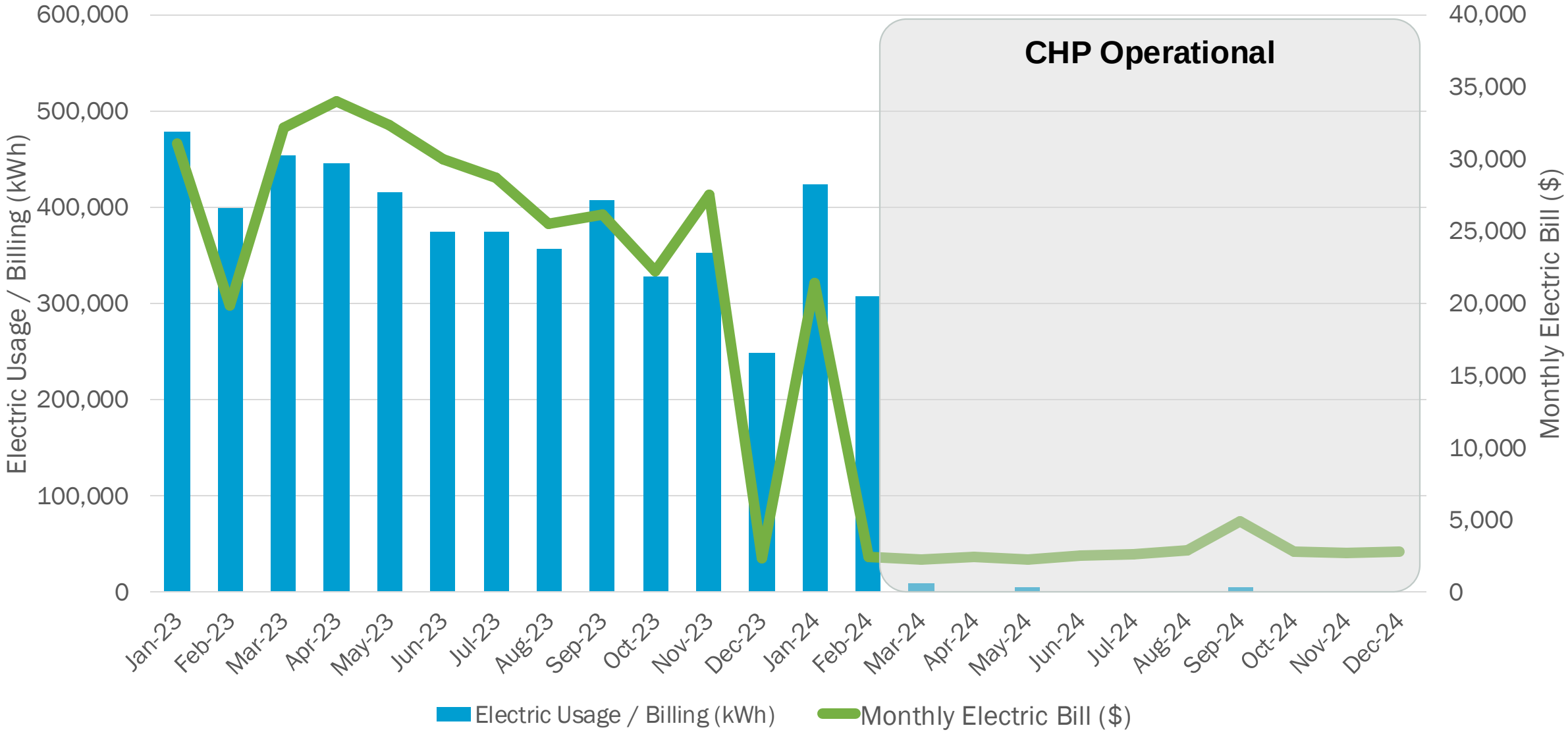
Biogas Production vs. VSR



Clearwater WWTF Electric Usage Vs. CHP Generation

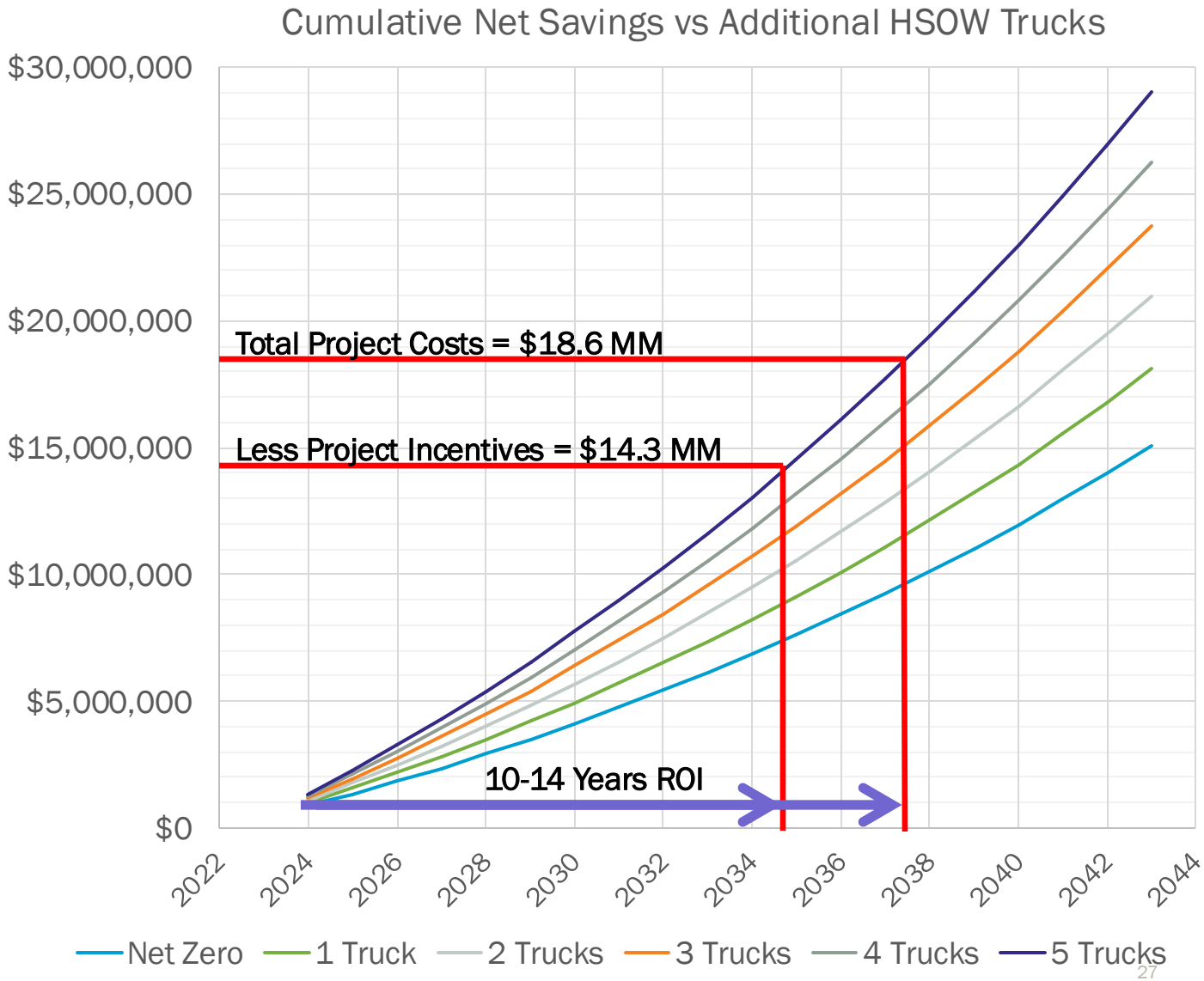


Clearwater WWTF – Electric Bill



Additional HSOW = Increased Net Savings

- ‘Net Zero’ Assumptions
  - 900 kW = Net Zero Electricity
  - Electricity Savings – 91%
  - NG Savings – 99%
  - Fuel Oil Savings – 99%
  - RECs = 5,500 MW per year – 95%
  - Net Export to Electric Grid = 50 kWh
  - 1.6 additional trucks/d = 900 kW
- Cogen O&M Cost
  - $0.025/kWh
- Exporting Power Net Revenue
  - 1 Additional Truck/Day = $106/d of Net Revenue
- Additional Tipping Fee
  - $150/truck/day
- Project Incentives
  - $500k rebate from PPL
  - $3.8 million tax credit from IRA - ITC



Construction Phase - "Lessons" Learned

“Lessons Learned”

- Engage utility partners and pre-procurement early and often
- Pre-purchasing schedule and sequencing
- Extended warranty provisions
- Negotiate service contracts during installation (or sooner)

Conclusions

- ✓ Upsizing the biogas management system was essential to leveraging HSOW
- ✓ Co-digestion improves savings with renewal energy projects
- ✓ N+1 redundancy for a cogeneration facility allows for more uptime
- ✓ Energy projects impact O&M savings

Thank you. Questions?

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Special Thanks to our Project Stakeholders:

Eastern Environmental Contractors (GC)

Pagoda Electric (EC)

AIS – formerly Heisey Mechanical (HVAC)

Optimum Controls Corporation (Systems Integrator)

Cummins Inc. (and local Harrisburg branch)

RK&K (Electrical Design)

Bassett Engineering (Site Design & Air Permitting)

HRG (RPR)