

Putting the Principles of Sustainability and Resiliency into Practice – The GLSD Organics to Energy Project

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Discussion Topics

GLSD Background

Project Drivers

System Components

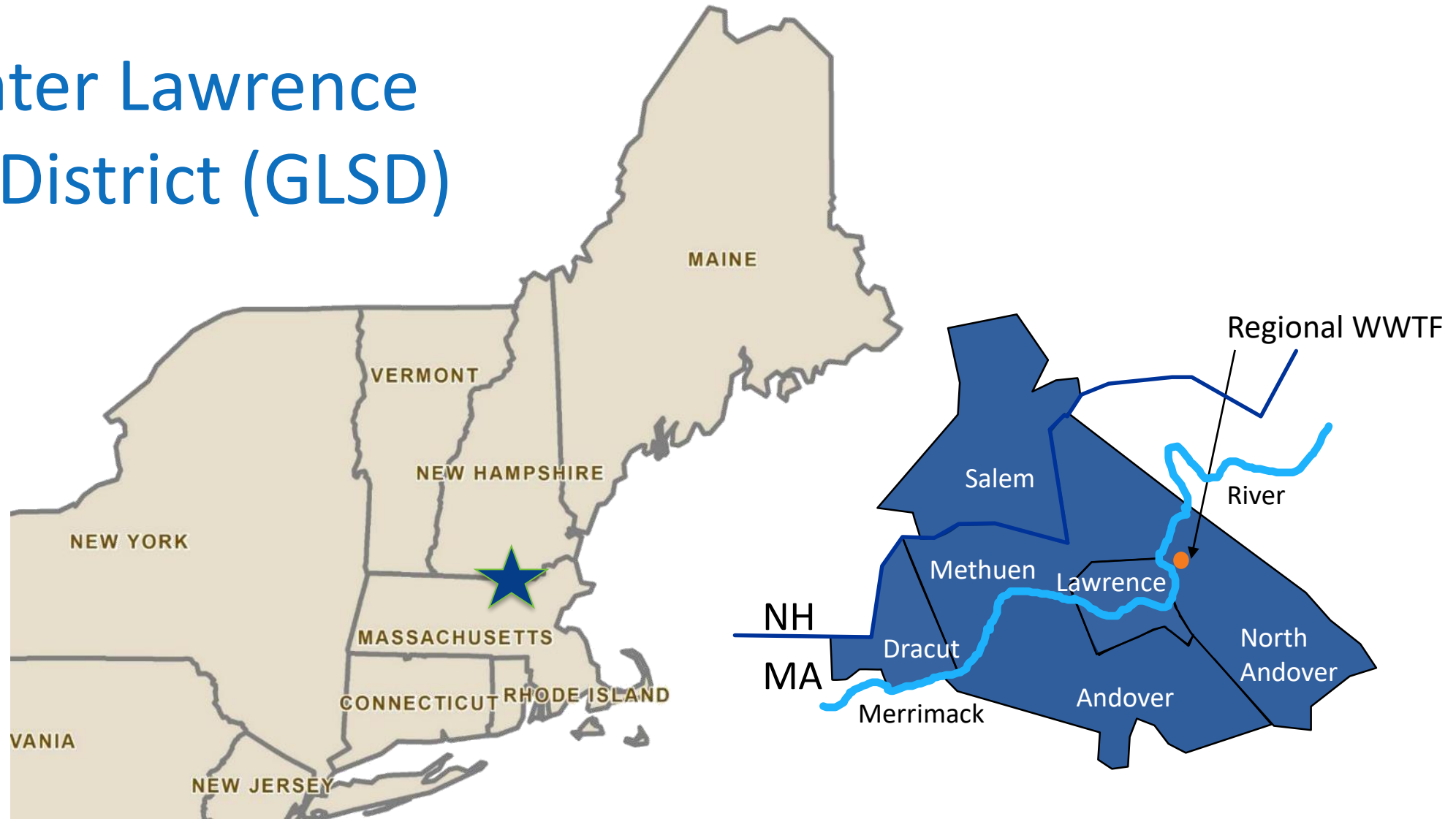
Energy Production

Challenges and Benefits

Questions



The Greater Lawrence Sanitary District (GLSD)

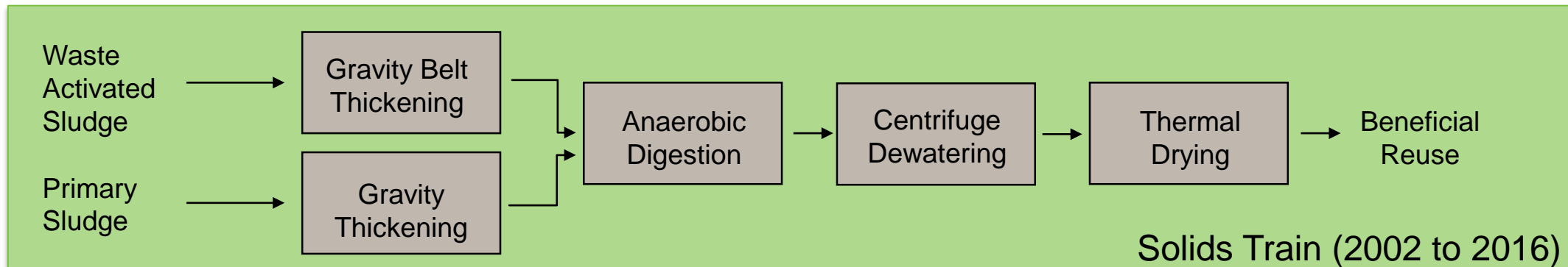
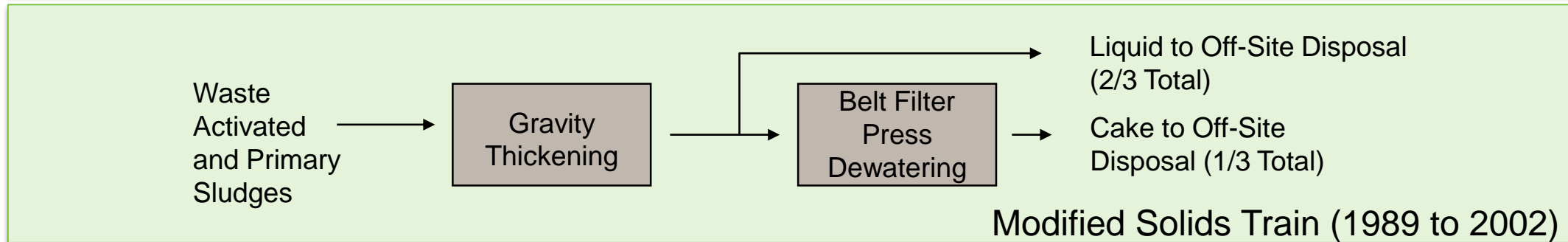
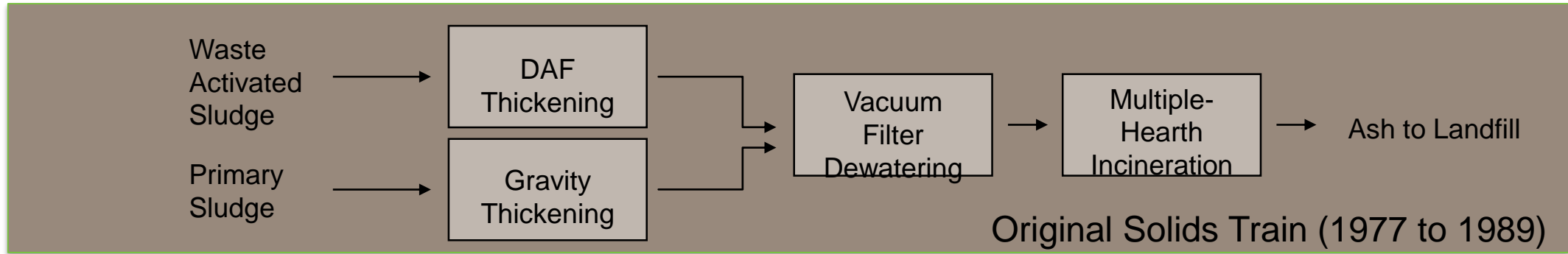


GLSD Background

- Established in 1968
- Operational Since April 1977
- Regulated by USEPA & MassDEP
- Average flows
 - 52 MGD design
 - 30 MGD current
- Class A Biosolids Heat Drying Facility Built in 2002, ~ 6,000 Tons/Yr of Fertilizer Pellets
- 100% of Class A Fertilizer is recycled by local farmers and landscapers



Evolution of Biosolids Management at GLSD



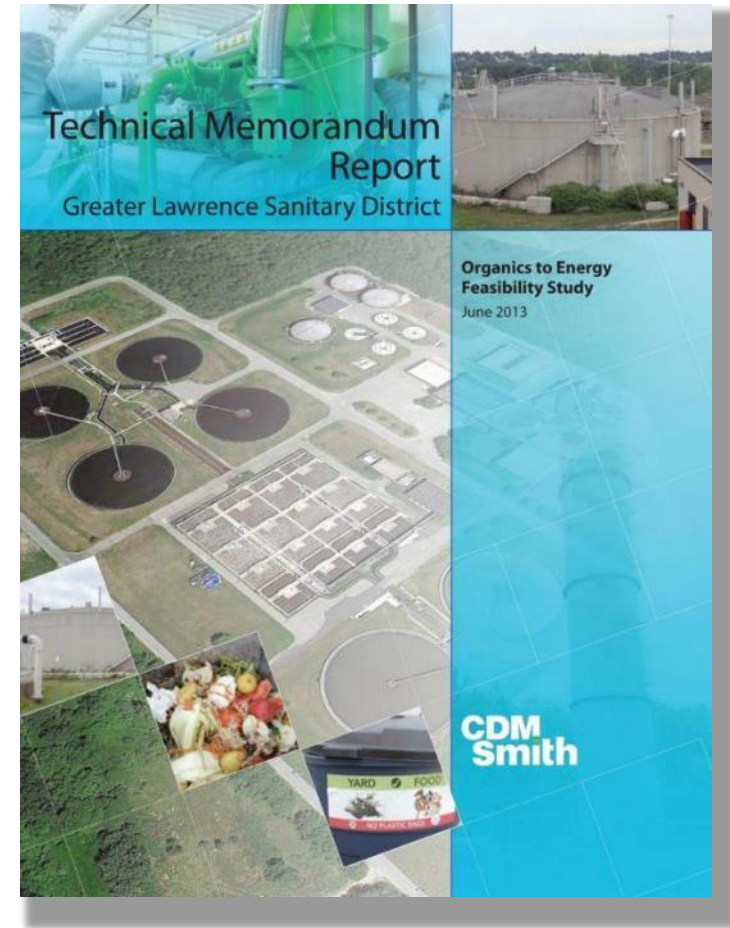
Massachusetts Organic Waste Disposal Ban

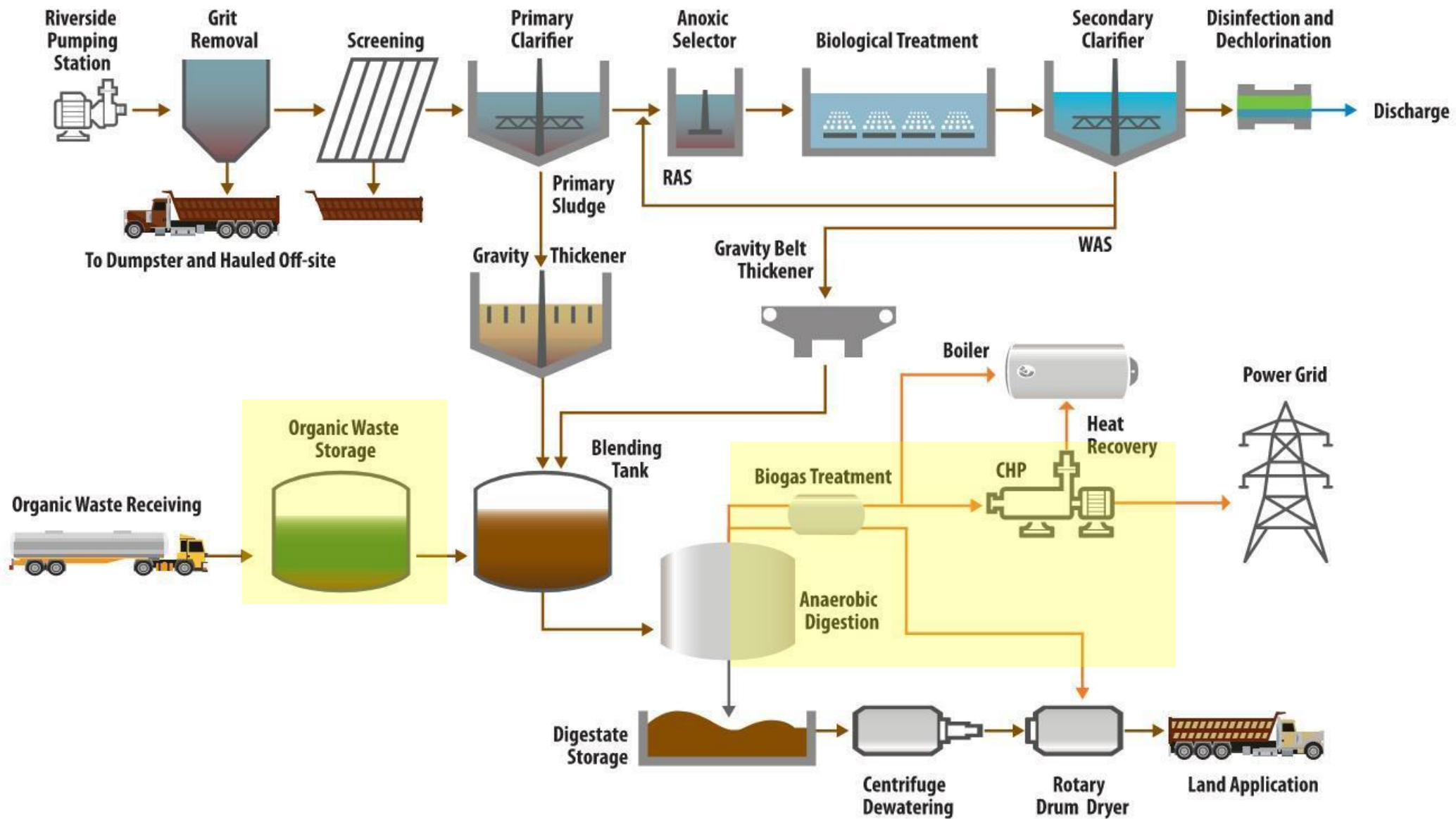


- Producers of >1 ton of food waste per week banned from landfills or incinerators
- Must be diverted to food kitchens, composting or anaerobic digestion
- Impacts hotels, restaurants, universities, hospitals, supermarkets, food processors and wholesalers
- Long-term target is 80% diversion by 2050
- Waste ban threshold being lowered to ½ ton per week in November 2022

GLSD Co-Digestion Feasibility Study (June 2013)

- GLSD could handle ~28,000 gpd of SSO material in existing digestion system
- Could accept up to 92,000 gpd of SSO material with addition of 4th digester
- GLSD is generating 100% of its WWTP energy needs using 100% renewable energy
- Project could eliminate \$2.8 M annual electrical costs & provide stable back up power to facility
- At full capacity, GLSD will meet a sizable fraction of the State's goal for SSO diversion based on DEP projections





Organic Waste Receiving and Conveyance



Truck Offload Stations



Receiving Tanks



Transfer & Mix Pumping Station



Anaerobic Digester No. 4

- 1.4-MG volume
- Draft tube mixers & Steel gas-holding cover
- Space available within existing building for new equipment

Biogas Conveyance and Treatment



Fixed media H₂S & siloxane treatment



Expanded gas conveyance capacity



New flare for increased capacity

CHP Production

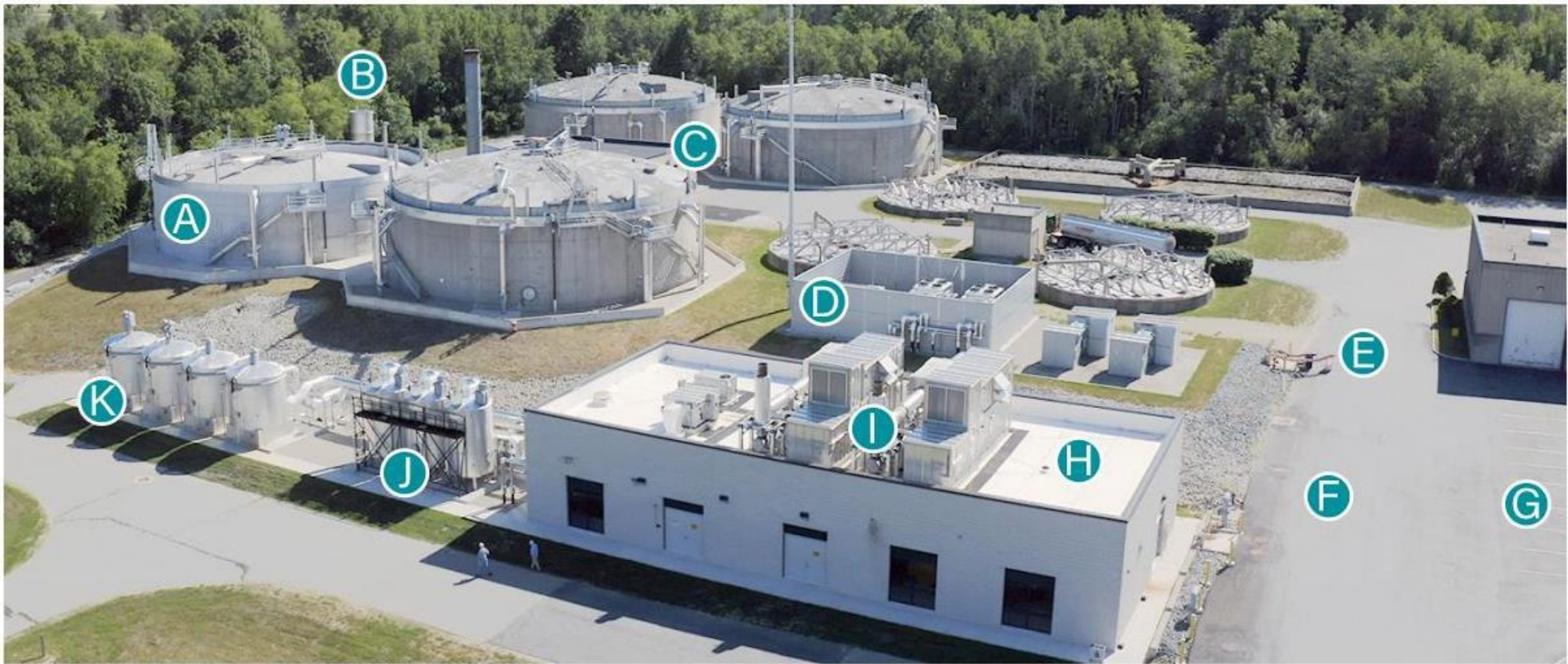
- Two reciprocating CHP generators
- Total capacity of 3.2 MW
- Space for future third engine
- Power fed to site electrical system and net metered to the utility grid
- Projected avg power demands:
 - Plant: 1,700 kW (onsite)
 - RSPS: 700 kW (via net metering)
- Heat captured to supply digesters and other on-site heating demands





CHP Engine Emissions Control

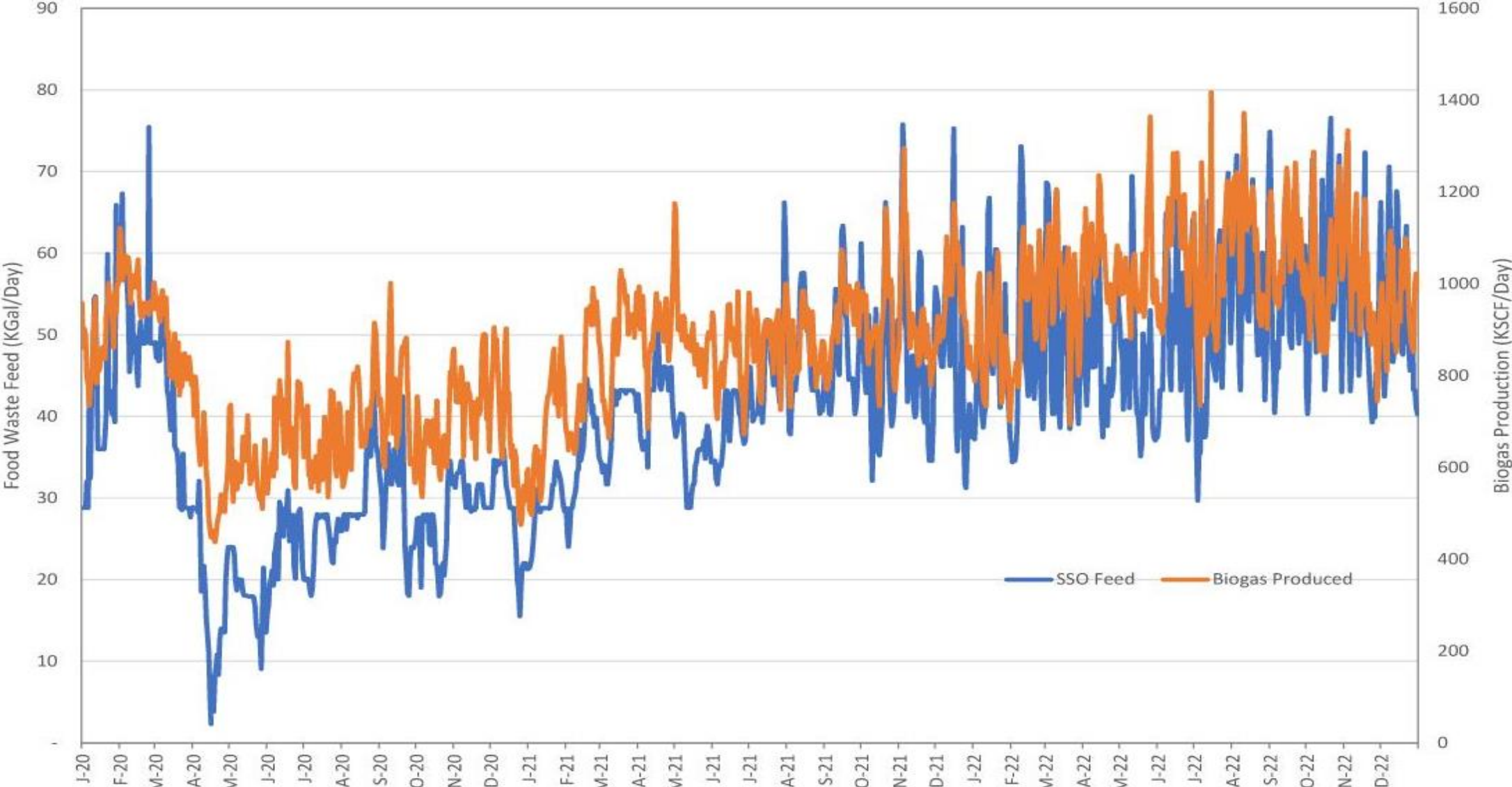
- Oxidation catalyst technology to remove VOC and CO
- Selective Catalytic Reduction (SCR) technology to remove NO_x
- Best available control technology as determined by MassDEP



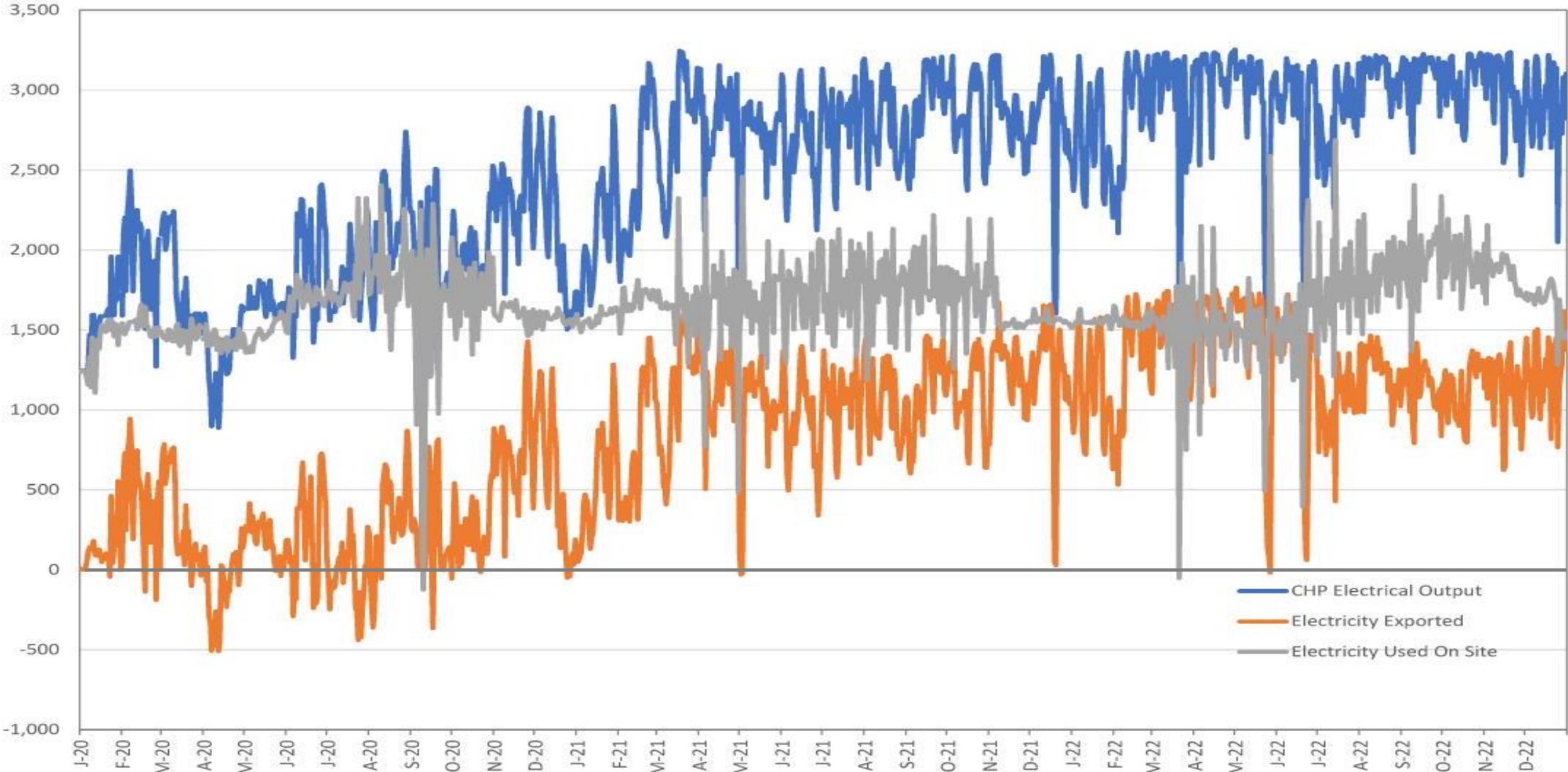
GLSD Organics to Energy
Project Components

- A** Digester #4
- B** Waste Gas Burner
- C** Digester Equipment Upgrades
- D** Radiators and Chillers
- E** Organic Waste Receiving Station
- F** Organic Waste Receiving Tanks (*below grade*)
- G** Organic Waste Pump Station (*below grade*)
- H** Cogeneration Building
- I** CHP Exhaust Treatment (Oxidation Catalysts & Selective Catalytic Reduction)
- J** Siloxane Removal
- K** H₂S Removal

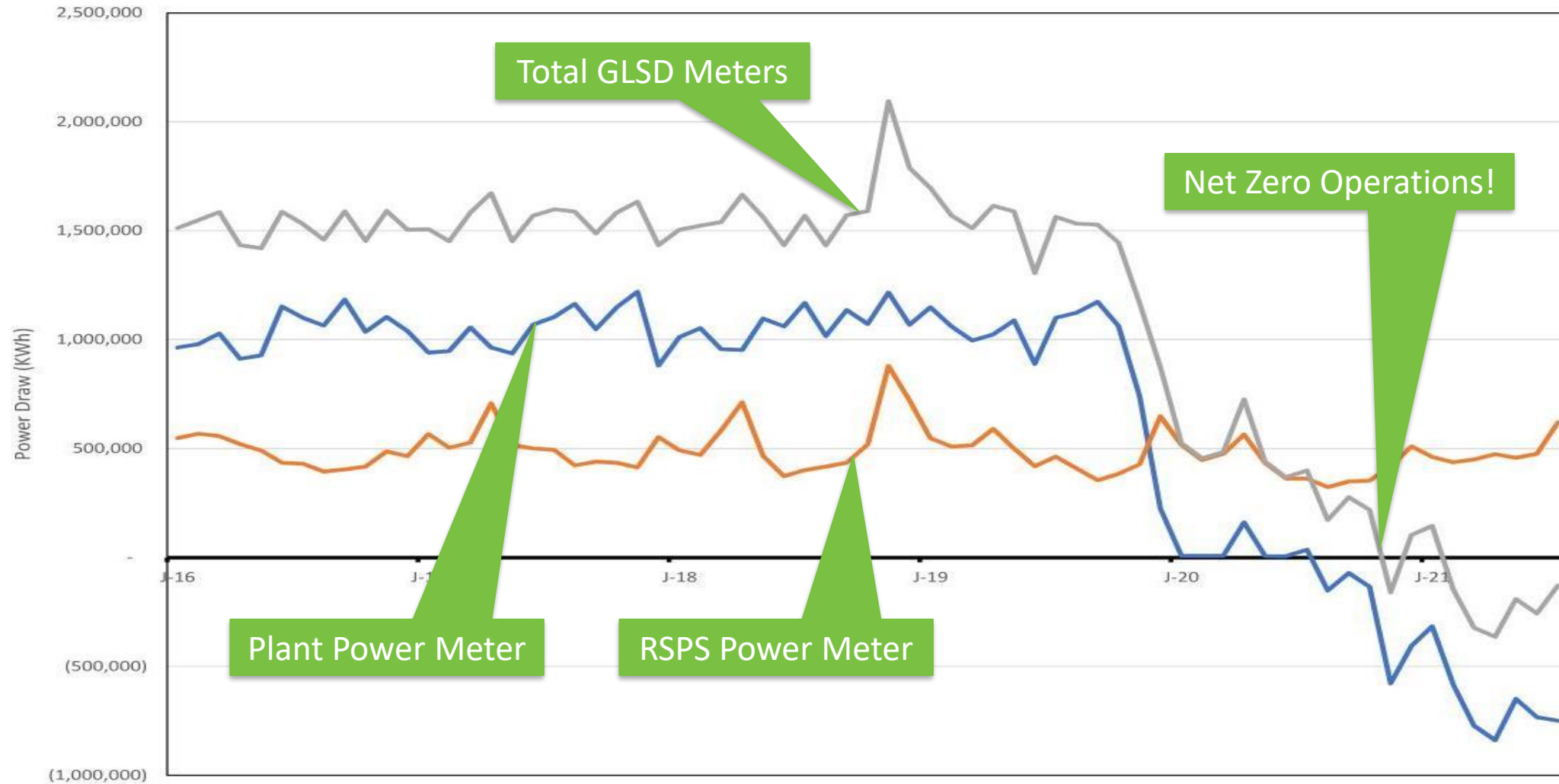
Food Waste Addition and Biogas Production



Electrical Power Production and Export



Achieving Net Zero Power Status



Challenges

- Financing an Atypical Wastewater Project
- Net Metering Cap
- Community Acceptance
- Securing Feedstock
- Permitting (Air and Noise Pollution Control)
- Engine O&M
- Market Analysis



Resiliency and Sustainability

- If utility power fails, can:
 - Sustain full plant operations during an extended power outage using natural gas
 - Provides operational reliability and flexibility
- Biogas is a 100% Renewable Energy
- 20% reduction in net GHG Emissions
- Energy benefits alone equivalent to removing 1,035+ cars from the road (MA DOER)





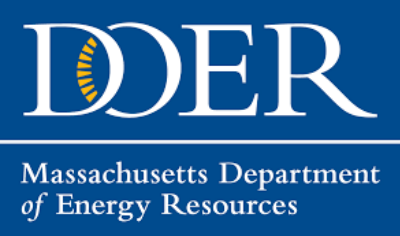
Project Benefits

- \$28 M total investment in new facilities
- \$9.8 M in financial assistance (MA DOER, MassDEP, CEC, CWT, National Grid)
- Provides a net economic benefit to the District (Environmental Justice)
- Advances the Recycling of Organics for Massachusetts to meet state goals
- GLSD has now become a Net Zero/Net Positive Electric Energy User

Project Partners



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