METROPOLITAN COUNCIL

BIOGAS ENERGY USE

FROM

DIGESTION

Legislative Energy Commission Update
September 16, 2014

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Metropolitan Council Environmental Services

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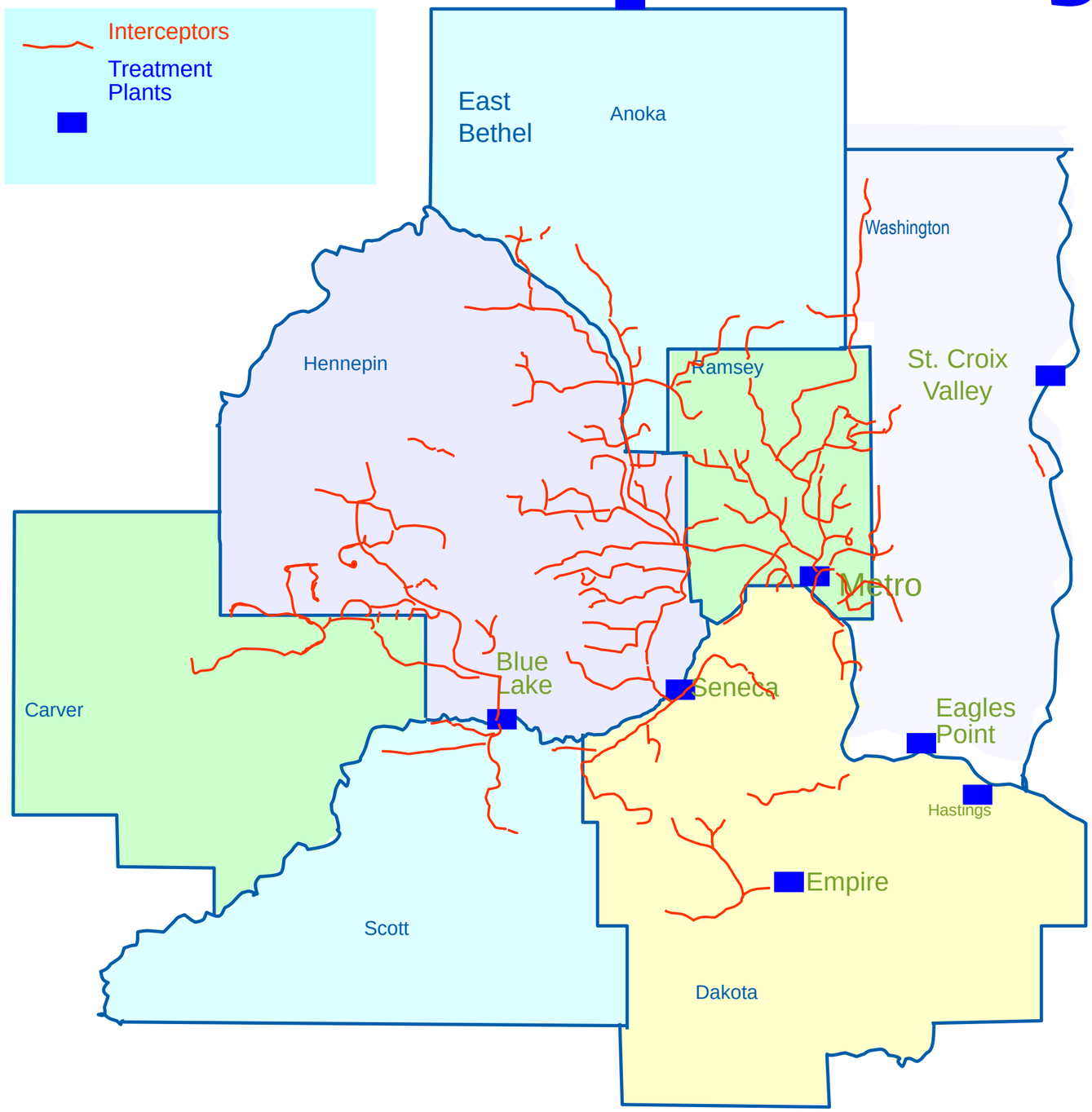
Wastewater System



- Eight Treatment Plants
- 600 miles of Regional Interceptors
- Estimated $6 Billion Replacement Value
- 108 Communities Served
- Approximately 372 million gallons per day of Wastewater capacity

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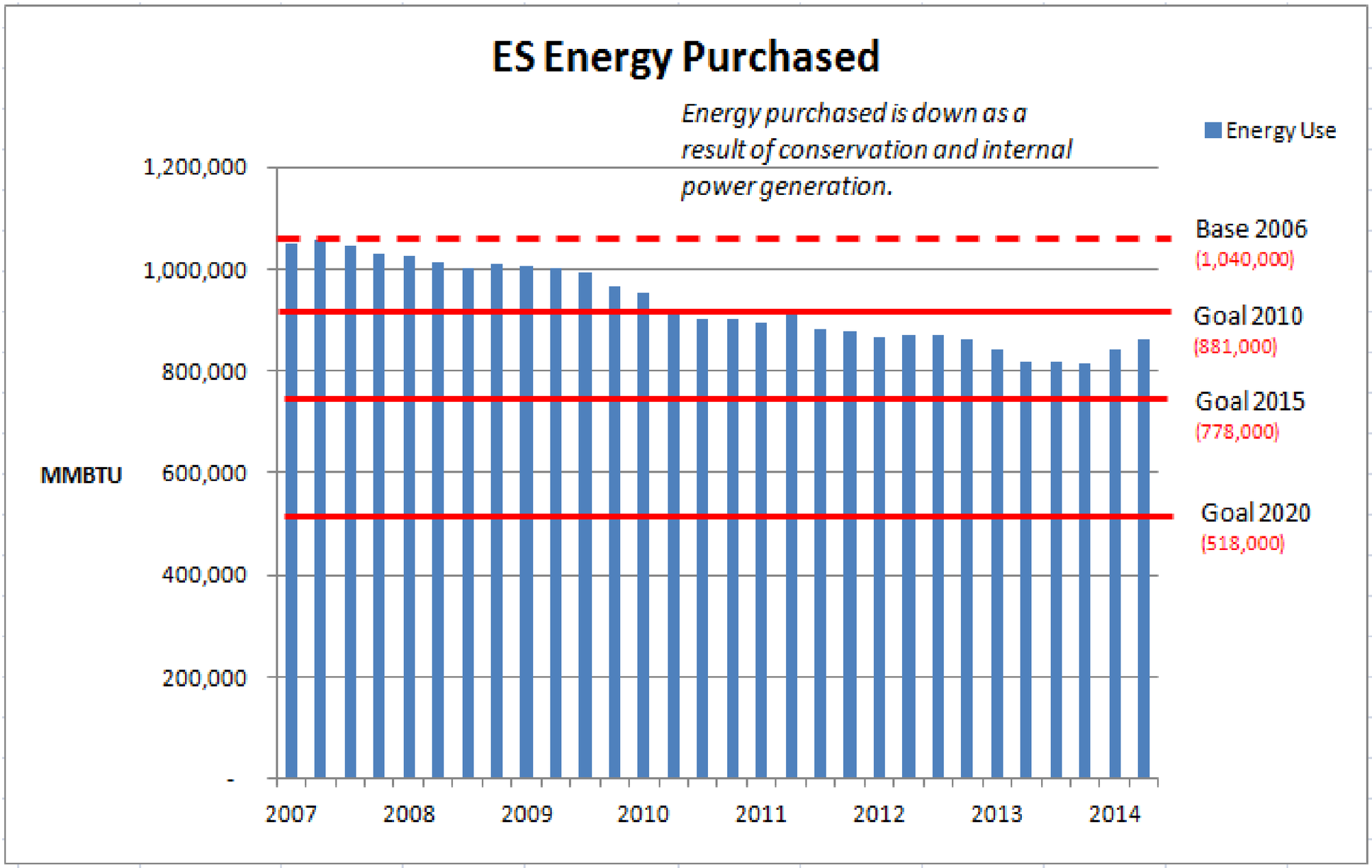
MCES Energy Goals



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Biogas Uses at WWTP

Application	Pros & Cons
• Microturbine / Combined H&P	P: Constant need for electricity C: Wattage too low for large motors, corrosion risk
• Boiler	P: Efficient conversion C: Seasonal demand; corrosion risk
• Rotary drum dryer	P: Directly “fires” biogas C: Only for plant with dryer
• Fuel vehicles	P: Constant demand C: Biogas quality

Empire WWTP Plant

Boiler Heat System

Currently, biogas fuels boiler to preheat sludge and heat building

Digestion Process

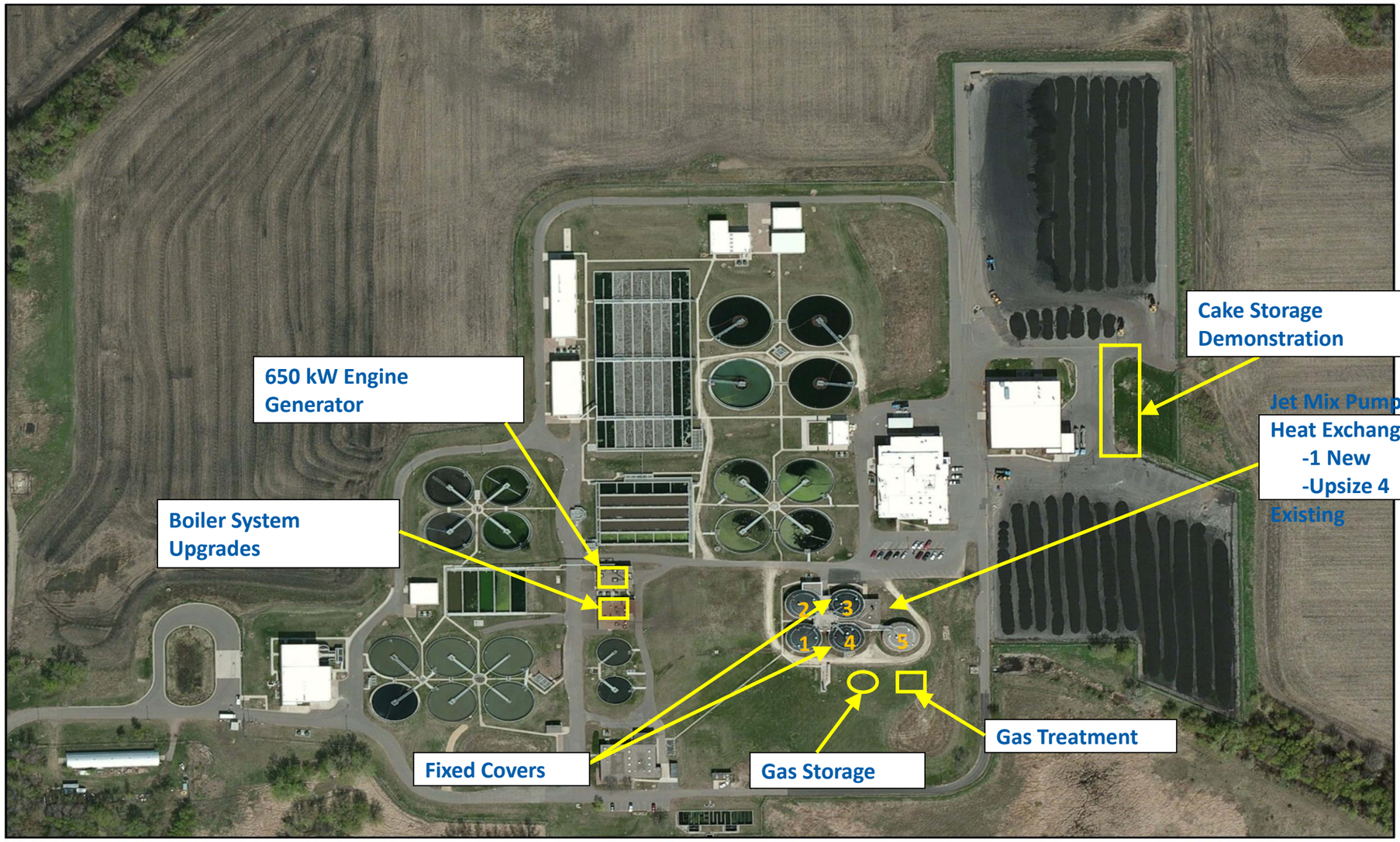
- Convert Existing Secondary Digesters to Primary Digesters (30% capacity increase)

Energy

Install Combined Heat & Power (CHP) system to convert digester gas to electricity & heat

Design 2014

Construction 2015-2016



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Combined Heat & Power (CHP) System

Digester gas treatment to improve gas quality

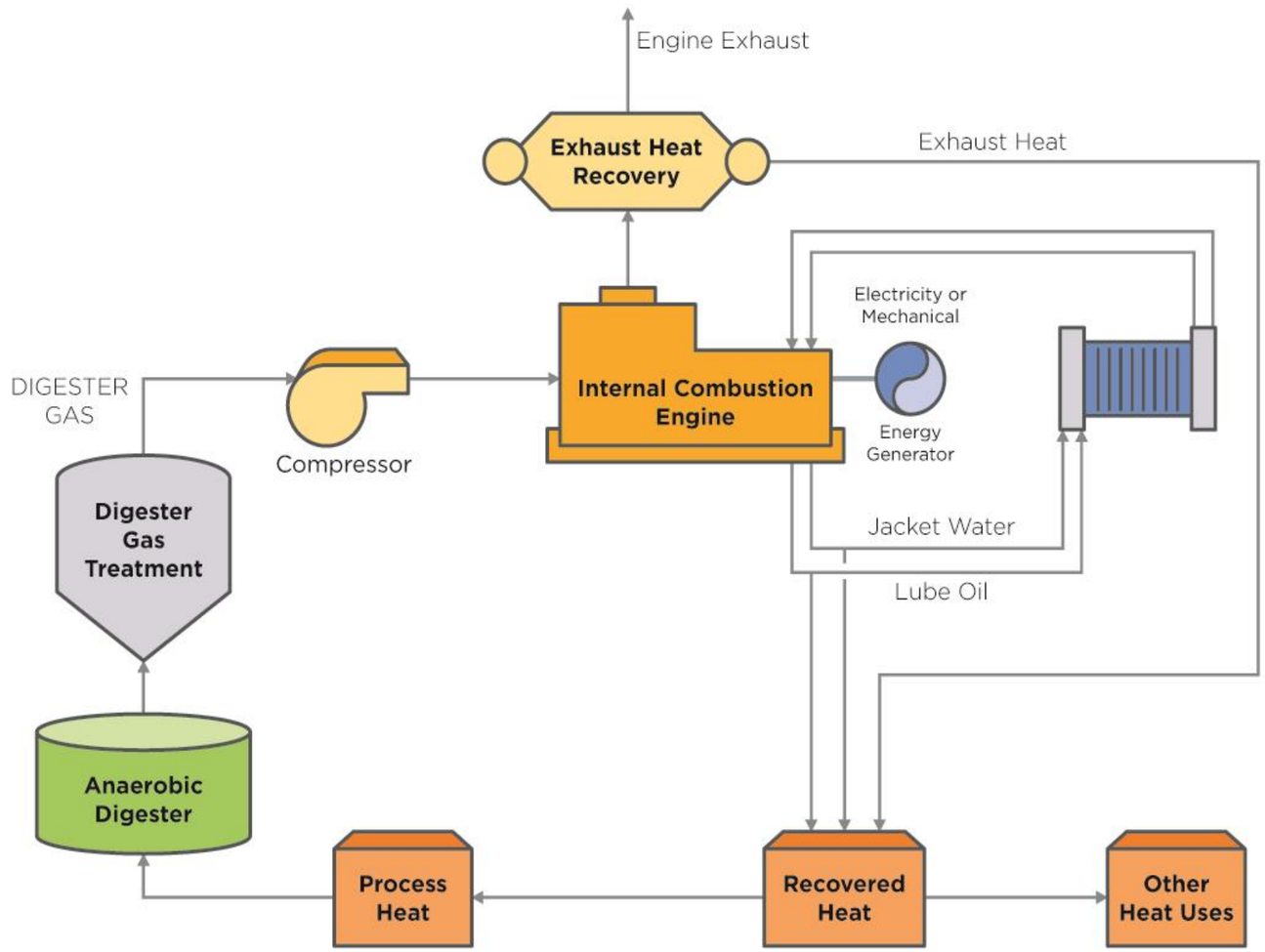
Gas storage to reduce flaring

Electricity production =

- >1/3 of the plant's power needs
- $350k/yr savings

Recovered heat = 21,600 MMBTU/year

- meets digester heating needs
- additional heat for buildings



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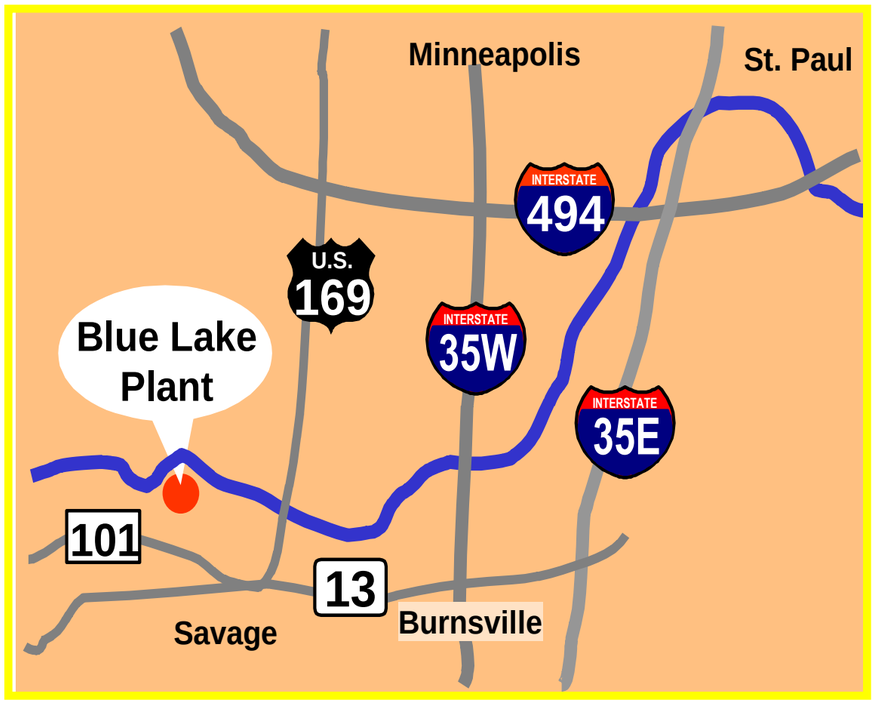
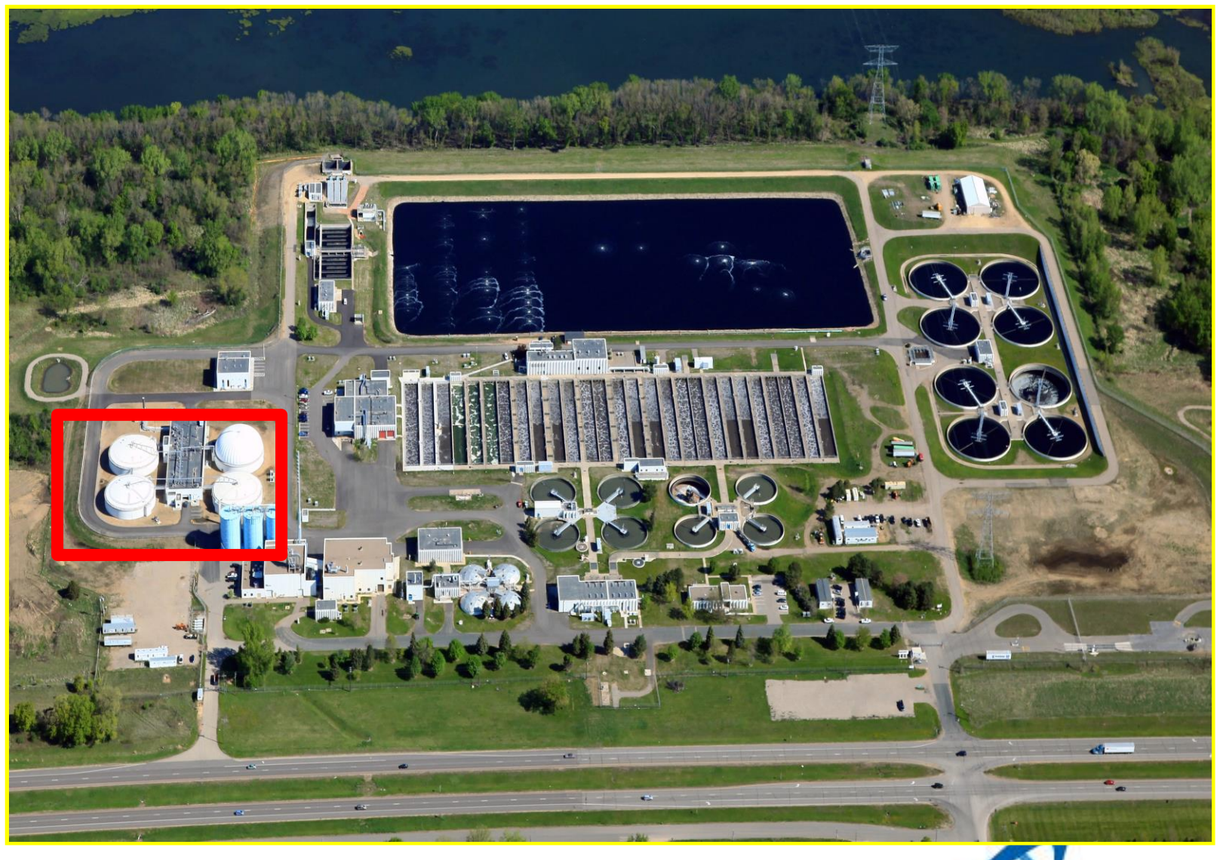


Blue Lake Wastewater Treatment Plant

Plant produces heat-dried pellets for use as an agricultural fertilizer.



Located in: Shakopee, MN

Type: Advanced secondary with chlorination/dechlorination

Capacity: 32 million gallons/day

Discharges to: Minnesota River

Communities served: 29

Population served: 300,000

Interceptors to plant: 122 miles

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Biosolids Processing

From Flush to Field

- Biosolids: residuals from wastewater treatments

- Solids dried in rotary drum at ~ 400 deg F to kill pathogens

- Partner NEFCO applies “MinneGrow” fertilizer pellets to crop land

- Until 2012, dryer fueled by natural gas

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Energy Alternatives

Dryer nearing capacity

Alternatives:

2nd dryer –

Increase fossil fuel use?

or

Anaerobic Digestion

Agency wide energy savings goals

- 10% reduction ‘06- ‘10
- 15% reduction ‘06 – ‘15

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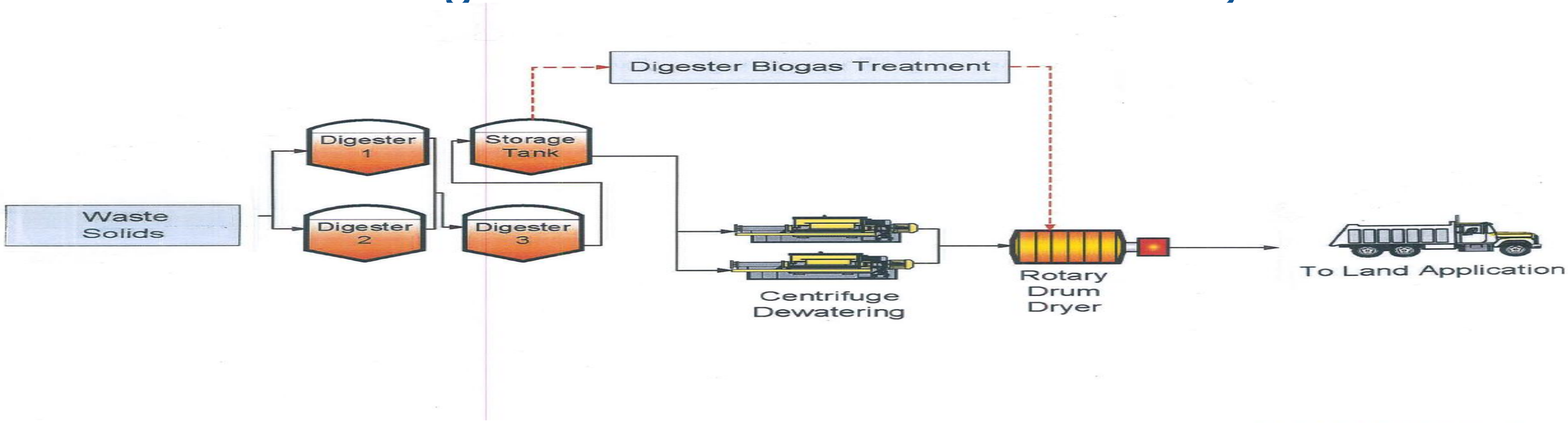
Digestion and Drying: Process Synergy

Advantages of Digestion

- Provides a “wide spot” between solids production and processing; “de-couples” liquids and solids treatment systems
- Reduces loading to dryer by 30%
- Delays dryer expansion until ~2030
- Produces biogas ~ 55 % methane - fuels dryer



Digester Startup

- Resolve equipment coordination issues (biogas production, treatment, booster, burner)
- Anaerobic microbes grow slowly
- “Mesophillic” process – heat to 98 deg F
- 5 months to full gas production
- 7 months to full biogas utilization
- 6 month demonstration for CenterPoint Rebate

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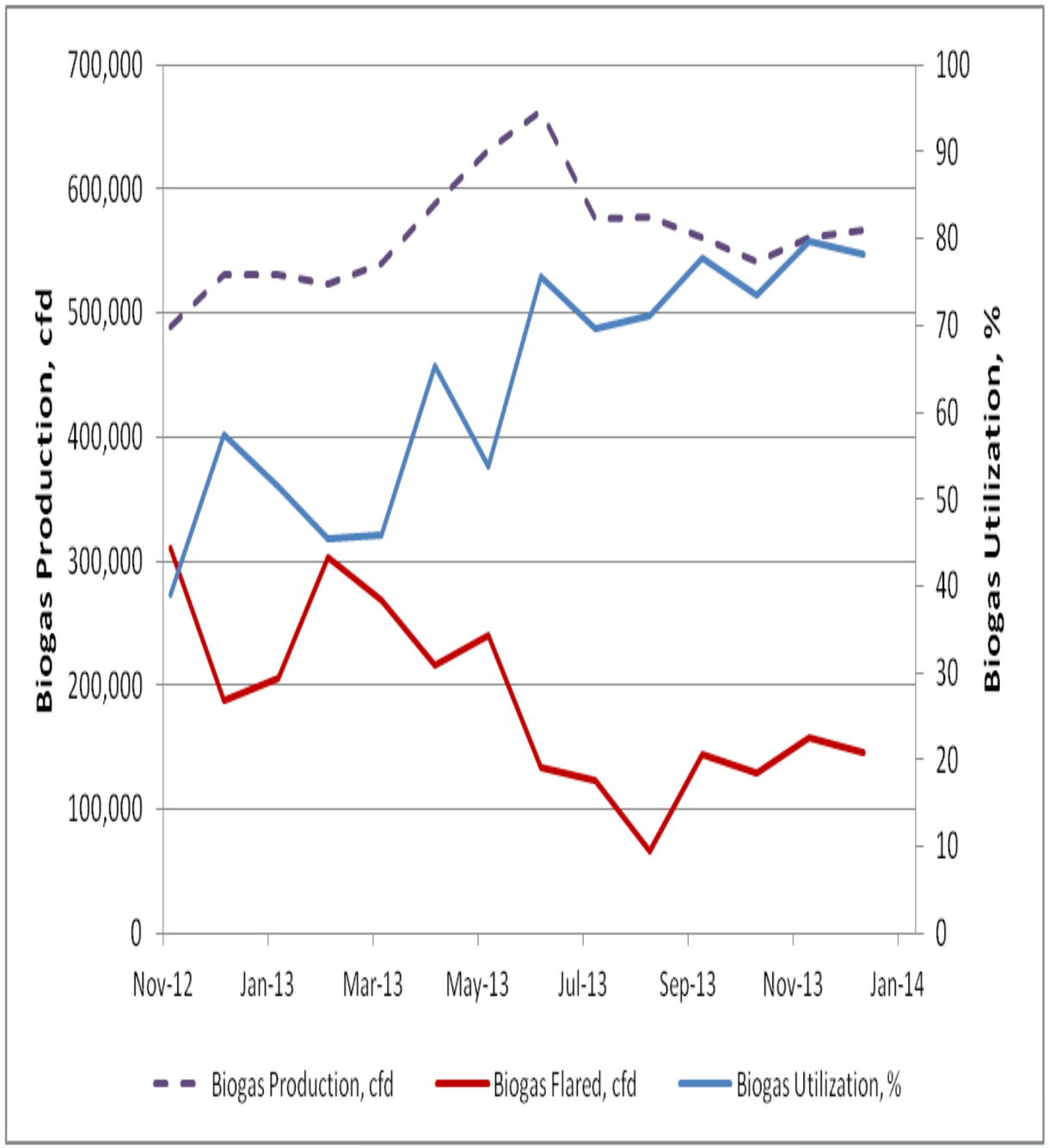
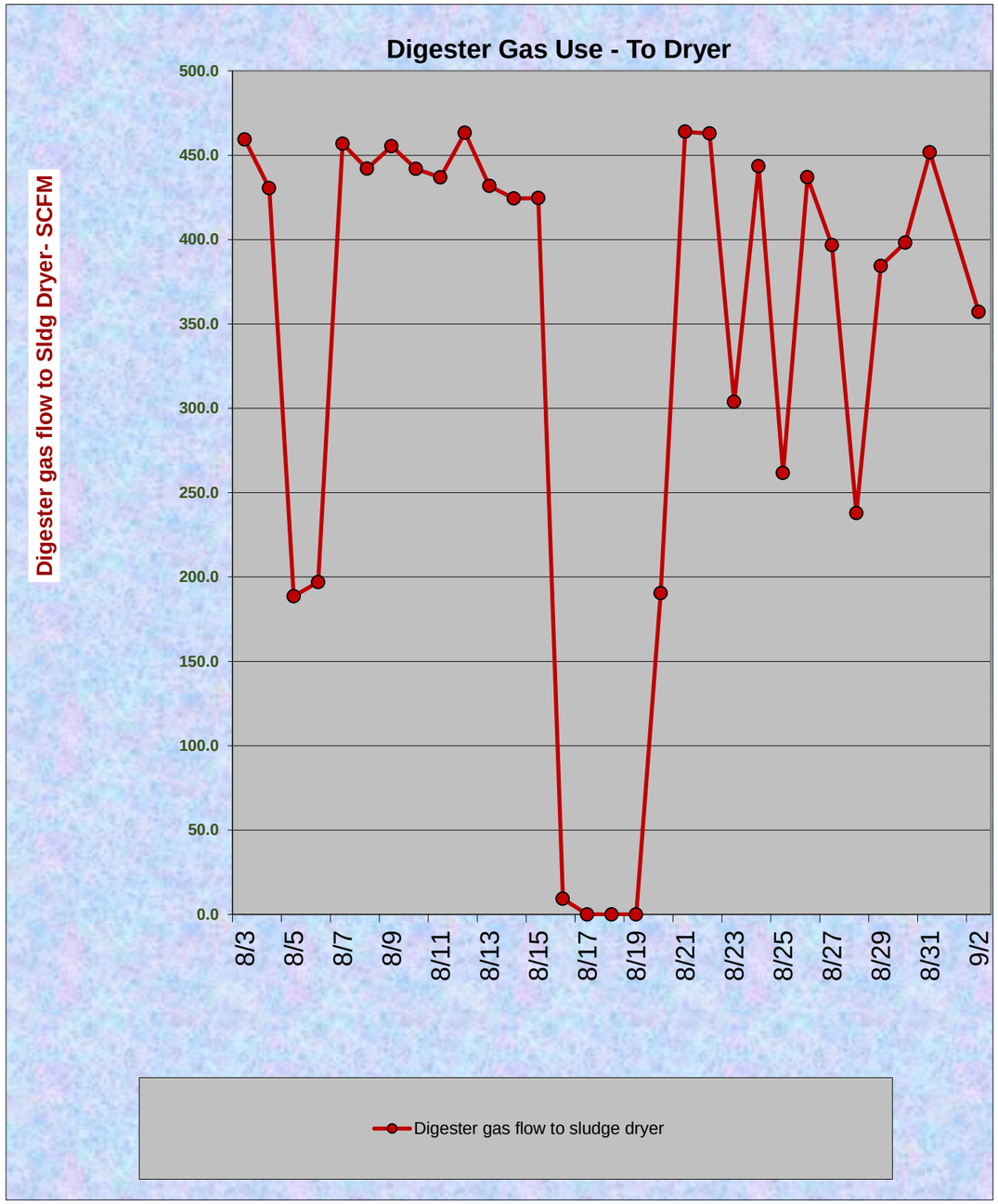
Biogas Use

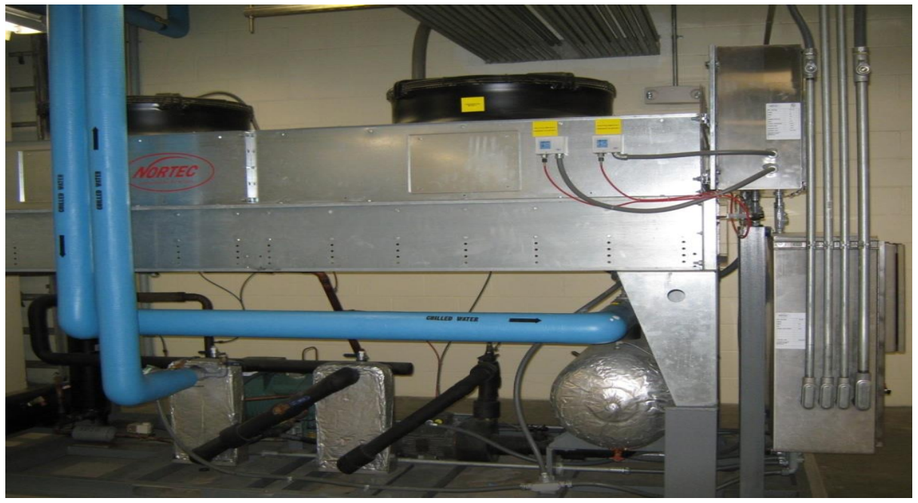




Approximately 80% of biogas used in drying process

Biogas Conditioning

- Biogas contains moisture, dirt and sulfides
- Corrosive/ reduce BTU value
- Foam separator (top) removes particles
- Refrigerant dryer (bottom) condenses moisture
- Membrane cover – 8 hour “cushion” of gas for drying operation



Biogas Use Benefits

- Eliminated purchased NG: 200 – 300 therms/ hour
- Annual fuel cost savings ~ $500,000
- Fuel equivalent of biogas would serve 900 households
- Reduced pellet production 30% & fossil fuel to transport pellets
- Document before/ after NG use and construction costs
- MCES available as resource for other clients
- $150,000 rebate from CenterPoint Energy

Proposed Industrial Pretreatment Incentive Program (IPIP)

- Specific MCES plants will need solids capacity within 10 years
- Propose that industrial customers build system to pre treat waste at their sites to reduce strength
- Council to initially own and finance facilities using taxable bonds
- Customer leases system at discounted rates
- Council pays up to 30% of lease payment depending on success of waste reduction
- Industry uses energy on site

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Costs and Benefits

TO COUNCIL:

- Costs for facility/ loss of treatment revenue
- Reduce loading to plant: delays/ avoids expansion
- Reduce operating costs (energy, labor)
- Possible rebates

TO INDUSTRIES:

- Cost to operate facility, lease payment
- Reduce waste treatment fees
- Potential energy generation on site

WIN – WIN – WIN for environment, Council, industry

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Questions?

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