

Sheboygan Regional WWTF's Waste to Energy

The Good, the Bad, and the Ugly

2016 Spring Biosolids Symposium
March 22, 2016

Sheboygan Regional WWTF



- 7 Communities, Western Shore of Lake Michigan
- Population 68,000
- 18.4 MGD Average, 56.8 MGD Max
- 10 MGD Average Daily Flow
- Activated Sludge with Biological P Removal and Backup Ferric Chloride Addition
- Anaerobic Co-Digestion, Biogas Recovery for Combined Heat & Power
- Liquid Storage of AD Biosolids and Biosolids Drying & Storage
- \$4.7 Million O&M Budget
- 2013 ACEC Engineering Excellence Grand Award - Net Zero Energy



Biogas to Energy



2005

Energy conservation initiatives &
Co-digestion implemented

2006

Co-digestion
program increased
biogas

2012

Purchased biogas
conditioning equipment and
turbines from Alliant Energy -
City recoups all cost savings
from biogas to energy
systems

2006

Partnered with Alliant Energy -
installed biogas conditioning and
turbines;
300 kW, 1MMBtu/hour heat

2010

Installed additional biogas
conditioning and turbines;
400 kW,
1.4MMBtu/hour heat

Initial CHP Generation Project



Alliant Energy-Wisconsin Power & Light funded the turbine project and recovered costs through the sale of generated electricity to the WWTF

- 10—30 kW Capstone Turbines
- 2 Cain Heat Exchangers
- Unison Gas Conditioning
- 300 kW Electrical Power
- 1 MMBtu per hour heat recovery

Co-Digestion Program Implemented



- Used Excess Capacity
- Dairy, Food Additives, FOG Waste
- Tanker Trucks
 - 24/7 Access
- 6000 gal/load

HSW Receiving & Feeding

In-line Strainer



HSW Unloading



HSW Feed Pump



Second CHP Generation Project



- Allowed Beneficial Use of Excess Biogas
- 2—200 kW Capstone Turbines
- 2 Cain Heat Exchangers
- Unison Gas Conditioning
- 400 kW Electrical Power
- 1.4 MMBtu/h Heat Recovery



Biosolids Storage Requirements

- NR 204 Requires 180 Day Biosolids Storage
- Increase in Biosolids Production Attributable to HSW
- 10.08 MG Required; 5.96 MG Available
- Alternatives Considered to Expand Biosolids Storage Capacity
 - Minimal Additional Liquid Storage & Eliminate HSW Receiving Program
 - Large Scale Liquid Storage
 - Liquid Storage & Drying

Biosolids Process Improvements



- Dewatering & Drying: Huber Screw Press & Huber Medium Temperature Belt Dryer
- Dryer Utilizes Excess Biogas & Waste Heat from CHP
- Class A, EQ Product
- Significant Cost Savings (Drying vs Hauling Liquid)

Biosolids Process Improvements



10 Years of HSW Program

- Process 60,000 gpd High Strength Waste
- Biogas Produced: 500,000 cu ft/day
- Biogas Quality: 53-63% Methane
- Equipment Installed: 700kW Electrical Generation
- Electrical Energy Produced: 5,000,000 kWh Annually
- Thermal Energy Produced: >100,000 Therms Annually
- Energy Savings: >\$450,000 Annually
- CHP Program Produces: ~80% Electrical Needs & Heating Requirements
- Existing Facilities Deteriorated
- Significant Capital Improvements Required

HSW Challenges



Evolution of HSW Program

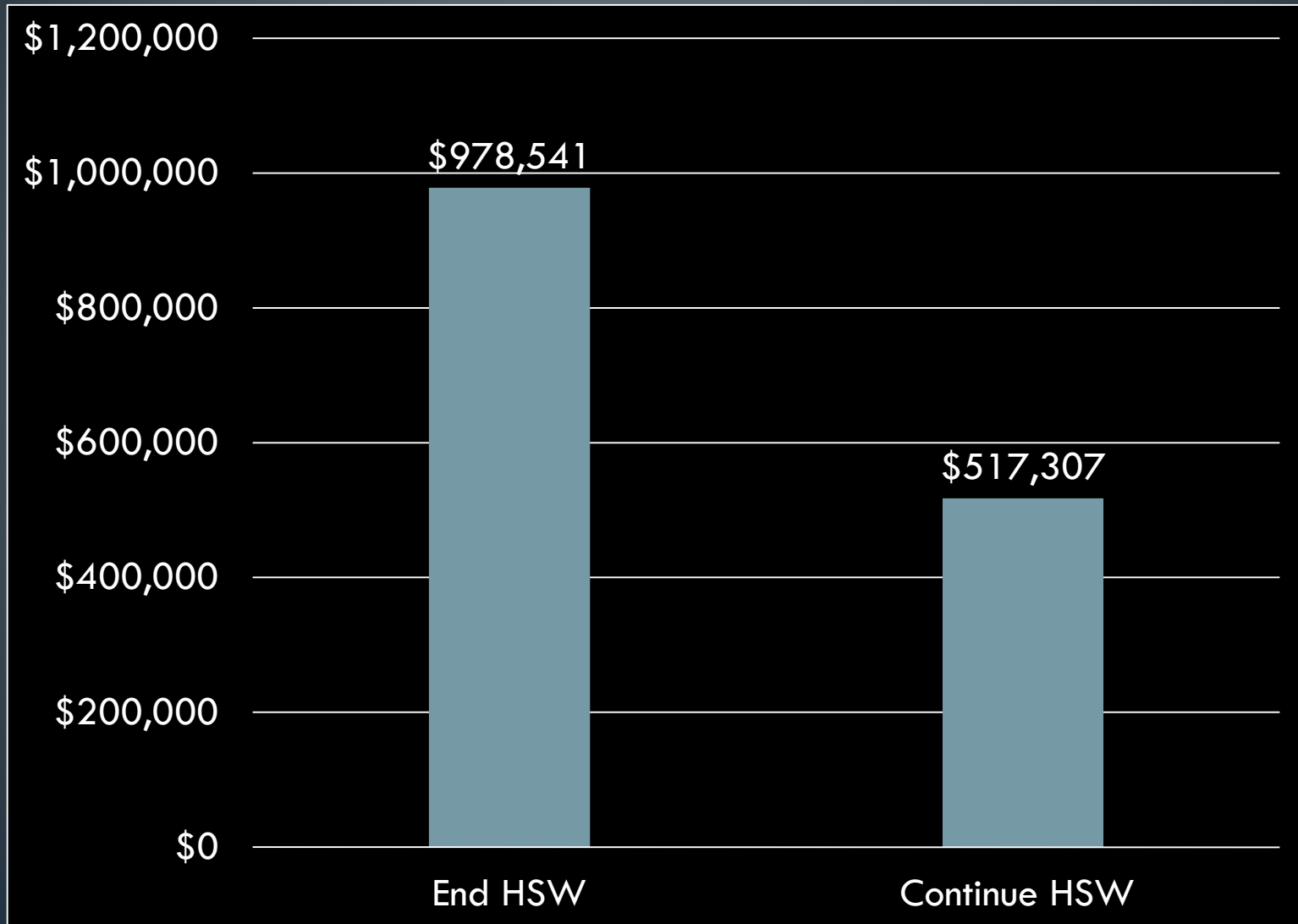
2005

- Sheboygan Only Regional HSW Program
- Increasing Revenue from Tipping Fees
- Significant Grant Money Available
- Utilized Existing Tank Capacity

2015

- Multiple Co-digestion Programs
- 90% HSW from One Supplier
- Decreasing Revenue from Tipping Fees
- Minimal Grant Money Available
- Significant Capital Improvements to Continue HSW and Co-digestion

Annual Operating Costs Energy + Biosolids

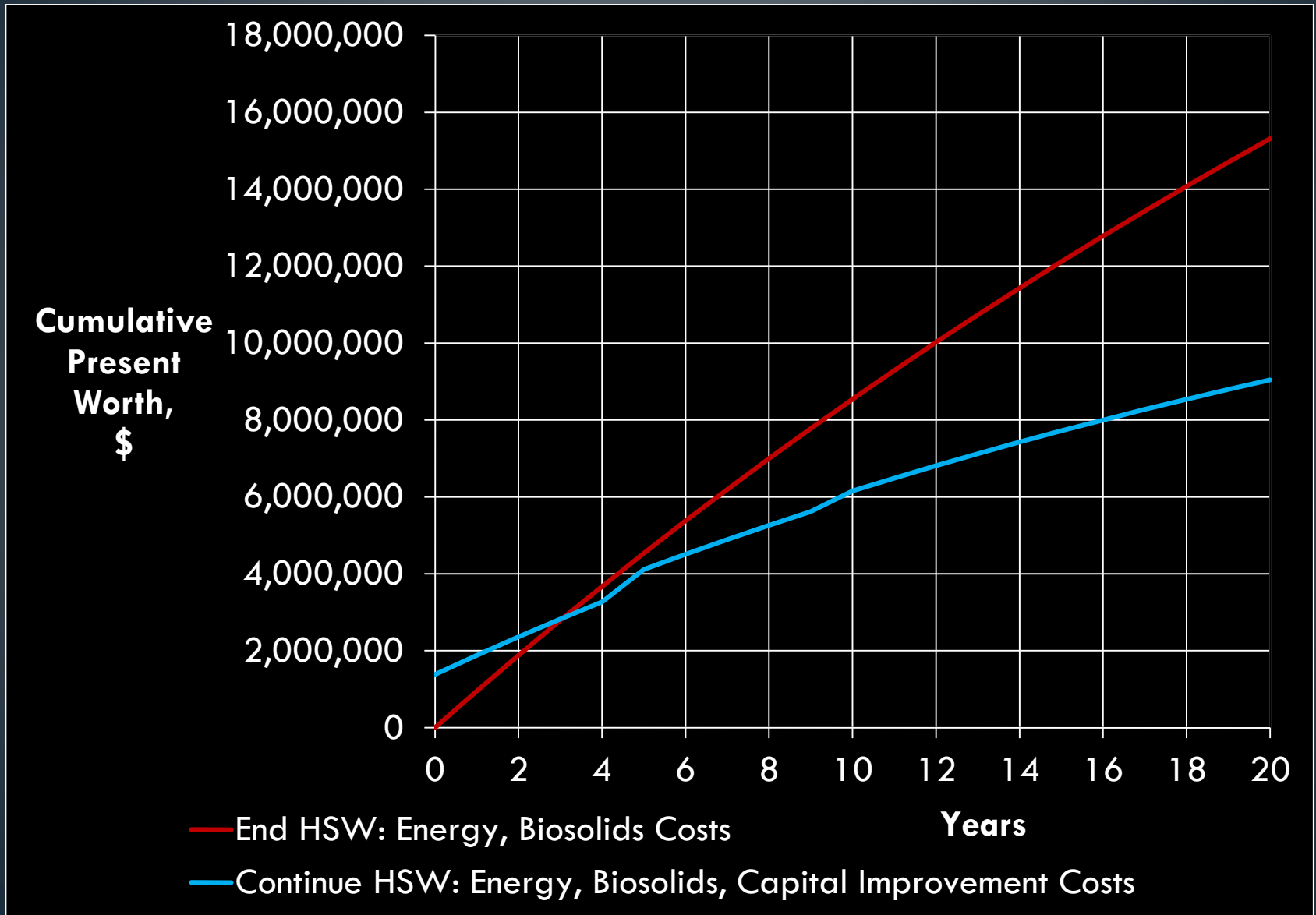


Future of Co-Digestion Program

Capital Improvements – Phased Approach

- Sustain the Current HSW Program - \$1.4 Million
 - Receiving & Storage Tank: Rehab & Line Existing Tank
 - Enhance HSW Receiving & Debris Removal
 - New Truck Unloading Area
- Evaluate HSW Types
 - Diversify and/or Expand HSW Program
- Evaluate Biogas Utilization Alternatives
- Expand and Enhance Biogas Storage
- Anaerobic Digestion Improvements

Future of Co-Digestion Program



Resource Recovery Facility



- Team Effort
- Evaluate Energy Consumption
- Keep User Rates Low
- Continue Path to Sustainability & Being a RESOURCE RECOVERY FACILITY

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