# JKM

**NEWEA Annual Conference Monday, January 28, 2019** 

Sustainable Wastewater Facilities & Infrastructure:

A Creative Approach to Energy Management & Cost Control

Carina Hart, JKMuir Dave Newman, ECG

#### The Triple Bottom Line

- Water Energy Nexus
- Energy Efficiency
- Greenhouse Gas Reduction
- Carbon Footprint
- Sea Level Rise
- Accountability
- Energy Reduction

### Sustainability



# The Almighty Dollar!

- Ancillary benefits:
  - More reliable equipment
  - Better process control
  - More equipment and treatment flexibility



# Waterbury Energy Initiatives



### Energy Management Plan – Timeline



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### Pathway to Successful Implementation



#### **Current Energy Use**

- Electric Bills (Demand Charges & Rate Structure)
- Fuel Bills
- DOE SWIFT



Engage the Electric Utility

- Energy Efficiency
- Benchmark the Facility Energy
  Use
- Potential Energy Conservation Measures (ECMs)

On-site Energy Production / Renewable Energy Alternatives 4

Energy Savings Performance Contract (ESPC)

## Energy Management Strategy





### #1 SWIFT Program

- United States Department of Energy (DOE)
- Sustainable Wastewater Infrastructure of the Future (SWIFT)
- Waterbury WPCF is a facility partner
- Additional Industry Partners include Eversource & CT DEEP

Goal of 30% energy reduction at the Waterbury WPCF

### #1 What are you Currently Using?

- Electric Bills Rate Structure & Demand Charge
- Annual Cost of Operation

Facility	Annual Usage (kWh)	Average Monthly Demand (kW)	Annual Cost	Unit Cost (\$/kWh)
Waterbury WPCF	13,835,934	2,047	\$1,512,112	\$0.11

Note: Electrical Data from 2013-2014

#### #2 – Contact Electric Utility





- 2015 Waterbury WPCF contacted Eversource
  - Eversource hired JKMuir to conduct an energy evaluation
  - Following preliminary evaluation, a detailed evaluation was conducted based on selected Energy Conservation Measures (ECMs)

### **#2 Energy Efficiency** Evaluation for Waterbury WPCF

- Odor Control Fan Modifications
- Raw Sewage Pump Rebuild
- Return Activated Sludge (RAS) Pump Rebuild
- Plant Water Pump Modifications
- Ultraviolet Disinfection System
   Modification
- Anoxic Mixer Replacement

#### Annual Energy Savings of 1.4 million kWhs (\$156,000 saved annually)





# # 2Rebuild Raw Sewage Pumps

- 4 Extended Shaft Centrifugal Pumps
- 250 HP, Design of 22 MGD at 39 ft TDH
- VFD Driven
- Send flow to the Primary Clarifiers
- Tested Pump Efficiency of 39%
- Potential Rebuild efficiency at 75% speed = 80% hydraulically efficient (Increase of 41%)
- Saves over 500,000 kWhs (\$55,000 annually)



# #2 Raw Sewage Pump Rebuild

- Tighe & Bond Design Engineer
  - Provided Specification for pump rebuild and testing
- New England Pump & Valve Contractor
  - Conducted rebuild and testing under Tighe & Bond oversight
  - Pump Efficiency documentation and testing
  - Motor Vibration and Alignment
- Eversource Electric Utility

Incentive = \$89,000



Additional Sustainability initiatives by City of Waterbury, CT

# Solar PV Array – Waterbury Landfill

#### **Project Overview**

- RFP for Land Lease Agreement
- Solar Provider "Leases" the acreage from the City for a pre-negotiated annual fee
- Takes advantage of otherwise unusable plot of land on the closed City-owned landfill



#### **Project Financials**

- \$33,000/yr in annual "lease payments" back to the City
- 2.36 MW-AC Solar Array
- Solar Provider responsible for on-going maintenance and operation of system



# **Fuel Cell Installation @ WWTP**

#### Financials:

- +\$150k per year in savings
- +\$3.0M over the 20-yr term
- Re-purposing waste heat
- Turnkey design/installation by Doosan



#### **Project Overview**

- RFP for Power Purchase Agreement using Fuel Cells
- Doosan was selected to install 3 x 460 kW Fuel Cells on-site
- Guaranteed kWh pricing 1.5 cents <u>below</u> the market utility rate for the plant.



# What Is An Energy Savings Performance Contract (ESPC)?

 Partnership between a Public Agency and an Energy Services Company (ESCO)

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- Make needed building improvements <u>now</u> and pay for them out of the future, <u>guaranteed</u> energy savings
- ECG's model use a <u>NO out-of-pocket</u> cost approach



# Why Consider an ESPC?

- Mounting lists of facility needs with constrained budgets. Innovative and tax/budget-neutral funding source
- **Proven Concept** recognized by the federal government and throughout the energy industry
- Myriad of options for energy efficiency. An ESPC identifies, evaluates, implements, and measures all viable upgrades
- **Risk-Free, Cost-Free Model** –No obligation or cost until the Owner executes a contract
- Lucrative Rebate Programs providing incentives for energy efficiency improvements

# **ESPC for the City of Waterbury, CT**

#### **Financials:**

- Project Size: \$27.4 M
- Annual Savings: \$1.67 M
- 39% Reduction in Baseline
- Estimated Rebates: ~ \$3.7 M

#### Scope Highlights:

- 14 Boiler Plant Upgrades
- LED Upgrades to +20,000 fixtures
- Elimination of Pneumatics and upgraded front-end EMS
- Steam Traps, Pipe Insulation, Building Envelope, etc.



The ECG team is highly knowledgeable and effective in communicating complex subject matter that is clear and understandable to the City's stakeholders -Michael LeBlanc, Director of Finance



#### Questions?

- Carina L. Hart, JKMuir
- <u>chart@jkmuir.com</u>
- (860) 249-0989 x701

- Dave Newman, ECG
- <u>dnewman@ecgengineers.com</u>
- (631) 360-0006 x406

### **State Correctional Institute – Dallas, PA**

#### **General Project Overview**

- Project Size: \$19M
- Completed in Nov, 2016
- Annual Savings: ~\$2.1M



#### Scope Highlights:

- Comprehensive LEDs, Steam System Improvements, and Boiler Plant Upgrades
- Improvements to Sludge Dewatering Techniques to improve % of solids being hauled off-site.
  - ESCO guaranteed \$90k in annual savings
  - Year 1 performance exceeded the guarantee (\$234k/yr)
  - Projected to save nearly \$5 Million over 20 yr term of project.

# Town of Branford, CT

#### **General Project Overview**

- Project Size: \$6.0M
- Annual Savings: ~\$350k
- Utility Rebates: +\$500k
- Phase: Performance Period



#### WWTP Scope Highlights:

- Energy Efficiency Upgrades to Administration Bldgs
- Modification of SCADA system for efficient operation of Odor Control, Sludge Blowers, Reaeration Blowers, etc.
- Upgrade and Replacement of Primary Aeration Blower
- Improvements to UV Disinfection System