



# **CHP: Opportunities at Wastewater Treatment Facilities**

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# Webinar Objectives

- CHP in the WWTF Market
- CHPP Objectives
  - Market Outreach
  - Going Forward
- Case Studies
  - NYSERDA Anaerobic Digestion to Electricity Program
  - Gloversville-Johnstown, NY WWTP CHP
  - Fairhaven, MA WWTF CHP

# Engineering Rules of Thumb for Considering CHP at a WWTF

- A typical WWTF processes 100 gallons per day of wastewater for every person served
- 1.0 cubic foot (ft<sup>3</sup>) of digester gas per person per day = 2.2. Watts of power generation.
- The heating value of the biogas produced by anaerobic digesters is approximately 600 Btu/ft<sup>3</sup>.
- For each 4.5 MGD processed by a WWTF with anaerobic digestion, the generated biogas can produce approximately 100 kilowatts (kW) of electricity and 12.5 million British thermal units (MMBtus) of thermal energy.

Source: Opportunities for and Benefits of Combined Heat and Power at Wastewater Treatment Facilities, EPA CHP Partnership, December 2007, [http://www.epa.gov/chp/documents/wwtf\\_opportunities.pdf](http://www.epa.gov/chp/documents/wwtf_opportunities.pdf)



# WWTF CHP – Proven Technologies

- WWTF CHP
  - There are currently 116 WWTF that have CHP systems, representing about 490 MW of capacity.
- Rich history:
  - Oldest system is reciprocating engine system installed in 1956 at Santa Clara Water Pollution Control in San Jose, CA
  - 87 MW of WWTF CHP installed prior to 1990 and still operating

*(EEA Database, 1/20/10))*

# WWTF CHP Capacity by Prime Mover

PRIME MOVER	# Sites	Capacity (MW)
Boiler / Steam Turbine	3	151.0
Combined Cycle	1	28.0
Gas Turbine	9	144.2
Recip Engine	64	157.5
Fuel Cell	12	5.3
Microturbine	27	3.3
<b>Total</b>	<b>116</b>	<b>489.2</b>

(EEA Database, 1/20/10))

# CHP in the WWTF Market: Market Drivers

- Effective strategy for facility energy conservation plans
- Effective strategy for local government sustainability plans
- High electric rates lead to good CHP applications
- Odor control and reduction of solids
- Proximity to electric or gas infrastructure and prevailing economics
- State Policies:
  - State RPS will help drive REC value and economics of electricity generation

# Benefits of CHP at WWTFs

A well designed CHP system that is powered by digester gas offers many benefits for WWTFs because it:

- Produces power at a cost below retail electricity.
- Displaces fuels normally purchased for the facility's thermal needs.
- Qualifies as a renewable fuel for green power programs.
- Offers an opportunity to reduce greenhouse gas and other air pollution emissions.
- Enhances power reliability for the treatment plant.

# CHPP Objectives

- Develop resources to spur market
- Develop collaborations to benefit the deployment of CHP in market sector
- Highlight applications to raise awareness

# CHPP Resources

- Opportunities for and Benefits of Combined Heat and Power at Wastewater Treatment Facilities
  - [http://epa.gov/chp/documents/wwtf\\_opportunities.pdf](http://epa.gov/chp/documents/wwtf_opportunities.pdf)
  - Clean Watershed Needs Survey Database
    - Joint effort between EPA's Office of Wastewater Management and the States
    - Current database developed in 2004. An update planned for this year.
  - DOE/ORNL CHP Installation Database
- CHPP strategic market website:
  - <http://epa.gov/chp/markets/wastewater.html>

# Market Outreach Activities

- NASEO/ASERTTI Webinar with Midwest RAC, September 2009
  - <http://www.epa.gov/chp/events>
- CHPP ASERTTI Study – Strategic CHP Deployment for WWTF, October 2009
- Pacific West Biomass Presentation, January 2010

# ASERTTI Study : Common Lessons Learned

- CHP projects require due diligence from design through operation and maintenance
- Provide additional training for O &M personnel
- Immediate and continuing coordination with local utility is highly recommended
- Need to be aware of problems with highly corrosive siloxane deposits
- A rigorous gas pre-treatment approach is needed for specific applications.

# Case Studies Focus

- Anaerobic digestion to electricity – the role of CHP
- The use of additives to boost gas production – FOG, PHS, EPA's Region IX work with EBMUD.
- CHP applications based on municipal waste stream and industrial waste stream
- Current project development challenges – installing a new facility at this time
  - use of incentives, through a State's RPS, federal stimulus funds

# For More Information

## CHP Partnership Contacts:

CHPP Website : [www.epa.gov/chp](http://www.epa.gov/chp)

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