



CHP at WWTF: Market Potential and Strategies

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Presentation Outline

- CHP and WWTF - Market Potential
- Market Strategies
 - Existing Federal Mechanisms
 - Existing State Mechanisms
- Preliminary CHP Assessment

WWTF CHP – Proven Technologies

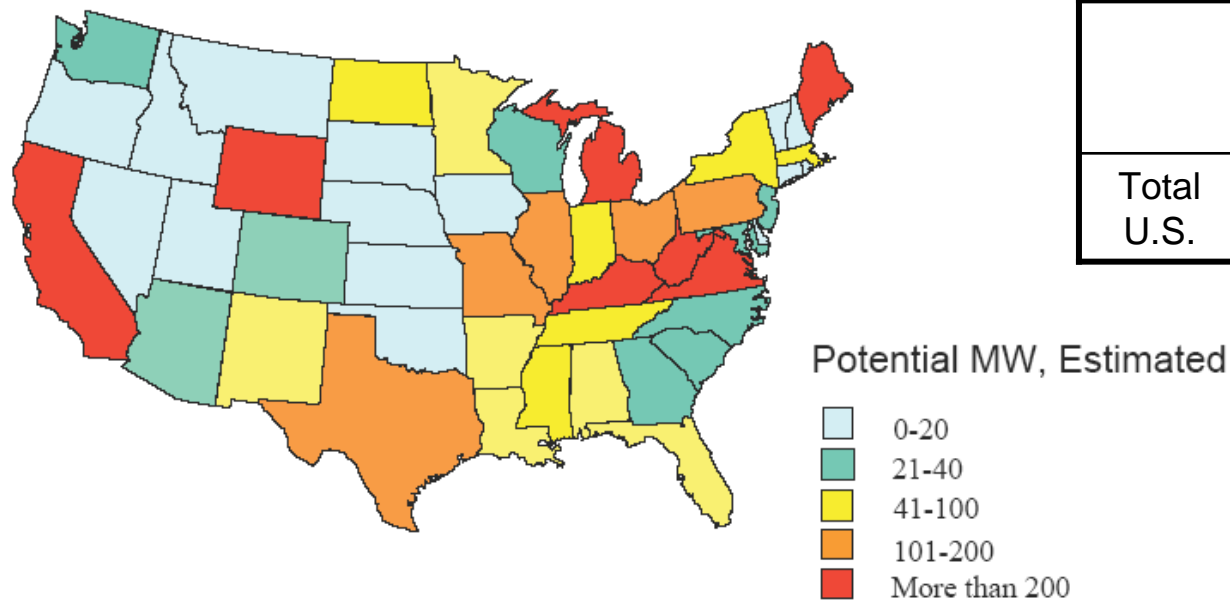
- WWTF CHP
 - There are currently 112 WWTF that have CHP systems, representing about 488 MW of capacity.
- Wide range of initial operating years:
 - Oldest system is reciprocating engine system installed in 1956 at Santa Clara Water Pollution Control in San Jose, CA
 - 87 MW of CHP were installed in WWT plants prior to 1990 and still operating

(EEA Database, 9/22/09)

Total CHP Market Potential in Municipal WWTFs

If 1 MGD is the cut-off size limit for feasible AD/CHP applications...
(note: technically feasible, not economically feasible)

Figure 4-1. Potential MW for WWTP ADG Projects by State



	Potential Projects	Potential MW
Total U.S.	6,850	4,275

Source: Combined Heat and Power Market Potential for Opportunity Fuels, Resource Dynamics Corporation, December 2004, <http://files.harc.edu/Sites/GulfCoast/CHP/MarketAssessment/CHPMarketAssessmentFinal.pdf>

Market Potential

- ~ 1,000 WWTFs operate with total influent rate greater than 5 million gallons per day (MGD)
 - Only 544 of these utilize anaerobic digestion
- If all 544 of these WWTFs used their gas for CHP, it would result in...
 - Almost 340 MW of clean electric capacity for onsite electricity needs or for sale to the grid
 - Offset all heat required for digesters with additional thermal energy available for building heating.
 - More than 2.3 million metric tons of annual CO₂ emission reductions, equivalent to:
 - Planting approx. 640,000 acres of forest
 - Emissions of approx. 430,000 cars

Benefits of CHP to Wastewater Treatment Plants

- Produces power at a cost below retail electricity
- Displaces purchased fuels for thermal needs
- Qualifies as a renewable fuel for green power programs
- Enhances power reliability for the plant – serves as an additional back-up supply
- Can act as a long-term price and volatility hedge against purchased fuels and electricity
- Offers an opportunity to reduce GHG and other emissions

Federal Strategies

- ***EPA Clean Water and Drinking Water State Revolving Funds***
- ***Renewable Energy Production Incentive (REPI)***
- ***Energy Efficiency and Conservation Block Grant Program (EECBG)***
- ***Clean Renewable Energy Bonds (CREBs)***
- ***Qualified Energy Conservation Bonds (QECBs)***

EPA Clean Water and Drinking Water State Revolving Funds

- States must provide at least 20 percent of their grants for green projects, including green infrastructure, energy or water efficiency, and environmentally innovative activities. CHP projects at wastewater treatment facilities qualify for grants under the 20 percent set-aside
- More information and program guidance, including grant allocations to each of the states is available through the Clean Water and Drinking Water State Revolving Funds Web site (<http://www.epa.gov/water/eparecovery/>).

Renewable Energy Production Incentive (REPI)

- REPI provides financial incentives for renewable energy electricity produced and sold by qualified renewable energy generation facilities.
- To be eligible, qualified renewable energy facilities must be operational before October 1, 2016.

Energy Efficiency and Conservation Block Grant Program (EECBG)

- The EECBG Program provides grants to local governments, tribal governments, states, and U.S. territories to reduce energy use and fossil fuel emissions, and to implement energy efficiency improvements.

Clean Renewable Energy Bonds (CREBs)

- Clean renewable energy bonds (CREBs) may be used by certain entities -- primarily in the public sector -- to finance renewable energy projects. The list of qualifying technologies is generally the same as that used for the federal renewable energy production tax credit (PTC).

Qualified Energy Conservation Bonds (QECCBs)

- EIEA created a new funding mechanism similar to the CREB model in which a bondholder receives tax credits in lieu of interest. The act authorizes state, local, and tribal governments to issue energy conservation bonds to finance qualified projects. The 2008 legislation allows the IRS to distribute up to \$800 million in bond authorizations. In 2009, the ARRA provided an additional \$2.4 billion in bonding authority.

State Strategies

- ***Renewable Portfolio Standards***
- ***Colorado Carbon Fund***
- ***Illinois Biogas and Biomass to Energy Grant Program***
- ***NYSERDA Anaerobic Digester Gas-to-Electricity Program***
- ***Energy Trust of Oregon Wastewater Incentives***
- ***Vermont Property Tax Exemption***
- ***Washington Renewable Energy Production Credit***
- ***Wisconsin Focus on Energy Biogas Digestion Financial Incentives***

Renewable Portfolio Standards

- As of March 2009, RPS requirements or goals have been established in 33 states plus the District of Columbia. Thirteen of these states include CHP or waste heat recovery as an eligible resource, and Arizona explicitly includes renewable fueled CHP systems. In each of these states electricity produced from WWTF biogas is eligible for compliance.
- In states that utilize renewable energy certificates (RECs), the environmental attributes of electricity generated from WWTF biogas can be monetized.

Colorado Carbon Fund

- The Colorado Carbon Fund is interested in receiving a variety of innovative and viable proposals for emission reduction projects, but has a preference for:
 - Anaerobic digestion projects
 - Biomass projects
 - Commercial solar hot water heater installations
 - Energy efficiency projects with direct emissions reductions, such as cogeneration
 - Transportation-related projects
 - Project contract terms of less than 15 years

NYSERDA Anaerobic Digester Gas-to-Electricity Program

- The Anaerobic Digester Gas-to-Electricity Program is designed to provide incentives to the agricultural, industrial, and municipal sectors to support the purchase, installation, and operation of anaerobic digester gas-to-electricity systems in New York State.
- The overall goals of the program are to fund 3.7 MW of capacity and 25,700 MWh of annual generation by the end of 2009.
- In 2009, a total of \$20.1 million was made available for financial incentives to support the installation and operation of anaerobic digester gas-to-electricity systems in New York State, with up to \$1 million available per Digester System.

Washington Renewable Energy Production Credit

- ***In May 2005, Washington enacted Senate Bill 5101, establishing production incentives for individuals, businesses, or local governments that generate electricity from solar power, wind power or anaerobic digesters.***
- ***The incentive amount paid to the producer is adjusted according to how the electricity was generated; anaerobic digesters get the base amount of 15 cents per kilowatt-hour, which is capped at \$2,000 per year.***
- ***The incentives apply to power generated as of July 1, 2005, and remain in effect through June 30, 2014.***

Wisconsin Focus on Energy Biogas Digestion Financial Incentives

- WI Focus on Energy provides both planning and installation incentives for anaerobic digesters at WWTFs.
- Planning Incentives
 - Feasibility Study Grants.
 - Development Grants
- Installation incentives
 - Industrial/Municipal Anaerobic Digester Implementation Grant.

Preliminary CHP Assessment

- Determine CHP Feasibility
 - Planning Tools: EPA CHPP website, DOE CHP Calculator
- Assess Applicability of Regulatory Incentive Mechanisms
 - Appropriate Federal and State Offices, EPA CHPP website
- Proposed Regulatory Incentive Programs

Engineering Rules of Thumb for Considering CHP at a WWTF

- A typical WWTF processes 100 gallons per day of wastewater for every person served
- Approximately 1.0 cubic foot (ft³) of digester gas can be produced by an anaerobic digester per person per day. This volume of gas can provide approximately 2.2. Watts of power generation.
- The heating value of the biogas produced by anaerobic digesters is approximately 600 British thermal units per cubic foot (Btu/ft³).
- For each 4.5 million gallons per day 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 (Btu) of thermal energy.

Source: Opportunities for and Benefits of Combined Heat and Power at Wastewater Treatment Facilities, EPA CHP Partnership, December 2006, <http://www.epa.gov/chp/documents>



Is My Facility a Good Candidate for CHP?

- Do you have an influent flow rate greater than 5 MGD?
- Do you pay more than \$0.06/kWh for electricity?
- Is reliable, high-quality power and thermal energy important to you?
- Is it important to reduce energy costs and increase the overall energy efficiency of your wastewater treatment process?
- Do you want to increase your facility's environmental performance?
- If the answer is "yes" to two or more of these questions, CHP can benefit your facility.

For More Information

CHP Partnership Contacts:

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