

Biogas Production at Wastewater Treatment Facilities

Congressional Briefing – May 16, 2012

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Energy Potential in Wastewater

- The organic matter in raw wastewater contains almost 10x the energy needed to treat it.
- Some WWTPs can produce 100% of the energy they need to operate.
- Energy generated at WWTPs could potentially meet 12% of national electricity demand, enough to power NYC, Houston, Dallas, and Chicago annually.

Energy from Biosolids

Pathways, Processes, Products

Energy Source	Treatment Process	Energy Product	Energy Use
Wastewater Biosolids	Biodegradation Anaerobic Digestion	Biogas (Methane) Compressed Natural Gas Pipeline Quality Gas	Process Heat Power Generation Vehicle Use Natural Gas Replacement
	Thermal Conversion Incineration Co-Combustion	Heat	Process Heat Power Generation
	Gasification	Syngas Compressed Natural Gas Pipeline Quality Gas	Process Heat Power Generation Vehicle Use Natural Gas Replacement
	Pyrolysis	Fuel Product	Process Heat

Biogas Production at WWTPs

- **Anaerobic Digestion:** microorganisms break down biodegradable material in the absence of oxygen and produce methane/carbon dioxide used to generate electricity and heat
- Over 16,000 WWTPs in the U.S.
- 1,500 WWTPs use Anaerobic Digestion
- 104 WWTPs with Combined Heat & Power
- CHP Technically feasible at 1,351 (> 1 mgd)
- Potential Electric Generation: nearly 400 MWh



Utilization Rates at WWTPs

●Table 3: Number of U.S. Wastewater Treatment Facilities with Anaerobic Digestion and without CHP

WWTFs Flow Rate Range (MGD)	Total WWTFs	WWTFs with Anaerobic Digestion	Percentage of WWTFs with Anaerobic Digestion
>200	10	7	70%
100-200	18	13	72%
75-100	25	17	68%
50-75	24	17	71%
20-50	137	82	60%
10-20	244	140	57%
5-10	451	230	51%
1-5	2,262	845	37%
Total	3,171	1,351	43%

Source: CWNS, 2008

Biogas Usage

Produced biogas is used in the following ways:

- On-site through CHP technology
- Export to
 - local natural gas utilities
 - local industrial users or power producers
 - fleet vehicle fuel

More Than Just Wastewater

- More WTPs are adding post-consumer food waste to existing anaerobic digesters at their facilities.
- Food waste has up to three times as much energy potential as biosolids.
- If 50% of food waste was used in anaerobic digesters to make energy, we could supply electricity to 2.5 million homes for a year.
- EBMUD - first WWTP in nation to turn post-consumer food waste into energy. It processes 200 tons of food waste/week.

Environmental Benefits

- Potential CO₂ Emissions Displaced with CHP at WWTFs

Input/Output	Value
Total annual electric production potential at WWTFs with anaerobic digesters	400 MW
Total displaced CO ₂ emissions	3,350,880 tons CO ₂ /year
Equivalent number of passenger vehicles	596,052

Environmental Benefits

- Higher Quality Biosolids – Class A
- Reduced Truck Traffic
 - GHG emissions reductions
 - Neighborhood noise
- Reduced odors

Economic Benefits

- 1.1 to 8.3 cents / kWh installation v.
3.9 to over 21 cents / kWh electricity cost
- Boston's MWRA - \$15 m savings/yr.
 - Plus \$1m REC revenues
- DC Blue Plains - \$16 m savings/ yr.

Blue Plains Advanced Wastewater Treatment Plant is the largest advanced WWTP in the world



Barriers to Production

Policy Barriers:

- Policies to promote renewable energy sources overlook the wastewater sector
- Clean Electricity Standard

Cost Barriers:

- Installing new technology is expensive
- Lack of federal support and financial incentives

Space Barriers:

- Anaerobic Digestion requires a large footprint

Questions?

- Contact:

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