BIOPOWER

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Biomass Power Overview

Biomass power technologies convert renewable biomass fuels to heat and electricity using processes similar to that used with fossil fuels. Next to hydropower, more electricity is generated from biomass than any other renewable energy resource in the United States. A key attribute of biomass is its availability upon demand - the energy is stored within the biomass until it is needed. Other forms of renewable energy are dependent on variable environmental conditions such as wind speed or sunlight intensity.

Today in parts of the developing world, biomass is primarily used to provide heat for cooking and comfort. Technologies have now been developed which can generate electricity from the energy in biomass fuels. Biomass technologies are highly scaleable - small enough to be used on a farm or in remote villages, or large enough to provide power for a small city.

There are four primary classes of biopower systems: direct-fired, co-fired, gasification, and modular systems. Most of today's biopower plants are **direct-fired** systems that are similar to most fossil-fuel fired power plants. The biomass fuel is burned in a boiler to produce high-pressure steam. This steam is introduced into a steam turbine, where it flows over a series of aerodynamic turbine blades, causing the turbine to rotate. The turbine is connected to an electric generator, so as the steam flow causes the turbine to rotate, the electric generator turns and electricity is produced. Biomass power boilers are typically in the 20-50 MW range, compared to coal-fired plants in the 100-1500 MW range. The small capacity plants tend to be lower in efficiency because of economic trade-offs; efficiency-enhancing equipment cannot pay for itself in small plants. Although techniques exist to push biomass steam generation efficiency over 40%, actual plant efficiencies are often in the low 20% range.

Co-firing involves substituting biomass for a portion of coal in an existing power plant furnace. It is the most economic near-term option for introducing new biomass power generation. Because much of the existing power plant equipment can be used without major modifications, cofiring is far less expensive than building a new biopower plant. Compared to the coal it replaces, biomass reduces sulphur dioxide (SO2), nitrogen oxides (NOx), and other air emissions. After "tuning" the boiler for peak performance, there is little or no loss in efficiency from adding biomass. This allows the energy in biomass to be converted to electricity with the high efficiency (in the 33-37% range) of a modern coal-fired power plant.

Biomass gasifiers operate by heating biomass in an oxygen-limited environment where the solid biomass breaks down to form a flammable gas. The producer gas can be cleaned and filtered to remove problem chemical compounds. The producer gas can be used in more efficient power generation systems called combined-cycles, which combine gas turbines and steam turbines to produce electricity. The efficiency of these systems can reach 60 percent. Additionally, gasifiers are sometimes located next to existing coal or natural gas boilers and used to fire or supplement the fuels to these boilers.

Modular systems employ some of the same technologies mentioned above, but on a smaller scale that is more applicable to villages, farms, and small industry. These systems are now under development and could be most useful in remote areas where biomass is abundant and electricity is scarce. There are many opportunities for these systems in developing countries.

Source: U.S. Department of Energy, Energy Efficiency and Renewable Energy
http://www1.eere.energy.gov/biomass/abcs_biopower.html

Section: BIOPOWER
Biomass Power Technology in Commercial/Demonstration Phase during 2000-2006

Technology Category	Biomass Conversion Technology	Primary Energy Form Produced	Primary Energy Conversion and RecoveryTechnology	Final Energy Products
Direct combustion	Stove/Furnace	Heat	Heat exchanger	Hot air, hot water
Direct combustion	Pile burners	Heat, steam	Steam turbine	Electricity
Direct combustion	Stoker grate boilers	Heat, steam	Steam turbine	Electricity
Direct combustion	Suspension boilers: Air spreader stoker or cyclonic	Heat, steam	Steam turbine	Electricity
Direct combustion	Fluidized-bed combustor FB – bubbling CFB-circulating	Heat, steam	Steam turbine	Electricity
Direct combustion	Co-firing in coal-fired boilers (several types)	Heat, steam	Steam turbine	Electricity
Gasification (atmospheric)	updraft, counter current fixed bed	Low Btu producer gas	Combustion boiler + steam generator and turbine	Process heat or heat plus electricity
Gasification (atmospheric)	Downdraft, moving bed	Low Btu producer gas	Spark engine (internal combustion)	Power, electricity
Gasification (atmospheric)	Circulating Fluidized Bed (CFB) dual vessel	medium Btu producer gas	Burn gas in boiler w/ Steam Turbine	Electricity
Gasification (atmospheric)	Co-fueling in CFB gasifiers	Low or medium Btu producer gas	Combustion turbine or boiler and steam turbine	Electricity
Slow pyrolysis	Kilns or retorts	Charcoal	Stoves and furnaces	Heat
Fast (flash) pyrolysis	Reactors	Pyrolysis oil (bio-oil), charcoal	Combustion turbines, boilers, diesel engines, furnaces, catalytic reactors	Heat, electricity, synthetic liquid fuels, (BTL)
Anerobic digestion	Digesters, landfills	Biogas (medium Btu gas)	Spark ignition engines, combustion turbines,	Heat, electricity

Source:
Compiled by Lynn Wright, Oak Ridge, TN.

Note: See Glossary for definitions of terms found under the "Technology Category" column.

The following references are suggested for further reading:

* Overend, Ralph. 2003. Heat, power and combined heat and power. Chapter 3 in: Sims, R. Bioenergy Options for a Cleaner Environment: In Developed and Developing Countries, Elsiver, ISBN: 0-08-044351-6. 193 pages
* Broek, R. van den, Faaij, A., and van Wijk, J. 1995, Biomass Combustion Power Generation Technologies, Study performed within the framework of the extended JOULE-IIA programme of CECDGXII, project “Energy from biomass: an assessment of two promising systems for energy production”, Department of Science, Technology and Society, Utrech University, Utrecht (Report no. 95029). Available at website:

http://nws.chem.uu.nl/publica/Publicaties%201995/95029.htm

Many biomass fuels cause slagging and other forms of deposit formation during combustion. These deposits can reduce heat transfer, reduce combustion efficiency, and damage combustion chambers when large particles break off. Research has focused on two alkali metals, potassium and sodium, and silica, all elements commonly found in living plants. In general, it appears that faster growing plants (or faster growing plant components such as seeds) tend to have higher concentrations of alkali metal and silica. Thus materials such as straw, nut hulls, fruit pits, weeds, and grasses tend to create more problems when burned than wood from a slow growing tree.

Potassium and sodium metals, whether in the form of oxides, hydroxides, or metallo-organic compounds tend to lower the melting point of ash mixtures containing various other minerals such as silica (SiO2). The high alkali content (up to 35%) in the ash from burning annual crop residues lowers the fusion or 'sticky temperature' of these ashes from 2200' F for wood ash to as low as 1300' F. This results in serious slagging on the boiler grate or in the bed and fouling of convection heat transfer surfaces. Even small percentages (10%) of some of these high alkali residues burned with wood in conventional boilers will cause serious slagging and fouling in a day or two, necessitating combustion system shutdown.

A method to predict slagging and fouling from combustion of biomass fuels has been adapted from the coal industry. The method involves calculating the weight in pounds of alkali (K20 + Na20) per million Btu in the fuel as follows:

$$\frac{1 \times 10^6}{\text{Btu/lb}} \times \text{\% Ash} \times \text{\% Alkali of the Ash} = \frac{\text{lb Alkali}}{\text{MM Btu}}$$

This method combines all the pertinent data into one Index Number. A value below 0.4lb/MM Btu is considered a fairly low slagging risk. Values between 0.4 and 0.8 lb/MM Btu will probably slag with increasing certainty of slagging as 0.8 lb/MM Btu is approached. Above 0.8 lb/MM Btu, the fuel is virtually certain to slag and foul.

Section: BIOPOWER
Alkali Content and Slagging Potential of Various Biofuels

Fuel	Btu/lb (dry)	Ash %	Total Alkali % in Ash	Total Alkali lb/ton	Total Alkali lb/MMBtu	
WOOD						**Minimal Slagging**
Pine Chips	8,550	0.70%	3.00%	0.4	0.07	**.4 lb/MMBtu**
White Oak	8,165	0.40%	31.80%	2.3	0.14	
Hybrid Poplar	8,178	1.90%	19.80%	7.5	0.46	
Urban Wood Waste "Clean"	8,174	6.00%	6.20%	7.4	0.46	**Probable Slagging**
Tree Trimmings	8,144	3.60%	16.50%	11.9	0.73	
PITS, NUTS, SHELLS						
Almond Shells	7,580	3.50%	21.10%	14.8	0.97	**Certain Slagging**
Refuse Derived Fuel	5,473	9.50%	9.20%	17.5	1.60	
GRASSES						
Switch Grass	7,741	10.10%	15.10%	30.5	1.97	
Wheat Straw-average	7,978	5.10%	31.50%	32.1	2.00	
Wheat Straw-hi alkali	7,167	11.00%	36.40%	80.0	5.59	
Rice Straw	6,486	18.70%	13.30%	49.7	3.80	
Bagasse - washed	8,229	1.70%	12.30%	4.2	0.25	

Source:

Thomas R. Miles, Thomas R. Miles Jr., Larry L. Baxter, Bryan M. Jenkins, Laurance L. Oden. Alkali Slagging Problems with Biomass Fuels, First Biomass Conference of the Americas: Energy, Environment, Agriculture, and Industry, Volume 1, 1993.

Reburning with Wood Fuels for NOx Mitigation

Reburning is a combustion modification technology based on the principle that hydrocarbon fragments (CH) can react with Nitrogen Oxides (NOx). Reburning is accomplished by secondary fuel injection downstream of the fuel-lean primary combustion zone or a furnace. The second stage or reburning zone is usually operated at an overall fuel-rich condition, allowing a significant fraction of the primary NOx to be reduced to N2 and other nitrogenous species. In the third zone, additional air is introduced to establish overall fuel-lean conditions and allow for the burnout of remaining fuel fragments.

Reburning studies with coal and natural gas have shown NOx emission reductions of 50-60% with about 15% of the heat input coming from the reburn fuel. In contrast, experimental results have shown NOx reductions as high as 70% using approximately 10-15% wood heat input.

The stoichiometric ratio in the reburn zone was the single most important variable affecting NOx reduction. The highest reductions were found at a reburn stoichiometric ratio of 0.85.

One additional benefit of using wood instead of natural gas for reburning—it is difficult to mix natural gas into the products of the primary combustion zone since the gas must be injected from the wall, at relatively low flows. Wood particles, which must be transported to the furnace by a carrier medium (likely candidates are air or flue gas), would have a ballistic effect upon entering the furnace that would enhance cross-stream mixing compared to natural gas.

Source: Brouwer, J., N.S. Harding, M.P. Heap, J.S. Lighty, and D.W. Pershing, 1997, *An Evaluation of Wood Reburning for NOx Reduction from Stationary Sources*, final report to the DOE/TVA Southeastern Regional Biomass Energy Program, Muscle Shoals, AL, Contract No. TV-92271 (available at www.bioenergyupdate.com).

Section: BIOPOWER
Carbon Dioxide Uncontrolled Emission Factors
(Pounds of CO_2 per Million Btu)

Fuel And EIA Fuel Code	Factor[a]
Bituminous Coal	205.573
Distillate Fuel Oil	161.386
Geothermal	16.600
Jet Fuel	156.258
Kerosene	159.535
Lignite Coal	215.070
Municipal Solid Waste	91.900
Natural Gas	117.080
Petroleum Coke	225.130
Propane Gas	139.178
Residual Fuel Oil	173.906
Synthetic Coal	205.573
Subbituminous Coal	214.212
Tire-Derived Fuel	189.538
Waste Coal	205.573
Waste Oil	210.000

Source:
U.S. Department of Energy, Energy Information Administration, *Electric Power Annual 2009*, Washington, D.C., Revised January, 2011. Web site: http://www.eia.gov/cneaf/electricity/epa/epata3.html

[a] CO_2 factors do not vary by combustion system type or boiler firing configuration.

Section: BIOPOWER
Nitrogen Oxides Uncontrolled Emission Factors

		Combustion System Type/Firing Configuration							
Fuel And EIA Fuel Code	**Emissions Units**	**Cyclone Boiler**	**Fluidized Bed Boiler**	**Opposed Firing Boiler**	**Spreader Stoker Boiler**	**Tangential Boiler**	**All Other Boiler Types**	**Combustion Turbine**	**Internal Combustion Engine**
Agricultural Byproducts	Lbs per ton	1.2	1.2	1.2	1.2	1.2	1.2	NA	NA
Blast Furnace Gas	Lbs per MMCF	15.4	15.4	15.4	15.4	15.4	15.4	30.4	256.55
Bituminous Coal	Lbs per ton	33	5	12 [31]	11	10.0 [14.0]	12.0 [31.0]	NA	NA
Black Liquor	Lbs per ton[a]	1.5	1.5	1.5	1.5	1.5	1.5	NA	NA
Distillate Fuel Oil	Lbs per MG	24	24	24	24	24	24	122	443.8
Jet Fuel	Lbs per MG	24	24	24	24	24	24	118	432
Kerosene	Lbs per MG	24	24	24	24	24	24	118	432
Landfill Gas	Lbs per MMCF	72.44	72.44	72.44	72.44	72.44	72.44	144	1215.22
Lignite Coal	Lbs per ton	15	3.6	6.3	5.8	7.1	6.3	NA	NA
Municipal Solid Waste	Lbs per ton	5	5	5	5	5	5	NA	NA
Natural Gas	Lbs per MMCF	280	280	280	280	170	280	328	2768
Other Biomass Gas	Lbs per MMCF	112.83	112.83	112.83	112.83	112.83	112.83	313.6	2646.48
Other Biomass Liquids	Lbs per MG	19	19	19	19	19	19	NA	NA
Other Biomass Solids	Lbs per ton	2	2	2	2	2	2	NA	NA
Other Gases	Lbs per MMCF	152.82	152.82	152.82	152.82	152.82	152.82	263.82	2226.41
Other	Lbs per MMCF	280	280	280	280	170	280	328	2768
Petroleum Coke	Lbs per ton	21	5	21	21	21	21	NA	NA
Propane Gas	Lbs per MMCF	215	215	215	215	215	215	330.75	2791.22
Residual Fuel Oil	Lbs per MG	47	47	47	47	32	47	NA	NA
Synthetic Coal	Lbs per ton	33	5	12 [31]	11	10.0 [14.0]	12.0 [31.0]	NA	NA
Sludge Waste	Lbs per ton[a]	5	5	5	5	5	5	NA	NA
Subbituminous Coal	Lbs per ton	17	5	7.4 [24]	8.8	7.2	7.4 [24.0]	NA	NA
Tire-Derived Fuel	Lbs per ton	33	5	12 [31]	11	10.0 [14.0]	12.0 [31.0]	NA	NA
Waste Coal	Lbs per ton	15	3.6	6.3	5.8	7.1	6.3	NA	NA
Wood Waste Liquids	Lbs per MG	5.43	5.43	5.43	5.43	5.43	5.43	NA	NA
Wood Waste Solids	Lbs per ton	2.51	2	2.51	1.5	2.51	2.51	NA	NA
Waste Oil	Lbs per MG	19	19	19	19	19	19	NA	NA

Source:
U.S. Department of Energy, Energy Information Administration, Electric Power Annual 2009, Washington, D.C., November 2010. Web site: http://www.eia.gov/cneaf/electricity/epa/epata2.html

Note:
Factors for Wet-Bottom Boilers are in Brackets; All Other Boiler Factors are for Dry-Bottom
Units: Lbs = pounds; MMCF = million cubic feet; MG = thousand gallons
[a]Although Sludge Waste and Black Liquor consist substantially of liquids, these fuels are measured and reported to EIA in tons.

Section: BIOPOWER
Sulfur Dioxide Uncontrolled Emission Factors

		Combustion System Type/Firing Configuration							
Fuel And EIA Fuel Code	**Emissions Units**	**Cyclone Boiler**	**Fluidized Bed Boiler**	**Opposed Firing Boiler**	**Spreader Stoker Boiler**	**Tangential Boiler**	**All Other Boiler Types**	**Combustion Turbine**	**Internal Combustion Engine**
Agricultural Byproducts	Lbs per ton	0.08	0.01	0.08	0.08	0.08	0.08	NA	NA
Blast Furnace Gas	Lbs per MMCF	0.60	0.06	0.60	0.60	0.60	0.60	0.60	0.60
Bituminous Coal[a]	Lbs per ton	38.00	3.80	38.00	38.00	38.00	38.00	NA	NA
Black Liquor	Lbs per ton[b]	7.00	0.70	7.00	7.00	7.00	7.00	NA	NA
Distillate Fuel Oil[a]	Lbs per MG	157.00	15.70	157.00	157.00	157.00	157.00	140.00	140.00
Jet Fuel[a]	Lbs per MG	157.00	15.70	157.00	157.00	157.00	157.00	140.00	140.00
Kerosene[a]	Lbs per MG	157.00	15.70	157.00	157.00	157.00	157.00	140.00	140.00
Landfill Gas	Lbs per MMCF	0.60	0.06	0.60	0.60	0.60	0.60	0.60	0.60
Lignite Coal[a]	Lbs per ton	30.00	3.00	30.00	30.00	30.00	30.00	NA	NA
Municipal Solid Waste	Lbs per ton	1.70	0.17	1.70	1.70	1.70	1.70	NA	NA
Natural Gas	Lbs per MMCF	0.60	0.06	0.60	0.60	0.60	0.60	0.60	0.60
Other Biomass Gas	Lbs per MMCF	0.60	0.06	0.60	0.60	0.60	0.60	0.60	0.60
Other Biomass Liquids[a]	Lbs per MG	157.00	15.70	157.00	157.00	157.00	157.00	140.00	140.00
Other Biomass Solids	Lbs per ton	0.23	0.02	0.23	0.23	0.23	0.23	NA	NA
Other Gases	Lbs per MMCF	0.60	0.06	0.60	0.60	0.60	0.60	0.60	0.60
Other	Lbs per MMCF	0.60	0.06	0.60	0.60	0.60	0.60	0.60	0.60
Petroleum Coke[a]	Lbs per ton	39.00	3.90	39.00	39.00	39.00	39.00	NA	NA
Propane Gas	Lbs per MMCF	0.60	0.06	0.60	0.60	0.60	0.60	0.60	0.60
Residual Fuel Oil[a]	Lbs per MG	157.00	15.70	157.00	157.00	157.00	157.00	NA	NA
Synthetic Coal[a]	Lbs per ton	38.00	3.80	38.00	38.00	38.00	38.00	NA	NA
Sludge Waste	Lbs per ton[b]	2.80	0.28	2.80	2.80	2.80	2.80	NA	NA
Subbituminous Coal[a]	Lbs per ton	35.00	3.50	35.00	38.00	35.00	35.00	NA	NA
Tire-Derived Fuel[a]	Lbs per ton	38.00	3.80	38.00	38.00	38.00	38.00	NA	NA
Waste Coal[a]	Lbs per ton	30.00	3.00	30.00	30.00	30.00	30.00	NA	NA
Wood Waste Liquids[a]	Lbs per MG	157.00	15.70	157.00	157.00	157.00	157.00	140.00	140.00
Wood Waste Solids	Lbs per ton	0.29	0.08	0.29	0.08	0.29	0.29	NA	NA
Waste Oil[a]	Lbs per MG	147.00	14.70	147.00	147.00	147.00	147.00	NA	NA

Source:
U.S. Department of Energy, Energy Information Administration, Electric Power Annual 2009, Washington, D.C., Revised: January 2011. Web site: http://www.eia.gov/cneaf/electricity/epa/epata1.html

Note:
Units: Lbs = pounds; MMCF = million cubic feet; MG = thousand gallons.

[a]For these fuels, emissions are estimated by multiplying the emissions factor by the physical volume of fuel and the sulfur percentage of the fuel (other fuels do not require the sulfur percentage in the calculation).

[b]Although Sludge Waste and Black Liquor consist substantially of liquids, these fuels are measured and reported to EIA in tons.

For the purpose of agricultural soil amendment, wood ash application is similar to lime application. Both materials can benefit crop productivity but wood ash has an added advantage of supplying additional nutrients. Both materials are also alkaline and could cause crop damage if over applied or misused.

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Range in Elemental Composition of Industrial Wood Ash Samples and Ground Limestone

Element	Wood Ash[a]	Limestone
Macroelements	**Concentration in %**	
Calcium	15 (2.5-33)	31.00
Potassium	2.6 (0.1-13)	0.13
Aluminum	1.6 (0.5-3.2)	0.25
Magnesium	1.0 (0.1-2.5)	5.10
Iron	0.84 (0.2-2.1)	0.29
Phosphorus	0.53 (0.1-1.4)	0.06
Manganese	0.41 (0-1.3)	0.05
Sodium	0.19 (0-0.54)	0.07
Nitrogen	0.15 (0.02-0.77)	0.01
Microelements	**Concentration in mg/kg**	
Arsenic	6 (3-10)	.
Boron	123 (14-290)	.
Cadmium	3 (0.2-26)	0.7
Chromium	57 (7-368)	6.0
Copper	70 (37-207)	10.0
Lead	65 (16-137)	55.0
Mercury	1.9 (0-5)	.
Molybdenum	19 (0-123)	.
Nickel	20 (0-63)	20.0
Selenium	0.9 (0-11)	.
Zinc	233 (35-1250)	113.0
	Other Chemical Properties	
$CaCO_3$ Equivalent	43% (22-92%)	100%
pH	10.4 (9-13.5)	9.9
% Total solids	75 (31-100)	100.0

Source:

Risse, Mark, and Glen Harris. Soil Acidity and Liming Internet Inservice Training Website: "Best Management Practices for Wood Ash Used as an Agricultural Soil Amendment." Website accessed 09/20/11.
http://hubcap.clemson.edu/~blpprt/bestwoodash.html

[a] Mean and (Range) taken from analysis of 37 ash samples.

Section: BIOPOWER
Biomass Power Technology Fuel Specifications and Capacity Range

Biomass Conversion Technology	Commonly used fuel types[a]	Particle Size Requirements	Moisture Content Requirements (wet basis)[b]	Average capacity range / link to examples
Stove/Furnace	Solid wood, pressed logs, wood chips and pellets	Limited by stove size and opening	10 – 30%	15 kWt to ?
Pile burners	Virtually any kind of wood residues[c] or agricultural residues[d] except wood flour	Limited by grate size and feed opening	< 65%	4 to 110 MWe
Pile burner fed with underfire stoker (biomass fed by auger below bed)	Sawdust, non-stringy bark, shavings, chips, hog fuel	0.25-2 in (6-38 mm)	10-30%	4 to 110 MWe
Stoker grate boilers	Sawdust, non-stringy bark, shavings, end cuts, chips, chip rejects, hog fuel	0.25 – 2 in (6 -50 mm)	10-50% (keep within 10% of design rate)	20 to 300 MWe many in 20 to 50 MWe range
Suspension boilers Cyclonic	Sawdust. Non-stringy bark, shavings, flour, sander dust	0.25 in (6 mm) max	< 15%	many < 30 MWe
Suspension boilers, Air spreader-stoker	Wood flour, sander dust, and processed sawdust, shavings	0.04 in -0.06 in (1-1.6 mm)	< 20%	1.5 MWe to 30 MWe
Fluidized-bed combustor (FB- bubbling or CFB-circulating)	Low alkali content fuels, mostly wood residues or peat no flour or stringy materials	< 2 in (<50 mm)	< 60%	Many at 20 to 25 MWe, up to 300 Example
Co-firing: pulverized coal boiler	Sawdust, non-stringy bark, shavings, flour, sander dust	<0.25 in (<6 mm)	< 25%	Up to 1500 MWee Example
Co-firing: cyclones	Sawdust, non-stringy bark, shavings, flour, sander dust	<0.5 in (<12 mm)	10 – 50%	40 to 1150 MWee Example
Co-firing: stokers, fluidized bed	Sawdust, non-stringy bark, shavings, flour, hog fuel	< 3 in (<72 mm)	10 – 50%	MWee Example
Counter current, fixed bed (updraft) atmospheric	Chipped wood or hog fuel, rice hulls, dried sewage sludge	0.25 – 4 in (6 – 100 mm)	< 20%	5 to 90 MWt, + up to 12 Mwe
Downdraft, moving bed atmospheric gasifier	Wood chips, pellets, wood scrapes, nut shells	< 2 in (<50 mm)	<15%	~ 25-100 kWe Example
Circulating fluidized bed (CFB), dual vessel, gasifier	Most wood and chipped agricultural residues but no flour or stringy materials	0.25 – 2 in (6 -50 mm)	15-50%	~ 5 to 10 Mwe
Fast pyrolysis	Variety of wood and agricultural resources	0.04-0.25 in (1-6 mm)	< 10%	~ 2.5 MWe Example 1 Example 2
Anerobic digesters	Animal manures & bedding, food processing residues, brewery by-products, other industry organic residues	NA	65 to 99.9% liquid depending on type, i.e., 0.1 to 35% solids	145 to 1700 x 103 kWhr/yr Example

Source:
Compiled by Lynn Wright, Oak Ridge, TN.

[a] Primary source for fuel types is: Badger, Phillip C. 2002. Processing Cost Analysis for Biomass Feedstocks. ORNL/TM-2002/199. Available at http://bioenergy.ornl.gov/main.aspx (search by title or author)

[b] Most primary biomass, as harvested, has a moisture content (MC) of 50 to 60% (by wet weight) while secondary or tertiary sources of biomass may be delivered at between 10 and 30%. A lower MC always improves efficiency and some technologies require low MC biomass to operate properly while others can handle a range of MC.

[c] Wood residues may include forest logging residues and storm damaged trees (hog fuel), primary mill residues (e.g., chipped bark and chip rejects), secondary mill residues (e.g., dry sawdust), urban wood residues such as construction and demolition debris, pallets and packaging materials, tree trimmings, urban land clearing debris, and other wood residue components of municipal solid waste (as wood chips).

[d] Agricultural residues may include straws and dried grasses, nut hulls, orchard trimmings, fruit pits, etc. Slagging may be more of a problem in some types of combustion units with high alkali straws and grasses, unless the boilers have been specially designed to handle these type fuels.

[e] The biomass component of a co-firing facility will usually be less than the equivalent of 50MWe.

There are three distinct markets for green power in the United States. In regulated markets, a single utility may provide a green power option to its customers through "green pricing," which is an optional service or tariff offered to customers. These utilities include investor-owned utilities, rural electric cooperatives, and other publicly-owned utilities.

In restructured (or competitive) electricity markets, retail electricity customers can choose from among multiple electricity suppliers, some of which may offer green power. Electricity markets are now open to full competition in a number of states, while others are phasing in competition.

Finally, consumers can purchase green power through "renewable energy certificates." These certificates represent the environmental attributes of renewable energy generation and can be sold to customers in either type of market, whether or not they already have access to a green power product from their existing retail power provider.

Utility market research shows that a majority of customer respondents is likely to state that they would pay at least $5 more per month for renewable energy. And business and other nonresidential customers, including colleges and universities, and government entities, are increasingly interested in green power.

Section: BIOPOWER
Renewable Energy Generation and Capacity Supplying Green Pricing Programs, 2009

Source	Sales MWh	Percentage of Total Sales	Total MW	MW New Renewable
Wind	4,434,400	85.9%	1,534	1,472
Landfill gas	**353,400**	**6.8%**	**45**	**42**
Other biomass	**248,600**	**4.8%**	**35**	**35**
Solar	18,875	0.4%	14	13
Geothermal	45,000	0.9%	5	5
Hydro	63,100	1.2%	18	17
Unknown	1,700	0.0%	1	-
Total	**5,165,075**	**100.0%**	**1,652**	**1,584**

Source:
Green Power Marketing in the United States: A Status Report (2009 Data) Table 11
http://www.nrel.gov/docs/fy11osti/49403.pdf

Notes:
MW=megawatt
MWh=megawatt-hour

An estimated 24.8 billion kWh of renewable energy was sold to retail customers by competitive green power and REC marketers in 2009. This figure includes renewable energy from both pre-existing and new sources. In 2009, about 83% of the REC and green power competitive-market retail kilowatt-hour sales were supplied from new renewable energy sources.

Section: BIOPOWER
Renewable Energy Sources Supplying Competitive and REC Markets, 2009

Source	MWh Sales	Percentage of Total Sales	Total MW	MW New Renewable
Wind	17,683,000	71.2%	6,120	5,680
Biomass/Landfill gas	**2,391,000**	**9.6%**	**320**	**260**
Solar	28,000	0.1%	20	20
Geothermal	48,000	0.2%	10	10
Hydro	2,912,000	11.7%	830	420
Unknown	1,783,000	7.2%	410	-
Total	**24,845,000**	**100.0%**	**7,710**	**6,390**

Source:
Green Power Marketing in the United States: A Status Report (2009 Data) Table 16.
http://www.nrel.gov/docs/fy11osti/49403.pdf

Notes:
REC=Renewable Energy Certificate
MW=megawatt
MWh=megawatt-hour

There are a growing number of utilities offering green pricing programs that utilize biomass resources.

Section: BIOPOWER

Utility Green Pricing Programs Using Biomass and Biomass Based Resources

(Updated August 2011)

State	Program Name	Type	Start Date	Premium
AL	Renewable Energy Rate	biomass co-firing (wood)	2003/2000	4.5¢/kWh
AL	Green Power Choice	landfill gas	2006	2.0¢/kWh
AL	Green Power Switch	landfill gas, PV, wind	2000	2.67¢/kWh
AK	Sustainable Natural Alternative Power (SNAP)	various local projects	2005	Contribution
AZ	Green Choice	wind and geothermal	2007	0.4¢/kWh
AZ	EarthWise Energy	central PV, wind, landfill gas, small hydro, geothermal	1998/2001	3.0¢/kWh
AZ	Renewable Resource Power Service	wind, hydro	2001	0.8¢/kWh
AZ	GreenWatts	landfill gas, PV	2000	10¢/kWh
AZ	GreenWatts	PV	2004	10¢/kWh
AR	ECA Green Power	hydro	2008	5.0¢/kWh
CA	Sun Power for the Schools	PV	2002	Contribution
CA	Green Power for the Grid	wind, landfill gas	2002	1.5¢/kWh
CA	Green Energy Champion	various	2007	2.0¢/kWh
CA	Green Power for a Green LA	wind, landfill gas	1999	3.0¢/kWh
CA	Light Green	25% renewable	2008	0.0¢/kWh
CA	Deep Green	100% renewable	2010	1.0¢/kWh
CA	Blue Sky Block	wind	2000	1.95¢/kWh
CA	Palo Alto Green	wind, PV	2003 / 2000	1.5¢/kWh
CA	Green Power	wind	2003	2.5¢/kWh
CA	Green Roseville	wind, PV	2005	1.5¢/kWh
CA	Greenergy	wind, landfill gas, hydro, PV	1997	1.0¢/kWh or $6/month
CA	SolarShares	PV	2007	5.0¢kWh or $30/month
CA	Santa Clara Green Power	wind, PV	2004	1.5¢/kWh
CA	Voluntary Renewable Energy Certificates Program	wind	2008	2.0¢/kWh
CO	Green Power	wind	1999	3.0¢/kWh
CO	Renewable Energy Certificates Program	wind and geothermal	2008	0.34¢/kWh
CO	Wind Power Pioneers	wind	1998	1.5¢/kWh
CO	Local Renewable Energy Pool	small hydro, PV	2002	2.33¢/kWh
CO	National Wind	wind	2006	1.0¢/kWh
CO	National Solar	solar	2006	5.5¢/kWh
CO	Wind Energy Premium	wind	1999	1.0¢/kWh-2.5¢/kWh
CO	Renewable Resource Power Service	wind, hydro	1998	0.8¢/kWh
CO	Renewable Energy Trust	PV	1993	Contribution
CO	WindSource	wind	1997	-0.67¢/kWh
CO	Wind Energy Program	wind	1999	0.6¢/kWh
DE	Renewable Energy Rider	landfill gas	2006	0.2¢/kWh
FL	Green for You	biomass, PV	2002	1.6¢/kWh
FL	Green for You	PV only	2002	11.6¢/kWh
FL	GRUgreen Energy	landfill gas, wind, PV	2003	2.0¢/kWh
FL	GO GREEN: USA Green	wind, biomass,PV	2004	1.60¢/kWh
FL	GO GREEN: Florida Ever Green	solar hot water, PV, biomass	2004	2.75¢/kWh
FL	Green Power Choice	landfill gas	2006	2.0¢/kWh
FL	Renewable Energy	PV, landfill, biomass co-firing (wood)	2001	2.5¢/kWh

Continued on next page

Utility Green Pricing Programs Using Biomass and Biomass Based Resources
(Continued)

State	Program Name	Type	Start Date	Premium
FL	Green Fund	local PV projects	1999	Contribution
GA	Green Power EMC	landfill gas, PV in schools	2001	2.0¢/kWh-3.3¢/kWh
GA	Green Energy	landfill gas, solar	2006	3.5¢/kWh
GA	Green Power Switch	landfill gas, PV, wind	2000	2.67¢/kWh
HI	Sun Power for Schools	PV in schools	1997	Contribution
HI	Green Rate	distributed renewable energy systems	TBD	TBD
ID	Buck-A-Block	wind	2002	0.33¢/kWh
ID	Green Power Program	various	2001	0.98¢/kWh
ID	Blue Sky	wind	2003	0.71¢/kWh-1.94¢/kWh
ID	Alternative Renewable Energy Program	wind	2003	1.1¢/kWh
IL	Renewable Energy Option	wind, small hydro, PV	2005	2.5¢/kWh
IL	Green Power Program	wind, landfill gas	2003	1.2¢/kWh
IL	Evergreen Renewable Energy Program	landfill gas, biogas, hydro, wind	1997	1.5¢/kWh
IL	EnviroWatts	wind, landfill gas	2000	0.9¢/kWh-1.0¢/kWh
IN	GoGreen Power	wind, PV, landfill gas, digester gas	2001	2.5¢/kWh
IN	EnviroWatts	landfill gas	2001	2.0¢/kWh-4.0¢/kWh
IN	Green Power Option	wind	1998	0.35¢/kWh
IN	EnviroWatts	wind, landfill gas	2000	0.9¢/kWh-1.0¢/kWh
IA	Second Nature	landfill gas, wind	2001	2.0¢/kWh
IA	varies by utility	biomass, wind	2003	2.0¢/kWh-3.5¢/kWh
IA	Prairie Winds	wind	2000	0.5¢/kWh
IA	Harvest the Wind	wind	2000	2.5¢/kWh
IA	Wind Power	wind	2006	1.5¢/kWh-2.5¢/kWh
IA	Energy Wise Renewables	wind	2003	1.5¢/kWh
IA	Evergreen Renewable Energy Program	hydro, wind, landfill gas, biogas	1998	3.0¢/kWh
IA	Green Power Project	biodiesel, wind	2004	Contribution
IA	Green City Energy	wind, biomass, PV	2003	Varies by utility
IA	Renewable Advantage	wind	2004	Contribution
IA	RiverWinds	wind	2003	2.0¢/kWh-2.5¢/kWh
IA	Solar Muscatine	PV	2004	Contribution
IA	Green Power Choice	wind	2003	Contribution
IA	Iowa Energy Tags	wind	2001	2.0¢/kWh
KY	Renewable Resources Energy (EnviroWatts)	100% biomass	2007	3.65¢/kWh
KY	Green Energy	100% KY Low Impact Hydro Institute-Certified hydro	2007	1.3¢/kWh-1.67¢/kWh
KY	EnviroWatts	landfill gas	2002	2.75¢/kWh
KY	Green Power Switch	landfill gas, PV, wind	2000	2.67¢/kWh
LA	Green Pricing Program	biomass	2007	2.5¢/kWh
MA	BGreen	solar and wind	2009	2.0¢/kWh
MA	Green Power	hydro	2004	3.0¢/kWh
MA	NSTAR Green	wind	2008	0.8¢/kWh-1.45¢/kWh
MA	SELCO GreenLight	wind	2007	6.67¢/kWh
MI	Green Generation	68% wind, 32% landfill gas	2005	1.67¢/kWh
MI	GreenCurrents	wind, biomass	2007	2.0¢/kWh-2.5¢/kWh
MI	GreenWise Electric Power	landfill gas, small hydro	2001	3.0¢/kWh
MI	NatureWise	wind, landfill gas and animal waste methane	2004	1.4¢/kWh
MI	EnviroWatts	wind, landfill gas	2000	0.9¢/kWh-1.0¢/kWh

Continued on next page

Utility Green Pricing Programs Using Biomass and Biomass Based Resources
(Continued)

State	Program Name	Type	Start Date	Premium
MI	Energy for Tomorrow	wind, landfill gas, hydro	2000	2.04¢/kWh
MN	Second Nature	landfill gas, wind	2002	2.0¢/kWh
MN	Prairie Winds	wind	2002	0.5¢/kWh
MN	Green Energy Program	wind, landfill gas	2000	1.5¢/kWh-2.5¢/kWh
MN	Evergreen Renewable Energy Program	hydro, wind, landfill gas, biogas	1998	1.5¢/kWh
MN	Wellspring Renewable Wind Energy Program	wind	1998	1.55¢/kWh-2.0¢/kWh
MN	WindSense	wind	2002	2.5¢/kWh
MN	Infinity Wind Energy	wind	1999	0.5¢/kWh
MN	RiverWinds	wind	2002	2.0¢/kWh-2.5¢/kWh
MN	Capture the Wind	wind	1998	1.5¢/kWh
MN	TailWinds	wind	2002	1.6¢/kWh
MN	WindSource	wind	2003	2.0¢/kWh
MS	Green Power Switch	landfill gas, PV, wind	2000	2.67¢/kWh
MO	Pure Power	75% wind, 25% other renewables	2007	1.5¢/kWh
MO	varies by utility	biomass, wind	2003	2.0¢/kWh-3.5¢/kWh
MO	WindCurrent	wind	2000	5.0¢/kWh
MO	EnviroWatts	wind, landfill gas	2000	0.9¢/kWh-1.0¢/kWh
MT	Prairie Winds	wind	2000	0.5¢/kWh
MT	E+ Green	wind, PV	2003	2.0¢/kWh
MT	Green Power Program	various renewables	2002	1.02¢/kWh
MT	Environmentally Preferred Power	wind, hydro	2002	1.05¢/kWh
MT	Renewable Resource Power Service	wind, hydro	2001	0.8¢/kWh
MT	Alternative Renewable Energy Program	wind	2003	1.1¢/kWh
NC	NC GreenPower	biomass, hydro, landfill gas, PV, wind	2003	2.5¢/kWh-4.0¢/kWh
NC	Green Power Switch	landfill gas, PV, wind	2000	2.67¢/kWh
ND	PrairieWinds	wind	2000	0.5¢/kWh
ND	Infinity Wind Energy	wind	1999	0.5¢/kWh
ND	RiverWinds	wind	2002	2.0¢/kWh-2.5¢/kWh
NE	Green Power Program	landfill gas, wind	2002	3.0¢/kWh
NE	Renewable Resource Power Service	wind, hydro	2001	0.8¢/kWh
NV	GreenWay	various	2005	1.95¢/kWh
NV	Desert Research Institute's GreenPower Program	PV on schools	Unknown	Contribution
NM	Renewable Energy Tariff	wind	2003	2.28¢/kWh
NM	Green Power	wind	2005	1.8¢/kWh
NM	Voluntary Renewable Energy Program	TBD	2008	4.0¢/kWh
NM	PNM Sky Blue	wind	2003	1.1¢/kWh
NM	Renewable Resource Power Service	wind, hydro	2001	0.4¢/kWh-2.5¢/kWh
NM	WindSource	wind	1999	3.0¢/kWh
OH	Nature's Energy	small hydro, landfill gas, wind	2003	1.3¢/kWh-1.5¢/kWh
OH	EnviroWatts	landfill gas	2006	2.0¢/kWh
OH	Green Connect	various	2008	1.0¢/kWh
OH	GoGreen Power	wind, PV, landfill gas, digester gas	2001	2.5¢/kWh

Continued on next page

Utility Green Pricing Programs Using Biomass and Biomass Based Resources

(Continued)

State	Program Name	Type	Start Date	Premium
OH	Green Resource Program	various	2007	0.5¢/kWh
OH	EnviroWatts	wind, landfill gas	2000	0.9¢/kWh-1.0¢/kWh
OK	varies by utility	biomass, wind	2003	2.0¢/kWh-3.5¢/kWh
OK	OG&E Wind Power	wind	2003	-0.246¢/kWh
OK	Pure & Simple	wind	2004	1.8¢/kWh (-0.45¢/kWh Edmond)
OK	WindChoice	100% wind	2011	1.72¢/kWh
OK	WindWorks	wind	2004	0.5¢/kWh
OR	Renewable Pioneers	PV, wind	2003	2.0¢/kWh
OR	Choice Energy	wind	2005	1.5¢/kWh
OR	Choose Renewable Electricity	wind, geothermal	2003	1.2¢/kWh
OR	EWEB Greenpower	various renewables	2007	1.0¢/kWh-1.5¢/kWh
OR	EWEB Wind Power	wind	1999	0.91¢/kWh
OR	Green Power Program	various	2001	0.98¢/kWh
OR	Environmentally-Preferred Power	wind	1999	2.5¢/kWh
OR	Green Power	wind	2002	1.5¢/kWh
OR	Blue Sky QS (Commercial Only)	wind	2004	Sliding scale depending on size
OR	Blue Sky Block	wind	2000	1.95¢/kWh
OR	Blue Sky Habitat	wind, biomass, PV	2002	0.78¢/kWh + $2.50/mo. donation
OR	Blue Sky Usage	wind, biomass, PV	2002	0.78¢/kWh
OR	Green Power	landfill gas	1998	1.8¢/kWh-2.0¢/kWh
OR	Clean Wind for Medium to Large Commercial & Industrial Accounts	wind	2003	1.7¢/kWh
OR	Clean Wind Power	wind	2002	1.75¢/kWh
OR	Green Source	existing geothermal, hydro, new wind	2002	0.8¢/kWh
OR	Renewable Future	wind	2007	1.5¢/kWh
OR	ECOchoice	various	2007	1.0¢/kWh
SC	Palmetto Clean Energy (PaCE)	wind, solar, landfill gas	2008	4.0¢s;/kWh
SC	Green Power Program	landfill gas	2001	3.0¢/kWh
SD	Prairie Winds	wind	2000	0.5¢/kWh
SD	RiverWinds	wind	2002	2.0¢/kWh-2.5¢/kWh
SD	Renewable Resource Power Service	wind, hydro	2001	0.8¢/kWh
TN	Green Power Switch	landfill gas, PV, wind	2000	2.67¢/kWh
TX	GreenChoice	wind, landfill gas	2000/1997	1.85¢/kWh
TX	Choose-To-Renew	wind, hydro	2005	-0.114¢/kWh
TX	Windtricity	wind	2000	3.0¢/kWh
TX	Wind Watts (10%/50%/100%)	new wind	2009	TBD
TX	Renewable Energy Tariff	wind	2001	1.92¢/kWh
TX	Renewable Power	wind, hydro	2006	0.5¢/kWh
UT	Clean Green Power	wind, small hydro	2005	2.95¢/kWh
UT	GreenWay	various	2004	1.95¢/kWh
UT	Blue Sky	wind	2003	0.71¢/kWh-1.94¢/kWh
UT	Blue Sky	wind	2000	1.95¢/kWh
UT	Renewable Resource Power Service	wind, hydro	2001	0.8¢/kWh

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Utility Green Pricing Programs Using Biomass and Biomass Based Resources
(Continued)

State	Program Name	Type	Start Date	Premium
VT	CVPS Cow Power	biogas	2004	4.0¢/kWh
VT	CoolHome / CoolBusiness	wind, biomass	2002	Contribution
VT	Greener GMP	various renewables	2006	3.0¢/kWh
VA	Green Pricing Option	low impact hydro	2009	1.5¢/kWh
VA	Dominion Green Power	biomass, low-impact hydro, solar, wind	2009	1.5¢/kWh
WA	Buck-A-Block	wind	2002	0.33¢/kWh
WA	Green Power Program	landfill gas, wind, hydro	1999	Contribution
WA	Sustainable Natural Alternative Power (SNAP)	PV, wind, micro hydro	2001	Contribution
WA	Clallam County PUD Green Power Program	landfill gas	2001	0.69¢/kWh
WA	Green Lights	PV, wind	2002	1.5¢/kWh
WA	Renewable Resource Energy	wind, PV	2002	2.0¢/kWh
WA	Alternative Energy Resources Program	wind	2002	2.0¢/kWh
WA	Green Power	wind	2002	3.0¢/kWh
WA	Green Power Energy Rate	wind	2003	2.0¢/kWh
WA	Mason Evergreen Power	wind	2003	1.0¢/kWh
WA	Pure Power	wind	2007	2.5¢/kWh
WA	Go Green	wind, hydro	1999	3.5¢/kWh
WA	Green Power	landfill gas	2002	1.05¢/kWh
WA	Blue Sky Block	wind	2000	1.95¢/kWh
WA	Green by Choice	wind, hydro, biogas	2002	2.0¢/kWh
WA	Green Power Program	wind, PV, biogas	2002	1.25¢/kWh
WA	Seattle Green Power	PV, biogas	2002	Contribution
WA	Green Up	wind	2005	1.5¢/kWh
WA	Planet Power	wind	2002	2.0¢/kWh
WA	EverGreen Options	wind	2000	1.2¢/kWh
WV	Green Pricing Option	wind and hydro	2008	1.5¢/kWh
WI	Second Nature	wind, landfill gas	2000	2.0¢/kWh
WI	Evergreen Renewable Energy Program	hydro, wind, landfill gas, biogas	1998	1.5¢/kWh
WI	Wellspring Renewable Wind Energy Program	wind	1997	1.45¢/kWh-2.0¢/kWh
WI	Green Power Tomorrow	wind	1999	1.0¢/kWh
WI	Renewable Energy Program	small hydro, wind, biogas	2001	1.0¢/kWh
WI	Energy for Tomorrow	landfill gas, PV, hydro, wind	1996	1.37¢/kWh
WI	Solar Wise for Schools	PV in schools	1996	Contribution
WI	NatureWise	wind, landfill gas, biogas	2002	1.25¢/kWh
WY	Prairie Winds	wind	2000	0.5¢/kWh
WY	Renewable Premium Program	99% new wind, 1% new solar	2006	3.5¢/kWh
WY	Green Power	wind	2003	1.167¢/kWh
WY	Blue Sky	wind	2000	1.95¢/kWh
WY	Renewable Resource Power Service	wind, hydro	2001	0.8¢/kWh
WY	Wind Energy Program	wind	1999	0.6¢/kWh

Source: National Renewable Energy Laboratory, Golden, Colorado.
http://apps3.eere.energy.gov/greenpower/markets/pricing.shtml?page=1

Note: Utility green pricing programs may only be available to customers located in the utility's service territory.

A growing number of states have companies that offer a range of green power products that allow consumers to purchase electricity generated in part or entirely from biomass resources.

Section: BIOPOWER

Competitive Electricity Markets Retail Green Power Product Offerings[a], August 2010

State	Company	Product Name	Resource Mix[b]	Certification
Connecticut	CL&P/United Illuminating/Community Energy (CT Clean Energy Options Program)	New Wind Energy/Landfill Gas 50% or 100% of usage	50% new wind, 50% landfill gas	—
	CL&P/United Illuminating/Sterling Planet (CT Clean Energy Options Program)	Sterling Select 50% or 100% of usage	33% new wind, 33% small hydro, 34% landfill gas	—
Maine	Kennebunk Light and Power District	Village Green	hydro, landfill gas	—
Maryland	PEPCO Energy Services	Green Electricity 100% of usage	landfill gas	—
Massachusetts	Cape Light Compact	Cape Light Compact Green 50% or 100%[*]	75% small hydro, 24% new wind or landfill gas, 1% new solar	—
	Massachusetts Electric/Nantucket Electric/Clear Sky Power[d]	Clear Sky Home[*]	100% biomass	—
	Massachusetts Electric/Nantucket Electric/Mass Energy Consumers Alliance	New England GreenStart 50% or 100% of usage[*]	75% small hydro, 25% new biomass, wind and solar	—
	Massachusetts Electric/Nantucket Electric/Sterling Planet[d]	MA Clean Choice[*]	33% new wind, 33% new landfill gas, 33% small hydro	Environmental Resources Trust
New Jersey	PSE&G/JCP&L/Atlantic City Electric/Rockland Electric/Sterling Planet	NJ Clean Power Choice - Sterling Select	33% wind, 33% small hydro, 34% landfill gas	Environmental Resources Trust
New York	BlueRock Energy	Green Power (10%/50%/100%)	biomass, small and low-impact hydro	—
	Energy Cooperative of New York[e]	Renewable Electricity	25% new wind, 75% landfill gas	—
	Long Island Power Authority / EnviroGen	Green Power Program	75% landfill gas, 25% small hydro	—
	Long Island Power Authority / Sterling Planet	New York Clean	55% small hydro, 35% bioenergy, 10% wind	Environmental Resources Trust
	Long Island Power Authority / Sterling Planet	Sterling Green	40% new wind, 30% small hydro, 30% bioenergy	Environmental Resources Trust
	National Grid / EnviroGen	Think Green!	75% landfill gas, 25% low impact hydro	—
	Sterling Planet	NY Clean Choice	40% new wind, 30% small hydro, 30% bioenergy	Environmental Resources Trust
	Suburban Energy Services /Sterling Planet	Sterling Green Renewable Electricity	40% new wind, 30% small hydro, 30% bioenergy	Environmental Resources Trust

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Competitive Electricity Markets Retail Green Power Product Offerings as of August 2010
(continued)

Pennsylvania	Energy Cooperative of Pennsylvania	EcoChoice 100	89% landfill gas, 10% wind, 1% solar	—
	UGI Utilities	Renewable Residential Service - Alternative Energy (50% or 100% of usage)	100% MSW, waste coal, wood pulp	—
Rhode Island	Narragansett Electric / Clear Sky Power	Clear Sky Home	100% new bioenergy	—
	Narragansett Electric / People's Power and Light	New England GreenStart RI 50% or 100% of usage	70% small hydro, 17% bioenergy, 13% wind and solar	—
	Narragansett Electric / Sterling Planet	Sterling Supreme 100%	40% small hydro, 25% biomass, 25% new solar, 10% new wind	Environmental Resources Trust

Source:
National Renewable Energy Laboratory, *The Green Power Network*
http://apps3.eere.energy.gov/greenpower/markets/marketing.shtml?page=1

[a] As product prices fluctuate, please contact the listed marketers to get accurate price quote for products.
[b] New is defined as operating or repowered after January 1, 1997 based on the Green-e standard.
[c] Offered in PEPCO service territory.
[d] Products are only available in the National Grid service territory.
[e] Offered in Niagra Mohawk and NYSEG service territories.
[*] The Massachusetts Technology Collaborative's Clean Energy Choice (CEC) program provides local matching grants for clean energy projects for residents who make a voluntary offering.

Renewable energy certificates (RECs)—also known as green tags, renewable energy credits, or tradable renewable certificates—represent the environmental attributes of power generated from renewable electric plants. A number of organizations offer green energy certificates separate from electricity service (i.e., customers do not need to switch from their current electricity supplier to purchase these certificates). Organizations that offer green certificate products using biomass resources are listed below.

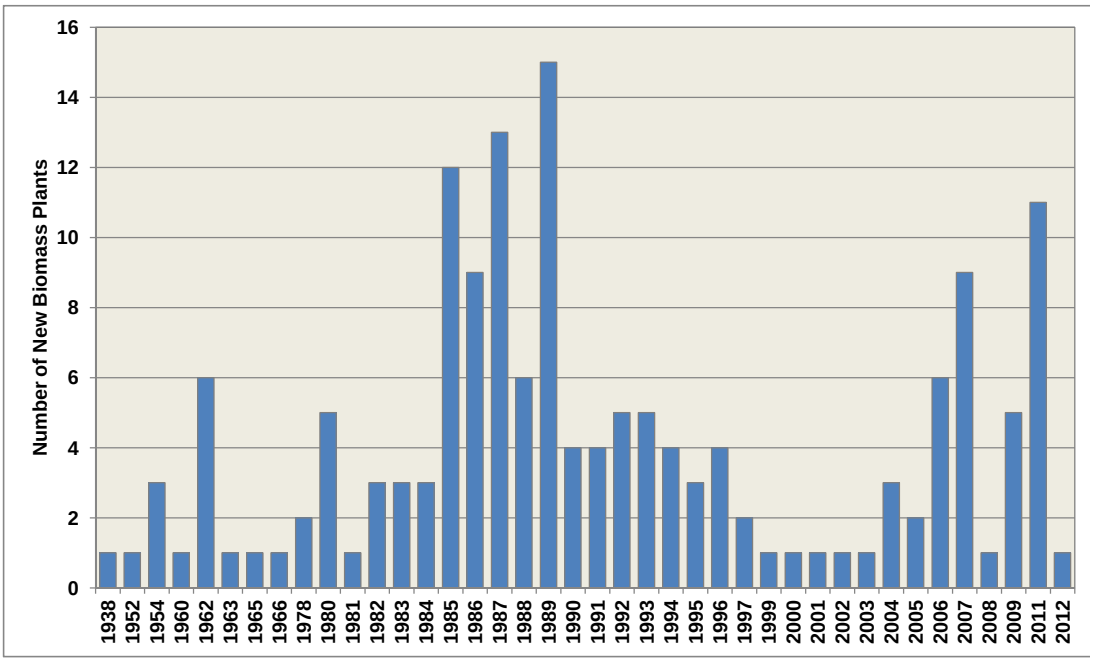
Section: BIOPOWER
National Retail Renewable Energy Certificate Product Offerings, August 2010

Certificate Marketer	Product Name	Renewable Resources	Location of Renewable Resources	Residential Price Premium*	Certification
3 Phases Renewables	Green Certificates	100% biomass, geothermal, hydro, solar, wind	Nationwide	1.2¢/kWh	Green-e
3Degrees	National Renewable Energy Certificates	100% wind, solar, geothermal, low-impact hydro, biogas, biomass	Nationwide	0.5¢/kWh-1.5¢/kWh	Green-e
NativeEnergy	Remooable Energy	100% new biogas	Pennsylvania	0.8¢/kWh-1.0¢/kWh	**
Carbon Solutions Group	CSG CleanBuild	biomass, biogas, wind, solar, hydro	Nationwide	0.9¢/kWh	Green-e
GP Renewables & Trading LLC	GP-REC Structured Product	solar, hydro, biomass, landfill gas, energy efficiency	Localized by state and region	0.2¢/kWh	–
Green Mountain Energy	BeGreen RECs	wind, solar, biomass	Nationwide	1.4¢/kWh	—
Santee Cooper	SC Green Power	landfill gas, solar	South Carolina	3.0¢/kWh	Green-e
Village Green Energy	Village Green Power	solar, wind, biogas	California, Nationwide	2.0¢/kWh-2.5¢/kWh	Green-e

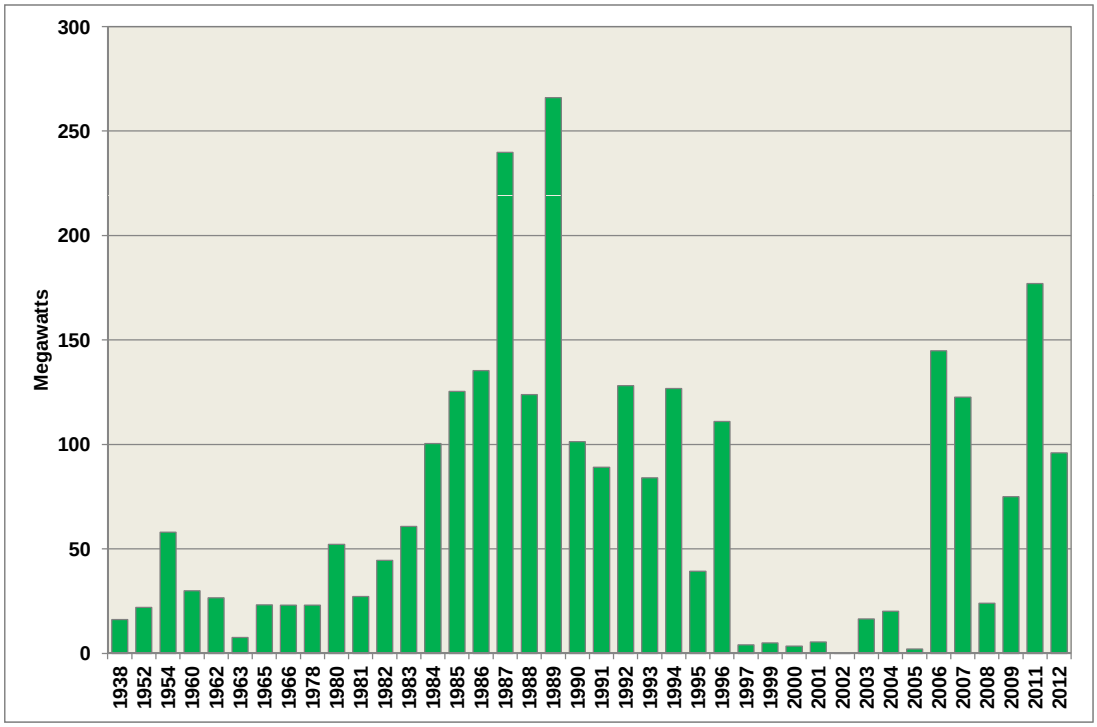
Source:
National Renewable Energy Laboratory, *The Green Power Network*
http://apps3.eere.energy.gov/greenpower/markets/certificates.shtml?page=1

Notes:
— Information not available.
* Product prices are updated as of August 2010. Premium may also apply to small commercial customers. Large users may be able to negotiate price premiums.
** Product is sourced from Green-e and ERT-certified RECs. ERT also certifies the entire product portfolio.

Section: BIOPOWER
New Biomass Power Plants by Year



New Biomass Power Plant Capacity by Year



Source:
National Electric Energy System (NEEDS) Database for IPM 2006
http://epa.gov/airmarkets/progsregs/epa-ipm/BaseCasev410.html

Notes:
1. Only years in which new plants were brought online are shown.
2. Power plant capacity based on NEEDS 2010 Data

Section: BIOPOWER
Current Biomass Power Plants

Plant Name	Boiler/Generator/ Committed Unit	State Name	County	Capacity MW	Heat Rate (Btu/kWh)	Cogeneration	On-line Year
Kettle Falls Generating Station	B	Washington	Stevens	50.00	13,809	No	1983
J C McNeil	B	Vermont	Chittenden	52.00	14,736	No	1984
Mitchell	B	Georgia	Dougherty	96.00	8,911	No	2012
M L Hibbard	B	Minnesota	St. Louis	15.30	14,500	Yes	1988
M L Hibbard	B	Minnesota	St. Louis	33.30	14,500	Yes	1988
Hibbing	B	Minnesota	St. Louis	20.00	14,500	Yes	2007
Virginia	B	Minnesota	St. Louis	15.00	14,500	Yes	2007
Schiller	B	New Hampshire	Rockingham	36.97	9,540	No	2006
Bay Front	B	Wisconsin	Ashland	22.00	18,720	No	1954
Bay Front	B	Wisconsin	Ashland	30.00	12,513	No	1960
Bay Front	B	Wisconsin	Ashland	22.00	16,190	No	1952
E J Stoneman Station	B	Wisconsin	Grant	25.00	8,911	No	2009
E J Stoneman Station	B	Wisconsin	Grant	25.00	8,911	No	2009
Boralex Fort Fairfield	B	Maine	Aroostook	31.00	15,517	No	1987
Everett Cogen	B	Washington	Snohomish	36.00	15,517	Yes	1996
Fairhaven Power	B	California	Humboldt	17.30	15,517	No	1986
Sierra Pacific Lincoln Facility	G	California	Placer	17.22	15,517	Yes	2004
White Pine Electric Power	B	Michigan	Ontonagon	18.00	15,517	No	1954
White Pine Electric Power	B	Michigan	Ontonagon	18.00	15,517	No	1954
Worcester Energy	B	Maine	Washington	4.33	15,517	No	1989
Worcester Energy	B	Maine	Washington	4.33	15,517	No	1989
Worcester Energy	B	Maine	Washington	4.33	15,517	No	1989
Alabama River Pulp	B	Alabama	Monroe	22.32	15,517	Yes	1978
Leaf River Cellulose LLC	B	Mississippi	Perry	37.50	15,517	Yes	1984
Bridgewater Power LP	B	New Hampshire	Grafton	16.00	15,517	No	1987
Mecca Plant	B	California	Riverside	23.50	15,517	No	1991
Mecca Plant	B	California	Riverside	23.50	15,517	No	1991
Hillman Power LLC	B	Michigan	Montmorency	17.80	15,517	No	1987
SI Group Energy LLC	G	Florida	Jefferson	7.50	24,943	No	1990
Boralex Beaver Livermore Falls	B	Maine	Androscoggin	35.88	15,517	No	1992
Green Power Kenansville	B	North Carolina	Duplin	16.20	15,517	Yes	1986
Green Power Kenansville	B	North Carolina	Duplin	16.20	11,564	Yes	1986
Tracy Biomass	B	California	San Joaquin	18.75	15,517	No	1990
Craven County Wood Energy LP	B	North Carolina	Craven	48.00	15,517	No	1990
Agrilectric Power Partners Ltd	G	Louisiana	Calcasieu	1.30	16,136	No	1995
Agrilectric Power Partners Ltd	B	Louisiana	Calcasieu	10.90	15,517	No	1984
Domtar - Woodland Mill	B	Maine	Washington	23.00	15,517	Yes	1966
Burney Forest Products	B	California	Shasta	15.50	15,517	Yes	1989
Burney Forest Products	B	California	Shasta	15.50	15,517	Yes	1989
Collins Pine Project	B	California	Plumas	12.00	15,517	Yes	1985
Rapids Energy Center	B	Minnesota	Itasca	11.25	15,517	Yes	1980
Rapids Energy Center	B	Minnesota	Itasca	11.25	20,328	Yes	1980
Indeck Jonesboro Energy Center	B	Maine	Washington	26.80	15,517	No	1987
Indeck West Enfield Energy Center	B	Maine	Penobscot	25.60	15,517	No	1987
Rio Bravo Fresno	B	California	Fresno	24.30	15,517	No	1988
Rio Bravo Rocklin	B	California	Placer	24.40	15,517	No	1989
HL Power	B	California	Lassen	30.00	15,517	No	1989
Ogdensburg Power	G	New York	St. Lawrence	8.34	8,911	Yes	2009
Ogdensburg Power	G	New York	St. Lawrence	8.34	8,911	Yes	2009
Ogdensburg Power	G	New York	St. Lawrence	8.34	8,911	Yes	2009
Grayling Generating Station	B	Michigan	Crawford	36.20	15,517	No	1992
Woodland Biomass Power Ltd	B	California	Yolo	25.00	15,517	No	1989
AES Mendota	B	California	Fresno	25.00	15,517	No	1989
Hemphill Power & Light	B	New Hampshire	Sullivan	14.13	15,517	No	1987
Whitefield Power & Light	B	New Hampshire	Coos	14.50	15,517	No	1987
Delano Energy	B	California	Kern	27.00	15,517	No	1990
Delano Energy	B	California	Kern	22.00	15,517	No	1993
Biomass One LP	B	Oregon	Jackson	8.50	15,517	Yes	1985
Biomass One LP	B	Oregon	Jackson	14.00	15,517	Yes	1985
Pacific Lumber	B	California	Humboldt	8.67	15,517	Yes	1989
Pacific Lumber	B	California	Humboldt	8.67	15,517	Yes	1989
Pacific Lumber	B	California	Humboldt	16.17	15,517	Yes	1938
Sierra Power	G	California	Tulare	7.00	15,517	Yes	1985
Tillotson Rubber	B	New Hampshire	Coos	0.70	14,594	Yes	1978
Tamarack Energy Partnership	G	Idaho	Adams	5.80	15,943	Yes	1983
Sierra Pacific Burney Facility	B	California	Shasta	16.33	15,517	Yes	1986

Continued on next page

Current Biomass Power Plants
(Continued)

Plant Name	Boiler/Generator/Committed Unit	State Name	County	Capacity MW	Heat Rate (Btu/kWh)	Cogeneration	On-line Year
Sierra Pacific Loyalton Facility	B	California	Sierra	13.08	15,517	No	1989
Sierra Pacific Quincy Facility	B	California	Plumas	14.42	15,517	Yes	1986
Sierra Pacific Quincy Facility	B	California	Plumas	14.42	15,517	Yes	1986
Susanville	G	California	Lassen	11.00	16,506	No	1985
Susanville	G	California	Lassen	2.00	16,506	No	1985
Snider Industries	G	Texas	Harrison	5.00	15,517	Yes	1983
Pinetree Power Bethlehem	B	New Hampshire	Grafton	15.00	15,517	No	1987
Bucksport Mill	B	Maine	Hancock	23.25	15,517	Yes	1965
Boralex Chateaugay Power Station	B	New York	Franklin	18.00	15,517	No	1993
Wadham Energy LP	B	California	Colusa	25.50	15,517	No	1989
Mobile Energy Services LLC	B	Alabama	Mobile	14.35	15,517	Yes	1985
S D Warren Westbrook	B	Maine	Cumberland	11.88	15,517	Yes	1982
S D Warren Westbrook	B	Maine	Cumberland	26.88	15,517	Yes	1982
American Ref-Fuel of Niagara	B	New York	Niagara	9.00	15,517	Yes	1980
Bryant Sugar House	B	Florida	Palm Beach	4.42	15,517	Yes	1962
Bryant Sugar House	B	Florida	Palm Beach	4.42	15,517	Yes	1962
Bryant Sugar House	B	Florida	Palm Beach	4.42	15,517	Yes	1962
Bryant Sugar House	B	Florida	Palm Beach	4.42	15,517	Yes	1962
Bryant Sugar House	B	Florida	Palm Beach	4.42	15,517	Yes	1962
Bryant Sugar House	B	Florida	Palm Beach	4.42	15,517	Yes	1962
Pacific-Ultrapower Chinese Station	B	California	Tuolumne	19.80	15,517	No	1985
Potlatch Idaho Pulp Paper	B	Idaho	Nez Perce	27.20	15,517	Yes	1981
Potlatch Southern Wood Products	B	Arkansas	Bradley	10.00	15,517	Yes	1991
Boralex Stratton Energy	B	Maine	Franklin	45.70	15,517	No	1989
Pinetree Power Tamworth	B	New Hampshire	Carroll	20.00	15,517	No	1987
Viking Energy of McBain	B	Michigan	Missaukee	16.00	15,517	No	1988
Viking Energy of Northumberland	B	Pennsylvania	Northumberland	16.00	15,517	Yes	1988
Viking Energy of Lincoln	B	Michigan	Alcona	16.00	15,517	No	1989
Telogia Power	B	Florida	Liberty	12.50	15,517	No	1986
Stone Container Florence Mill	B	South Carolina	Florence	7.63	15,517	Yes	1963
Stone Container Hopewell Mill	B	Virginia	Hopewell (city)	20.35	15,517	Yes	1980
Wheelabrator Sherman Energy Facility	B	Maine	Penobscot	21.00	15,517	No	1986
Wheelabrator Shasta	G	California	Shasta	3.50	19,538	No	2000
Wheelabrator Shasta	B	California	Shasta	17.30	15,517	No	1987
Wheelabrator Shasta	B	California	Shasta	17.30	15,517	No	1987
Wheelabrator Shasta	B	California	Shasta	17.30	15,517	No	1987
Co-Gen LLC	G	Oregon	Grant	6.98	17,974	Yes	1986
Co-Gen II LLC	G	Oregon	Douglas	6.98	17,139	Yes	1987
Ryegate Power Station	B	Vermont	Caledonia	20.00	21,020	No	1992
Multitrade of Pittsylvania LP	B	Virginia	Pittsylvania	26.55	15,517	No	1994
Multitrade of Pittsylvania LP	B	Virginia	Pittsylvania	26.55	15,517	No	1994
Multitrade of Pittsylvania LP	B	Virginia	Pittsylvania	26.55	15,517	No	1994
Burney Mountain Power	B	California	Shasta	9.75	15,517	No	1985
Cadillac Renewable Energy	B	Michigan	Wexford	36.80	15,517	No	1993
Alabama Pine Pulp	B	Alabama	Monroe	32.09	15,517	Yes	1991
Mt Lassen Power	B	California	Lassen	10.50	15,517	No	1985
Pacific Oroville Power Inc	B	California	Butte	8.25	15,517	No	1985
Pacific Oroville Power Inc	B	California	Butte	8.25	15,517	No	1985
Sierra Pacific Sonora	G	California	Tuolumne	5.45	15,517	Yes	2001
Lyonsdale Biomass LLC	B	New York	Lewis	19.00	15,517	Yes	1992
Ridge Generating Station	B	Florida	Polk	47.10	15,517	No	1994
Pinetree Power Fitchburg	B	Massachusetts	Worcester	17.00	15,517	No	1992
Okeelanta Cogeneration	G	Florida	Palm Beach	74.90	15,517	Yes	2006
Okeelanta Cogeneration	B	Florida	Palm Beach	24.97	15,517	Yes	1996
Okeelanta Cogeneration	B	Florida	Palm Beach	24.97	15,517	Yes	1996
Okeelanta Cogeneration	B	Florida	Palm Beach	24.97	15,517	Yes	1996
Genesee Power Station LP	B	Michigan	Genesee	35.00	15,517	No	1995
Cox Waste to Energy	G	Kentucky	Taylor	3.00	15,517	Yes	1995
Cox Waste to Energy	G	Kentucky	Taylor	0.30	15,517	Yes	2002
Greenville Steam	B	Maine	Piscataquis	19.00	14,192	No	1988
Sauder Power Plant	G	Ohio	Fulton	3.60	18,060	Yes	1993
Sauder Power Plant	G	Ohio	Fulton	3.60	18,060	Yes	1993
J & L Electric	G	Maine	Franklin	0.35	15,517	Yes	1980
J & L Electric	G	Maine	Franklin	0.50	15,517	Yes	2004
Sierra Pacific Anderson Facility	G	California	Shasta	5.00	15,517	Yes	1999
Plummer Forest Products	G	Idaho	Benewah	5.77	16,912	Yes	1982
Fibrominn Biomass Power Plant	G	Minnesota	Swift	55.00	15,517	No	2007
Sierra Pacific Aberdeen	B	Washington	Grays Harbor	16.50	15,517	Yes	2003
McMinnville	G	Tennessee	Warren	1.80	12,397	No	2005
STEC-S LLC	B	Arkansas	Arkansas	2.00	15,517	Yes	1997

Continued on next page

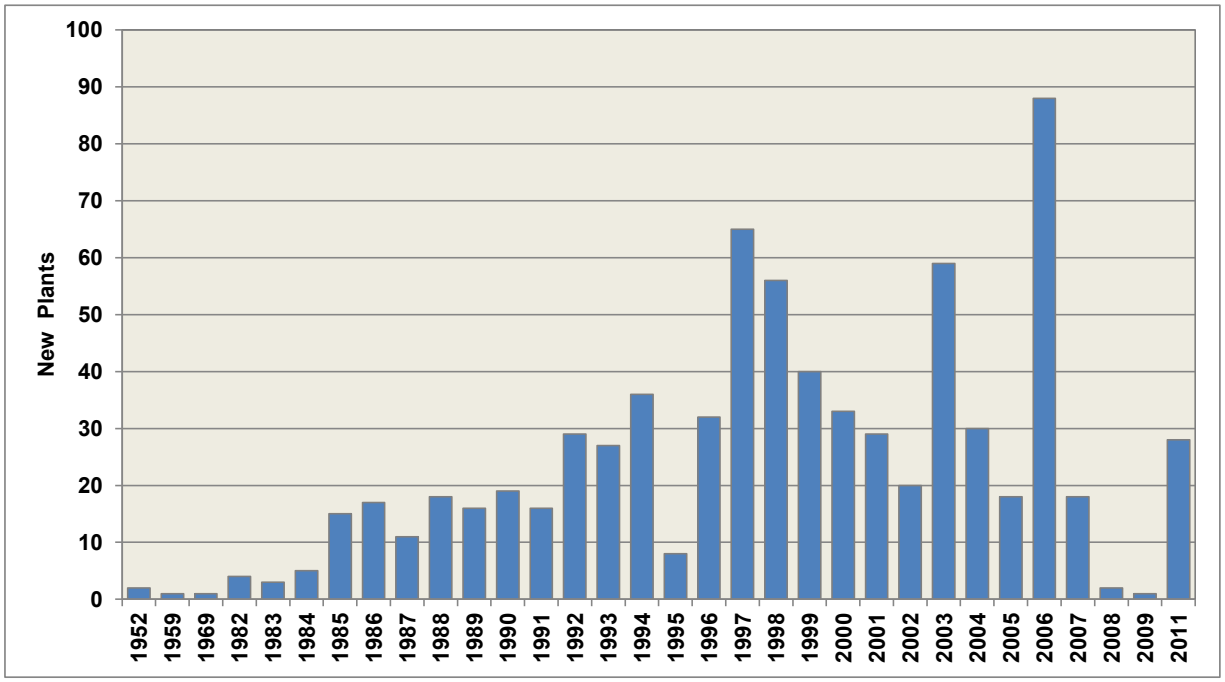
Current Biomass Power Plants
(Continued)

Plant Name	Boiler/Generator/ Committed Unit	State Name	County	Capacity MW	Heat Rate (Btu/kWh)	Cogeneration	On-line Year
STEC-S LLC	B	Arkansas	Arkansas	2.00	15,517	Yes	1997
Western Renewable	G	Arizona	Apache	2.50	9,650	No	2004
Sierra Pacific Burlington Facility	G	Washington	Skagit	25.00	15,517	Yes	2006
Snowflake White Moun	G	Arizona	Navajo	24.00	10,500	No	2008
APS Biomass I	G	Arizona	Eagar	2.85	15,517	No	2006
Central Minn. Ethano	C	Minnesota	NA	0.95	15,517	No	2006
Ware Cogeneration	G	Massachusetts	Hampshire	4.09	15,517	Yes	2006
Plant Carl Project	G	Georgia	Franklin	20.00	10,625	No	2007
Rough and Ready Lumb	G	Oregon	Josephine	1.70	10,500	No	2007
Lincoln Paper & Tissue	G	Maine	Penobscot	10.00	10,500	No	2007
Montagne Farms	G	Vermont	Franklin	0.30	15,517	No	2007
Green Mtn Dairy	G	Vermont	Franklin	0.30	15,517	No	2007
Berkshire Cow Power	G	Vermont	Franklin	0.30	15,517	No	2007
Blue Spruce Farm Ana	G	Vermont	Addison	0.30	15,517	No	2005
CA-S_CA_Biomass	C	California	NA	2.20	8,911	No	2011
ENTG_TX_Biomass	C	Texas	NA	14.20	8,911	No	2011
ERCT_TX_Biomass	C	Texas	NA	50.09	8,911	No	2011
MACW_PA_Biomass	C	Pennsylvania	NA	30.00	8,911	No	2011
MRO_MN_Biomass	C	Minnesota	NA	16.50	8,911	No	2011
NENG_ME_Biomass	C	Maine	NA	16.00	8,911	No	2011
NENG_NH_Biomass	C	New Hampshire	NA	17.50	8,911	No	2011
NWPE_NV_Biomass	C	Nevada	NA	1.00	8,911	No	2011
PNW_OR_Biomass	C	Oregon	NA	13.20	8,911	No	2011
PNW_WA_Biomass	C	Washington	NA	16.25	8,911	No	2011
SOU_AL_Biomass	C	Alabama	NA	0.03	8,911	No	2011

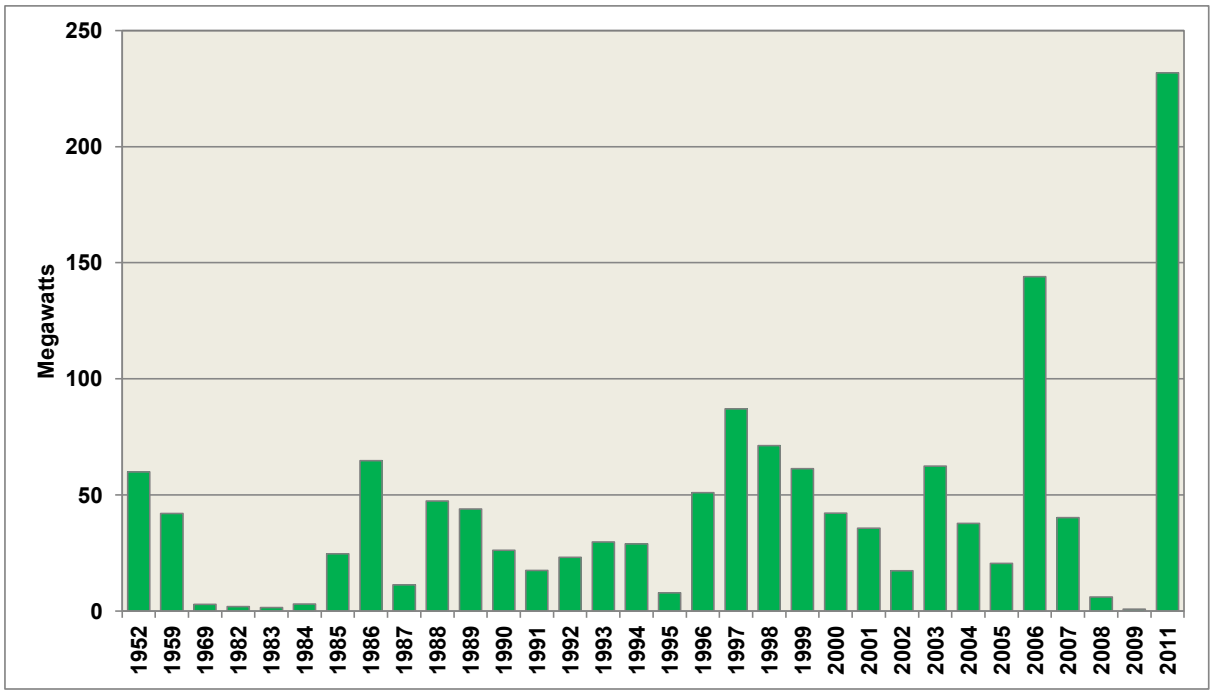
Source:
(National Electric Energy System (NEEDS) Database for IPM 2010.
http://epa.gov/airmarkets/progsregs/epa-ipm/BaseCasev410.html

[a] Data are not available

Section: BIOPOWER
New Landfill Gas Power Plants by Year



New Landfill Gas Power Plant Capacity by Year



Source:
National Electric Energy System (NEEDS) Database for IPM 2010
http://epa.gov/airmarkets/progsregs/epa-ipm/BaseCasev410.html

Notes:
1. Only years in which new plants were brought online are shown.
2. Power plant capacity based on NEEDS 2010 Data.

Plant Name	Boiler/Generator/ Committed Unit	State Name	County	Capacity MW	Heat Rate (Btu/kWh)	Cogeneration	On-line Year
Grayson	B	California	Los Angeles	42.00	13,698	No	1959
Pennsbury	G	Pennsylvania	Bucks	2.67	19,621	No	1987
Pennsbury	G	Pennsylvania	Bucks	2.67	19,621	No	1987
Fairless Hills	B	Pennsylvania	Bucks	30.00	13,682	Yes	1952
Fairless Hills	B	Pennsylvania	Bucks	30.00	13,682	Yes	1952
Girvin Landfill	G	Florida	Duval	3.00	13,595	No	1997
Coffin Butte	G	Oregon	Benton	0.75	12,758	No	1995
Coffin Butte	G	Oregon	Benton	0.75	12,758	No	1995
Coffin Butte	G	Oregon	Benton	0.75	12,758	No	1995
Roosevelt Biogas 1	G	Washington	Klickitat	2.10	11,900	No	1999
Roosevelt Biogas 1	G	Washington	Klickitat	2.10	11,900	No	1999
Roosevelt Biogas 1	G	Washington	Klickitat	2.10	11,900	No	1999
Roosevelt Biogas 1	G	Washington	Klickitat	2.10	11,900	No	1999
Roosevelt Biogas 1	G	Washington	Klickitat	2.10	11,900	No	2000
Elk City Station	G	Nebraska	Douglas	0.80	13,648	No	2009
Elk City Station	G	Nebraska	Douglas	0.80	13,682	No	2006
Elk City Station	G	Nebraska	Douglas	0.80	13,682	No	2002
Elk City Station	G	Nebraska	Douglas	0.80	13,682	No	2006
Elk City Station	G	Nebraska	Douglas	0.80	13,682	No	2002
Elk City Station	G	Nebraska	Douglas	0.80	13,682	No	2002
Elk City Station	G	Nebraska	Douglas	0.80	13,682	No	2006
Elk City Station	G	Nebraska	Douglas	0.80	13,682	No	2002
Horry Land Fill Gas Site	G	South Carolina	Horry	1.10	10,504	No	2003
Horry Land Fill Gas Site	G	South Carolina	Horry	1.10	10,504	No	2001
Horry Land Fill Gas Site	G	South Carolina	Horry	1.10	10,504	No	2001
Horry Land Fill Gas Site	G	South Carolina	Horry	1.10	13,682	No	2007
South West Landfill	G	Florida	Alachua	0.65	12,498	No	2003
South West Landfill	G	Florida	Alachua	0.65	12,498	No	2003
South West Landfill	G	Florida	Alachua	0.65	12,498	No	2003
Tri Cities	G	Arizona	Maricopa	0.80	12,081	No	2001
Tri Cities	G	Arizona	Maricopa	0.80	12,081	No	2001
Tri Cities	G	Arizona	Maricopa	0.80	12,081	No	2001
Tri Cities	G	Arizona	Maricopa	0.80	12,081	No	2001
Tri Cities	G	Arizona	Maricopa	0.80	12,081	No	2001
San Marcos	G	California	San Diego	0.70	16,716	No	1990
San Marcos	G	California	San Diego	0.70	16,716	No	1990
Sycamore San Diego	G	California	San Diego	0.70	17,446	No	1989
Sycamore San Diego	G	California	San Diego	0.70	17,446	No	1989
Sycamore San Diego	G	California	San Diego	2.80	13,000	No	2004
Newby Island I	G	California	Santa Clara	0.50	13,655	No	1984
Newby Island I	G	California	Santa Clara	0.50	13,655	No	1984
Newby Island I	G	California	Santa Clara	0.50	13,655	No	1984
Newby Island I	G	California	Santa Clara	0.50	13,655	No	1984
Newby Island II	G	California	Santa Clara	1.00	13,016	No	1989
Newby Island II	G	California	Santa Clara	1.00	13,016	No	1989
Newby Island II	G	California	Santa Clara	1.00	13,016	No	1989
Guadalupe Power Plant	G	California	Santa Clara	0.50	13,577	No	1983
Guadalupe Power Plant	G	California	Santa Clara	1.00	13,577	No	1987
Guadalupe Power Plant	G	California	Santa Clara	0.50	13,577	No	1983
Guadalupe Power Plant	G	California	Santa Clara	0.50	13,577	No	1983
Marsh Road Power Plant	G	California	San Mateo	0.50	15,903	No	1982
Marsh Road Power Plant	G	California	San Mateo	0.50	15,903	No	1982
Marsh Road Power Plant	G	California	San Mateo	0.50	15,903	No	1982
Marsh Road Power Plant	G	California	San Mateo	0.50	15,903	No	1982
American Canyon Power Plan	G	California	Napa	0.70	11,881	No	1985
American Canyon Power Plan	G	California	Napa	0.70	11,881	No	1985
Coyote Canyon Steam Plant	B	California	Orange	17.00	13,682	No	1989
Spadra Landfill Gas to Energy	B	California	Los Angeles	7.00	13,682	No	1990
Puente Hills Energy Recovery	B	California	Los Angeles	22.50	13,682	No	1986
Puente Hills Energy Recovery	B	California	Los Angeles	22.50	13,682	No	1986
Puente Hills Energy Recovery	G	California	Los Angeles	2.70	13,682	No	2006
Puente Hills Energy Recovery	G	California	Los Angeles	1.10	35,987	No	1984
Puente Hills Energy Recovery	G	California	Los Angeles	2.70	13,682	No	2006
Puente Hills Energy Recovery	G	California	Los Angeles	2.70	13,682	No	2006
Palos Verdes Gas to Energy	B	California	Los Angeles	2.00	13,682	No	1988
Palos Verdes Gas to Energy	B	California	Los Angeles	2.00	13,682	No	1988
Granger Electric Generating Station #2	G	Michigan	Clinton	0.80	13,682	No	1996
Granger Electric Generating Station #2	G	Michigan	Clinton	0.80	13,682	No	1991
Granger Electric Generating Station #2	G	Michigan	Clinton	0.80	13,682	No	1991
Granger Electric Generating Station #2	G	Michigan	Clinton	0.80	13,682	No	1997
Granger Electric Generating Station #2	G	Michigan	Clinton	0.80	13,682	No	1991
Al Turi	G	New York	Orange	0.80	16,730	No	1998
Al Turi	G	New York	Orange	0.70	16,730	No	1988
Al Turi	G	New York	Orange	0.70	16,730	No	1988
Al Turi	G	New York	Orange	0.70	16,730	No	1989
Al Turi	G	New York	Orange	0.70	16,730	No	1995
Lebanon Methane Recovery	G	Pennsylvania	Lebanon	0.60	13,970	No	1985
Lebanon Methane Recovery	G	Pennsylvania	Lebanon	0.60	13,970	No	1985
Olinda Landfill Gas Recovery Plan	G	California	Orange	1.70	12,319	No	1985
Olinda Landfill Gas Recovery Plan	G	California	Orange	1.70	12,319	No	1985
Olinda Landfill Gas Recovery Plan	G	California	Orange	1.70	12,319	No	1985
Marina Landfill Gas	G	California	Monterey	0.90	13,682	No	1997
Marina Landfill Gas	G	California	Monterey	0.90	13,682	No	2002
Marina Landfill Gas	G	California	Monterey	0.70	13,682	No	1994
Marina Landfill Gas	G	California	Monterey	0.90	13,682	No	1998

Continued on next page

Current Landfill Gas Power Plants
(Continued)

Plant Name	Boiler/Generator/ Committed Unit	State Name	County	Capacity MW	Heat Rate (Btu/kWh)	Cogeneration	On-line Year
Prince Georges County Brown Station	G	Maryland	Prince	0.74	13,682	No	1987
Prince Georges County Brown Station	G	Maryland	Prince	0.74	13,682	No	1987
Prince Georges County Brown Station	G	Maryland	Prince	0.74	13,682	No	1987
EQ Waste Energy Services	G	Michigan	Wayne	0.30	13,388	Yes	1986
EQ Waste Energy Services	G	Michigan	Wayne	0.30	13,388	Yes	1986
EQ Waste Energy Services	G	Michigan	Wayne	0.50	13,388	Yes	1986
EQ Waste Energy Services	G	Michigan	Wayne	0.30	13,388	Yes	1986
Archbald Power Station	B	Pennsylvania	Lackawanna	20.00	13,682	Yes	1988
Smithtown Energy Partners LP	G	New York	Suffolk	0.60	13,001	No	1988
Smithtown Energy Partners LP	G	New York	Suffolk	0.60	13,001	No	1988
Onondaga Energy Partners LP	G	New York	Onondaga	0.60	13,940	No	1988
Onondaga Energy Partners LP	G	New York	Onondaga	0.60	13,940	No	1988
Oceanside Energy	G	New York	Nassau	0.60	13,428	No	1990
Oceanside Energy	G	New York	Nassau	0.60	13,428	No	1990
Oceanside Energy	G	New York	Nassau	0.60	13,428	No	1990
Ridgewood Providence Power	G	Rhode Island	Providence	1.50	13,682	No	2005
Ridgewood Providence Power	G	Rhode Island	Providence	1.20	13,682	No	2004
Ridgewood Providence Power	G	Rhode Island	Providence	1.20	13,682	No	2004
Ridgewood Providence Power	G	Rhode Island	Providence	1.50	13,682	No	2005
Ridgewood Providence Power	G	Rhode Island	Providence	1.70	12,049	No	1990
Ridgewood Providence Power	G	Rhode Island	Providence	1.50	13,682	No	2005
Ridgewood Providence Power	G	Rhode Island	Providence	1.70	12,049	No	1990
Ridgewood Providence Power	G	Rhode Island	Providence	1.70	12,049	No	1990
Ridgewood Providence Power	G	Rhode Island	Providence	1.70	12,049	No	1990
Ridgewood Providence Power	G	Rhode Island	Providence	1.50	13,682	No	2005
Ridgewood Providence Power	G	Rhode Island	Providence	1.70	12,049	No	1990
Ridgewood Providence Power	G	Rhode Island	Providence	1.70	12,049	No	1990
Ridgewood Providence Power	G	Rhode Island	Providence	1.70	12,049	No	1990
Ridgewood Providence Power	G	Rhode Island	Providence	1.70	12,049	No	1990
Ridgewood Providence Power	G	Rhode Island	Providence	1.70	12,049	No	1997
Settlers Hill Gas Recovery	G	Illinois	Kane	2.90	18,229	No	1988
Settlers Hill Gas Recovery	G	Illinois	Kane	2.90	18,229	No	1998
New Milford Gas Recovery	G	Connecticut	Litchfield	1.60	17,053	No	1991
Monroe Livingston Gas Recovery	G	New York	Monroe	0.80	13,303	No	1988
Monroe Livingston Gas Recovery	G	New York	Monroe	0.80	13,303	No	1988
Monroe Livingston Gas Recovery	G	New York	Monroe	0.80	13,303	No	1988
Milam Gas Recovery	G	Illinois	St. Clair	0.80	12,168	No	1991
Milam Gas Recovery	G	Illinois	St. Clair	0.80	12,168	No	1991
Milam Gas Recovery	G	Illinois	St. Clair	0.80	12,168	No	1993
High Acres Gas Recovery	G	New York	Monroe	0.80	11,773	No	1991
High Acres Gas Recovery	G	New York	Monroe	0.80	11,773	No	1991
High Acres Gas Recovery	G	New York	Monroe	0.80	11,773	No	1991
High Acres Gas Recovery	G	New York	Monroe	0.80	11,773	No	1991
DFW Gas Recovery	G	Texas	Denton	2.90	20,551	No	1988
DFW Gas Recovery	G	Texas	Denton	2.90	20,551	No	1988
Chestnut Ridge Gas Recovery	G	Tennessee	Anderson	0.80	12,912	No	1992
Chestnut Ridge Gas Recovery	G	Tennessee	Anderson	0.80	12,912	No	1992
Chestnut Ridge Gas Recovery	G	Tennessee	Anderson	0.80	12,912	No	1992
Chestnut Ridge Gas Recovery	G	Tennessee	Anderson	0.80	12,912	No	1992
Altamont Gas Recovery	G	California	Alameda	1.30	13,825	No	2002
Altamont Gas Recovery	G	California	Alameda	2.90	17,435	No	1969
Altamont Gas Recovery	G	California	Alameda	1.30	13,825	No	2002
Altamont Gas Recovery	G	California	Alameda	2.90	17,435	No	1989
CSL Gas Recovery	G	Florida	Broward	2.90	11,860	No	1989
CSL Gas Recovery	G	Florida	Broward	2.90	11,860	No	1989
CSL Gas Recovery	G	Florida	Broward	2.90	11,860	No	1989
CSL Gas Recovery	G	Florida	Broward	2.20	11,860	No	2000
CID Gas Recovery	G	Illinois	Cook	2.90	19,778	No	1989
CID Gas Recovery	G	Illinois	Cook	2.90	19,778	No	1989
Lake Gas Recovery	G	Illinois	Cook	2.90	19,330	No	1988
Lake Gas Recovery	G	Illinois	Cook	2.90	19,330	No	1993
Lake Gas Recovery	G	Illinois	Cook	2.90	19,330	No	1993
Metro Gas Recovery	G	Wisconsin	Milwaukee	0.80	14,317	No	2000
Metro Gas Recovery	G	Wisconsin	Milwaukee	0.80	14,317	No	2000
Metro Gas Recovery	G	Wisconsin	Milwaukee	0.80	14,317	No	2000
Metro Gas Recovery	G	Wisconsin	Milwaukee	0.80	14,317	No	2000
Metro Gas Recovery	G	Wisconsin	Milwaukee	2.90	18,504	No	1985
Metro Gas Recovery	G	Wisconsin	Milwaukee	2.90	18,504	No	1985
Omega Hills Gas Recovery	G	Wisconsin	Washington	2.90	19,141	No	1985
Omega Hills Gas Recovery	G	Wisconsin	Washington	2.90	19,141	No	1985
Omega Hills Gas Recovery	G	Wisconsin	Washington	3.00	19,141	No	2001
Stowe Power Production Plant	G	Pennsylvania	Montgomery	2.90	19,113	No	1989
Stowe Power Production Plant	G	Pennsylvania	Montgomery	2.90	19,113	No	1991
Tazewell Gas Recovery	G	Illinois	Tazewell	0.80	12,246	No	1989
Tazewell Gas Recovery	G	Illinois	Tazewell	0.80	12,246	No	1989
Tazewell Gas Recovery	G	Illinois	Tazewell	0.80	12,246	No	1999
Taylor Energy Partners LP	G	Pennsylvania	Lackawanna	0.60	13,982	No	1987
Taylor Energy Partners LP	G	Pennsylvania	Lackawanna	0.40	13,982	No	1987
Taylor Energy Partners LP	G	Pennsylvania	Lackawanna	0.40	13,982	No	1987
Taylor Energy Partners LP	G	Pennsylvania	Lackawanna	0.40	13,982	No	1987
Lafayette Energy Partners LP	G	New Jersey	Sussex	0.50	15,927	No	1990
Lafayette Energy Partners LP	G	New Jersey	Sussex	0.50	15,927	No	1990
Nove Power Plant	G	California	Contra Costa	1.00	11,414	No	1985
Nove Power Plant	G	California	Contra Costa	1.00	11,414	No	1985
Nove Power Plant	G	California	Contra Costa	1.00	11,414	No	1987

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Current Landfill Gas Power Plants
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Plant Name	Boiler/Generator/Committed Unit	State Name	County	Capacity MW	Heat Rate (Btu/kWh)	Cogeneration	On-line Year
Winnebago County Landfill Gas	G	Wisconsin	Winnebago	0.90	11,900	No	2000
Winnebago County Landfill Gas	G	Wisconsin	Winnebago	0.90	11,900	No	2000
Winnebago County Landfill Gas	G	Wisconsin	Winnebago	0.90	11,900	No	2000
I 95 Municipal Landfill Phase I	G	Virginia	Fairfax	0.80	11,123	No	1992
I 95 Municipal Landfill Phase I	G	Virginia	Fairfax	0.80	11,123	No	1992
I 95 Municipal Landfill Phase I	G	Virginia	Fairfax	0.80	11,123	No	1992
I 95 Municipal Landfill Phase I	G	Virginia	Fairfax	0.80	11,123	No	1992
Otay	G	California	San Diego	1.70	10,135	No	1986
Otay	G	California	San Diego	1.70	10,135	No	1991
Salinas	G	California	Monterey	1.30	10,374	No	1986
Oxnard	G	California	Ventura	1.70	12,254	No	1985
Oxnard	G	California	Ventura	1.70	12,254	No	1991
Oxnard	G	California	Ventura	1.70	12,254	No	1985
BKK Landfill	G	California	Los Angeles	4.40	11,518	No	1999
BKK Landfill	G	California	Los Angeles	4.40	22,519	No	1993
Riverview Energy Systems	G	Michigan	Wayne	2.81	16,466	No	1988
Riverview Energy Systems	G	Michigan	Wayne	2.81	16,466	No	1988
Penrose Power Station	G	California	Los Angeles	1.70	12,426	No	1986
Penrose Power Station	G	California	Los Angeles	1.70	12,426	No	1986
Penrose Power Station	G	California	Los Angeles	1.70	12,426	No	1986
Penrose Power Station	G	California	Los Angeles	1.70	12,426	No	1986
Penrose Power Station	G	California	Los Angeles	1.70	12,426	No	1986
Toyon Power Station	G	California	Los Angeles	1.70	17,198	No	1986
Toyon Power Station	G	California	Los Angeles	1.70	17,198	No	1986
Toyon Power Station	G	California	Los Angeles	1.70	17,198	No	1986
Toyon Power Station	G	California	Los Angeles	1.70	17,198	No	1986
BJ Gas Recovery	G	Georgia	Gwinnett	0.80	12,577	No	1993
BJ Gas Recovery	G	Georgia	Gwinnett	0.80	12,577	No	1993
Sumpter Energy Associates	G	Michigan	Wayne	0.80	13,682	No	1992
Sumpter Energy Associates	G	Michigan	Wayne	0.80	13,682	No	1992
Sumpter Energy Associates	G	Michigan	Wayne	0.80	13,682	No	1992
Sumpter Energy Associates	G	Michigan	Wayne	0.80	13,682	No	1992
Sumpter Energy Associates	G	Michigan	Wayne	0.80	13,682	No	1992
Sumpter Energy Associates	G	Michigan	Wayne	0.80	13,682	No	1992
Sumpter Energy Associates	G	Michigan	Wayne	0.80	13,682	No	1992
Sumpter Energy Associates	G	Michigan	Wayne	0.80	13,682	No	1992
Sumpter Energy Associates	G	Michigan	Wayne	0.80	13,682	No	1992
Sumpter Energy Associates	G	Michigan	Wayne	0.80	13,682	No	1992
Sumpter Energy Associates	G	Michigan	Wayne	0.80	13,682	No	1998
Sumpter Energy Associates	G	Michigan	Wayne	0.80	13,682	No	1998
Sumpter Energy Associates	G	Michigan	Wayne	0.80	13,682	No	1998
Sumpter Energy Associates	G	Michigan	Wayne	0.80	13,682	No	1998
Sumpter Energy Associates	G	Michigan	Wayne	0.80	13,682	No	1998
Venice Resources Gas Recovery	G	Michigan	Shiawassee	0.80	15,045	No	1992
Venice Resources Gas Recovery	G	Michigan	Shiawassee	0.80	15,045	No	1992
Granger Electric Generating Station #1	G	Michigan	Clinton	0.80	13,682	No	1993
Granger Electric Generating Station #1	G	Michigan	Clinton	0.80	13,682	No	1997
Granger Electric Generating Station #1	G	Michigan	Clinton	0.80	13,682	No	1993
Granger Electric Generating Station #1	G	Michigan	Clinton	0.80	13,682	No	1994
MM Yolo Power LLC Facility	G	California	Yolo	0.45	20,277	No	1990
MM Yolo Power LLC Facility	G	California	Yolo	0.45	20,277	No	1990
MM Yolo Power LLC Facility	G	California	Yolo	0.60	20,277	No	1993
MM Yolo Power LLC Facility	G	California	Yolo	0.45	20,277	No	1990
Kankakee Gas Recovery	G	Illinois	Kankakee	0.80	12,214	No	1992
Kankakee Gas Recovery	G	Illinois	Kankakee	0.80	12,214	No	1992
Pheasant Run Landfill Gas Recovery	G	Wisconsin	Kenosha	0.80	13,103	No	2000
Pheasant Run Landfill Gas Recovery	G	Wisconsin	Kenosha	0.80	13,103	No	1992
Pheasant Run Landfill Gas Recovery	G	Wisconsin	Kenosha	0.80	13,103	No	2002
Pheasant Run Landfill Gas Recovery	G	Wisconsin	Kenosha	0.80	13,103	No	2002
Pheasant Run Landfill Gas Recovery	G	Wisconsin	Kenosha	0.80	13,103	No	2002
Pheasant Run Landfill Gas Recovery	G	Wisconsin	Kenosha	0.80	13,103	No	2002
Pheasant Run Landfill Gas Recovery	G	Wisconsin	Kenosha	0.80	13,103	No	1996
Pheasant Run Landfill Gas Recovery	G	Wisconsin	Kenosha	0.80	13,103	No	1992
Pheasant Run Landfill Gas Recovery	G	Wisconsin	Kenosha	0.80	13,103	No	2000
Pheasant Run Landfill Gas Recovery	G	Wisconsin	Kenosha	0.80	13,103	No	2000
Pheasant Run Landfill Gas Recovery	G	Wisconsin	Kenosha	0.80	13,103	No	2000
Woodland Landfill Gas Recovery	G	Illinois	Kane	0.80	12,961	No	1992
Woodland Landfill Gas Recovery	G	Illinois	Kane	0.80	12,961	No	1992
Turnkey Landfill Gas Recovery	G	New Hampshire	Strafford	2.90	17,180	No	1997
Turnkey Landfill Gas Recovery	G	New Hampshire	Strafford	0.80	13,952	No	1992
Turnkey Landfill Gas Recovery	G	New Hampshire	Strafford	0.80	13,952	No	1992
Turnkey Landfill Gas Recovery	G	New Hampshire	Strafford	0.80	13,952	No	1992
Turnkey Landfill Gas Recovery	G	New Hampshire	Strafford	2.90	17,180	No	1997
Turnkey Landfill Gas Recovery	G	New Hampshire	Strafford	0.80	13,952	No	1993
Metro Methane Recovery Facility	G	Iowa	Polk	0.80	12,425	No	1998
Metro Methane Recovery Facility	G	Iowa	Polk	0.80	12,425	No	1998
Metro Methane Recovery Facility	G	Iowa	Polk	0.80	12,425	No	1998
Metro Methane Recovery Facility	G	Iowa	Polk	0.80	12,425	No	1998
Metro Methane Recovery Facility	G	Iowa	Polk	0.80	12,425	No	1998
Metro Methane Recovery Facility	G	Iowa	Polk	0.80	12,425	No	1998
Metro Methane Recovery Facility	G	Iowa	Polk	0.80	12,425	No	1998
Metro Methane Recovery Facility	G	Iowa	Polk	0.80	12,425	No	1998

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Current Landfill Gas Power Plants
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Plant Name	Boiler/Generator/Committed Unit	State Name	County	Capacity MW	Heat Rate (Btu/kWh)	Cogeneration	On-line Year
I 95 Landfill Phase II	G	Virginia	Fairfax	0.80	10,907	No	1993
I 95 Landfill Phase II	G	Virginia	Fairfax	0.80	10,907	No	1993
I 95 Landfill Phase II	G	Virginia	Fairfax	0.80	10,907	No	1993
I 95 Landfill Phase II	G	Virginia	Fairfax	0.80	10,907	No	1993
Ottawa Generating Station	G	Michigan	Ottawa	0.80	13,682	No	1994
Ottawa Generating Station	G	Michigan	Ottawa	0.80	13,682	No	1994
Ottawa Generating Station	G	Michigan	Ottawa	0.80	13,682	No	1994
Ottawa Generating Station	G	Michigan	Ottawa	0.80	13,682	No	1994
Ottawa Generating Station	G	Michigan	Ottawa	0.80	13,682	No	1994
Ottawa Generating Station	G	Michigan	Ottawa	0.80	13,682	No	1994
Grand Blanc Generating Station	G	Michigan	Genesee	0.80	13,682	No	1994
Grand Blanc Generating Station	G	Michigan	Genesee	0.80	13,682	No	2003
Grand Blanc Generating Station	G	Michigan	Genesee	0.80	13,682	No	1994
Grand Blanc Generating Station	G	Michigan	Genesee	0.80	13,682	No	1994
Grand Blanc Generating Station	G	Michigan	Genesee	0.80	13,682	No	2000
Suffolk Energy Partners LP	G	Virginia	Suffolk	0.70	13,030	No	1994
Suffolk Energy Partners LP	G	Virginia	Suffolk	0.70	13,030	No	1994
Suffolk Energy Partners LP	G	Virginia	Suffolk	0.70	13,030	No	1994
Suffolk Energy Partners LP	G	Virginia	Suffolk	0.70	13,030	No	1994
Seneca Energy	G	New York	Seneca	0.77	11,036	No	1996
Seneca Energy	G	New York	Seneca	0.77	11,036	No	1996
Seneca Energy	G	New York	Seneca	0.77	11,036	No	1998
Seneca Energy	G	New York	Seneca	0.77	11,036	No	1996
Seneca Energy	G	New York	Seneca	0.77	11,036	No	1996
Seneca Energy	G	New York	Seneca	0.77	11,036	No	1998
Seneca Energy	G	New York	Seneca	0.77	11,036	No	1996
Seneca Energy	G	New York	Seneca	0.77	11,036	No	1998
Seneca Energy	G	New York	Seneca	0.77	11,036	No	1997
Seneca Energy	G	New York	Seneca	0.77	11,036	No	1997
Seneca Energy	G	New York	Seneca	0.77	11,036	No	1998
Seneca Energy	G	New York	Seneca	0.77	11,036	No	1998
Seneca Energy	G	New York	Seneca	0.77	11,036	No	1998
Seneca Energy	G	New York	Seneca	0.77	11,036	No	1998
Seneca Energy	G	New York	Seneca	1.60	13,682	No	2006
Seneca Energy	G	New York	Seneca	1.60	13,682	No	2006
Seneca Energy	G	New York	Seneca	1.60	13,682	No	2006
Seneca Energy	G	New York	Seneca	1.60	13,682	No	2006
Outagamie County Co-Generation Facility	G	Wisconsin	Outagamie	0.80	13,682	Yes	1991
Outagamie County Co-Generation Facility	G	Wisconsin	Outagamie	0.80	13,682	No	1991
Outagamie County Co-Generation Facility	G	Wisconsin	Outagamie	0.80	13,682	No	1991
Peoples Generating Station	G	Michigan	Genesee	2.20	11,900	No	1995
Adrian Energy Associates LLC	G	Michigan	Lenawee	0.80	12,942	No	1994
Adrian Energy Associates LLC	G	Michigan	Lenawee	0.80	12,942	No	1994
Adrian Energy Associates LLC	G	Michigan	Lenawee	0.80	12,942	No	1994
Brent Run Generating Station	G	Michigan	Genesee	0.80	13,682	No	1998
Brent Run Generating Station	G	Michigan	Genesee	0.80	13,682	No	1998
Twin Bridges Gas Recovery	G	Indiana	Hendricks	0.80	13,682	No	2002
Twin Bridges Gas Recovery	G	Indiana	Hendricks	0.80	12,070	No	1994
Twin Bridges Gas Recovery	G	Indiana	Hendricks	0.80	12,070	No	1994
Twin Bridges Gas Recovery	G	Indiana	Hendricks	0.80	13,682	No	2002
Twin Bridges Gas Recovery	G	Indiana	Hendricks	0.80	13,682	No	2002
Twin Bridges Gas Recovery	G	Indiana	Hendricks	0.80	12,070	No	1994
Twin Bridges Gas Recovery	G	Indiana	Hendricks	0.80	13,682	No	2002
Twin Bridges Gas Recovery	G	Indiana	Hendricks	0.80	12,070	No	1994
Prairie View Gas Recovery	G	Indiana	St. Joseph	0.80	11,428	No	1994
Prairie View Gas Recovery	G	Indiana	St. Joseph	0.80	11,428	No	1994
Prairie View Gas Recovery	G	Indiana	St. Joseph	0.80	11,428	No	1994
Prairie View Gas Recovery	G	Indiana	St. Joseph	0.80	11,428	No	1994
Keystone Landfill	G	Pennsylvania	Lackawanna	0.70	12,162	No	1994
Keystone Landfill	G	Pennsylvania	Lackawanna	0.70	12,162	No	1994
Keystone Landfill	G	Pennsylvania	Lackawanna	0.70	12,162	No	1994
Keystone Landfill	G	Pennsylvania	Lackawanna	0.70	12,162	No	1994
Keystone Landfill	G	Pennsylvania	Lackawanna	0.70	12,162	No	1994
Keystone Landfill	G	Pennsylvania	Lackawanna	0.70	12,162	No	1994
Keystone Landfill	G	Pennsylvania	Lackawanna	0.70	12,162	No	1994
EKS Landfill	G	Minnesota	Dakota	1.50	12,157	No	1994
EKS Landfill	G	Minnesota	Dakota	1.50	12,157	No	1994
EKS Landfill	G	Minnesota	Dakota	0.80	12,157	No	1994
Deercroft Gas Recovery	G	Indiana	La Porte	0.80	12,063	No	1999
Deercroft Gas Recovery	G	Indiana	La Porte	0.80	12,063	No	1999
Deercroft Gas Recovery	G	Indiana	La Porte	0.80	12,063	No	1999
Deercroft Gas Recovery	G	Indiana	La Porte	0.80	12,063	No	1999
Ocean County Landfill	G	New Jersey	Ocean	9.60	11,900	No	2007
Ocean County Landfill	G	New Jersey	Ocean	0.80	11,900	No	1997
Ocean County Landfill	G	New Jersey	Ocean	0.80	11,900	No	1997
Ocean County Landfill	G	New Jersey	Ocean	0.80	11,900	No	1997
Ocean County Landfill	G	New Jersey	Ocean	0.80	11,900	No	1997
Ocean County Landfill	G	New Jersey	Ocean	0.80	11,900	No	1997
Ocean County Landfill	G	New Jersey	Ocean	0.80	11,900	No	1997
Salem Energy Systems LLC	G	North Carolina	Forsyth	3.30	15,751	No	1996
Pine Tree Acres	G	Michigan	Macomb	0.80	11,900	No	1998
Pine Tree Acres	G	Michigan	Macomb	0.80	11,900	No	1998
Pine Tree Acres	G	Michigan	Macomb	0.80	11,900	No	1998
Pine Tree Acres	G	Michigan	Macomb	0.80	11,900	No	2003

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Current Landfill Gas Power Plants
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Plant Name	Boiler/Generator/Committed Unit	State Name	County	Capacity MW	Heat Rate (Btu/kWh)	Cogeneration	On-line Year
Pine Tree Acres	G	Michigan	Macomb	0.80	11,900	No	2003
Pine Tree Acres	G	Michigan	Macomb	0.80	11,900	No	1998
Pine Tree Acres	G	Michigan	Macomb	0.80	11,900	No	1998
Four Hills Nashua Landfill	G	New	Hillsborough	0.70	15,844	No	1996
Four Hills Nashua Landfill	G	New	Hillsborough	0.46	15,844	No	1996
Mallard Ridge Gas Recovery	G	Wisconsin	Walworth	0.80	11,607	No	1996
Mallard Ridge Gas Recovery	G	Wisconsin	Walworth	0.80	11,607	No	1996
Mallard Ridge Gas Recovery	G	Wisconsin	Walworth	0.80	11,607	No	1997
Greene Valley Gas Recovery	G	Illinois	DuPage	2.90	18,396	No	1998
Greene Valley Gas Recovery	G	Illinois	DuPage	2.90	18,396	No	1996
Greene Valley Gas Recovery	G	Illinois	DuPage	2.90	18,396	No	1996
Biodyne Pontiac	G	Illinois	Livingston	4.20	17,835	No	2001
Biodyne Pontiac	G	Illinois	Livingston	4.20	17,835	No	1999
Biodyne Pontiac	G	Illinois	Livingston	4.20	10,000	No	2000
Biodyne Peoria	G	Illinois	Peoria	0.80	13,682	No	1997
Biodyne Peoria	G	Illinois	Peoria	0.80	13,682	No	1997
Biodyne Peoria	G	Illinois	Peoria	0.80	13,682	No	1997
Biodyne Peoria	G	Illinois	Peoria	0.80	13,682	No	1997
Biodyne Peoria	G	Illinois	Peoria	0.80	13,682	No	1997
Biodyne Springfield	G	Illinois	Sangamon	0.60	13,682	No	1997
Biodyne Springfield	G	Illinois	Sangamon	0.60	13,682	No	1997
Biodyne Springfield	G	Illinois	Sangamon	0.60	13,682	No	1997
Biodyne Springfield	G	Illinois	Sangamon	0.60	13,682	No	1997
Biodyne Lyons	G	Illinois	Cook	0.90	13,682	No	1997
Biodyne Lyons	G	Illinois	Cook	0.90	13,682	No	1997
Biodyne Lyons	G	Illinois	Cook	0.90	13,682	No	1997
Lakeview Gas Recovery	G	Pennsylvania	Erie	3.00	12,399	No	1997
Lakeview Gas Recovery	G	Pennsylvania	Erie	3.00	12,399	No	1997
O'Brien Biogas IV LLC	G	New Jersey	Middlesex	9.50	18,797	No	1997
Taunton Landfill	G	Massachusetts	Bristo	0.88	11,445	No	1997
Taunton Landfill	G	Massachusetts	Bristo	0.88	11,445	No	1997
Miramar Landfill Metro Biosolids Center	G	California	San Diego	1.56	11,855	Yes	1997
Miramar Landfill Metro Biosolids Center	G	California	San Diego	1.56	11,855	Yes	1997
Miramar Landfill Metro Biosolids Center	G	California	San Diego	1.56	11,855	Yes	1997
Miramar Landfill Metro Biosolids Center	G	California	San Diego	1.56	11,855	Yes	1997
Lowell Landfill	G	Massachusetts	Middlesex	0.78	10,726	No	1997
Lowell Landfill	G	Massachusetts	Middlesex	0.78	10,726	No	1997
Modern Landfill Production Plant	G	Pennsylvania	York	3.00	11,900	No	1998
Modern Landfill Production Plant	G	Pennsylvania	York	3.00	11,900	No	1998
Modern Landfill Production Plant	G	Pennsylvania	York	3.00	11,900	No	1998
Albany Landfill Gas Utilization Project	G	New York	Albany	0.90	11,306	No	1998
Albany Landfill Gas Utilization Project	G	New York	Albany	0.90	11,306	No	1998
Prince William County Landfill	G	Virginia	Prince William	0.89	10,740	No	1998
Prince William County Landfill	G	Virginia	Prince William	0.89	10,740	No	1998
Balefill Landfill Gas Utilization Proj	G	New Jersey	Bergen	1.80	11,640	No	1998
Balefill Landfill Gas Utilization Proj	G	New Jersey	Bergen	1.80	11,640	No	1998
Visalia Landfill Gas Utilization Project	G	California	Tulare	0.78	14,756	No	1998
Visalia Landfill Gas Utilization Project	G	California	Tulare	0.78	14,756	No	1998
Lopez Landfill Gas Utilization Project	G	California	Los Angeles	2.73	12,256	No	1998
Lopez Landfill Gas Utilization Project	G	California	Los Angeles	2.73	12,256	No	1998
Volusia Landfill Gas Utilization Project	G	Florida	Volusia	1.85	10,712	No	1998
Volusia Landfill Gas Utilization Project	G	Florida	Volusia	1.85	10,712	No	1998
Hartford Landfill Gas Utilization Proj	G	Connecticut	Hartford	0.63	12,127	No	1998
Hartford Landfill Gas Utilization Proj	G	Connecticut	Hartford	0.63	12,127	No	1998
Hartford Landfill Gas Utilization Proj	G	Connecticut	Hartford	0.63	12,127	No	1998
Blackburn Landfill Co-Generation	G	North Carolina	Catawba	1.00	12,328	Yes	1999
Blackburn Landfill Co-Generation	G	North Carolina	Catawba	1.00	12,328	Yes	1999
Blackburn Landfill Co-Generation	G	North Carolina	Catawba	0.90	12,328	Yes	2002
Atascosita	G	Texas	Harris	1.70	11,048	No	2003
Atascosita	G	Texas	Harris	1.70	11,048	No	2003
Atascosita	G	Texas	Harris	1.70	11,048	No	2003
Atascosita	G	Texas	Harris	1.70	13,682	No	2004
Atascosita	G	Texas	Harris	1.70	11,048	No	2003
Atascosita	G	Texas	Harris	1.70	11,048	No	2003
Baytown	G	Texas	Chambers	1.00	11,270	No	2003
Baytown	G	Texas	Chambers	1.00	11,270	No	2003
Baytown	G	Texas	Chambers	1.00	11,270	No	2003
Baytown	G	Texas	Chambers	1.00	11,270	No	2003
Bluebonnet	G	Texas	Harris	1.00	11,718	No	2003
Bluebonnet	G	Texas	Harris	1.00	11,718	No	2003
Bluebonnet	G	Texas	Harris	1.00	11,718	No	2003
Bluebonnet	G	Texas	Harris	1.00	11,718	No	2003
Coastal Plains	G	Texas	Galveston	1.70	11,045	No	2003
Coastal Plains	G	Texas	Galveston	1.70	11,045	No	2003
Coastal Plains	G	Texas	Galveston	1.70	11,045	No	2003
Coastal Plains	G	Texas	Galveston	1.70	11,045	No	2003
Conroe	G	Texas	Montgomery	1.00	11,830	No	2003
Conroe	G	Texas	Montgomery	1.00	11,830	No	2003
Conroe	G	Texas	Montgomery	1.00	11,830	No	2003
Security	G	Texas	Liberty	1.70	10,637	No	2003
Security	G	Texas	Liberty	1.70	10,637	No	2003
East Bridgewater	G	Massachusetts	Plymouth	0.90	14,237	No	1997
East Bridgewater	G	Massachusetts	Plymouth	0.90	14,237	No	1997
East Bridgewater	G	Massachusetts	Plymouth	0.90	14,237	No	1997

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Current Landfill Gas Power Plants
(Continued)

Plant Name	Boiler/Generator/ Committed Unit	State Name	County	Capacity MW	Heat Rate (Btu/kWh)	Cogeneration	On-line Year
East Bridgewater	G	Massachusetts	Plymouth	0.90	14,237	No	1997
East Bridgewater	G	Massachusetts	Plymouth	0.90	14,237	No	1997
East Bridgewater	G	Massachusetts	Plymouth	0.90	14,237	No	1997
Randolph Electric	G	Massachusetts	Norfolk	0.90	13,798	No	2000
Randolph Electric	G	Massachusetts	Norfolk	0.90	13,798	No	2000
Randolph Electric	G	Massachusetts	Norfolk	0.90	13,798	No	2000
Halifax Electric	G	Massachusetts	Plymouth	0.90	13,498	No	1997
Halifax Electric	G	Massachusetts	Plymouth	0.90	13,498	No	1997
Halifax Electric	G	Massachusetts	Plymouth	0.90	13,498	No	1997
Richmond Electric	G	Virginia	Henrico	0.90	13,182	No	1993
Richmond Electric	G	Virginia	Henrico	0.90	13,182	No	1993
Sunset Farms	G	Texas	Travis	0.90	13,072	No	1996
Sunset Farms	G	Texas	Travis	0.90	13,682	No	2004
Sunset Farms	G	Texas	Travis	0.90	13,072	No	1996
Sunset Farms	G	Texas	Travis	0.90	13,072	No	1996
Fall River Electric	G	Massachusetts	Bristo	0.90	13,448	No	2000
Fall River Electric	G	Massachusetts	Bristo	0.90	13,448	No	2000
Fall River Electric	G	Massachusetts	Bristo	4.40	13,079	No	2000
Chicopee Electric	G	Massachusetts	Hampden	0.90	13,921	No	1993
Chicopee Electric	G	Massachusetts	Hampden	0.90	13,921	No	1993
Rockford Electric	G	Illinois	Ogle	0.90	15,737	No	1996
Rockford Electric	G	Illinois	Ogle	0.90	15,737	No	1996
Mallard Lake Electric	G	Illinois	DuPage	3.80	9,800	No	1997
Mallard Lake Electric	G	Illinois	DuPage	3.80	9,800	No	1997
Mallard Lake Electric	G	Illinois	DuPage	3.80	9,800	No	1997
Quad Cities	G	Illinois	Rock Island	0.90	16,940	No	1998
Quad Cities	G	Illinois	Rock Island	1.00	16,940	No	2002
South Barrington Electric	G	Illinois	DuPage	0.80	12,910	No	1997
South Barrington Electric	G	Illinois	DuPage	0.80	12,910	No	1997
Lyon Development	G	Michigan	Oakland	0.90	16,859	No	1993
Lyon Development	G	Michigan	Oakland	0.90	16,859	No	1993
Lyon Development	G	Michigan	Oakland	0.90	16,859	No	1993
Lyon Development	G	Michigan	Oakland	0.90	16,859	No	1993
Lyon Development	G	Michigan	Oakland	0.90	16,859	No	1993
Arbor Hills	G	Michigan	Washtenaw	3.80	13,682	No	1996
Arbor Hills	G	Michigan	Washtenaw	3.80	13,682	No	1996
Arbor Hills	G	Michigan	Washtenaw	3.80	13,682	No	1996
C & C Electric	G	Michigan	Calhoun	0.90	13,078	No	1995
C & C Electric	G	Michigan	Calhoun	0.90	13,078	No	1995
C & C Electric	G	Michigan	Calhoun	0.90	13,078	No	1995
C & C Electric	G	Michigan	Calhoun	2.30	13,078	No	2007
Pine Bend	G	Minnesota	Dakota	3.80	11,860	No	1996
Pine Bend	G	Minnesota	Dakota	3.80	11,860	No	1996
Pine Bend	G	Minnesota	Dakota	6.00	11,860	No	1996
Charlotte Motor Speedway	G	North Carolina	Cabarrus	4.30	15,603	No	1999
Prima Desheha Landfill	G	California	Orange	2.70	13,849	No	1999
Prima Desheha Landfill	G	California	Orange	2.70	13,849	No	1999
North City Cogen Facility	G	California	San Diego	0.88	14,554	No	1999
North City Cogen Facility	G	California	San Diego	0.88	14,554	No	1999
North City Cogen Facility	G	California	San Diego	0.88	14,554	No	1999
North City Cogen Facility	G	California	San Diego	0.88	14,554	No	1999
Tajiguas Landfill	G	California	Santa Barbara	2.70	11,359	No	2000
HMDC Kingsland Landfill	G	New Jersey	Bergen	0.97	11,668	No	1998
HMDC Kingsland Landfill	G	New Jersey	Bergen	0.97	11,668	No	1998
HMDC Kingsland Landfill	G	New Jersey	Bergen	0.97	11,668	No	1998
Cuyahoga Regional Landfill	G	Ohio	Cuyahoga	1.80	11,088	No	1999
Cuyahoga Regional Landfill	G	Ohio	Cuyahoga	1.80	11,088	No	1999
Monmouth Landfill Gas to Energy	G	New Jersey	Monmouth	7.40	19,760	No	1998
MM Nashville	G	Tennessee	Davidson	0.80	11,549	No	2000
MM Nashville	G	Tennessee	Davidson	0.80	11,549	No	2000
Sonoma Central Landfill Phase I	G	California	Sonoma	0.70	13,634	No	1993
Sonoma Central Landfill Phase I	G	California	Sonoma	0.70	13,634	No	1993
Sonoma Central Landfill Phase I	G	California	Sonoma	0.70	13,634	No	1993
Sonoma Central Landfill Phase I	G	California	Sonoma	0.70	13,634	No	1993
Sonoma Central Landfill Phase II	G	California	Sonoma	0.70	13,643	No	1996
Sonoma Central Landfill Phase II	G	California	Sonoma	0.70	13,643	No	1996
Sonoma Central Landfill Phase II	G	California	Sonoma	0.70	13,643	No	1996
Sonoma Central Landfill Phase II	G	California	Sonoma	0.70	13,643	No	1996
Model City Energy Facility	G	New York	Niagara	0.77	14,280	No	2001
Model City Energy Facility	G	New York	Niagara	0.77	14,280	No	2001
Model City Energy Facility	G	New York	Niagara	0.77	14,280	No	2001
Model City Energy Facility	G	New York	Niagara	0.77	14,280	No	2001
Model City Energy Facility	G	New York	Niagara	0.77	14,280	No	2001
Model City Energy Facility	G	New York	Niagara	0.77	14,280	No	2001
Model City Energy Facility	G	New York	Niagara	0.77	14,280	No	2001
Roxana Resource Recovery	G	Illinois	Madison	0.90	10,870	No	1999
Roxana Resource Recovery	G	Illinois	Madison	0.90	10,870	No	1999
Roxana Resource Recovery	G	Illinois	Madison	0.90	10,870	No	1999
Roxana Resource Recovery	G	Illinois	Madison	0.90	10,870	No	1999
Streator Energy Partners LLC	G	Illinois	La Salle	0.90	10,686	No	1999
Devonshire Power Partners LLC	G	Illinois	Cook	1.00	11,273	No	1997
Devonshire Power Partners LLC	G	Illinois	Cook	1.00	11,273	No	1997
Devonshire Power Partners LLC	G	Illinois	Cook	1.00	11,273	No	1997
Devonshire Power Partners LLC	G	Illinois	Cook	1.00	11,273	No	1997
Devonshire Power Partners LLC	G	Illinois	Cook	1.00	11,273	No	1997

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Current Landfill Gas Power Plants
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Plant Name	Boiler/Generator/ Committed Unit	State Name	County	Capacity MW	Heat Rate (Btu/kWh)	Cogeneration	On-line Year
Brickyard Energy Partners LLC	G	Illinois	Vermilion	0.90	11,267	No	1999
Brickyard Energy Partners LLC	G	Illinois	Vermilion	0.90	11,267	No	1999
Brickyard Energy Partners LLC	G	Illinois	Vermilion	0.90	11,267	No	1999
Dixon/Lee Energy Partners LLC	G	Illinois	Lee	0.90	10,414	No	1999
Dixon/Lee Energy Partners LLC	G	Illinois	Lee	0.90	10,414	No	1999
Dixon/Lee Energy Partners LLC	G	Illinois	Lee	0.90	10,414	No	1999
Dixon/Lee Energy Partners LLC	G	Illinois	Lee	0.90	10,414	No	1999
Upper Rock Energy Partners LLC	G	Illinois	Rock Island	0.90	11,216	No	2000
Upper Rock Energy Partners LLC	G	Illinois	Rock Island	0.90	11,216	No	2000
Upper Rock Energy Partners LLC	G	Illinois	Rock Island	0.90	11,216	No	2000
Green Knight Energy Center	G	Pennsylvania	Northhampton	2.40	18,344	No	2001
Green Knight Energy Center	G	Pennsylvania	Northhampton	2.40	18,344	No	2001
Green Knight Energy Center	G	Pennsylvania	Northhampton	2.40	18,344	No	2001
Kiefer Landfill	G	California	Sacramento	2.80	13,682	No	1999
Kiefer Landfill	G	California	Sacramento	2.80	13,682	No	1999
Kiefer Landfill	G	California	Sacramento	2.80	13,682	No	1999
Riveside Resource Recovery LLC	G	Illinois	Will	0.90	10,960	No	1997
Avon Energy Partners LLC	G	Illinois	Cook	0.90	10,378	No	1997
Avon Energy Partners LLC	G	Illinois	Cook	0.90	10,378	No	1997
Dane County Landfill #2 Rodefeld	G	Wisconsin	Dane	0.80	10,822	No	2004
Dane County Landfill #2 Rodefeld	G	Wisconsin	Dane	1.60	13,682	No	2004
Dane County Landfill #2 Rodefeld	G	Wisconsin	Dane	0.80	10,822	No	1997
Dane County Landfill #2 Rodefeld	G	Wisconsin	Dane	0.80	10,822	No	1997
P.E.R.C.	G	Washington	Pierce	0.75	15,885	No	1999
P.E.R.C.	G	Washington	Pierce	0.75	15,885	No	1999
P.E.R.C.	G	Washington	Pierce	0.75	15,885	No	1999
Countyside Genco LLC	G	Illinois	Lake	1.30	13,682	No	2000
Countyside Genco LLC	G	Illinois	Lake	1.30	13,682	No	2000
Countyside Genco LLC	G	Illinois	Lake	1.30	13,682	No	2000
Countyside Genco LLC	G	Illinois	Lake	1.30	13,682	No	2000
Countyside Genco LLC	G	Illinois	Lake	1.30	13,682	No	2000
Countyside Genco LLC	G	Illinois	Lake	1.30	13,682	No	2000
Morris Genco LLC	G	Illinois	Grundy	1.30	13,682	No	2001
Morris Genco LLC	G	Illinois	Grundy	1.30	13,682	No	2001
Morris Genco LLC	G	Illinois	Grundy	1.30	13,682	No	2001
Barre	G	Massachusetts	Worcester	0.40	12,310	No	1996
Barre	G	Massachusetts	Worcester	0.40	12,310	No	1996
Brookhaven Facility	G	New York	Suffolk	1.20	10,485	No	1997
Brookhaven Facility	G	New York	Suffolk	1.20	10,485	No	1997
Brookhaven Facility	G	New York	Suffolk	1.20	10,485	No	1998
Brookhaven Facility	G	New York	Suffolk	1.20	10,485	No	1998
Dunbarton Energy Partners LP	G	New	Hillsborough	0.60	11,751	No	1996
Dunbarton Energy Partners LP	G	New	Hillsborough	0.60	11,751	No	2001
Veolia Glacier Ridge Landfill	G	Wisconsin	Dodge	0.90	13,682	No	2001
Veolia Glacier Ridge Landfill	G	Wisconsin	Dodge	0.90	13,682	No	2001
RCWMD Badlands Landfill Gas Project	G	California	Riverside	1.00	13,682	No	2001
Sonoma Central Landfill Phase III	G	California	Sonoma	0.70	13,643	No	2004
Sonoma Central Landfill Phase III	G	California	Sonoma	0.70	13,643	No	2004
Ridgeview	G	Wisconsin	Manitowoc	0.80	13,682	No	2006
Ridgeview	G	Wisconsin	Manitowoc	0.80	11,087	No	2002
Ridgeview	G	Wisconsin	Manitowoc	0.80	11,087	No	2002
Ridgeview	G	Wisconsin	Manitowoc	0.80	13,682	No	2006
Ridgeview	G	Wisconsin	Manitowoc	0.80	11,087	No	2003
Ridgeview	G	Wisconsin	Manitowoc	0.80	11,087	No	2002
Ridgeview	G	Wisconsin	Manitowoc	0.80	13,682	No	2006
Ridgeview	G	Wisconsin	Manitowoc	0.80	13,682	No	2006
Ridgeview	G	Wisconsin	Manitowoc	0.80	13,682	No	2006
Ridgeview	G	Wisconsin	Manitowoc	0.80	13,682	No	2006
PG Cnty Brown Station Road II	G	Maryland	Prince George's	0.98	13,682	No	2003
PG Cnty Brown Station Road II	G	Maryland	Prince George's	0.98	13,682	No	2003
PG Cnty Brown Station Road II	G	Maryland	Prince George's	0.98	13,682	No	2003
PG Cnty Brown Station Road II	G	Maryland	Prince George's	0.98	13,682	No	2003
Berlin	G	Wisconsin	Green Lake	0.82	11,900	No	2001
Berlin	G	Wisconsin	Green Lake	0.82	11,900	No	2001
Berlin	G	Wisconsin	Green Lake	0.80	11,900	No	2001
BFI Tessman Rd Landfill	G	Texas	Bexar	1.40	13,682	No	2003
Lee County Landfill	G	South Carolina	Lee	1.90	10,123	No	2005
Lee County Landfill	G	South Carolina	Lee	1.90	10,123	No	2005
Lee County Landfill	G	South Carolina	Lee	1.90	10,123	No	2005
Lee County Landfill	G	South Carolina	Lee	1.90	13,682	No	2007
Anderson Regional Landfill	G	South Carolina	Anderson	5.30	13,682	No	2006
Richland County Landfill	G	South Carolina	Richland	5.30	13,682	No	2006
Seven Mile Creek LFG	G	Wisconsin	Eau Claire	0.80	13,682	No	2006
Seven Mile Creek LFG	G	Wisconsin	Eau Claire	0.83	10,123	No	2004
Seven Mile Creek LFG	G	Wisconsin	Eau Claire	0.83	10,123	No	2004
Seven Mile Creek LFG	G	Wisconsin	Eau Claire	0.83	10,123	No	2004
Colton Landfill	G	California	San Bernardino	1.27	12,143	No	2003
Mid Valley Landfill	G	California	San Bernardino	1.27	12,178	No	2003
Mid Valley Landfill	G	California	San Bernardino	1.27	12,178	No	2003
Milliken Landfill	G	California	San Bernardino	1.07	12,157	No	2003
Milliken Landfill	G	California	San Bernardino	1.07	12,157	No	2003
Ontario LFGTE	G	New York	Ontario	0.80	11,148	No	2003
Ontario LFGTE	G	New York	Ontario	0.80	11,148	No	2003
Ontario LFGTE	G	New York	Ontario	0.80	10,500	No	2005
Ontario LFGTE	G	New York	Ontario	0.80	10,500	No	2005
Ontario LFGTE	G	New York	Ontario	0.80	10,500	No	2005
Ontario LFGTE	G	New York	Ontario	0.80	11,148	No	2003
Ontario LFGTE	G	New York	Ontario	0.80	11,148	No	2003

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Current Landfill Gas Power Plants
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Plant Name	Boiler/Generator/Committed Unit	State Name	County	Capacity MW	Heat Rate (Btu/kWh)	Cogeneration	On-line Year
Bavarian LFGTE	G	Kentucky	Boone	0.80	13,343	No	2003
Bavarian LFGTE	G	Kentucky	Boone	0.80	13,343	No	2003
Bavarian LFGTE	G	Kentucky	Boone	0.80	13,343	No	2003
Bavarian LFGTE	G	Kentucky	Boone	0.80	13,343	No	2003
Green Valley LFGTE	G	Kentucky	Greenup	0.80	13,556	No	2003
Green Valley LFGTE	G	Kentucky	Greenup	0.80	13,556	No	2003
Green Valley LFGTE	G	Kentucky	Greenup	0.80	13,556	No	2003
Laurel Ridge LFGTE	G	Kentucky	Laurel	0.80	13,231	No	2003
Laurel Ridge LFGTE	G	Kentucky	Laurel	0.80	13,231	No	2003
Laurel Ridge LFGTE	G	Kentucky	Laurel	0.80	13,231	No	2003
Laurel Ridge LFGTE	G	Kentucky	Laurel	0.80	11,021	No	2006
Laurel Ridge LFGTE	G	Kentucky	Laurel	0.80	13,231	No	2003
Hardin County LFGTE	G	Kentucky	Hardin	0.80	13,682	No	2006
Hardin County LFGTE	G	Kentucky	Hardin	0.80	13,682	No	2006
Hardin County LFGTE	G	Kentucky	Hardin	0.80	13,682	No	2006
Fauquier Landfill Gas	G	Virginia	Fauquier	1.00	13,682	No	2004
Fauquier Landfill Gas	G	Virginia	Fauquier	1.00	13,682	No	2004
Modern Innovative Energy LLC	G	New York	Niagara	1.60	13,682	No	2006
Modern Innovative Energy LLC	G	New York	Niagara	1.60	13,682	No	2006
Modern Innovative Energy LLC	G	New York	Niagara	1.60	13,682	No	2006
Modern Innovative Energy LLC	G	New York	Niagara	1.60	13,682	No	2006
Colonie LFGTE Facility	G	New York	Albany	1.60	13,682	No	2006
Colonie LFGTE Facility	G	New York	Albany	1.60	13,682	No	2006
Colonie LFGTE Facility	G	New York	Albany	1.60	13,682	No	2006
Pendleton County LFGTE	G	Kentucky	Pendleton	0.80	13,682	No	2007
Pendleton County LFGTE	G	Kentucky	Pendleton	0.80	13,682	No	2007
Pendleton County LFGTE	G	Kentucky	Pendleton	0.80	13,682	No	2007
Pendleton County LFGTE	G	Kentucky	Pendleton	0.80	13,682	No	2007
Noble Hill Landfill	G	Missouri	Greene	3.00	13,682	No	2006
AMERESCO Chicopee Energy	G	Massachusetts	Hampden	1.90	13,648	No	2004
AMERESCO Chicopee Energy	G	Massachusetts	Hampden	1.90	13,648	No	2004
AMERESCO Chicopee Energy	G	Massachusetts	Hampden	1.90	13,648	No	2004
AMERESCO Janesville	G	Wisconsin	Rock	1.00	13,682	No	2004
AMERESCO Janesville	G	Wisconsin	Rock	1.00	13,682	No	2004
AMERESCO Janesville	G	Wisconsin	Rock	1.00	13,682	No	2004
AMERESCO Santa Cruz Energy	G	California	Santa Cruz	1.00	13,682	No	2006
AMERESCO Santa Cruz Energy	G	California	Santa Cruz	1.00	13,682	No	2006
AMERESCO Santa Cruz Energy	G	California	Santa Cruz	1.00	13,682	No	2006
AMERESCO Delaware South	G	Delaware	Sussex	1.00	13,682	No	2006
AMERESCO Delaware South	G	Delaware	Sussex	1.00	13,682	No	2006
AMERESCO Delaware South	G	Delaware	Sussex	1.00	13,682	No	2006
AMERESCO Delaware South	G	Delaware	Sussex	1.00	13,682	No	2006
AMERESCO Delaware South	G	Delaware	Sussex	1.00	11,430	No	2008
AMERESCO Delaware Central	G	Delaware	Kent	1.00	13,682	No	2006
AMERESCO Delaware Central	G	Delaware	Kent	1.00	13,682	No	2006
AMERESCO Delaware Central	G	Delaware	Kent	1.00	13,682	No	2006
Oak Ridge	G	Indiana	Cass	0.80	13,682	No	2003
Oak Ridge	G	Indiana	Cass	0.80	13,682	No	2003
Oak Ridge	G	Indiana	Cass	0.80	13,682	No	2003
Oak Ridge	G	Indiana	Cass	0.80	13,682	No	2003
Jay County	G	Indiana	Jay	0.80	13,682	No	2005
Jay County	G	Indiana	Jay	0.80	13,682	No	2005
Jay County	G	Indiana	Jay	0.80	13,682	No	2005
Jay County	G	Indiana	Jay	0.80	13,682	No	2005
Liberty	G	Indiana	White	0.80	13,682	No	2005
Liberty	G	Indiana	White	0.80	13,682	No	2005
Liberty	G	Indiana	White	0.80	13,682	No	2005
Liberty	G	Indiana	White	0.80	13,682	No	2005
Deertrack Park Gas Recovery	G	Wisconsin	Jefferson	0.80	13,682	No	2006
Deertrack Park Gas Recovery	G	Wisconsin	Jefferson	0.80	13,682	No	2006
Deertrack Park Gas Recovery	G	Wisconsin	Jefferson	0.80	13,682	No	2006
Deertrack Park Gas Recovery	G	Wisconsin	Jefferson	0.80	13,682	No	2006
Lake Mills Gas Recovery	G	Iowa	Winnebago	0.80	13,682	No	2006
Lake Mills Gas Recovery	G	Iowa	Winnebago	0.80	13,682	No	2006
Lake Mills Gas Recovery	G	Iowa	Winnebago	0.80	13,682	No	2006
Lake Mills Gas Recovery	G	Iowa	Winnebago	0.80	13,682	No	2006
Lake Mills Gas Recovery	G	Iowa	Winnebago	0.80	13,682	No	2006
Lake Mills Gas Recovery	G	Iowa	Winnebago	0.80	13,682	No	2006
Springhill Gas Recovery	G	Florida	Jackson	0.80	13,682	No	2006
Springhill Gas Recovery	G	Florida	Jackson	0.80	13,682	No	2006
Springhill Gas Recovery	G	Florida	Jackson	0.80	13,682	No	2006
Springhill Gas Recovery	G	Florida	Jackson	0.80	13,682	No	2006
Springhill Gas Recovery	G	Florida	Jackson	0.80	13,682	No	2006
Springhill Gas Recovery	G	Florida	Jackson	0.80	13,682	No	2006
Two Pine Gas Recovery	G	Arkansas	Pulaski	0.80	13,682	No	2006
Two Pine Gas Recovery	G	Arkansas	Pulaski	0.80	13,682	No	2006
Two Pine Gas Recovery	G	Arkansas	Pulaski	0.80	13,682	No	2006
Two Pine Gas Recovery	G	Arkansas	Pulaski	0.80	13,682	No	2006
Two Pine Gas Recovery	G	Arkansas	Pulaski	0.80	13,682	No	2006
Two Pine Gas Recovery	G	Arkansas	Pulaski	0.80	13,682	No	2006
Timberline Trails Gas Recovery	G	Wisconsin	Rusk	0.80	13,682	No	2006
Timberline Trails Gas Recovery	G	Wisconsin	Rusk	0.80	13,682	No	2006
Timberline Trails Gas Recovery	G	Wisconsin	Rusk	0.80	13,682	No	2006
Timberline Trails Gas Recovery	G	Wisconsin	Rusk	0.80	13,682	No	2006

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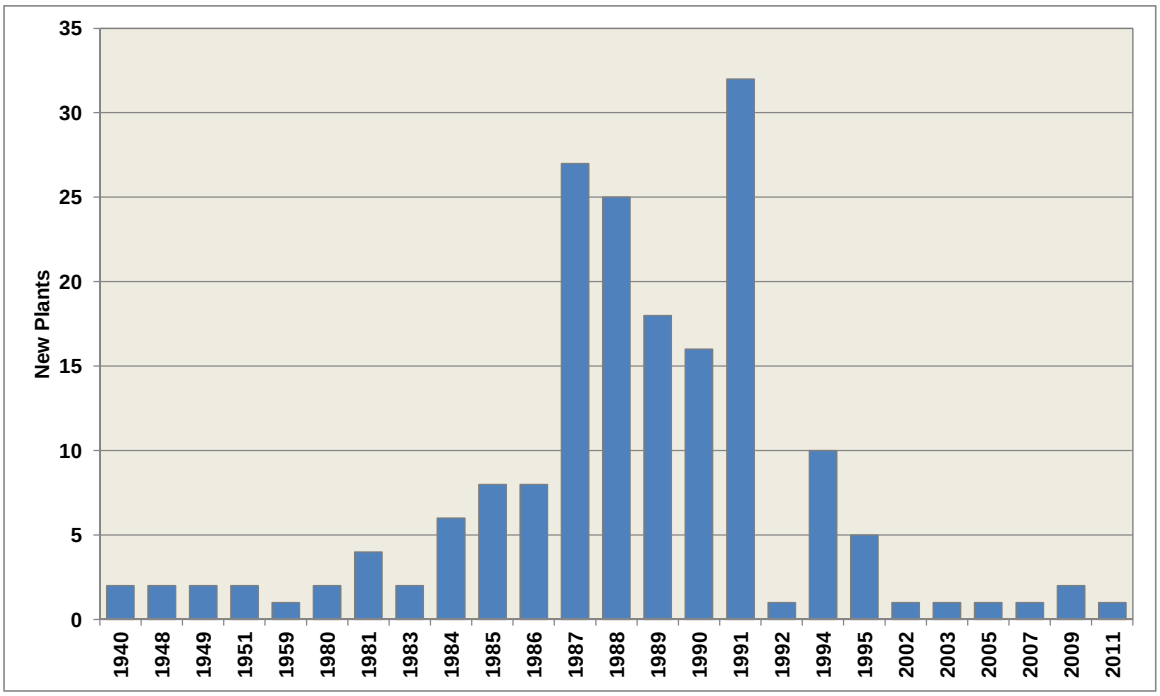
Current Landfill Gas Power Plants
(Continued)

Plant Name	Boiler/Generator/Committed Unit	State Name	County	Capacity MW	Heat Rate (Btu/kWh)	Cogeneration	On-line Year
Bradley Gas Recovery	G	California	Los	1.30	13,682	No	2004
Bradley Gas Recovery	G	California	Los	1.30	13,682	No	2004
Bradley Gas Recovery	G	California	Los	1.30	13,682	No	2004
Bradley Gas Recovery	G	California	Los	1.30	13,682	No	2004
Bradley Gas Recovery	G	California	Los	1.30	13,682	No	2004
El Sobrante Gas Recovery	G	California	Riversid	1.30	13,682	No	2004
El Sobrante Gas Recovery	G	California	Riversid	1.30	13,682	No	2004
El Sobrante Gas Recovery	G	California	Riversid	1.30	13,682	No	2004
Simi Valley	G	California	Ventura	1.30	13,682	No	2004
Simi Valley	G	California	Ventura	1.30	13,682	No	2004
Salt Lake Energy Systems	G	Utah	Salt	1.50	13,682	No	2006
Salt Lake Energy Systems	G	Utah	Salt	0.77	13,682	No	2006
Salt Lake Energy Systems	G	Utah	Salt	0.77	13,682	No	2006
Eastern Landfill Gas LLC	G	Maryland	Baltimor	1.00	13,682	No	2006
Eastern Landfill Gas LLC	G	Maryland	Baltimor	1.00	13,682	No	2006
Eastern Landfill Gas LLC	G	Maryland	Baltimor	1.00	13,682	No	2006
American Canyon SLF	G	California	Napa	0.21	13,682	No	2006
Burlington County SL	G	New Jersey	Burlingt	7.20	13,682	No	2006
Cedar Hills LF	G	Washington	King	26.00	13,682	No	2006
Chittenden County LF	G	Vermont	Chittend	0.09	13,682	No	2006
Clinton LF #2	G	Illinois	De Witt	3.20	13,682	No	2006
Fort Worth Regional	G	Texas	Tarrant	1.60	13,682	No	2006
Frey Farm Landfill	G	Pennsylvania	Lancast	3.20	13,682	No	2006
Glendale Road LF	G	Massachusett	Hampsh	0.80	13,682	No	2006
Kiefer LF	G	California	Sacram	3.00	13,682	No	2006
Los Angeles Landfill	G	New Mexico	Bernalill	0.07	13,682	No	2006
Los Reales LFG Expan	G	Arizona	Pima	1.90	13,682	No	2006
Orange County LF	G	New York	Orange	2.12	13,682	No	2006
Seminole Road MSW La	G	Georgia	Dekalb	3.20	13,682	No	2006
Warren County LF	G	New Jersey	Warren	3.80	13,682	No	2006
Waste Disposal Engin	G	Minnesota	Anoka	0.22	13,682	No	2006
Texas Mandate Landfill Gas	C	Texas	NA	5.00	13,682	No	2007
Texas Mandate Landfill Gas	C	Texas	NA	5.00	13,648	No	2008
Tullytown LF	G	Pennsylvania	Bucks	2.20	13,648	No	2007
Coventry LFG	G	Vermont	Orleans	1.60	10,265	No	2007
GROWS LF	G	Pennsylvania	Bucks	2.50	10,500	No	2007
Seccra LF	G	Pennsylvania	Chester	0.84	10,500	No	2007
Sauk County LF	G	Wisconsin	Sauk	0.36	10,500	No	2007
Cape May County SLF	G	New Jersey	Cape	0.30	10,500	No	2007
Newland Park SLF	G	Maryland	Wicomi	3.10	10,500	No	2007
Dry Creek Landfill	G	Oregon	Jackson	3.20	10,500	No	2007
East Windsor NORCAP	G	Connecticut	Hartford	3.00	13,682	No	2007
CA-N_CA_Landfill Gas	C	California	NA	16.80	13,648	No	2011
CA-S_CA_Landfill Gas	C	California	NA	8.00	13,648	No	2011
COMD_IL_Landfill Gas	C	Illinois	NA	6.40	13,648	No	2011
ERCT_TX_Landfill Gas	C	Texas	NA	6.40	13,648	No	2011
GWAY_MO_Landfill Gas	C	Missouri	NA	5.27	13,648	No	2011
MACS_MD_Landfill Gas	C	Maryland	NA	4.50	13,648	No	2011
MACW_PA_Landfill Gas	C	Pennsylvania	NA	21.70	13,648	No	2011
MECS_MI_Landfill Gas	C	Michigan	NA	8.00	13,648	No	2011
MRO_MN_Landfill Gas	C	Minnesota	NA	3.20	13,648	No	2011
MRO_WI_Landfill Gas	C	Wisconsin	NA	3.15	13,648	No	2011
NENG_ME_Landfill Gas	C	Maine	NA	3.00	13,648	No	2011
NENG_MA_Landfill Gas	C	Massachusett	NA	3.80	13,648	No	2011
PNW_ID_Landfill Gas	C	Idaho	NA	3.20	13,648	No	2011
PNW_OR_Landfill Gas	C	Oregon	NA	4.00	13,648	No	2011
RFCO_IN_Landfill Gas	C	Indiana	NA	12.52	13,648	No	2011
RFCO_OH_Landfill Gas	C	Ohio	NA	13.42	13,648	No	2011
RFCP_OH_Landfill Gas	C	Ohio	NA	4.80	13,648	No	2011
RMPA_CO_Landfill Gas	C	Colorado	NA	6.20	13,648	No	2011
TVAK_KY_Landfill Gas	C	Kentucky	NA	1.60	13,648	No	2011
UPNY_NY_Landfill Gas	C	New York	NA	14.40	13,648	No	2011
VACA_NC_Landfill Gas	C	North	NA	8.40	13,648	No	2011
VACA_SC_Landfill Gas	C	South	NA	6.40	13,648	No	2011
VAPW_VA_Landfill Gas	C	Virginia	NA	30.94	13,648	No	2011
WUMS_WI_Landfill Gas	C	Wisconsin	NA	7.55	13,648	No	2011
MACE_NJ_Landfill Gas	C	New Jersey	NA	3.80	13,648	No	2011
FRCC_FL_Landfill Gas	C	Florida	NA	20.75	13,648	No	2011
MACE_MD_Landfill Gas	C	Maryland	NA	2.00	13,648	No	2011
MACE_PA_Landfill Gas	C	Pennsylvania	NA	1.60	13,648	No	2011

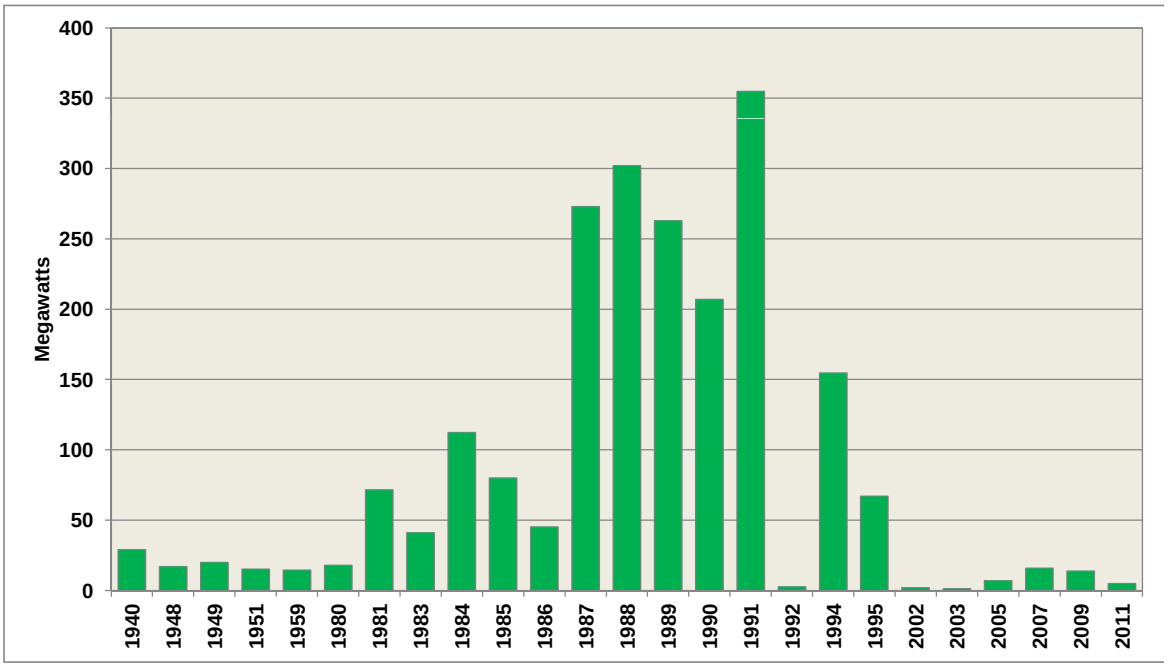
Source:
National Electric Energy System (NEEDS) Database for IPM 2010.
http://epa.gov/airmarkets/progsregs/epa-ipm/BaseCasev410.html

[a] Data are not available

Section: BIOPOWER
New Municipal Solid Waste Power Plants by Year



Municipal Solid Waste Power Plant Capacity by Year
(Megawatt Hours)



Source:
National Electric Energy System (NEEDS) Database for IPM 2010.
http://epa.gov/airmarkets/progsregs/epa-ipm/BaseCasev410.html

Notes:
1. Only years in which new plants were brought online are shown.
2. Power plant capacity based on NEEDS 2010 Data.

Plant Name	Boiler/Generator/ Committed Unit	State Name	County	Capacity MW	Heat Rate (Btu/kWh)	Cogeneration	On-line Year
French Island	B	Wisconsin	La Crosse	14.50	10,400	N	1940
French Island	B	Wisconsin	La Crosse	14.50	10,400	N	1940
Red Wing	B	Minnesota	Goodhue	10.00	20,114	N	1949
Red Wing	B	Minnesota	Goodhue	10.00	19,817	N	1949
Wilmarth	B	Minnesota	Blue Earth	9.00	19,243	N	1948
Wilmarth	B	Minnesota	Blue Earth	8.00	19,266	N	1948
Elk River	B	Minnesota	Sherburne	7.80	14,800	N	1951
Elk River	B	Minnesota	Sherburne	7.50	14,800	N	1951
Elk River	B	Minnesota	Sherburne	14.50	14,800	N	1959
Covanta Warren Energy	B	New Jersey	Warren	5.00	18,843	N	1988
Covanta Warren Energy	B	New Jersey	Warren	5.00	19,338	N	1988
Covanta Hennepin Energy	B	Minnesota	Hennepin	16.85	19,338	N	1989
Covanta Hennepin Energy	B	Minnesota	Hennepin	16.85	19,338	N	1989
Greater Detroit Resource Recovery	B	Michigan	Wayne	21.20	19,338	Y	1988
Greater Detroit Resource Recovery	B	Michigan	Wayne	21.20	19,338	Y	1988
Greater Detroit Resource Recovery	B	Michigan	Wayne	21.20	19,338	Y	1988
Miami Dade County Resource Recovery	B	Florida	Miami Dade	17.91	19,338	N	1981
Miami Dade County Resource Recovery	B	Florida	Miami Dade	17.91	19,338	N	1981
Miami Dade County Resource Recovery	B	Florida	Miami Dade	17.91	19,338	N	1981
Miami Dade County Resource Recovery	B	Florida	Miami Dade	17.91	19,338	N	1981
Commerce Refuse To Energy	B	California	Los Angeles	9.00	19,338	N	1986
Harrisburg Facility	B	Pennsylvania	Dauphin	6.93	19,338	Y	2009
Harrisburg Facility	B	Pennsylvania	Dauphin	6.93	19,338	Y	2009
Harrisburg Facility	B	Pennsylvania	Dauphin	6.93	19,338	Y	2005
Bay Resource Management Center	B	Florida	Bay	5.00	19,338	N	1987
Bay Resource Management Center	B	Florida	Bay	5.00	19,338	N	1987
Dutchess Cnty Resource Recovery	G	New York	Dutchess	7.20	28,175	N	1987
Maine Energy Recovery	B	Maine	York	9.00	19,338	N	1987
Maine Energy Recovery	B	Maine	York	9.00	19,338	N	1987
Charleston Resource Recovery Facility	B	South Carolina	Charleston	4.75	19,338	Y	1989
Charleston Resource Recovery Facility	B	South Carolina	Charleston	4.75	19,338	Y	1989
Camden Resource Recovery Facility	B	New Jersey	Camden	10.00	19,338	N	1991
Camden Resource Recovery Facility	B	New Jersey	Camden	10.00	19,338	N	1991
Camden Resource Recovery Facility	B	New Jersey	Camden	10.00	19,338	N	1991
Wheelabrator Hudson Falls	B	New York	Washington	5.75	19,338	N	1991
Wheelabrator Hudson Falls	B	New York	Washington	5.75	19,338	N	1991
Wheelabrator Baltimore Refuse	B	Maryland	City of Baltimore	20.43	19,338	Y	1984
Wheelabrator Baltimore Refuse	B	Maryland	City of Baltimore	20.43	19,338	Y	1984
Wheelabrator Baltimore Refuse	B	Maryland	City of Baltimore	20.43	19,338	Y	1984
Covanta Hempstead	B	New York	Nassau	23.67	19,338	N	1989
Covanta Hempstead	B	New York	Nassau	23.67	19,338	N	1989
Covanta Hempstead	B	New York	Nassau	23.67	19,338	N	1989
American Ref-Fuel of Essex	B	New Jersey	Essex	10.00	19,338	N	1990
American Ref-Fuel of Essex	B	New Jersey	Essex	10.00	19,338	N	1990
American Ref-Fuel of Essex	B	New Jersey	Essex	40.00	19,338	N	1990
American Ref-Fuel of SE CT	B	Connecticut	New London	8.00	19,338	N	1991
American Ref-Fuel of SE CT	B	Connecticut	New London	8.00	19,338	N	1991
Jackson County Resource Recovery	G	Michigan	Jackson	3.00	19,338	Y	1987
American Ref-Fuel of Delaware Valley	B	Pennsylvania	Delaware	13.33	18,434	N	1991
American Ref-Fuel of Delaware Valley	B	Pennsylvania	Delaware	13.33	18,434	N	1991
American Ref-Fuel of Delaware Valley	B	Pennsylvania	Delaware	13.33	18,434	N	1991
American Ref-Fuel of Delaware Valley	B	Pennsylvania	Delaware	13.33	18,434	N	1991
American Ref-Fuel of Delaware Valley	B	Pennsylvania	Delaware	13.33	18,434	N	1991
American Ref-Fuel of Delaware Valley	B	Pennsylvania	Delaware	13.33	18,434	N	1991
MMWAC Resource Recovery Facility	G	Maine	Androscoggin	2.70	19,338	N	1992
Penobscot Energy Recovery	B	Maine	Penobscot	10.60	19,338	N	1987
Penobscot Energy Recovery	B	Maine	Penobscot	10.60	19,338	N	1987
North County Regional Resource	B	Florida	Palm Beach	23.75	19,338	N	1989
North County Regional Resource	B	Florida	Palm Beach	23.75	19,338	N	1989
York County Resource Recovery	B	Pennsylvania	York	9.50	19,338	N	1989
York County Resource Recovery	B	Pennsylvania	York	9.50	19,338	N	1989
York County Resource Recovery	B	Pennsylvania	York	9.50	19,338	N	1989
Regional Waste Systems	B	Maine	Cumberland	5.75	19,338	N	1988
Regional Waste Systems	B	Maine	Cumberland	5.75	19,338	N	1988
New Hanover County WASTEC	B	North Carolina	New Hanover	0.57	19,338	N	1991
New Hanover County WASTEC	B	North Carolina	New Hanover	0.57	19,338	N	1991
New Hanover County WASTEC	B	North Carolina	New Hanover	0.57	19,338	N	1991
New Hanover County WASTEC	G	North Carolina	New Hanover	1.90	29,317	N	2002
Pioneer Valley Resource Recovery	G	Massachusetts	Hampden	7.50	22,403	N	1988
SEMASS Resource Recovery	B	Massachusetts	Plymouth	26.67	19,338	N	1988
SEMASS Resource Recovery	B	Massachusetts	Plymouth	26.67	19,338	N	1988
SEMASS Resource Recovery	B	Massachusetts	Plymouth	26.67	19,338	N	1988
Olmsted Waste Energy	G	Minnesota	Olmsted	1.30	19,338	Y	1987
Olmsted Waste Energy	G	Minnesota	Olmsted	1.40	19,338	Y	1987
American Ref-Fuel of Niagara	B	New York	Niagara	9.00	19,338	Y	1980
American Ref-Fuel of Niagara	B	New York	Niagara	9.00	19,338	Y	1980
Covanta Lake County Energy	B	Florida	Lake	6.25	19,338	N	1990
Covanta Lake County Energy	B	Florida	Lake	6.25	19,338	N	1990
Covanta Marion Inc	B	Oregon	Marion	5.75	19,338	Y	1986
Covanta Marion Inc	B	Oregon	Marion	5.75	19,338	Y	1986
Covanta Stanislaus Energy	B	California	Stanislaus	9.00	19,338	N	1988
Covanta Stanislaus Energy	B	California	Stanislaus	9.00	19,338	N	1988
Covanta Indianapolis Energy	G	Indiana	Marion	5.00	19,338	Y	1988

Continued on next page

Current Municipal Solid Waste Power Plants
(Continued)

Plant Name	Boiler/Generator/ Committed Unit	State Name	County	Capacity MW	Heat Rate (Btu/kWh)	Cogeneration	On-line Year
Covanta Bristol Energy	B	Connecticut	Hartford	6.60	19,338	N	1987
Covanta Bristol Energy	B	Connecticut	Hartford	6.60	19,338	N	1987
Covanta Babylon Energy	B	New York	Suffolk	7.18	19,338	N	1989
Covanta Babylon Energy	B	New York	Suffolk	7.18	19,338	N	1989
Huntington Resource Recovery Facility	B	New York	Suffolk	8.33	19,338	N	1991
Huntington Resource Recovery Facility	B	New York	Suffolk	8.33	19,338	N	1991
Huntington Resource Recovery Facility	B	New York	Suffolk	8.33	19,338	N	1991
Montgomery County Resource Recovery	B	Maryland	Montgomery	18.00	19,338	N	1995
Montgomery County Resource Recovery	B	Maryland	Montgomery	18.00	19,338	N	1995
Montgomery County Resource Recovery	B	Maryland	Montgomery	18.00	19,338	N	1995
Covanta Fairfax Energy	B	Virginia	Fairfax	19.75	19,338	N	1990
Covanta Fairfax Energy	B	Virginia	Fairfax	19.75	19,338	N	1990
Covanta Fairfax Energy	B	Virginia	Fairfax	19.75	19,338	N	1990
Covanta Fairfax Energy	B	Virginia	Fairfax	19.75	19,338	N	1990
Covanta Haverhill	B	Massachusetts	Essex	21.39	19,338	N	1989
Covanta Haverhill	B	Massachusetts	Essex	21.39	19,338	N	1989
Onondaga County Resource Recovery	B	New York	Onondaga	10.00	19,338	N	1994
Onondaga County Resource Recovery	B	New York	Onondaga	10.00	19,338	N	1994
Onondaga County Resource Recovery	B	New York	Onondaga	10.00	19,338	N	1994
Covanta Alexandria/Arlington Energy	B	Virginia	Alexandria (city)	9.67	19,338	N	1987
Covanta Alexandria/Arlington Energy	B	Virginia	Alexandria (city)	9.67	19,338	N	1987
Covanta Alexandria/Arlington Energy	B	Virginia	Alexandria (city)	9.67	19,338	N	1987
Covanta Wallingford Energy	B	Connecticut	New Haven	2.12	19,338	N	1988
Covanta Wallingford Energy	B	Connecticut	New Haven	2.12	19,338	N	1988
Covanta Wallingford Energy	B	Connecticut	New Haven	2.12	19,338	N	1988
Pasco Cnty Solid Waste Resource	B	Florida	Pasco	8.67	19,338	N	1991
Pasco Cnty Solid Waste Resource	B	Florida	Pasco	8.67	19,338	N	1991
Pasco Cnty Solid Waste Resource	B	Florida	Pasco	8.67	19,338	N	1991
Southeast Resource Recovery	B	California	Los Angeles	9.32	19,338	Y	1988
Southeast Resource Recovery	B	California	Los Angeles	9.32	19,338	Y	1988
Southeast Resource Recovery	B	California	Los Angeles	9.32	19,338	Y	1988
Hillsborough County Resource Recovery	B	Florida	Hillsborough	8.67	19,338	N	1987
Hillsborough County Resource Recovery	B	Florida	Hillsborough	8.67	19,338	N	1987
Hillsborough County Resource Recovery	B	Florida	Hillsborough	8.67	19,338	N	1987
Lancaster County Resource Recovery	B	Pennsylvania	Lancaster	10.80	19,338	N	1990
Lancaster County Resource Recovery	B	Pennsylvania	Lancaster	10.80	19,338	N	1990
Lancaster County Resource Recovery	B	Pennsylvania	Lancaster	10.80	19,338	N	1990
Kent County Waste to Energy Facility	B	Michigan	Kent	7.85	19,338	Y	1989
Kent County Waste to Energy Facility	B	Michigan	Kent	7.85	19,338	Y	1989
Wheelabrator Claremont Facility	G	New Hampshire	Sullivan	2.25	22,443	N	1986
Wheelabrator Claremont Facility	G	New Hampshire	Sullivan	2.25	21,020	N	1986
Wheelabrator Concord Facility	B	New Hampshire	Merrimack	7.00	19,338	N	1988
Wheelabrator Concord Facility	B	New Hampshire	Merrimack	7.00	19,338	N	1988
McKay Bay Facility	B	Florida	Hillsborough	4.50	19,338	N	1985
McKay Bay Facility	B	Florida	Hillsborough	4.50	19,338	N	1985
McKay Bay Facility	B	Florida	Hillsborough	4.50	19,338	N	1985
McKay Bay Facility	B	Florida	Hillsborough	4.50	19,338	N	1985
Wheelabrator North Andover	B	Massachusetts	Essex	15.00	19,338	N	1985
Wheelabrator North Andover	B	Massachusetts	Essex	15.00	19,338	N	1985
Wheelabrator Millbury Facility	B	Massachusetts	Worcester	20.00	19,338	N	1987
Wheelabrator Millbury Facility	B	Massachusetts	Worcester	20.00	19,338	N	1987
Wheelabrator Saugus	B	Massachusetts	Essex	16.00	19,338	N	1985
Wheelabrator Saugus	B	Massachusetts	Essex	16.00	19,338	N	1985
Wheelabrator Westchester	B	New York	Westchester	17.00	19,338	N	1984
Wheelabrator Westchester	B	New York	Westchester	17.00	19,338	N	1984
Wheelabrator Westchester	B	New York	Westchester	17.00	19,338	N	1984
Wheelabrator Bridgeport	B	Connecticut	Fairfield	19.40	19,338	N	1988
Wheelabrator Bridgeport	B	Connecticut	Fairfield	19.40	19,338	N	1988
Wheelabrator Bridgeport	B	Connecticut	Fairfield	19.40	19,338	N	1988
Pinellas County Resource Recovery	B	Florida	Pinellas	17.00	19,338	N	1986
Pinellas County Resource Recovery	B	Florida	Pinellas	20.55	19,338	N	1983
Pinellas County Resource Recovery	B	Florida	Pinellas	20.55	19,338	N	1983
Wheelabrator Gloucester LP	B	New Jersey	Gloucester	6.00	19,338	N	1990
Wheelabrator Gloucester LP	B	New Jersey	Gloucester	6.00	19,338	N	1990
Wheelabrator Spokane	B	Washington	Spokane	11.35	19,338	N	1991
Wheelabrator Spokane	B	Washington	Spokane	11.35	19,338	N	1991
Wheelabrator South Broward	B	Florida	Broward	19.30	19,338	N	1991
Wheelabrator South Broward	B	Florida	Broward	19.30	19,338	N	1991
Wheelabrator South Broward	B	Florida	Broward	19.30	19,338	N	1991
Oswego County Energy Recovery	G	New York	Oswego	1.67	19,338	Y	1986
Oswego County Energy Recovery	G	New York	Oswego	1.67	19,338	Y	1986
Union County Resource Recovery	B	New Jersey	Union	12.50	19,338	N	1994
Union County Resource Recovery	B	New Jersey	Union	12.50	19,338	N	1994
Union County Resource Recovery	B	New Jersey	Union	12.50	19,338	N	1994
MacArthur Waste to Energy Facility	B	New York	Suffolk	5.50	19,338	N	1990
MacArthur Waste to Energy Facility	B	New York	Suffolk	5.50	19,338	N	1990
Lee County Solid Waste Energy	G	Florida	Lee	16.00	19,338	N	2007
Lee County Solid Waste Energy	B	Florida	Lee	19.50	19,338	N	1994
Lee County Solid Waste Energy	B	Florida	Lee	19.50	19,338	N	1994
Wheelabrator North Broward	B	Florida	Broward	18.67	19,338	N	1991
Wheelabrator North Broward	B	Florida	Broward	18.67	19,338	N	1991
Wheelabrator North Broward	B	Florida	Broward	18.67	19,338	N	1991
Montenay Montgomery LP	B	Pennsylvania	Montgomery	14.00	19,338	N	1991
Montenay Montgomery LP	B	Pennsylvania	Montgomery	14.00	19,338	N	1991

Continued on next page

Current Municipal Solid Waste Power Plants
(Continued)

Plant Name	Boiler/Generator/Committed Unit	State Name	County	Capacity MW	Heat Rate (Btu/kWh)	Cogeneration	On-line Year
Wheelabrator Falls	B	Pennsylvania	Bucks	24.05	19,338	N	1994
Wheelabrator Falls	B	Pennsylvania	Bucks	24.05	19,338	N	1994
Wheelabrator Lisbon	B	Connecticut	New London	6.50	19,338	N	1995
Wheelabrator Lisbon	B	Connecticut	New London	6.50	19,338	N	1995
Covanta Mid-Connecticut Energy	B	Connecticut	Hartford	18.69	19,338	N	1987
Covanta Mid-Connecticut Energy	B	Connecticut	Hartford	18.69	19,338	N	1987
Covanta Mid-Connecticut Energy	B	Connecticut	Hartford	18.69	19,338	N	1987
SPSA Waste To Energy Power Plant	B	Virginia	Portsmouth (city)	11.63	19,338	Y	1987
SPSA Waste To Energy Power Plant	B	Virginia	Portsmouth (city)	11.63	19,338	Y	1987
SPSA Waste To Energy Power Plant	B	Virginia	Portsmouth (city)	11.63	19,338	Y	1987
SPSA Waste To Energy Power Plant	B	Virginia	Portsmouth (city)	11.63	19,338	Y	1987
Perham Incinerator	G	Minnesota	Otter Tail	1.24	19,338	Y	2003
MRO_MN_Municipal Solid Waste	C	Minnesota	NA	5.00	19,338	N	2011

Source:
National Electric Energy System (NEEDS) Database for IPM 2010.
http://epa.gov/airmarkets/progsregs/epa-ipm/BaseCasev410.html

Green Pricing Programs, which allow consumers to purchase electricity generated from renewable resources, had more than one million customers in 2009. Ninety-four percent of those were residential customers.

Net metering allows customers to sell any excess power generated over their load requirement back to the distributor to offset consumption. As with green pricing, most of the net metering customers were residential (91%).

Section: BIOPOWER
Green Pricing and Net Metering Customers, 2002 - 2009

	Green Pricing			Net Metering		
Year	**Residential**	**Non Residential**	**Total**	**Residential**	**Non Residential**	**Total**
2002	688,069	23,481	711,550	3,559	913	4,472
2003	819,579	57,547	877,126	5,870	943	6,813
2004	864,794	63,539	928,333	14,114	1,712	15,826
2005	871,774	70,998	942,772	19,244	1,902	21,146
2006	606,919	35,937	642,856	30,689	2,930	33,619
2007	773,391	62,260	835,651	44,886	3,943	48,829
2008	918,284	64,711	982,995	64,400	5,609	70,009
2009	1,058,185	65,593	1,123,778	88,222	8,284	96,506

Source:
U.S. Department of Energy, Energy Information Administration, *Electric Power Annual 2009*, Washington, D.C., 2009.

Section: BIOPOWER
Capacity Additions and Retirements by Energy Source, 2009

Energy Source	Generator Addition				Generator Retirements			
	Number of Generators	Generator Nameplate Capacity	Net Summer Capacity	Net Winter Capacity	Number of Generators	Generator Nameplate Capacity	Net Summer Capacity	Net Winter Capacity
		megawatts				megawatts		
Coal	13	2,021	1,793	1,793	12	537	529	528
Petroleum	25	93	48	83	41	623	540	567
Natural Gas	76	10,760	9,403	10,170	79	5,940	5,634	5,657
Other Gases[a]	--	--	--	--	3	51	46	46
Hydroelectric Conventional	8	26	26	26	5	14	3	4
Wind	120	9,581	9,410	9,443	1	2	2	2
Solar Thermal & Photovoltaic	20	88	82	80	--	--	--	--
Wood and Wood Derived Fuels[b]	3	99	89	89	4	22	21	21
Geothermal	13	199	164	193	14	21	9	14
Other Biomass[c]	104	278	264	261	13	39	32	32
Total	**382**	**23,144**	**21,279**	**22,138**	**172**	**7,249**	**6,815**	**6,870**

Source:
U.S. Department of Energy, Energy Information Administration, *Electric Power Annual 2009* , Washington, D.C., 2009.

[a] Blast furnace gas, propane gas, and other manufactured and waste gases derived from fossil fuels.
[b] Wood/wood waste solids (including paper pellets, railroad ties, utility poles, wood chips, bark and wood waste solids), wood waste liquids (red liquor, sludge wood, spent sulfite liquor, and other wood-based liquids) and black liquor.
[c] Municipal solid waste, landfill gas, sludge waste, agricultural byproducts, other biomass solids, other biomass liquids, and other biomass gases (including digester gases, methane, and other biomass gases).

Note:
Capacity by energy source is based on the capacity associated with the energy source reported as the most predominant (primary) one, where more than one energy source is associated with a generator.

Section: BIOPOWER
Coal Displacement Calculation, 2010

Conversion Formula:	*Step 1*	*Capacity (A) x Capacity Factor (B) x Annual Hours (C) = Annual Electricity Generation (D)*
	Step 2	*Annual Electricity Generation (D) x Conversion Efficiency (E) = Total Output (F)*
	Step 3	*Total Output (F) / Fuel Heat Rate (G) = Quantity Fuel (H)*

Technology	Wind	Geothermal	Biomass	Hydropower	PV	Solar Thermal
(A) Capacity (kW)	37,870,000	2,410,000	7,560,000	77,570,000	2,340,000	610,000
(B) Capacity Factor (%)	36.0%	90.0%	80.0%	44.2%	22.5%	24.4%
(C) Annual Hours	8,760	8,760	8,760	8,760	8,760	8,760
(D) Annual Electricity Generation (kWh)	119,426,832,000	19,000,440,000	52,980,480,000	300,301,647,108	4,612,140,000	1,303,838,400
(E) Conversion Efficiency (Btu/kWh)	9,854	9,854	9,854	9,854	9,854	9,854
(F) Total Output (Million Btu)	1,176,832,003	187,230,336	522,069,650	2,959,172,431	45,448,028	12,848,024
(G) Coal Heat Rate (Btu per short ton)	19,933,000	19,933,000	19,933,000	19,933,000	19,933,000	19,933,000
(H) Coal (short tons)	59,039,382	9,392,983	26,191,223	148,455,949	2,280,040	644,560

Sources: Capacity, EIA, Annual Energy Outlook 2011, DOE/EIA-0383 (2011) Washington, D.C., April 26, 2011, Summary Case Table 16.
Capacity Factor: National Renewable Energy Laboratory, Power Technologies Energy Data Book, Table 12.1,
http://www.nrel.gov/analysis/power_databook/chapter12.html
Annual Hours: National Renewable Energy Laboratory, Power Technologies Energy Data Book, Table 12.1,
http://www.nrel.gov/analysis/power_databook/chapter12.html
Conversion Efficiency: EIA, Annual Energy Review 2009, DOE/EIA-0384 (2009), Washington, D.C., August 19, 2010, Table A6.
Heat Rate: Annual Energy Outlook 2011, DOE/EIA-0383 (2011), Washington, D.C., April 2011, Table G1.

Section: BIOPOWER

Renewable Energy Impacts Calculation, 2010

Conversion Formula:	*Step 1*	*Capacity (A) x Capacity Factor (B) x Annual Hours (C) = Annual Electricity Generation (D)*
	Step 2	*Annual Electricity Generation (D) x Competing Heat Rate (E) = Annual Output (F)*
	Step 3	*Annual Output (F) x Emissions Coefficient (G) = Annual Emissions Displaced (H)*

Technology	Wind	Geothermal	Biomass	Hydropower	PV	Solar Thermal
(A) Capacity (kW)	37,870,000	2,410,000	7,560,000	77,570,000	2,340,000	610,000
(B) Capacity Factor (%)	36.0%	90.0%	80.0%	44.2%	22.5%	24.4%
(C) Annual Hours	8,760	8,760	8,760	8,760	8,760	8,760
(D) Annual Electricity Generation (kWh)	119,426,832,000	19,000,440,000	52,980,480,000	300,301,647,108	4,612,140,000	1,303,838,400
(E) Competing Heat Rate (Btu/kWh)	9,854	9,854	9,854	9,854	9,854	9,854
(F) Annual Output (Trillion Btu)	1,176.8	187.2	522.1	2,959.2	45.4	12.8
(G) Carbon Coefficient (MMTCB/Trillion Btu)	0.01783	0.01783	0.01783	0.01783	0.01783	0.01783
(H) Annual Carbon Displaced (MMTC)	20.983	3.172	8.328	54.635	0.100	0.128

Sources: Capacity, EIA, Annual Energy Outlook 2011, DOE/EIA-0383 (2011) Washington, D.C., April 26, 2011, Summary Case Table 16.
Capacity Factor: National Renewable Energy Laboratory, Power Technologies Energy Data Book, Table 12.1,
http://www.nrel.gov/analysis/power_databook/chapter12.html
Annual Hours: National Renewable Energy Laboratory, Power Technologies Energy Data Book, Table 12.1,
http://www.nrel.gov/analysis/power_databook/chapter12.html
Competing Heat Rate: EIA, Annual Energy Review 2009, DOE/EIA-0384 (2009), Washington, D.C., August 19, 2010, Table A6.
Carbon Coefficient: DOE, GPRA2003 Data Call, Appendix B, page B-16, 2003.

Section: BIOPOWER
Number of Home Electricity Needs Met Calculation, 2010

Conversion Formula: *Step 1* *Capacity (A) x Capacity Factor (B) x Annual Hours (C) = Annual Electricity Generation (D)*
Step 2 *Annual Electricity Generation (D) / Average Consumption (E) = Number of Households (F)*

Technology	Wind	Geothermal	Biomass	Hydropower	PV	Solar Thermal
(A) Capacity (kW)	37,870,000	2,410,000	7,560,000	77,570,000	2,340,000	610,000
(B) Capacity Factor (%)	36.0%	90.0%	80.0%	44.2%	22.5%	24.4%
(C) Annual Hours	8,760	8,760	8,760	8,760	8,760	8,760
(D) Annual Electricity Generation (kWh)	119,426,832,000	19,000,440,000	52,980,480,000	300,301,647,108	4,612,140,000	1,303,838,400
(E) Average Annual Household Electricity Consumption (kWh)	12,696	12,696	12,696	12,696	12,696	12,696
(F) Number of Households	9,406,857	1,496,602	4,173,097	23,653,769	363,283	102,699

Source:
Sources: Capacity, EIA, Annual Energy Outlook 2011, DOE/EIA-0383 (2011) Washington, D.C., April 26, 2011, Summary Case Table 16.
Capacity Factor: National Renewable Energy Laboratory, Power Technologies Energy Data Book, Table 12.1, http://www.nrel.gov/analysis/power_databook/chapter12.html
Annual Hours: National Renewable Energy Laboratory, Power Technologies Energy Data Book, Table 12.1, http://www.nrel.gov/analysis/power_databook/chapter12.html
Household Electricity Consumption: Annual Energy Outlook 2011, DOE/EIA-0383 (2011) Washington, D.C., April 26, 2011, Summary/Reference Case Table 4.