

## Biomass

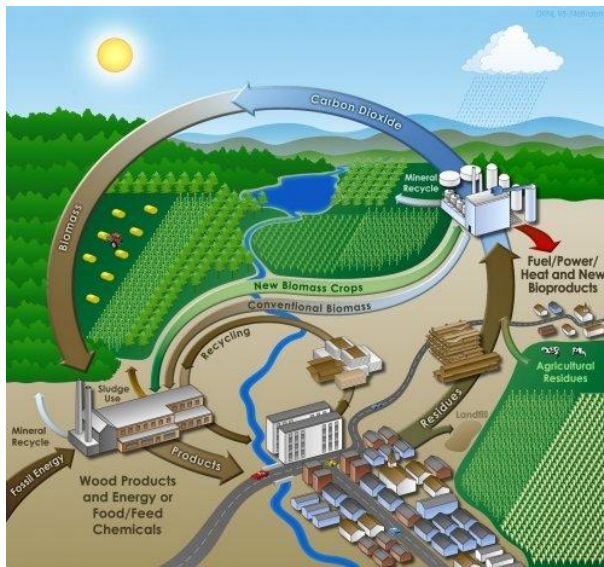
Essentially involves the combustion of organic matter to produce energy either directly as heating for cooking or heating for homes, but can also be used to produce electricity.

-Biomass can be burned to heat water which generates steam, and the steam turns the blades of a turbine thus producing electricity.

-Biomass can be a way to reduce our reliance on foreign oil, and increase our energy independence because it can be used to produce biofuels. This should be understood that this is only effective on the small scale level as the US subsidy program for corn ethanol has been revoked due to the lack of success and the huge land requirement.

-Can be used to support agriculture and the timber industries. This should only be utilized in a sustainable manner and in a way to reduce our greenhouse gas emissions and still protect the forests and wooded areas.

- Modern biomass boilers operate at extremely high temperatures and are highly efficient systems to where there is often little visible smoke and few odors.








Biomass systems are often referred to as a closed carbon system because as the figure shows there is often no net loss or gain of carbon through the cycle due to energy transformation processes.

<http://alternativeenergyatunc.wordpress.com/category/biomass/>

### Forms of Biomass:

1. Wood/plant materials
2. Agricultural wastes
3. Animal wastes
4. Municipal Solid Waste (MSW)

Types of Biomass	
	Wood fuel
	Rubbish
	Alcohol fuels
	Crops
	Landfill gas

<http://200403110.edu.glogster.com/biomass/>

Wood/ plant materials- the most prevalent example, where wood is the most common fuel source but can also include saw dust, wood chips, and algae. This form of energy utilization is considered renewable because trees can be replanted, and more importantly this form of biomass is considered carbon neutral.

Carbon neutral- the combustion process results in a net zero release of  $CO_2$  into the atmosphere. As a tree grows it sequesters  $CO_2$  from the atmosphere to be used during photosynthesis. The tree is thus serving as a carbon sink, or a storage center for  $CO_2$ . When the trees wood is burned then all of the  $CO_2$  the tree had sequestered is returned to the atmosphere which is carbon neutrality.

Agricultural Products/Wastes- the most common forms are sugar cane and corn, which can be used for ethanol, an octane enhancer for gasoline. Soy beans and sunflowers contain oily seeds which can be used to create diesel fuel. The residues can also be burned in the same way as wood would be utilized. Other examples include straw, and grass clippings.

Animal wastes- involves the use of animal manure that is often used in anaerobic digesters. These digesters can produce biogas (mostly methane) that can be combusted or used as a synthetic natural gas for heating and cooling. These wastes can also be dried and burned for heat but also for electricity generation using steam power turbines.

Municipal Solid Waste (MSW)- is used in the same ways as animal wastes but is used on larger scales, and is used for utility scale electricity generation in some places. MSW involves the incineration of trash and other human materials. This can be an effective way to reduce the volume of landfills while generating electricity and producing synthetic natural gas.

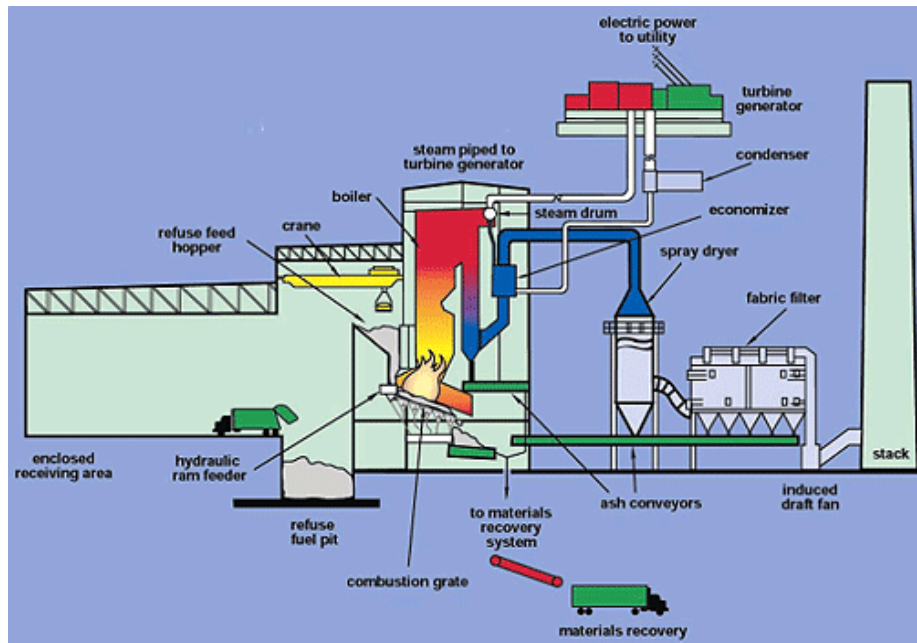


Figure depicting a waste to energy system as a MSW site. In this way the waste that we generate can be used as a source of electricity with a nearly limitless supply.

<http://www.pinellascounty.org/utilities/wte-diagrams.htm>

It is important to remember that the combustion processes of animal wastes and MSW does produce emissions that are harmful to the atmosphere and other harmful chemicals can be released especially when plastics and other materials are burned. This form of energy generation should not be the first choice of local governments or municipalities but does serve as a potential solution for the issue of overcrowding and other landfill problems where energy from waste systems can be put in place to reduce the volume of materials in the landfills and also generate electricity.

The two main factors to consider before deciding to utilize a biomass resource:

Availability- are there abundant resources present to provide the energy to sustain your needs?

Transportability- how far does the resource have to travel before it reaches its final destination, to use this resource sustainably you would want a short transportation distance to reduce energy costs and the increased emissions from transportation?

#### Biomass Incentive Programs:

Federal:

USDA Rural Energy for America Program (REAP) Loan Guarantees

-provides grants for up to 25% of the capital cost of the proposed project or less than \$25 million.

Residential Energy Efficiency Tax Credit

-\$300 for using a biomass system for heating/ cooling that uses plant materials from a renewable source.

Federal Renewable Energy Production Tax Credit (PTC)- \$0.02/ KWh for closed loop biomass. For the first 10 years of operation. Minimum capacity of 150 KW.

Provisions included for biomass in the American Recovery and Reinvestment Act (ARA) 2010

New York State:

Property tax incentive- 100% exemption from an increase in property taxes for employing a biomass system for 15 years. Specifically for farm waste systems that generate electricity using biogas formed during anaerobic digestion of animal wastes up to 400KW.

Not valid in:

Corning Painted Post School District

Avoca School District

Wayland Town and School District

Cohocton Town and School District

Residential Wood Fuel Heating Exemption:

-100% state sales tax exemption on wood used for heating. Also allows for local exemption as well.

NYSERDA Anaerobic Digester Gas-Electricity Performance and Rebate System:

Capital incentive- up to \$1000/KW or 50% of the capital cost to install the system.

Performance incentive- \$0.10/kwh of electricity produced for up to 3 years using a 70% capacity system.

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Information gathered from:

[www.dsireusa.org](http://www.dsireusa.org)

<http://www.nycwatershed.org/pdfs/Biomass%20Fact%20Sheet.pdf>

Boyle, Godfrey. Renewable Energy: Power for a Sustainable Future. Oxford Press. 2004

[http://www.nrel.gov/learning/re\\_biomass.html](http://www.nrel.gov/learning/re_biomass.html)

