



Florida Organics Recycling Workshop

ANAEROBIC DIGESTION

Patrick Serfass, Executive Director
January 24, 2017

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Organic Waste Systems



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American Biogas Council: The Voice of the US Biogas Industry

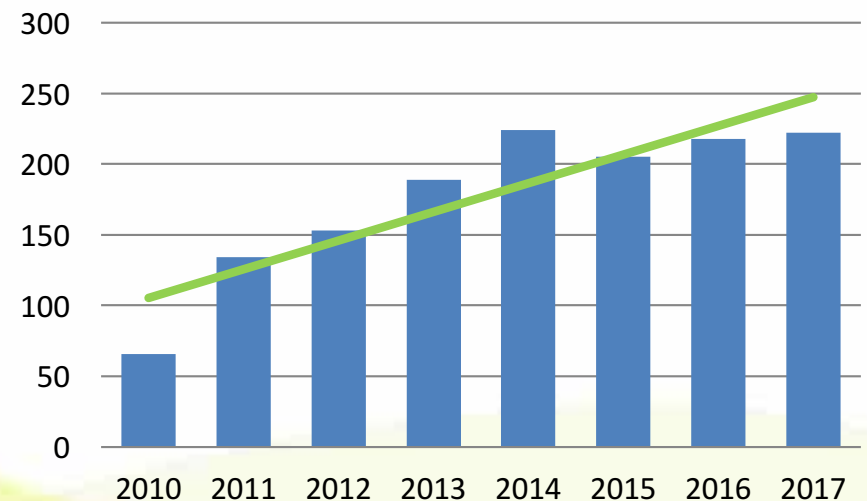
- The **only** U.S. organization representing the biogas and anaerobic digestion industry
- **Over 200+ Organizations** from the U.S., Germany, Italy, Canada, Sweden, Belgium and the UK

- **All Industry Sectors Represented:**

- project developers/owners
- anaerobic digestion designers
- equipment dealers
- waste managers
- waste water companies
- farms
- utilities
- consultants and EPCs
- financiers, accountants, lawyers and engineers
- Non-profits, universities and government agencies

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ABC Membership





Organic material is delivered to the digester system

This may include animal manure, food scraps, agricultural residues, or wastewater solids.

Digested material may be returned for livestock, agricultural and gardening uses.



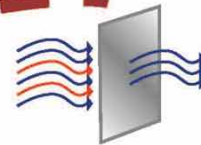
Organic material is broken down in a digester

The digester uses a natural biological process under controlled conditions to break down organic material into products for beneficial use or disposal.

Some biogas can be used to heat the digester.

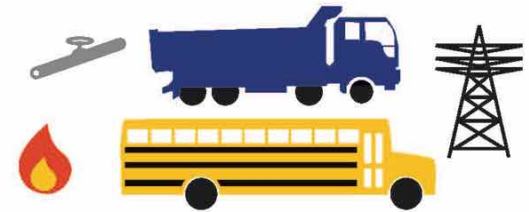
BIOGAS

DIGESTED MATERIAL



Raw biogas is processed

Typically, water, carbon dioxide and other trace compounds are removed, depending on the end use, leaving mostly methane.



Processed biogas is distributed and used

The gas may be used to produce heat, electricity, vehicle fuel or injected into natural gas pipelines.

SOLIDS

LIQUIDS



Digested material is processed and distributed

Solids and liquids from the digester may be used to produce marketable products, like fertilizer, compost, soil amendments or animal bedding.

organic material

Organic materials are the "input" or "feedstock" for a biogas system. Some organic materials will digest more readily than others. Restaurant fats, oils and grease; animal manures; wastewater solids; food scraps; and by-products from food and beverage production are some of the most commonly-digested materials. A single anaerobic digester may be built for a single material or a combination of them.

the digester

An anaerobic digester is one or more airtight tanks that can be equipped for mixing and warming organic material. Naturally occurring microorganisms thrive in the zero-oxygen environment and break down (digest) organic matter into usable products such as biogas and digested materials. The system will continuously produce biogas and digested material as long as the supply of organic material is continuous, and the microorganisms inside the system are healthy.

biogas processing

Biogas is mostly methane, the primary component of natural gas, and carbon dioxide, plus water vapor, and other trace compounds (e.g. siloxanes and hydrogen sulfide). Biogas can replace natural gas in almost any application, but first it must be processed to remove non-methane compounds. The level of processing varies depending on the final application.

biogas distribution

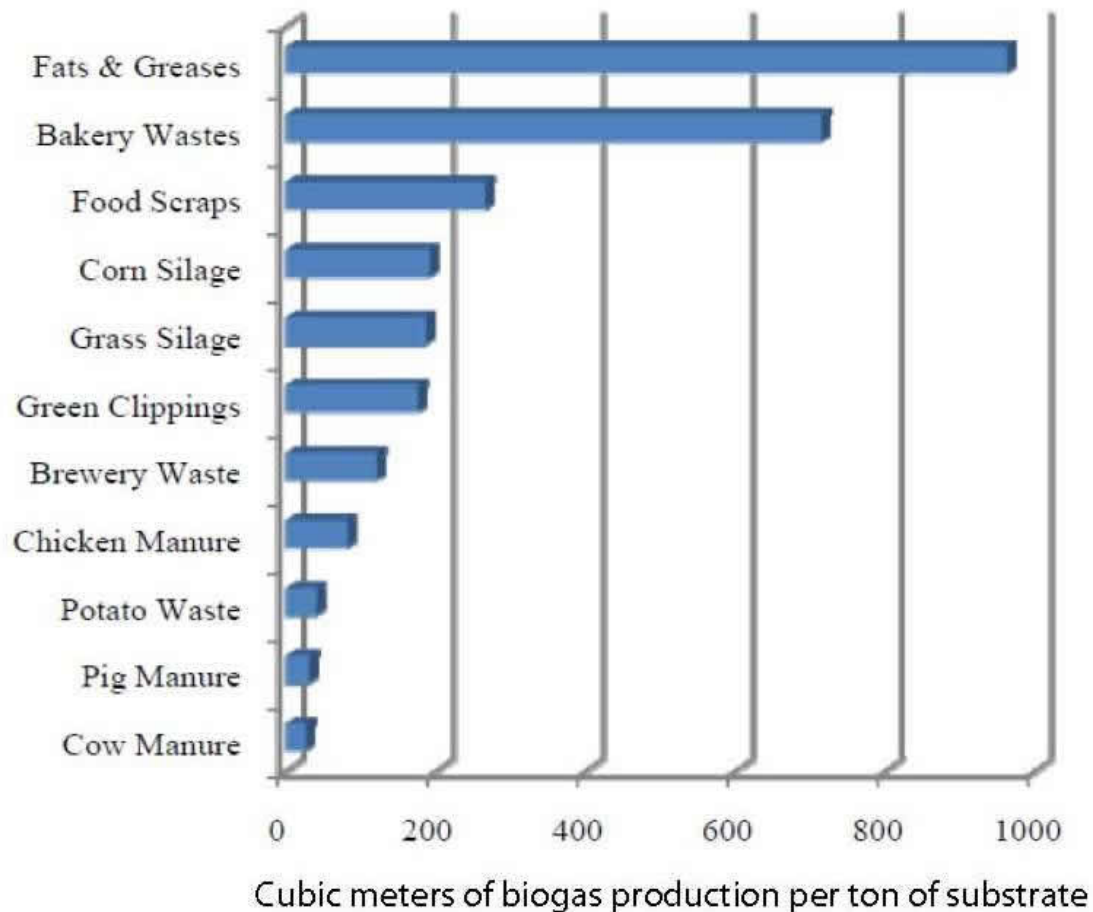
Processed biogas, often called "biomethane" or "renewable natural gas," can be used the same way you use fossil natural gas: to produce heat, electricity, or vehicle fuel, or to inject into natural gas pipelines. The decision to choose one use over another is largely driven by local markets.

digested material

In addition to biogas, digesters produce solid and liquid digested material, containing valuable nutrients (nitrogen, phosphorus and potassium) and organic carbon. Typically, raw digested material, or "digestate," is processed into a wide variety of products like fertilizer, compost, soil amendments, or animal bedding, depending on the initial feedstock and local markets. These "co-products" can be sold to agricultural, commercial and industrial customers.

http://www.americanbiogasCouncil.org/biogas_SystemsWork.asp

What wastes are BEST for making biogas?



35x manure

25x manure

10x manure

Food Waste



Energy (gas)



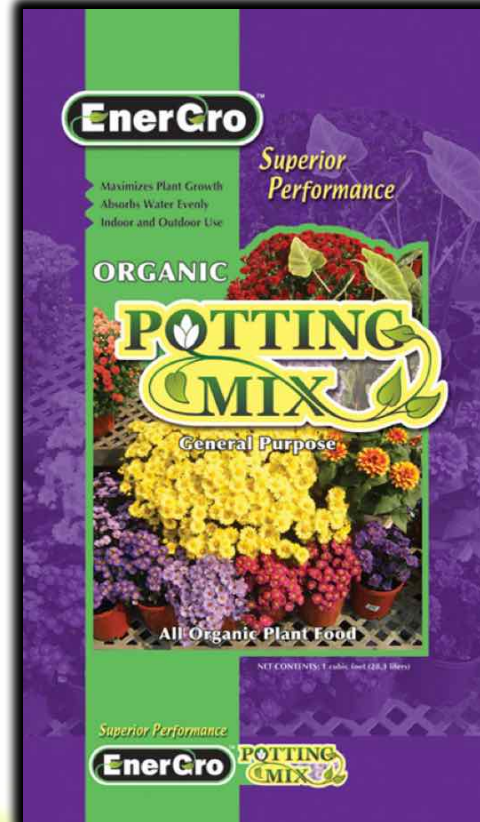
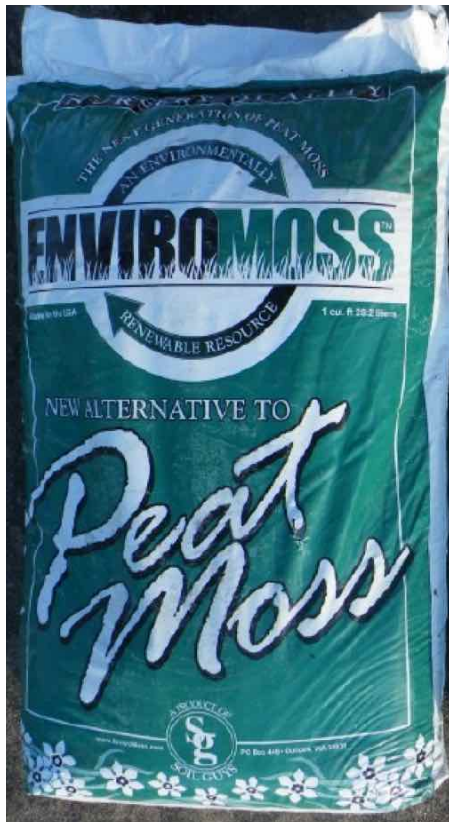
Heat



Digestate (liquid+solids)



Digestate Products





LA County, NYC, Boston

LA County Sanitation +
+PPP between LA County
Sanitation District and
Waste Management
+CORE System turns 85
TPD of food waste into a
slurry at transfer station
+Delivered to WRRF
+Running in LA since Feb
2014
+Interim results reported
at WEFTEC 2015
+Now piloted with NYC
Dept of Sanitation and
Dept of Environmental
Protection
+Soon to be used in
Boston.





Microdigester

Fremont Brewery, WA
+HORSE AD 25 (High-solids Organic-waste Recycling System with Electrical Output)
+24 tons/year (135 lbs/day)
+Containerized, 160 sqft, arrives built, needs water and power connection
+Produces 4kW elec., steam
+Base model ~\$100,000
+Ships 3 months after order



Food Waste (OR)

Junction City, Oregon

- +first food waste biogas system in NW US
- +25,000 tons/year
- +1.6 MW electricity + CHP
- +Can power half the homes in Junction City
- +Digested Material: sold as liquid and solid fertilizer products



Food Waste (CA)

Sacramento, CA

+Awarded International
Bioenergy Project of the
Year (2013)

+40,000 tons/year of food
waste

+700,000/year diesel
gallon equivalents of
renewable CNG

+fueling Atlas waste
haulers and city vehicles



Food Waste + Biosolids (FL)

Harvest Energy Garden

+130,000 tons per year of biosolids, fats, oils, grease, and food waste—mostly from Walt Disney Resorts and hotels
+3.2 MW of installed power generation
+2.2 MW of recoverable heat
+Digested material: class AA granular fertilizer and phosphorous-rich Struvite sold as a fertilizer additive



Food + Yard Waste (CA)

Zero Waste Energy

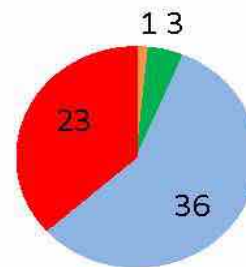
- +San Jose, CA
- +90,000 tons/year
- +1.6 MW electricity + CHP
- +Digested Material: high quality compost
- +Phase 2 completed
- +Phase 3: Turning residential food waste into biogas for vehicles



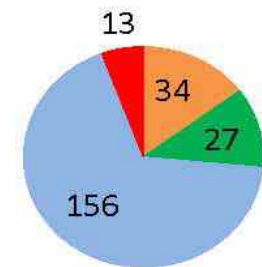
FL Biogas Market

- #6 among U.S. states for methane production potential from biogas sources
- 63 operational biogas systems today
- FL's full biogas potential:
 - 230 additional new biogas systems
 - \$690 million in new capital investments AND
 - 5,750 short-term construction jobs, 460 permanent jobs, and numerous industry-supporting jobs in the supply chain AND
 - Enough electricity to power 47,566 homes (1.3 billion KWh) or enough renewable natural gas to fuel 190,710 vehicles.
 - AND
 - reduce greenhouse gas emissions by the equivalent of 28.6 trillion tons of carbon dioxide, the same as growing 23.6 million tree seedlings for ten years or the 788,229 acres of U.S. American forest sequester each year.

Operational Systems

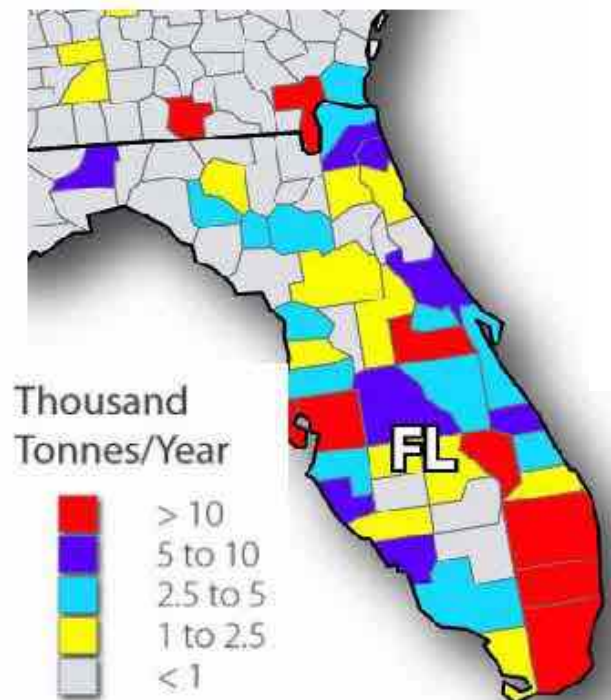


Potential Systems



Food Waste Agriculture Waste Water Landfill

Methane Generation Potential



U.S. Biogas Market – Current and Potential

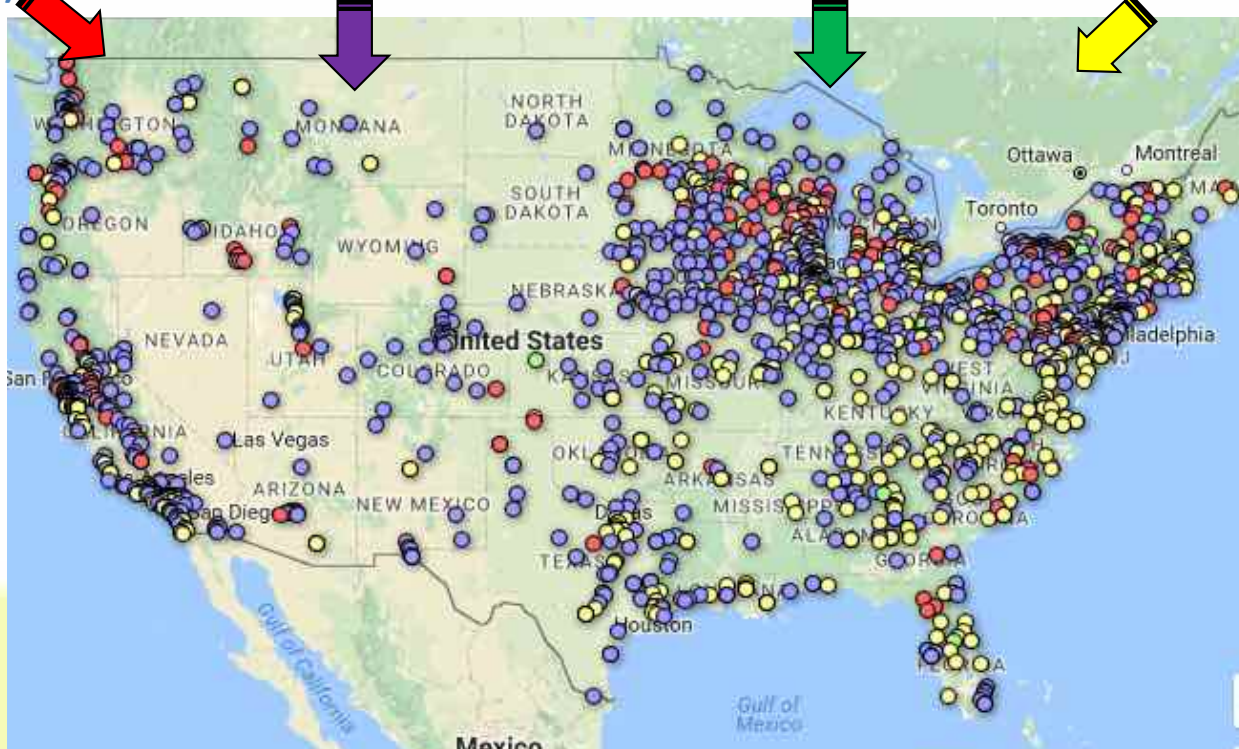
247
on Farm
(dairy, swine only)

1,269
Water
(860 using their biogas)

39
Food Scrap

645
at Landfills

2,200+
Operational
Biogas
Systems



13,500+
Potential
New Biogas
Systems

8,241
on Farm
(dairy, swine only)

3,888
Water
(incl. 380 not using their biogas)

931
Food Scrap

440
at Landfills

6 States + 5 Cities: Food Waste Recycling Policies

Municipalities: San Francisco, Seattle, Austin, Vancouver, New York City, most starting in 2009-10

2011: CT, Public Act 11-217 (updated in 2013)

2012: VT, Universal Recycling Law, Act 148—all organics, largest generators first, effective 7/1/2016

2013

- CT: Public Act 13-285 (update to 2011)—Commercial organics, effective 1/1/14
- NYC: Local Law 146-2013—Commercial organics, effective 7/1/2015

2014

- MA: 310 CMR 19.000 regulations—Commercial organics, effective 10/1/14
- RI: An Act Relating to Health and Safety—Commercial organics, effective 1/1/2016
- CA AB 1826: Mandatory Commercial Food Waste Recycling, effective 1/1/2016

2015

- MN: Statute 115A.151 Public Entities; Commercial Bldgs; Sports Facilities, effective now

2016-17: MD, NJ, NY?

Policies to Help Project Development

- Make permitting and interconnection easier.
Less time to develop = less expensive installations
- Buy the digestate. Revenue for the project, easier to get financing.
- Make long-term feedstock contracts with waste generators easier to obtain by project developers:
- Help project developers sell their gas/energy. Revenue for the project, easier to get financing:
 - FIT (Feed In Tariff)
 - Get gas utilities to buy pipeline quality RNG from new projects and offer local “green gas” to their gas customers



Thank You!

- **Learn More**
 - Sign up for the **FREE Biogas News**
 - www.AmericanBiogasCouncil.org
- **Become a Member**
 - Dues start @ \$75-\$1,900
 - Application online, or contact us

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