



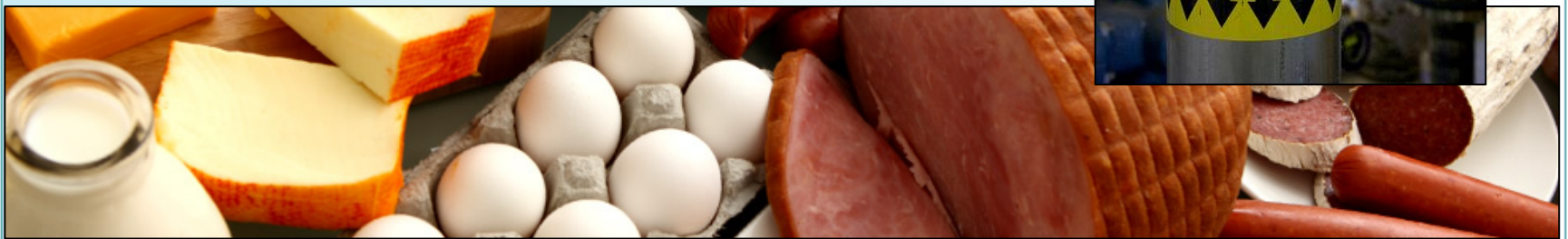
Legislative Symposium on Biogas in Wisconsin
February 15, 2012

Introduction to Biogas in Wisconsin

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About this Symposium

- Background
- End-uses
- WI has an advantage in biogas system development
 - Agriculture By-products
 - Food and Cheese Processing
 - Waste Treatment
 - Manufacturing



About this Symposium: Biogas Benefits in Agriculture

- Nutrient Management Flexibility
- Renewable Energy
- Energy Price Insulator
- New Farm Income
- Farm and Rural Economic Development



About this Symposium: Biogas Benefits in Energy and Manufacturing

SEO's Mission is to invest in Wisconsin by:

- Increasing energy efficiency
- Developing renewable and alternative energy sources
- Promoting energy-related economic development and jobs, and
- Reducing reliance on imported oil

Manages over \$85 million in federal energy related grants and loans including:

- Biogas at a goat cheese plant in Belmont WI
- Small farm biogas digester program
- Biogas compressed natural gas vehicle fueling stations in Janesville and Dane County



What is Biogas?

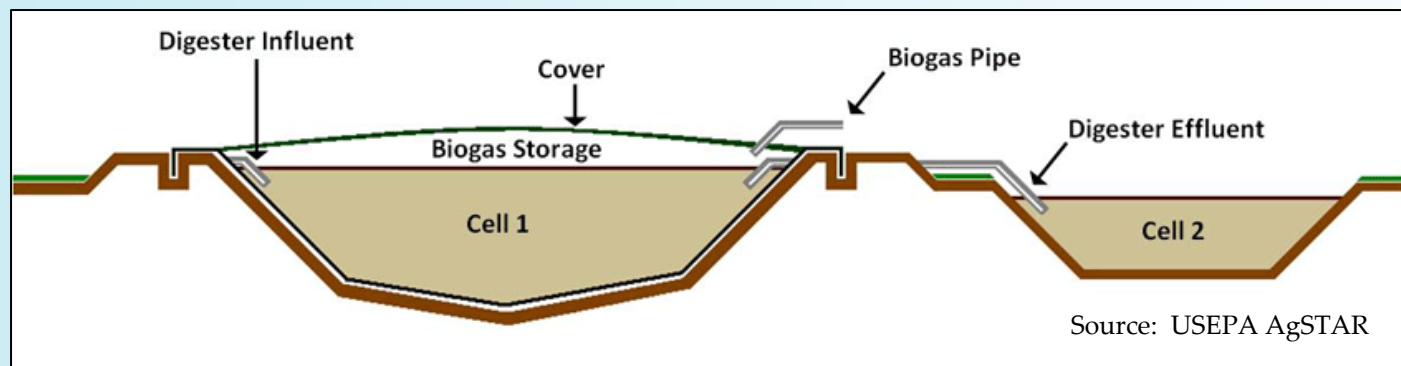
- 65% methane
- Produced by natural bacteria which consume organic material in oxygen –free environments

Anaerobic Digesters: Airtight containers providing an environment for bacteria to consume organic material in the absence of oxygen

- Covered lagoon (example below), in-ground or aboveground vessels



Source: Sergey Zimov in USEPA Methane and Nitrous Oxide from Natural Sources



Source: USEPA AgSTAR

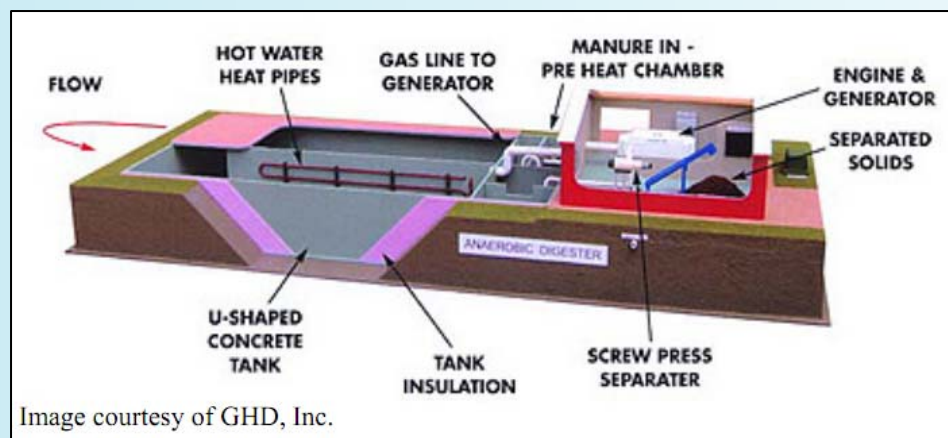
Anaerobic Digesters in Wisconsin

Designs Vary Widely

- Size
- Mixing
- Temperature
- Engineering and Customization to Match Specific Feedstocks



Source: Focus on Energy



Biogas Energy: Versatile

Heat

- Use on-farm/in-plant
- Nearby facilities such as greenhouses, industrial space heating

Electricity

- Competitive, scalable
- **Baseload** renewable power

Cogeneration (electricity + heat)

Vehicle Fuel

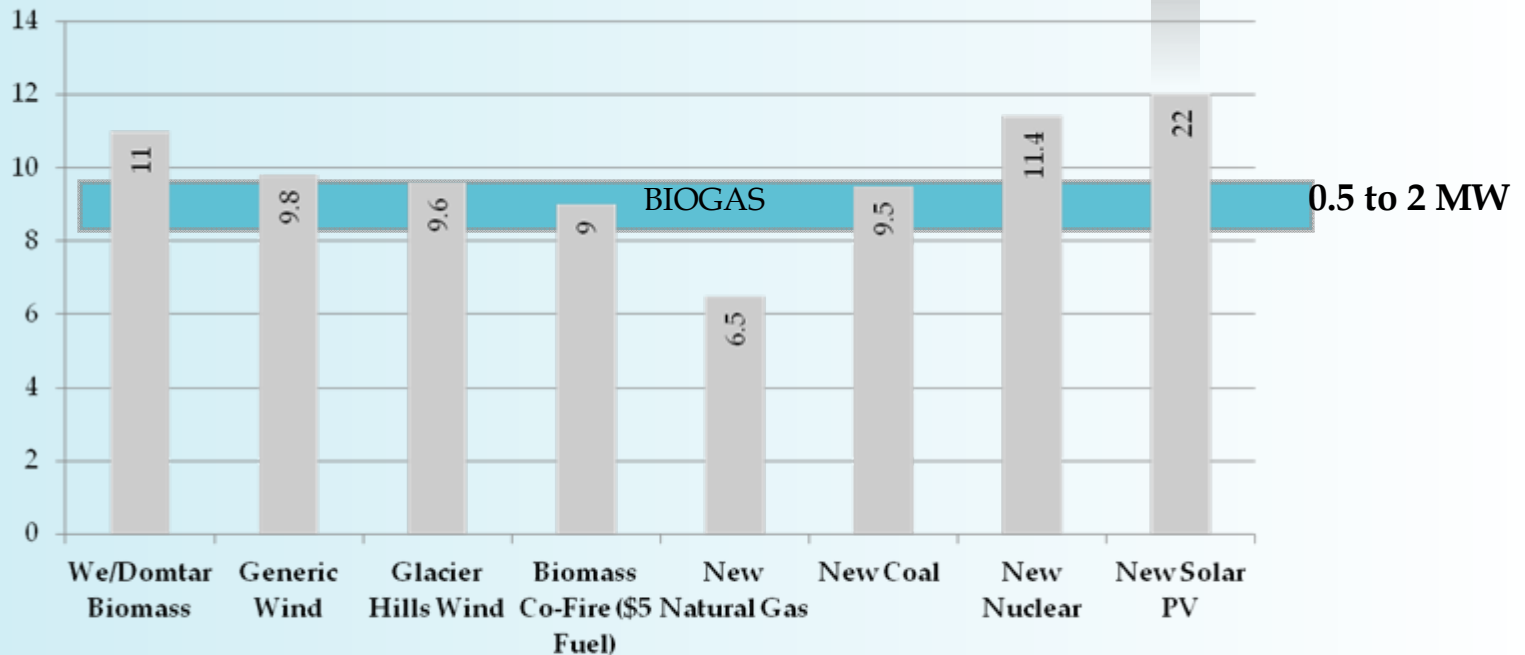
- Compressed for fleet vehicle uses

Renewable Natural Gas



Biogas Energy: Affordable, Scalable

Levelized Cost of Electricity (cents per kWh)



Plant Output: 50 MW 100+ M W 162 MW 5-50 MW 540 MW 1,300 MW 2,200 MW 150 MW

Sources:

- PSC Docket 6630-CE-305 Exhibit 13.3 (Generic Wind, Glacier Hills, Biomass Co-Fire, 10/2010)
http://psc.wi.gov/apps35/ERF_view/viewdoc.aspx?docid=140444
- EIA Energy Outlook 2011 (New Natural Gas, New Coal, New Nuclear, New Solar PV, 4/2011)
http://www.eia.gov/forecasts/aeo/electricity_generation.cfm

Note: We/Domtar Biomass cost based comments by Commissioner Callisto on revised capital cost division of 5/2011 (original estimate from Exhibit 13.3 was 12.3). Not all assumptions in the calculations of levelized costs between the PSC and EIA are identical. One MW of baseload power can meet the electrical needs of approximately 1,000 typical homes.

Wisconsin's Biogas Advantages

Feedstocks

- #1 Cheese State
- Large dairy, food processing and forestry industries, #1 in paper output

Support Infrastructure

- Top manufacturing state
- Major hub of water research and industry
- Many agricultural coops, aggregators

Energy Security

- WI has no fossil fuels
- Currently spends ~\$18 Billion on energy imports



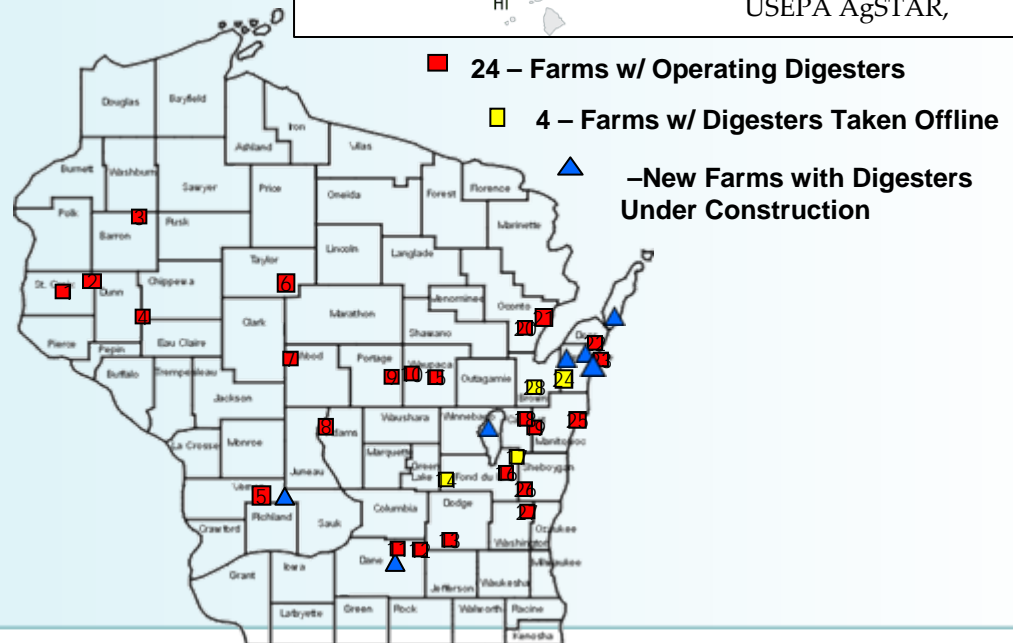
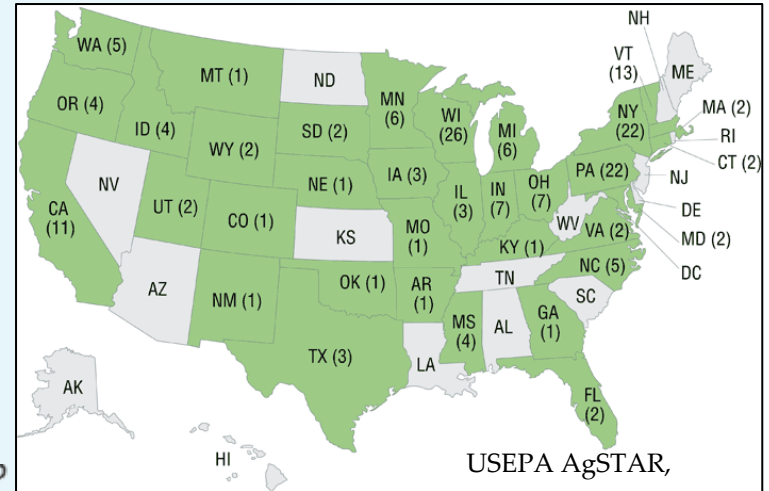
Cheese and Meat Packing are Major Wisconsin Industries (and identities) and Excellent Applications for Biogas Energy Production

Anaerobic Digesters in Wisconsin

WI leads the U.S. in on-farm digesters

WI is one of the top states for:

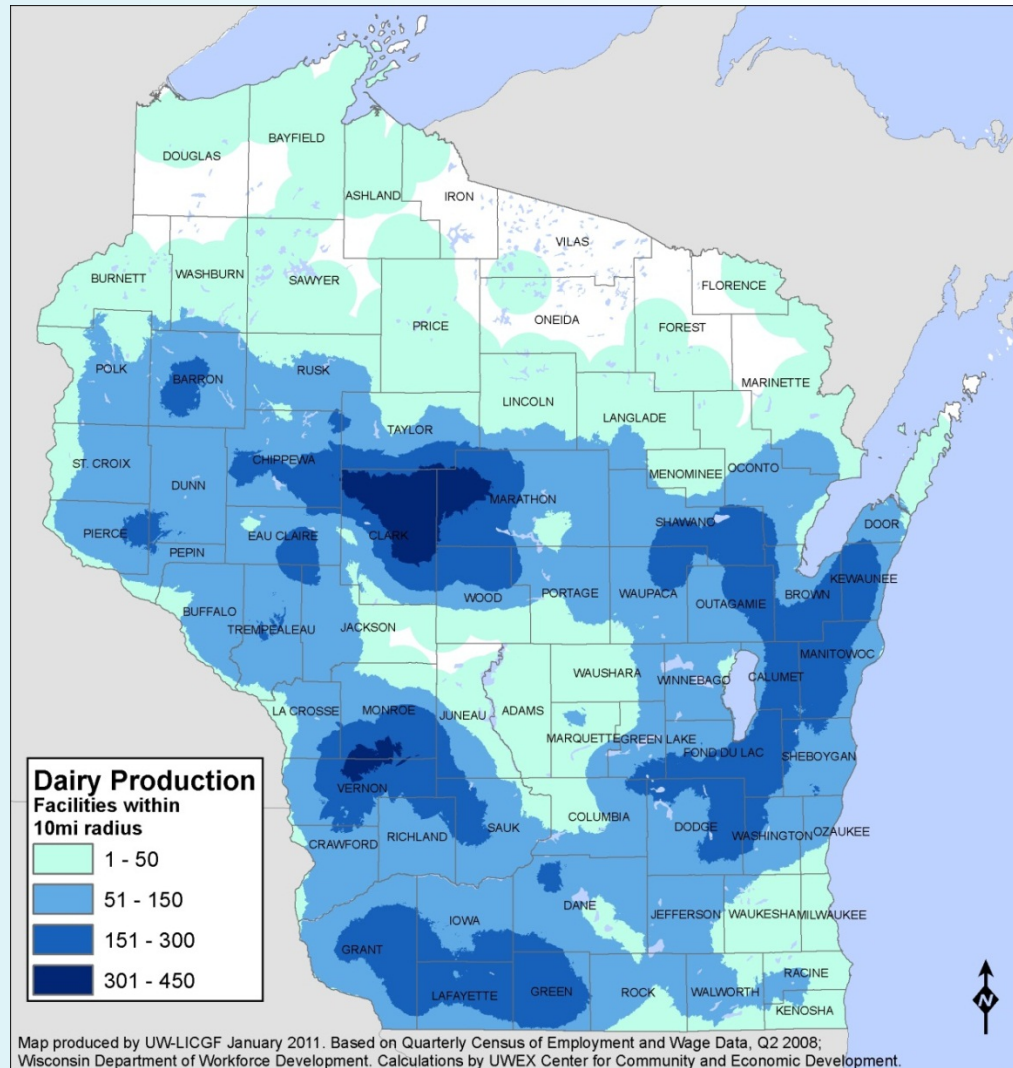
- food waste anaerobic digesters,
- wastewater treatment biogas systems and
- landfill gas to energy projects



Feedstocks and Opportunities

Agriculture

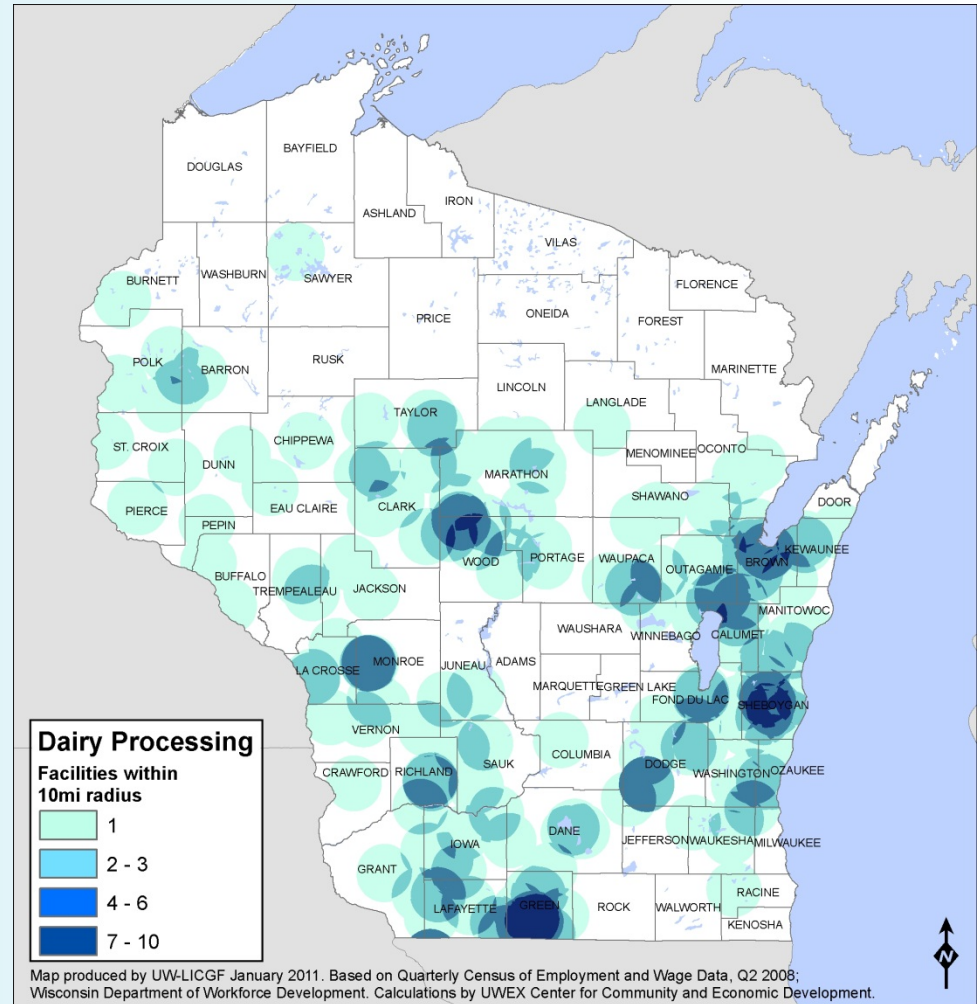
- Manure
 - Pork
 - Poultry
 - Cattle
- Crops and Wastes
 - Corn Silage,
 - Hay Silage,
 - Spoiled Feed, etc.



Feedstocks and Opportunities

Food Processing

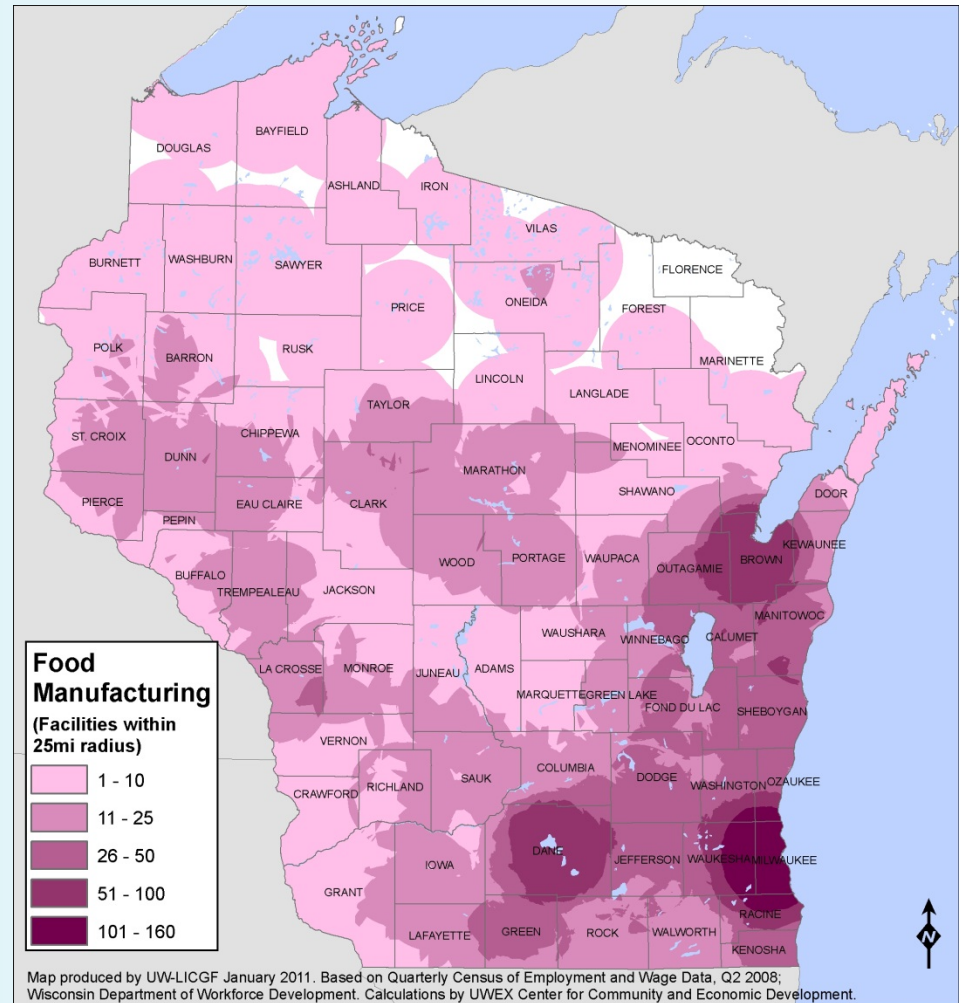
- High strength waste water produced by
 - Canning Facilities
 - Dairy Processors
 - Meat Packing and Slaughtering Plants



Feedstocks and Opportunities

Food Processing

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Feedstocks and Opportunities

Wastewater Treatment Plants & Landfills

- Many existing AD systems flare the gas
- Newer energy technologies are being deployed at smaller and older landfills

Emerging Markets

- Grocery & Cafeteria Food Waste
- Small Scale



Biogas Drives Economic Growth in WI

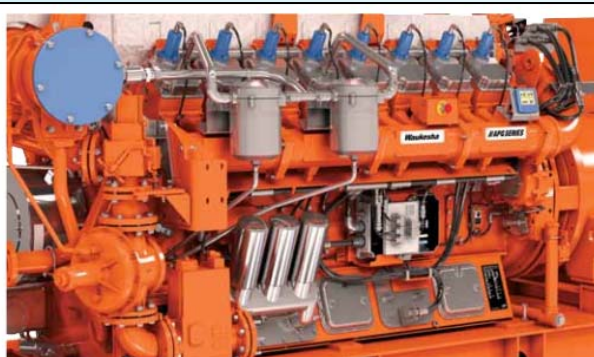
Biogas Developers of All Sizes

Expanding Manufacturing in Core Industries

- Steel vessels and piping
- Gas engines and compressors
- Electrical controls and fueling systems

Biogas fuel system

- Ease of use
- Simple fuel system - one electronic device. Eliminates complicated adjustment and set-up procedures. Simple HMI input and display screen.
- Increased availability by improving spark plug life, reducing and simplifying system components
- Minimized manual intervention during BTU variation from gas source



**Rockwell
Automation**



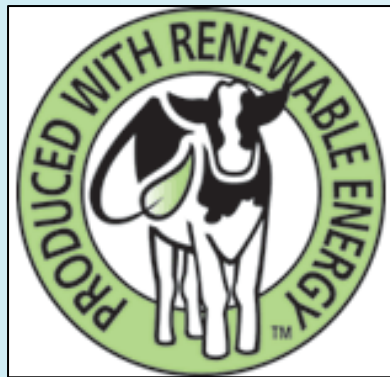
SIEMENS



**Example manufacturers in the
biogas supply chain**
(see biogas business handout)

About this Symposium

Wisconsin is a national leader in the growing
biogas opportunity



Examples of Biogas Energy Marketing
Sources: www.cravecheese.com www.fortisbc.com

Thank You