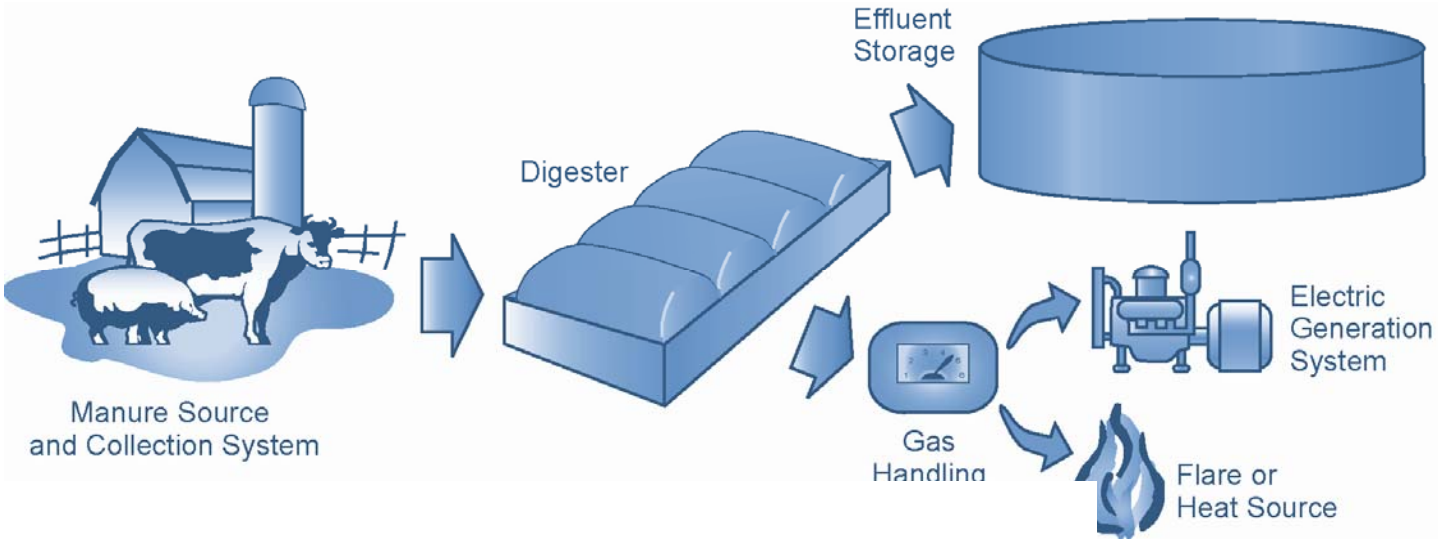
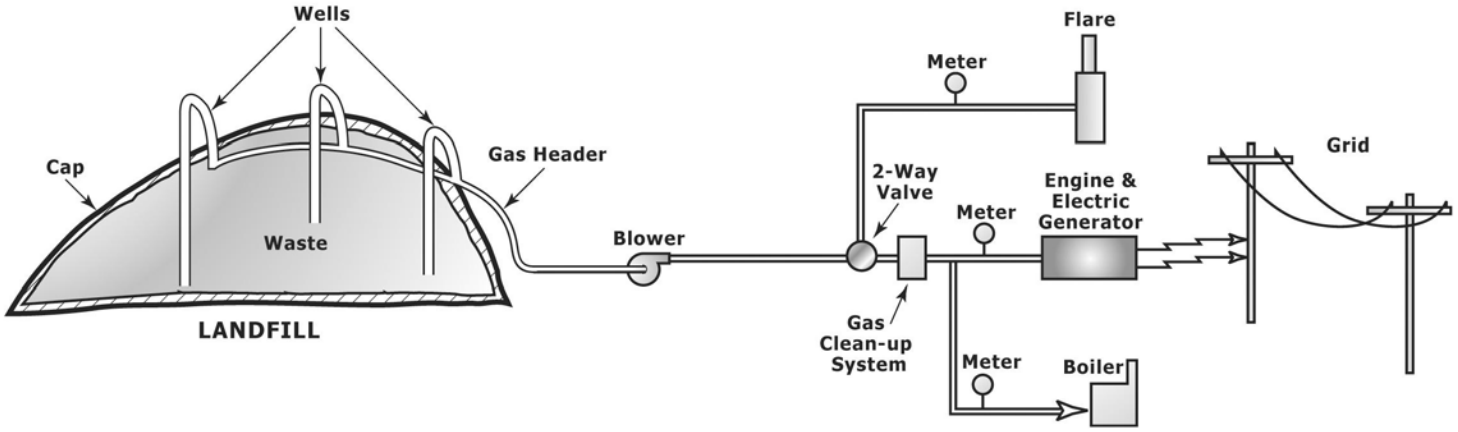
Renewable Biogas: Environmental Protection and Energy Independence

Chris Voell

Environmental Protection Agency

Renewable Biogas
(Methane Capture and Use)

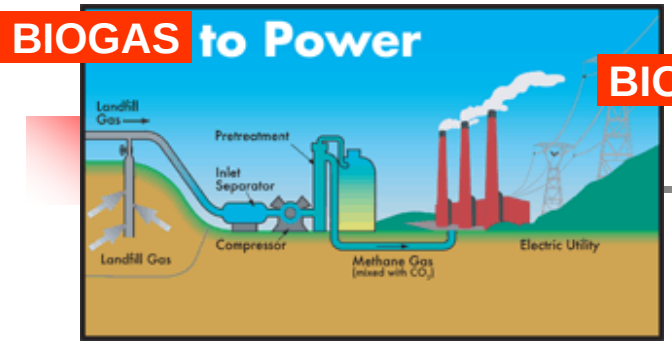


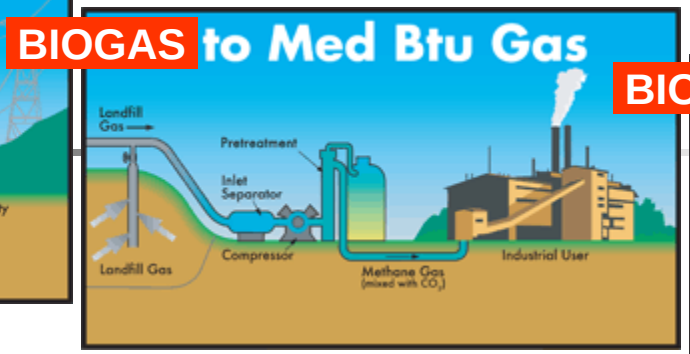


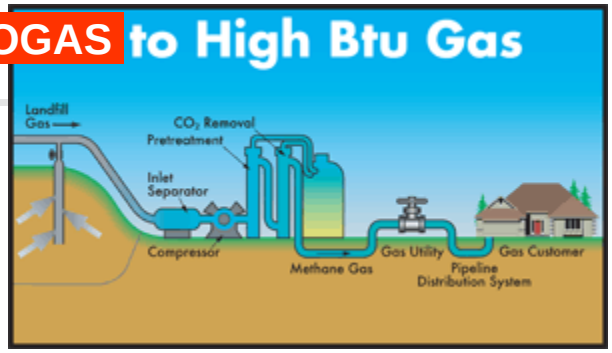
Methane Capture and Use

- The only renewable energy projects that directly reduce greenhouse gas emissions and generate energy!

Biogas Use Options



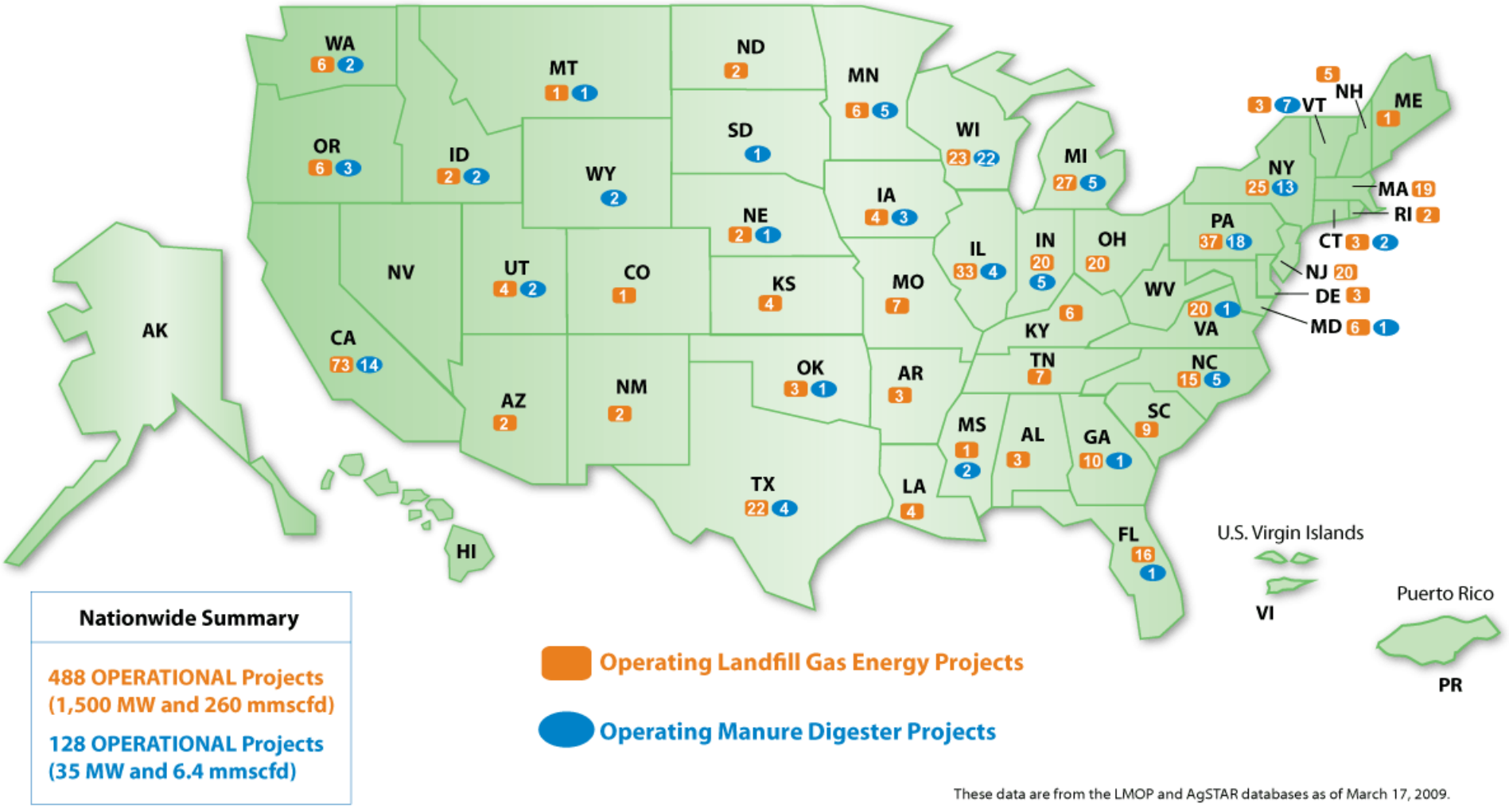




Graphics courtesy of Montauk Energy

- Electricity
- Combined Heat and Power
  - electricity and thermal energy
- Medium Btu fuel (500-700 Btu/scf)
  - Boiler, kiln, heater, greenhouse, etc.
  - Supplement NG and propane use
- High Btu upgrade (850-1000 Btu/scf)
  - Pipeline injection, vehicle fuel

Operating Landfill Gas Energy and Manure Digester Projects



Nationwide Summary

488 OPERATIONAL Projects
(1,500 MW and 260 mmscfd)

128 OPERATIONAL Projects
(35 MW and 6.4 mmscfd)

These data are from the LMOP and AgSTAR databases as of March 17, 2009.

Operational Methane Projects
(Landfill Gas and Manure Digesters)

- 450 electricity generation
- 135 direct use (medium Btu)
- 25 high Btu pipeline quality gas
  - AR, CA(2), GA(2), KS, LA, MI(2), NY, OH(3), PA(8), TN, TX(3), WI
  - Less than 5% of total projects

Renewable Biogas Project Benefits

- Direct greenhouse gas (methane) reductions
- Avoided greenhouse gas emissions from fossil fuel energy generation
- Increased energy independence
- Use of local, renewable energy source
- Enhanced air and water quality
- Jobs, revenue, cost savings

Greenhouse Gas Reduction Benefits

- GHG reductions from currently operating methane capture and use projects:
  - Direct Methane – 3.5 million metric tons CH4/year
  - Avoided CO2 – 9 million metric tons CO2e/year
  - Total Reductions – 80+ million metric tons CO2e/year

- Environmental equivalent to reducing CO2 emissions from:
  - More than 200,000,000 barrels of oil consumed, or
  - Nearly 16,000,000 passenger vehicles, or
  - Burning more than 450,000 railcars' worth of coal.

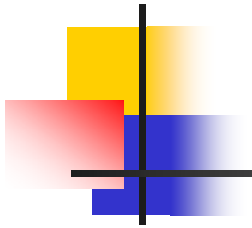
- Energy equivalent to:
  - Powering more than 915,000 homes and heating more than 700,000 homes

Energy Generation

- Current Methane Projects
  - 610 operational
  - 11 billion kWh of electricity produced and 80 billion cubic feet of gas delivered in 2008 alone
- Potential Methane Projects
  - 500+ landfills, 2000 livestock facilities
  - Potential to capture additional 150 billion cubic feet/year methane

LFG Project Economic Impacts

- A typical 3 MW LFG electricity project is estimated to have the following national benefits (direct, indirect, and induced) during the construction year:
  - Increase the output of the US economy by more than $10 million
  - Increase US employee earnings by more than $3.0 million (wages, salaries, etc.)
  - Employ more than 80 people (expressed in full-time equivalents per year)



Medium Btu Project Examples

Medium-Btu Biogas Users

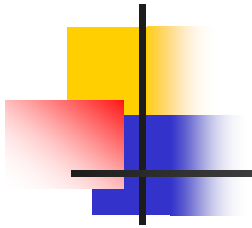
Jenkins Brick – Moody, AL

Jenkins Brick Company

Nucor Steel – Decatur, AL

NUCOR

SHEET MILL - DECATUR, LLC



High Btu Project Examples

Gas Utilities Currently Accepting Renewable Biogas

Fresh Kills Landfill, NY

- Began operation in the late 1970s
- LFG-to-high Btu pipeline quality
  - Selexol (chemical technology)
- Largest plant of it's kind until 2007

Photos courtesy of Montauk Energy

Valley and Monroeville Landfills, PA

- Began operation in 2006
- LFG-to-high Btu pipeline quality (2 plants)
  - Membrane technology
- Delivery of gas to:
  - low-pressure local distribution pipeline
  - high-pressure gas transmission line

Photos courtesy of Montauk Energy

3 Landfills - 1 Plant - 3 Businesses

(began operation 2007)

Thursday, February 23, 2006 The Tribur

Partners tapping gas from landfills

By SHAWN PIATEK
TRIBUNE-DEMOCRAT BUSINESS WRITER

Johnstown's selling points to business have included cheaper labor, outdoor recreation and low crime.

Now, another distinction will be added to that list: Discount natural gas.

Rising natural-gas bills have become a nuisance for homeowners and businesses alike. Now, three Johnstown businesses and the Johnstown Redevelopment Authority are working on a possible solution.

The four organizations have come together to partner in Johnstown Renewable Energy, which will process methane gas produced by three area landfills into usable natural gas.

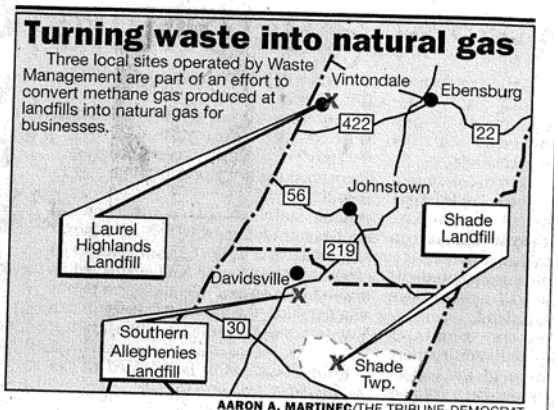
■ Project involves three landfills/A5

Johnstown Renewable Energy, or JRE, is bringing those four organizations together to work with Waste Management, which owns the three landfills, and Dominion Peoples to deliver considerably lower gas bills to the businesses.

Those businesses are Gautier Steel, Johnstown Wire Technology and Johnstown Welding and Fabrication.

Ron Repak of the Johnstown Redevelopment Authority is excited by the competitive advantage JRE will give the Johnstown region.

He said advantages such as Keystone Opportunity Zone tax breaks are standard in many places, but being able to market natural gas savings will make the city



AARON A. MARTINEC/THE TRIBUNE-DEMOCRAT

Gautier Steel's Daryl DiOrrio said the new gas supply will help protect the company's 100 jobs and likely allow it to expand and add more positions.

"We think this is a tremendous opportunity that will not only allow us to save jobs, but create new ones," DiOrrio said.

"When you look at our balance sheet, after labor, gas is our second-greatest expense."

The JRE fuel system is under construction.

More than $8 million procured through County National Bank has allowed for construction of a treatment plant at Laurel Highlands Landfill near Vintondale.

The plant could be operating as soon as mid-March.

The Somerset component of the project, which will tap into Southern Alleghenies Landfill near Davidsville and Shade Landfill in Shade Township, near Central City, is still in the funds-procurement phase.

Groundbreaking for the Somerset County facilities is expected in May, with gas beginning to flow in late October.

When all four of the wells are operating, the system will produce enough gas to fuel the equivalent of up to 45,000 households annually. Production is expected to increase as the landfills continue to grow.

"This is really a rare win-win situation," said Bill Polacek, president and chief executive officer of Johnstown Welding and Fabrication. "Being able to procure gas at a lower cost is a real competitive advantage. We're very fortunate to have this opportunity."

Shawn Piatek can be reached at 532-5060 or spiatek@tribdem.com.

"We think this is a tremendous opportunity that will not only allow us to save jobs, but create new ones. When you look at our balance sheet, after labor, gas is our second-greatest expense. "

Gautier Steel

"… annual natural-gas costs have increased from roughly $1 million in 1993 to $3.2 million in in 2005. 'This initiative could get us back down into the $1(million) to $1.5 million range.'"

Johnstown Wire Technology

"Johnstown's selling points to business have included cheaper labor, outdoor recreation, and low crime. Now, another distinction will be added to that list: Discount natural gas."

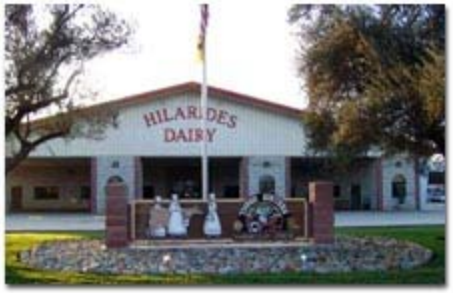
Scenic View Dairy, MI

- Began operation in 2007
- Dairy farm digester (3,500 head)
- Manure biogas-to-high Btu pipeline quality
  - Pressure swing absorption technology
- Small scale – 150 cfm of biogas

Photos courtesy of Phase 3 Renewables

Hilarides Dairy, CA

- Began operation in 2009
- Dairy farm digester (9,000 head)
- Manure biogas-to-vehicle fuel
  - Pressure swing absorption technology
- Biomethane is compressed for use as vehicle fuel-displacing diesel fuel.



Photos courtesy of Phase 3 Renewables

AgSTAR and LMOP Assistance

- Biogas resource ID and assessment
- Feasibility studies
- Technical assistance
- Industry / financial contacts
- Workshops / conferences
- AgSTAR (manure digesters)
  - www.epa.gov/agstar
- LMOP (landfill gas)
  - www.epa.gov/lmop