Biomass and Biogas Policy

Promoting clean heat, power, fuels and soil amendments

July 2019 | DeSales University, PA

www.MABEC.org
About MABEC

- Promotes the use of biomass to produce clean heat, power, fuels and soil amendments throughout the Mid-Atlantic region
- 30+ organizations across the region
- Formed in 2011
- Programs cover education and policy
- Dues: $2,500 - $250
- Join today: www.MABEC.org
Thermal Energy

- 33% of U.S. energy consumption is used for thermal energy
- 9% of thermal comes from biomass
- In 2008, industry officials convened to give a voice to the biomass thermal portion of the energy sector

Energy Use in the U.S.
- Transportation: 27%
- Electricity: 40%
- Thermal/Other: 33%
- Primary: 33%

Adapted from: U.S. Energy Information Administration
• **With what infrastructure will we manage:**
  - 66,500,000 TONS of food waste each year
  - The sludge from 31 BILLION gallons of wastewater EVERY DAY
  - The manure AND NUTRIENTS from 8 BILLION cows, chicken, turkey and pigs

• **Where will the nutrients for US agriculture come from?**
  - 12,840,000 short TONS of nitrogen (N) needed
  - 4,321,000 short TONS of phosphate (P$_2$O$_5$) needed
  - Nitrogen is mostly made from ammonia using fossil fuels
  - Phosphorus mining in the US creates radioactive waste—or we import it
How Biogas Systems Work

Source: ABC, adapted from EPA AgSTAR
Policies to Help Project Development

• Decrease development time
  • Example: Make permitting and interconnection easier.
  • Why: Less time to develop = less expensive installations

• Decrease project costs
  • Example: tax credit
  • Why: society benefits from the construction of certain systems

• Force purchases from some customers
  • Example: Public entity must buy some product
  • Why: Revenue for the project, easier to get financing.

• Help project developers sell their gas/energy. Revenue for the project, easier to get financing:
  • Example: Credit based market policy
  • Why: public entities want to incentivize certain projects for the greater good

• Require feedstock to go to certain destinations
  • Example: Large food waste generators must recycle food waste
  • Why: Certain stream of input material = financing possible
A Bill Becomes Law

1. Introduced in House (H 1)
   - Referred to Committee and Subcommittee
     - Floor Action: Debate and Voting

2. Introduced in Senate (S 1)
   - Referred to Committee and Subcommittee
     - Floor Action: Debate and Voting

President can sign into law or veto.

Conference Committee works out differences. New version sent back for approval.
• Must originate in the House of Representatives
• Changes Internal Revenue Code of the United States
• Policies
  • Section 45 Production Tax Credit (1.1 cents/kWh for 10 years) with election to take Investment Tax Credit (30% of capital costs)
    • Need tax liability
  • BTU Act: new investment tax credit for highly efficient biomass systems
  • Agriculture Environmental Stewardship Act (HR. 3744): new investment tax credit for non-electricity biogas systems and nutrient recovery systems
Origin of HR 3744

• Problems:
  1. Tax code does not equally support all kinds of biogas projects (i.e., those that generate electricity and pipeline quality gas)
  2. Algae blooms are an increasing threat to commercial, recreational and other activities

• Solution:
  • Incentivize the construction of systems that can address the problems

• Conundrum:
  • What should qualify?
  • What should be excluded?
“(5) Qualified biogas property.—

“(A) In general.—The term ‘qualified biogas property’ means property comprising a system which—

“(i) uses anaerobic digesters, or other biological, chemical, thermal, or mechanical processes (alone or in combination), to convert biomass (as defined in section 45K(e)(3)) into a gas which consists of not less than 52 percent methane, and

“(ii) captures such gas for use as a fuel.
From U.S. Code, Section 45K(c)(3) - link can be found here
https://www.law.cornell.edu/uscode/text/26/45K

(3) **Biomass** The term “biomass” means any organic material other than—

(A)

oil and natural gas (or any product thereof), and

(B)

coal (including lignite) or any product thereof.
• Certain projects, if approved by a government body can generate credits in addition to other products
• The credits can be sold in an open marketplace
• Quantity of credits determined by government policy
• Value of the credits determined by what customers will pay

• Examples:
  • Renewable Electricity Certificates/Credit (REC) = 1 MWh
  • Renewable Identification Number (RIN) = 1 gallon gasoline (equivalent) = 77,000 BTU (for non liquid fuels)
  • Low Carbon Fuel Standard Credits = [depends on carbon intensity score]
RFS Fuel Categories and D-Codes

Lifecycle Greenhouse Gas (GHG) Emissions
GHG emissions must take into account direct and significant indirect emissions, including land use change.

Renewable Fuels
- D6: 20% GHG reductions *

Advanced & Biodiesel Fuels
- D4 & D5: 50% GHG reductions *

Cellulosic Fuels
- D3 & D7: 60% GHG reductions *

* compared to a 2005 petroleum baseline

Credit: ecoengineers

American Biogas Council
www.americanbiogascouncil.org
# RNG Fuel Pathways

<table>
<thead>
<tr>
<th>PATHWAY</th>
<th>FUEL TYPE</th>
<th>FEEDSTOCK</th>
<th>PRODUCTION PROCESS</th>
<th>D CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q</td>
<td>Renewable Compressed Natural Gas, Renewable Liquefied Natural Gas, Renewable Electricity</td>
<td>Biogas From Landfills, <strong>Municipal Wastewater Treatment Facility Digesters</strong>, Agricultural Digesters, and Separated MSW Digesters; and Biogas From The Cellulosic Components Of Biomass Processed In Other Waste Digesters</td>
<td>ANY</td>
<td>D3</td>
</tr>
<tr>
<td>T</td>
<td>Renewable Compressed Natural Gas, Renewable Liquefied Natural Gas, Renewable Electricity</td>
<td>Biogas From Waste Digesters</td>
<td>ANY</td>
<td>D5</td>
</tr>
</tbody>
</table>

- D3 RIN ≈ $2.50
- D5 RIN ≈ $0.75
Applied RIN Math

- For upgraded biogas/RNG as vehicle fuel
  - Fossil NG = $3.00/MMBTU +
    - D3 RIN @ $2.50 = $30.00/MMBTU
    - D5 RIN @ $0.75 = $9.00/MMBTU
  - Electricity:
    - 1MMBTU will run a 100kW engine for 1hr
    - Biosolids, LFG
    - Manure, MSW
    - Food waste
    - Other
  - + $3 - $30/MMBTU if you can sell into the LCFS Market
Project example:

A 42 MGD WRRF is considering whether to not take in 60,000 TPY/0.16 MGD (0/4%) food waste, and if they do, how to account for the RINs—accept 100% D5 RINs or calculate a D3/D5 split for the biogas produced.

<table>
<thead>
<tr>
<th>100% D3 RINs</th>
<th>100% D5 RINs</th>
<th>Split 23% D3 RINs</th>
<th>77% D5 RINs</th>
</tr>
</thead>
<tbody>
<tr>
<td>WITHOUT food waste</td>
<td>WITH food waste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>300 MMBtu/day</td>
<td>1,000 MMBtu/day</td>
<td>1,000 MMBtu/day</td>
<td></td>
</tr>
<tr>
<td>$3,200,000 gross revenue/yr.</td>
<td>$3,200,000 gross revenue/yr. + food waste tip fee</td>
<td>$4,900,000 gross revenue/yr. + food waste tip fee</td>
<td></td>
</tr>
<tr>
<td>@ $2.50 per D3 RIN</td>
<td>@ $0.75 per D5 RIN</td>
<td>@ $2.50 / D3 RIN, $0.75 / D5 RIN</td>
<td></td>
</tr>
</tbody>
</table>

Same revenue (+ tip fees) $1.7 million in additional RIN revenue!

Reference: 1 MMBtu = 11.727 RINs
How much might the tipping fee be worth?
Project example:

A 42 MGD WRRF is considering whether to not take in 60,000 TPY/0.16 MGD (0/4%) food waste, and if they do, how to account for the RINs—accept 100% D5 RINs or calculate a D3/D5 split for the biogas produced.

<table>
<thead>
<tr>
<th>100% D3 RINs</th>
<th>100% D5 RINs</th>
<th>Split 23% D3 RINs</th>
<th>77% D5 RINs</th>
</tr>
</thead>
<tbody>
<tr>
<td>WITHOUT food waste</td>
<td>WITH food waste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>300 MMBtu/day</td>
<td>1,000 MMBtu/day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$3,200,000 gross revenue/yr.</td>
<td>$3,200,000 gross revenue/yr. + food waste tip fee</td>
<td></td>
<td></td>
</tr>
<tr>
<td>@ $2.50 per D3 RIN</td>
<td>@ $0.75 per D5 RIN</td>
<td>@ $2.50 / D3 RIN, $0.75 / D5 RIN</td>
<td></td>
</tr>
</tbody>
</table>

Same revenue (+ tip fees) $1.7 million in additional RIN revenue!

Tipping Fee:
24,000 TPY food waste (dry)
156,550 gal/day (wet, 10% TS)
$0.15/gal. tipping fee
$23,500/day
$8.6 million/year!

Reference: 1 MMBtu = 11.727 RINs
RIN Price Fluctuations

**RIN Values - D3**

- D3 '15
- D3 '16
- D3 '17

$1.50 or 55%

**RIN Values - 2017**

- D4 '15
- D5 '15
- D6 '15
- D4 '16
- D5 '16
- D6 '16
- D5 '17
- D4 '17
- D6 '17

$0.40 or 36%

Data: Progressive Fuels Limited

www.americanbiogascouncil.org
RIN D3 Pricing Forecast

Today

Reminders:
D5 = D3 - CWC
CWC('18) = $1.96
California Low Carbon Fuel Standard (LCFS)

- California Air Board charged with reducing Carbon Intensity (CI) of transportation fuel by 10% by 2020 as part of Global Warming Solutions Act of 2006
- Developed LCFS as essential cap and trade program in 2010
- Entities unable to meet requirement purchase credits from those who do meet it
- 2016 Credits Sold: 5+ million credits @ $101/MT CO$_2$e
- 2016 RNG Credits Sold: ~350,000 (7%)
Carbon Intensity

- The lower, the better (and more valuable)
- 2 pathways were developed by ARB for mesophilic anaerobic digestion at wastewater treatment plants in 2014
- Site specific pathways could also be developed and utilized
- Plan for price uncertainty and volatility

<table>
<thead>
<tr>
<th>Feedstock</th>
<th>Delivered fuel</th>
<th>Carbon Intensity gCO2e/MJ</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td><strong>AD Wastewater Sludge</strong></td>
<td>CNG</td>
<td>19</td>
</tr>
<tr>
<td><strong>Animal Waste</strong></td>
<td>CNG</td>
<td>-264</td>
</tr>
<tr>
<td><strong>Landfill Gas</strong></td>
<td>CNG</td>
<td>48</td>
</tr>
</tbody>
</table>

For comparison, Gasoline and Diesel CI are both ~ 96 CO2e/MJ

LCFS credits in California varied from $75/ton to $150/ton of CO2 equivalent in 2017.

Table: Sean Mezei, Dekany Consulting
Organics Recycling Policy

**Basic Formula:** Build it and they will come

**IF**
- You are a large organic waste generator; AND
- There is an organic waste recycling facility nearby; AND
- The facility will receive your material

**THEN**
- By a certain date, you must recycle your organic material

**ELSE**
- Nothing happens
Municipalities: San Francisco, Seattle, Austin, Vancouver, New York City, most starting in 2009-10

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


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

2019
• NY, MD & NJ
Promotes deployment of systems that convert woody biomass and non-woody biomass (organics) to energy
- Biogas, biomass to heat and power, and soil amendments
- 30+ organizations across the Mid-Atlantic
  - Dues: $2,700 - $500
    - Join today:
      www.mabec.org

Join us this September 17-18 at MABEX in Baltimore, MD

More info:
www.MABEX.org
Questions?

• Sign up for our Free Newsletter
• Join Us
• [www.MABEC.org](http://www.MABEC.org)

Patrick Serfass, Executive Director
team@mabec.org
(800) 507-0308