Biogas Opportunities Workshop
Federal Policy

Opportunities and Challenges in Anaerobic Digestion:
Maryland and the Northeast US Experience

Patrick Serfass | Executive Director

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U.S. Biogas Market

- **2,200+ Operational Biogas Systems**
- **8,241 on Farm (dairy, swine only)**
- **253 on Farm (dairy, swine only)**
- **1,269 Water (860 using their biogas)**
- **66 Food Scrap**
- **645 at Landfills**
- **13,500+ Potential New Biogas Systems**
- **3,888 Water (incl. 380 not using their biogas)**
- **931 Food Scrap**
- **440 at Landfills**

American Biogas Council
Federal Policy Highlights

1. Legislation
   • Farm Bill
   • Tax Credits

2. Administration
   • EPA, Renewable Fuel Standard
   • Treasury, 30% reduction in gas interconnection costs
Farm Bill

- Manure (e.g., dairy, swine)
- Wastewater Biosolids (e.g., Primary/Secondary Sludge)
- Food Waste (e.g., Household, Restaurant, Hospitality, Grocery)
- Other Organics (e.g., FOG, Crop Residue, Brewery Waste)

Anaerobic Digestion

- Biogas
  - Electricity
  - Heat
  - Vehicle Fuel
  - Pipeline Gas

- Digestate
  - Fertilizer
  - Animal Bedding
  - Other Products (e.g., building material, erosion control)

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Tax Credits

Manure (e.g., dairy, swine)

Wastewater Biosolids (e.g., Primary/Secondary Sludge)

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Anaerobic Digestion

Biogas

Electricity

Heat

Vehicle Fuel

Pipeline Gas

Digestate

Fertilizer

Animal Bedding

Other Products (e.g., building material, erosion control)

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Renewable Fuel Standard

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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**
  - 20% GHG reductions *
  - D6

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

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

* compared to a 2005 petroleum baseline

Credit: ecoengineers
# 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, Municipal Wastewater Treatment Facility Digesters, 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
Renewable Fuel Standard-RINs

- For upgraded biogas/RNG as vehicle fuel
- Fossil NG = $3.00/MMBTU + 
  + D3 RIN @ $2.50 = $30.00/MMBTU
  OR
  + D5 RIN @ $0.75 = $9.00/MMBTU

Electricity:
1 MMBTU will run a 1MW engine for ~ 6 mins
($5/MMBTU @ $.05/kWh)
+ 1/10 of a REC

Biosolids, LFG
Manure, MSW
Food waste

+ $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><strong>WITHOUT food waste</strong></td>
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</tr>
<tr>
<td>300 MMBtu/day</td>
<td>1,000 MMBtu/day</td>
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</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>
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</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>@ $2.50 / D3 RIN, $0.75 / D5 RIN</td>
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</table>

Same revenue (+ tip fees)

$1.7 million in additional RIN revenue!

Reference: 1 MMBtu = 11.727 RINs

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**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!
Treasury, ~30% CIAC Tax

Anaerobic Digestion

Biogas
- Electricity
- Heat
- Vehicle Fuel
- Pipeline Gas

Digested
- Fertilizer
- Animal Bedding
- Other Products (e.g., building material, emission control)

Organics
- Manure (e.g., dairy, swine)
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New US Digestate Standard

www.Digestate.org
Questions?

Patrick Serfass, Executive Director
American Biogas Council
1211 Connecticut Ave NW
Suite 650
Washington, DC 20036
202.640.6595
info@americanbiogascouncil.org (yes, it will come to my inbox)