U.S. Dairy Industry’s Sustainability Commitment

Business Models for Anaerobic Digester Adoption on U.S. Dairy Farms

Renewable Energy Education Field Day
Las Cruces, NM
October 26, 2011
Innovation Center for U.S. Dairy

Dairy Industry Committed to…

25% by 2020
GHG reduction for fluid milk

$238 million
Estimated business value across industry

1,300 Digesters
On U.S. Dairy Farms by 2020
USDA /Dairy Industry - Memorandum of Understanding

✓ USDA/Dairy Industry
✓ 25% GHG reduction by 2020
✓ $238 million of business value

USDA Secretary Vilsack
“a digester per week”
backed by
USDA grants, loan guarantees and assistance
Digester Finance Summit

September 20, 2011

Judy Canales, USDA
Mitigating and monetizing manure is predicated on successful piloting of new business model

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
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<tbody>
<tr>
<td>‘Going it Alone’</td>
<td>‘Quality Partnerships’</td>
</tr>
<tr>
<td>Manure only input</td>
<td>Manure plus substrates</td>
</tr>
<tr>
<td>Unproven technology</td>
<td>Technology performance guarantee</td>
</tr>
<tr>
<td>Limited / complex external funding</td>
<td>Ample private sector funding</td>
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<tr>
<td>Energy only off-take</td>
<td>Energy plus high-value by-products</td>
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</tbody>
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- USDA Program Support for Digester Development
- Develop Digester Business Case and Project Financing Options
- Digester Market Potential Study and National Site Analysis
Risk to Farmer

Low

3rd Party
B.O.O.

Equity/Profit - Sharing

Co-op Shared Ownership

D.I.Y.

High

Risk to Farmer

Legend:

- Orange: Developer
- Blue: Equity Investor
- Green: Host Farm(s)
“Project Finance” model for sustainable digester systems

- **Feedstock Agreement**
  - Contract for Term of Debt Service
  - Manure
  - Organic waste/Co-Substrates
  - Supply Contract for Term of Debt Service with Credit Worthy Supplier

- **Technology Agreement**
  - Digester Performance Guarantee
  - FINANCING OPTIONS
    - USDA
    - Banks
    - Bonds
    - Grants
    - Mutual Funds
    - Private Equity
    - Other

- **Off take Agreement**
  - Contract for Term of Debt Service
  - Electricity
  - Bio-Gas Sales
  - Fiber
  - Fertilizer
  - Carbon Credits
  - Compost
  - Waste Heat
  - Other
The Developer-Led Model

Dairy Farm(s) → Supply Agreement; Land Lease; Royalty

Feedstock Suppliers → Supply Agreement

Major Equipment Suppliers → Warranty

Contractor → EPC Wrap

Operator → O&M Contract

Equity Investors

Digester LLC

Debt Lenders

PPA

Offtake Agreement

Purchase Order

Utility

Contract Purchaser(s)

Retail Markets

Adapted from Garrad Hassan, EWEA: “Wind Energy – The Facts”
Values reflect Big Sky Dairy in Idaho
Gooding, ID
4,200 Cows
1.2 MW @ 95% CF
$6 Million project cost
Dairy feeding operation
Manure collection on cement floor to reduce dirt & contaminates
Manure washed from floor fed through gratings to slurry tank
Manure slurry supplied to the digester
Power from dual 710 kW gen-sets
Garden fiber output from the digester
Digester effluent used as fertilizer or P-K-N separated and sold
Market Potential

Table 1. Potential for Biogas Recovery Systems at Swine and Dairy Operations

<table>
<thead>
<tr>
<th>Animal Sector</th>
<th>Candidate Farms</th>
<th>Energy Generating Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MW</td>
<td>MWh/year</td>
</tr>
<tr>
<td>Swine</td>
<td>5,596</td>
<td>804</td>
</tr>
<tr>
<td>Dairy</td>
<td>2,645</td>
<td>863</td>
</tr>
<tr>
<td>Total</td>
<td>8,241</td>
<td>1,667</td>
</tr>
</tbody>
</table>

6,802,914 MWh x $0.08/kWh = $544 Million

New analysis includes:
- MWh (Electricity) plus 25% substrates
- Fiber
- Nutrients (P K N)
- Carbon, RECs & RINs

Market Size 2020 = $1.9 Billion
Co-Digestion Improves Economics

<table>
<thead>
<tr>
<th></th>
<th>Manure-Only</th>
<th>Co-Digestion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gross Receipts</strong></td>
<td>$/AU yr</td>
<td>$/AU yr</td>
</tr>
<tr>
<td><strong>Tipping Fees</strong></td>
<td>---</td>
<td>192.97</td>
</tr>
<tr>
<td><strong>Electrical Sales</strong></td>
<td>68.76</td>
<td>150.37</td>
</tr>
<tr>
<td><strong>Carbon Credit</strong></td>
<td>19.68</td>
<td>19.68</td>
</tr>
<tr>
<td><strong>Avoided Bedding Cost</strong></td>
<td>12.71</td>
<td>15.25</td>
</tr>
<tr>
<td><strong>Tax Credit</strong></td>
<td>27.50</td>
<td>60.15</td>
</tr>
<tr>
<td><strong>Fiber Sales</strong></td>
<td>31.78</td>
<td>38.11</td>
</tr>
<tr>
<td><strong>Total Revenue</strong></td>
<td>160.43</td>
<td>476.53</td>
</tr>
<tr>
<td><strong>Role Substrate % of Revenue</strong></td>
<td>---</td>
<td>66.3</td>
</tr>
</tbody>
</table>
Renewable Energy Market Potential (Billion kWh)

http://www.eia.gov/forecasts/aeo/source_renewable.cfm

Non-hydropower renewable electricity generation by energy source, 2009-2035 (bllion kilowatthours)

http://www.eia.gov/forecasts/aeo/source_renewable.cfm
Dairy digester locations – construction potential

2,242 Dairies > 1000 Head
Double A Dairy
Idaho
4.6 MW
15,000 cows