• Voluntary effort of the USEPA jointly sponsored by USDA – since 1993.

• The program encourages the use of methane capture and use from agro-industrial sources – work with producers, developers, industry, policy makers, federal agencies, NGOs, utilities.

• Five-year interagency agreement with USDA to advance digester systems (signed 2010).

• Collaboration with Dairy Power, American Biogas Council, and many state/local stakeholders.

• Hub for digester information nationally and internationally (Global Methane Initiative).
Current Digester Project Status

• 167 operating manure-based digesters
  – 137 dairy, 23 swine, 5 poultry, 2 beef
  – 2010 Reductions and Generation
    • 51,000 metric tons direct methane reductions
    • 450,000 MWh equivalent from electricity generation and other biogas use
  – Top five digester system states – WI(26), NY(23), PA(19), CA(14), VT(10) – 55% of total projects
  – Typical 1000-cow dairy manure only project
    • Reduce about 56,000 cubic feet methane/day
    • Enough to heat about 300 homes or power 250 homes
• Less than 2% of livestock manure market tapped
  – Even less if you consider other organic wastes
# US Operating Digester Overview

## Digester Technology

<table>
<thead>
<tr>
<th>Technology</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plug Flow/Modified PF</td>
<td>94</td>
</tr>
<tr>
<td>Complete Mix</td>
<td>40</td>
</tr>
<tr>
<td>Covered Lagoon</td>
<td>30</td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>- Induced Blanket Reactor</td>
<td>2</td>
</tr>
<tr>
<td>- Fixed Film</td>
<td>1</td>
</tr>
</tbody>
</table>

### Digesters by Animal Type

<table>
<thead>
<tr>
<th>Animal Type</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy</td>
<td>137</td>
</tr>
<tr>
<td>Swine</td>
<td>21</td>
</tr>
<tr>
<td>Layers</td>
<td>3</td>
</tr>
<tr>
<td>Beef</td>
<td>2</td>
</tr>
<tr>
<td>Duck</td>
<td>2</td>
</tr>
<tr>
<td>Beef and Poultry</td>
<td>1</td>
</tr>
<tr>
<td>Broiler</td>
<td>1</td>
</tr>
</tbody>
</table>

## Biogas Use

<table>
<thead>
<tr>
<th>Use</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-generation (electricity and heat)</td>
<td>107</td>
</tr>
<tr>
<td>Electricity</td>
<td>27</td>
</tr>
<tr>
<td>Boiler/Furnace Fuel</td>
<td>20</td>
</tr>
<tr>
<td>Flare Only</td>
<td>6</td>
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<tr>
<td>Pipeline Upgrade</td>
<td>1</td>
</tr>
<tr>
<td>Vehicle Fuel</td>
<td>1</td>
</tr>
</tbody>
</table>

- 12 projects have a combination of uses
- Five projects do not have a use identified
Digester Market Opportunity

- **Candidate Dairy/Hog Farms**
  - ~4,000,000 dairy cows on 2,600 farms
  - ~48,000,000 hogs on 5,500 farms

- **Energy Potential***
  - 13,000,000 MWh/yr OR 150 billion cubic feet methane per year
    - Enough electricity to power 870,000 households
    - Enough methane to heat 3 million households

* Estimates just for dairy and hog manure. Does not include beef, poultry or co-digestion.

* Based on EPA AgSTAR Market Opportunities Report (2010)
Introduction

AgSTAR Program Components

– Farm Bill and USDA Collaboration
– State programs coordination
– Informational Products
  • General Outreach
  • Technical Analysis
    – Supported by measurement and evaluation program
    – Compares economic and environmental performance of various waste management options
  • Project Development Tools
– Outreach and Extension
  • Conferences, workshops, field days, and tradeshow events
  • Website - www.epa.gov/agstar
General Informational Products

- **AgSTAR Digest** - Annual report
  - Highlights the year in animal waste digestion
  - Technologies, funding, national project listings
  - Quarterly

- **Managing Manure with Biogas Recovery Systems**
  - Introductory brochure on digester technology, costs, and environmental performance
Technical Products

• A Protocol for Quantifying and Reporting the Performance of Anaerobic Digestion Systems for Livestock Manures
  – Help standardize the process used to evaluate the performance of anaerobic digestion systems used to produce and capture methane (biogas) emissions from livestock manure
• Mass Balance Waste Management Evaluations
  • Economic and environmental process comparisons for pigs and dairy
Project Development Tools

- **Industry Directory**
  - Lists and provides description of designers, equipment suppliers, and consultant services.
- **AgSTAR Handbook** - *A Manual for Developing Biogas Systems at Commercial Farms in the United States*
- **FarmWare** - develops project specific feasibility assessments
  - technology type, energy, environmental, and cost/benefit.
Project Development Tools

- Funding Guide for Federal and State Resources
  - Summarizes federal and state animal waste digestion funding assistance
    - Grants, loans, energy production incentives
  - For each program type provides:
    - Program description
    - Eligibility requirements
    - Contacts
Project Development Tools

• Market Opportunities for Biogas Recovery Systems
  – Provides state-by-state profiles of numbers of farm candidates, renewable energy potential, and methane emission reductions.
  – Provides a summary of the national energy and digestion market potential.
For more information

- www.epa.gov/agstar
- Chris Voell
  - 202-343-9406
  - voell.christopher@epa.gov