

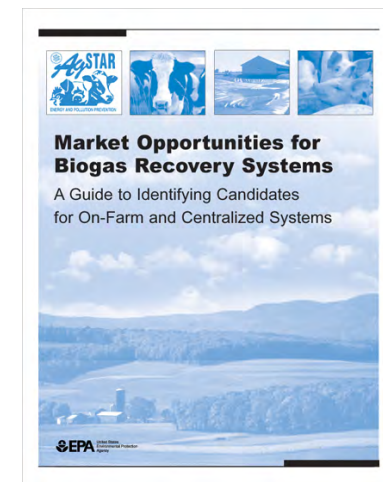
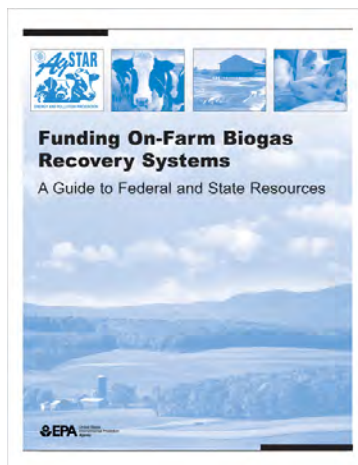
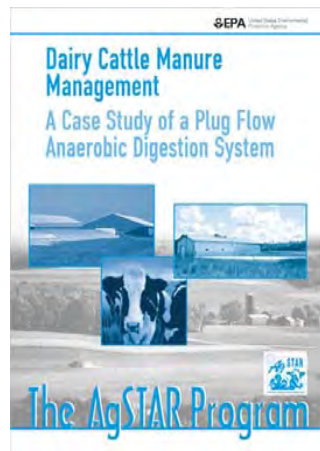


# A Manurial Anaerobic Digester Protocol



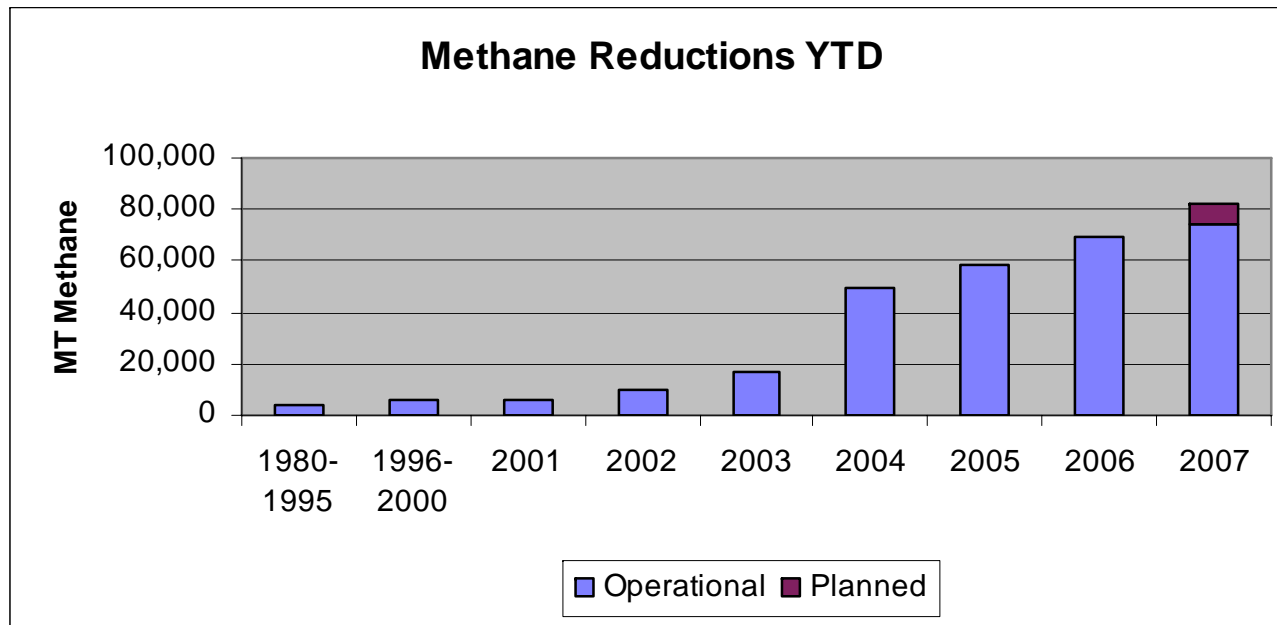


# AgSTAR Program





# Digesters Historical Trend



## In 2006

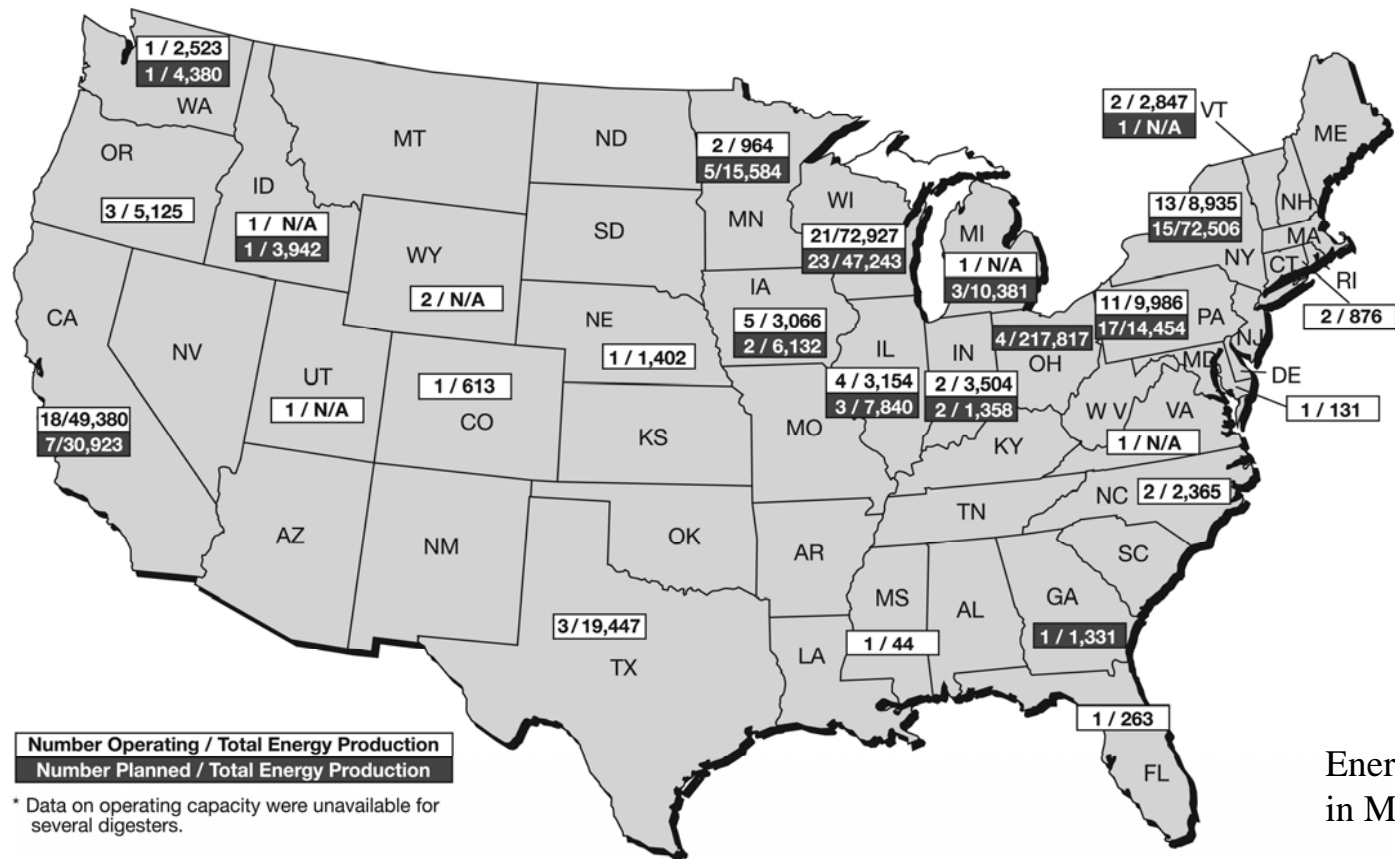
All 'operating' projects ~275 million kWh equivalent.

~200 total projects: ~135 operating or in start-up and ~65 planned or in construction.

\*\*\* *Projects are estimated, currently updating database.*



# 2006 Digester Distribution



Number Operating / Total Energy Production  
 Number Planned / Total Energy Production

\* Data on operating capacity were unavailable for several digesters.

Energy values are in MWh



# Market Potential

## Top 10 States for Electricity Production from Dairy and Swine Manure

[# of Candidate Farms , Methane Emissions Reduction (000 Tons), Methane Production Potential (billion ft<sup>3</sup>/year), Electricity Generation Potential (000 MWh/year) ]

### SWINE FARMS

<b>NORTH CAROLINA</b>	1,179	247	11.5	766
<b>IOWA</b>	1,022	126	10.2	677
<b>MINNESOTA</b>	429	40	3.5	234
<b>OKLAHOMA</b>	52	54	2.9	196
<b>ILLINOIS</b>	267	36	2.8	184
<b>MISSOURI</b>	200	53	2.7	177
<b>INDIANA</b>	234	28	2.2	145
<b>NEBRASKA</b>	148	25	2.0	134
<b>KANSAS</b>	91	29	1.6	109
<b>TEXAS</b>	13	21	1.1	75
<b>Remaining 40 States</b>	646	113	7.3	487
<b>Subtotal</b>	<b>4,281</b>	<b>773</b>	<b>48</b>	<b>3,184</b>

### DAIRY FARMS

<b>CALIFORNIA</b>	963	263	18.1	1203
<b>IDAHO</b>	185	61	4.0	267
<b>NEW MEXICO</b>	123	62	3.9	259
<b>TEXAS</b>	149	32	2.3	154
<b>WISCONSIN</b>	175	8	2.1	138
<b>NEW YORK</b>	157	6	2.0	132
<b>ARIZONA</b>	73	35	1.9	126
<b>WASHINGTON</b>	122	22	1.9	126
<b>MICHIGAN</b>	72	6	1.9	73
<b>MINNESOTA</b>	60	3	0.7	46
<b>Remaining 40 States</b>	544	75	9.4	624
<b>Subtotal</b>	<b>2,623</b>	<b>573</b>	<b>48</b>	<b>3,148</b>
<b>U.S. Total</b>	<b>6,904</b>	<b>1,346</b>	<b>96</b>	<b>6,332</b>

## U.S. Estimated Livestock Potential

	MW	MWh/year	MT CH <sub>4</sub>	Farms
Pigs	301	2,636,760	660,000	4,000
Dairy	256	2,242,560	466,500	2,500
<b>Total</b>	<b>557</b>	<b>4,879,320</b>	<b>1,126,500</b>	<b>6,500</b>



# Digester Protocol Development

## **Background**

- From 2000-2004 state programs key catalyst for project development
  - NYSERDA
  - CEC
  - Wisconsin Focus on Energy
  - Pennsylvania Harvest Program
  - Others
- From 2004 – present: Farm Bill (Section 9006) plays large role

## **Results**

- Number of commercial systems increase awareness of digester benefits, however
  - All programs experience some design, construction, operational difficulties
  - Concurrently, numbers of systems and developers increased claiming performance superiority
  - Some claims were supported by rigorous performance evaluations whereas others based on minimal data
- Agencies recognize importance of developing standardized digester evaluation methodology
  - ASERRTI, AgSTAR, USDA convened workshop in Chicago January 2006
  - University, industry, and agencies to review and provide comment on a draft
- Final protocol released January 2007



# Digester Protocol Development (cont)

## Protocol Overview and Elements

- Protocol developed to provide:
  - System developers and third parties with a standard approach for quantifying performance and supporting claims that receive general acceptance as credible
- Protocol establishes a standard for acceptance of evaluation reports in a central repository
- Protocol consists of:
  - Prerequisites
  - Required information
  - Constituents measured
  - Sampling methods and study duration
  - Data analysis and reporting
- Other protocol implications
  - Credible reporting to potential consumers, investors, carbon traders on system performance and reliability
  - Could provide basis for loan and loan guarantee programs
    - Provides level of confidence/reliability
  - May provide basis for an industry labeling/certification program





# Protocol - Next Steps

- Identify and Develop repository
  - Scope peer review
- Populate repository
  - Some evaluations complete - need final acceptance review
  - NYSERDA starting large evaluation effort for NY dairy projects 2007
  - California Energy Commission also implementing evaluation effort 2007
  - AgSTAR assisting Wisconsin in smaller effort
- 2007 Farm Bill in development
  - Becomes effective in FY 2008
  - 9006 program to continue
  - Increased budget potential
    - Expected range \$50 – \$150 million
    - \$50 million most probable
  - May contain an evaluation component

2003	\$12.9 M
2004	\$9.3 M
2005	\$5.0 M
2006	\$2.5 M