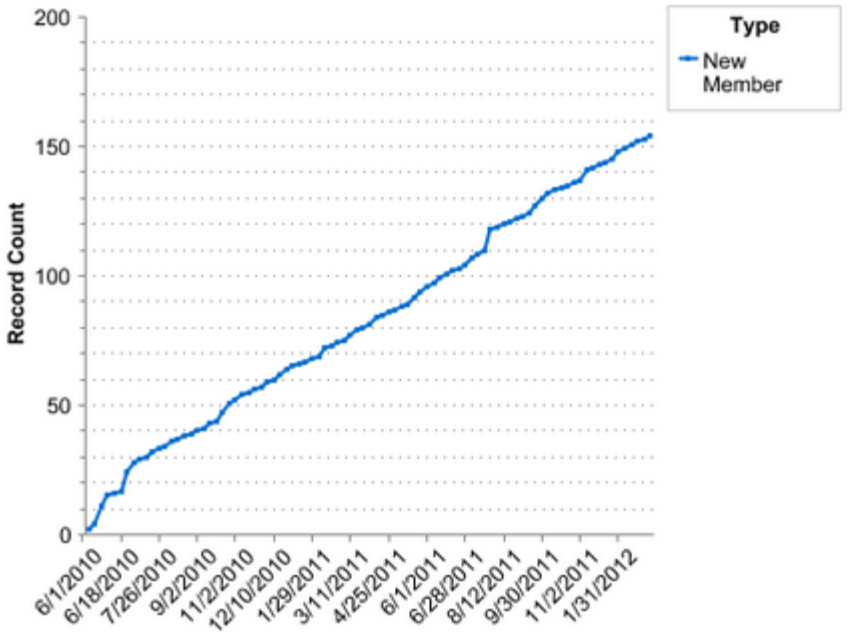
Snapshot of the U.S. Biogas Industry

Josh Lieberman

American Biogas Council: The Voice of the US Biogas Industry

- The **only** U.S. organization representing the biogas and anaerobic digestion industry
- **163 Organizations** from the U.S., Germany, Italy, Canada, Sweden, Belgium, Israel and the UK
- **All** Industry Sectors Represented:
  - project developers/owners
  - anaerobic digestion designers
  - equipment and supply chain companies
  - waste managers
  - waste water companies
  - farms
  - composters
  - utilities
  - consultants and EPCs
  - financial firms



American biogas Council

Promoting the Anaerobic Digestion and Biogas Industries

Dedicated to maximizing the production and use of biogas from organic waste

Some of our members:

Board of Directors

Wayne Davis

Harvest Power, Inc.

Chairman

Amy McCrae Kessler

Turning Earth, LLC

Vice-Chair

Norma McDonald

Organic Waste Systems

Vice-Chair

Patrick Serfass

Executive Director (ex officio)

Melissa VanOrnum

DVO, Inc.

Treasurer (ex officio)

Paul Greene

O'Brien & Gere

Paul Relis

CR&R

David McCallum

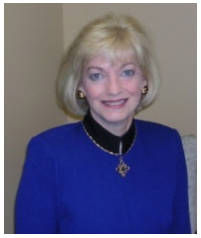
GE Energy

Nora Goldstein

BioCycle

Trevor Nickel

Himark bioGas



Kerry Kelly

Waste Management

Christine McKiernan

Bioferm Energy Systems

Bernie Sheff

UTS Residual Processing LLC

Chris Voell

BioCNG, LLC

Ben Mathews

Caterpillar

Juliette Bohn

Humboldt Waste Management Authority

Working Groups

- **Biofuel**
  - **Chair:** Rolfe Philip, Yield Energy - Chair
- **Biomethane**
  - **Co-chair:** Bernie Sheff – UTS Residual Processing, Co-chair: Sean Mezei – Flotech-Greenlane North America
- **AD Co-Products**
  - **Co-chair:** Amy Kessler – Turning Earth LLC, Co-chair: Tom Ferencevic – Yield Energy)
- **Municipalities**
  - **Chair:** Chris Voell, BioCNG, LLC
- **Biogas Industry Data**
  - **Chair:** Ben Mathews – Caterpillar, Inc.
- **Biogas Industry Connection**
  - **Chair:** Richard Mattocks, Veolia Water

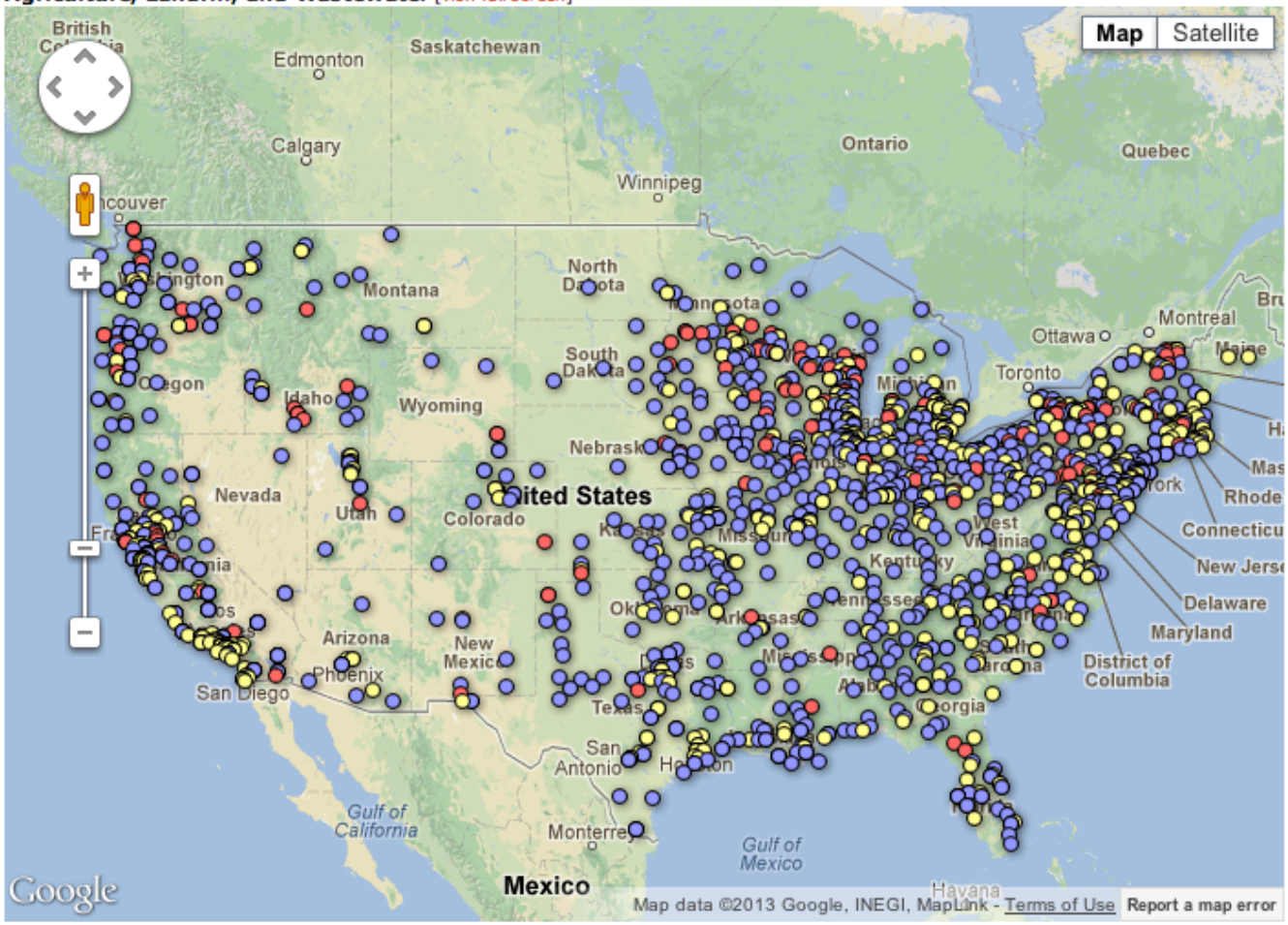
Committees

- **Legislative and Regulatory Affairs**
  - **Federal Co-Chairs :** Ted Niblock, Homeland Biogas Energy; Amy Kessler, Turning Earth
  - **State Co-Chairs:** Norma McDonald, Organic Waste Systems; Wayne Davis, Harvest Power
- **Marketing and Education**
  - **Chair:** Chris Voell, BioCNG, LLC, Kendall Christiansen, Gaia Strategies, Kim Lee, Rollcast Energy, Inc
- **Membership**
  - **Chair:** Paul Green, O'brien and Gere

Operational Anaerobic Digesters in the U.S.

Display/Hide Feedstock Maps ☐ Agriculture ☐ Landfill ☐ Wastewater Go

Agriculture, Landfill, and Wastewater [view full screen]



Operational Anaerobic Digesters in the U.S.

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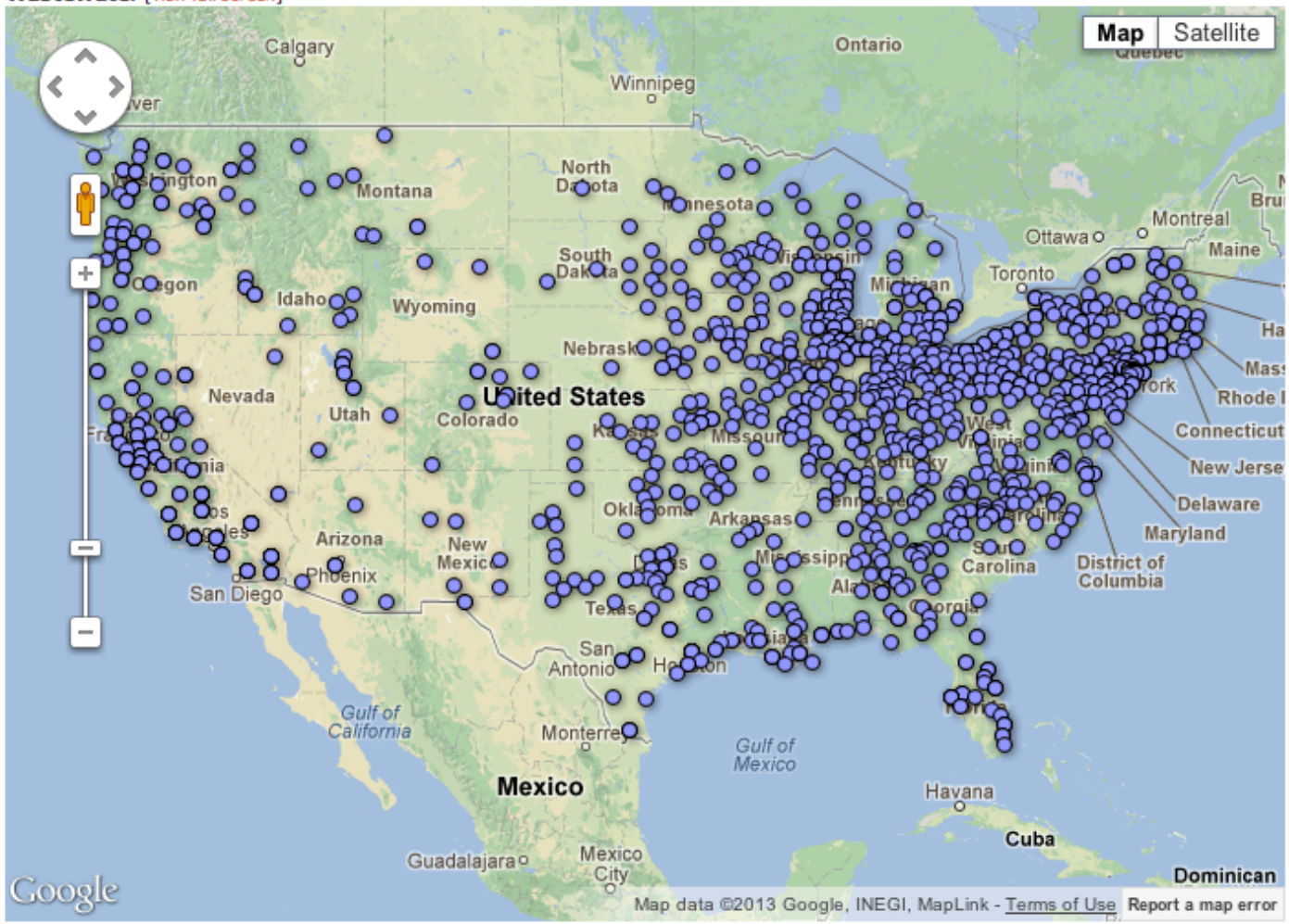
Wastewater [view full screen]



Operational Anaerobic Digesters in the U.S.

Display/Hide Feedstock Maps ● ☐ Agriculture ● ☐ Landfill ● ☐ Wastewater Go

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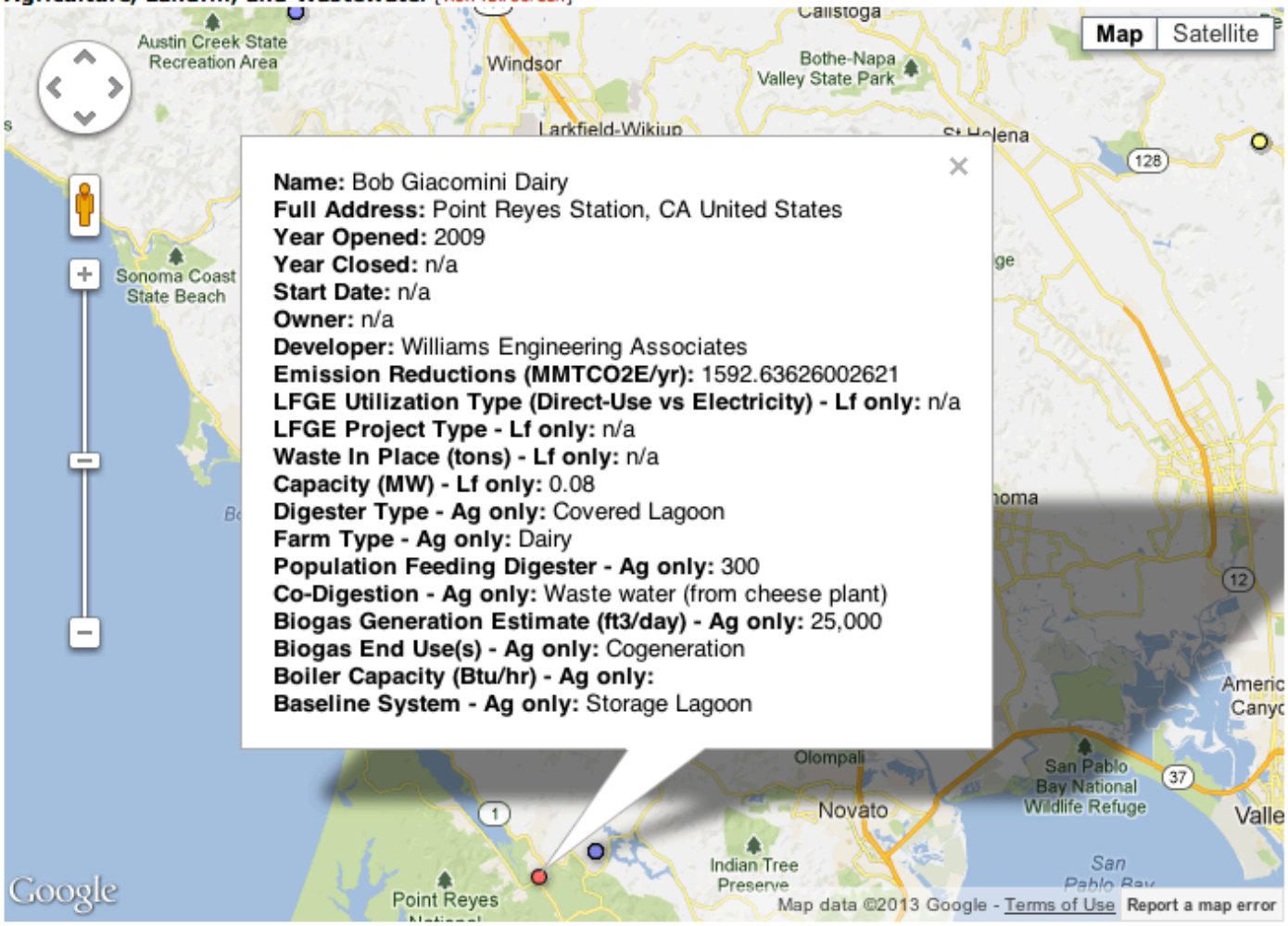
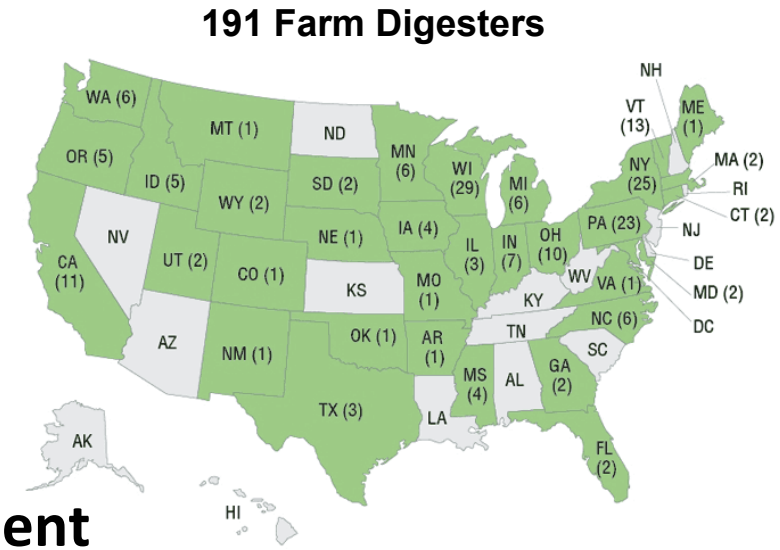


Name: Bob Giacomini Dairy
Full Address: Point Reyes Station, CA United States
Year Opened: 2009
Year Closed: n/a
Start Date: n/a
Owner: n/a
Developer: Williams Engineering Associates
Emission Reductions (MMTCO2E/yr): 1592.63626002621
LFGE Utilization Type (Direct-Use vs Electricity) - Lf only: n/a
LFGE Project Type - Lf only: n/a
Waste In Place (tons) - Lf only: n/a
Capacity (MW) - Lf only: 0.08
Digester Type - Ag only: Covered Lagoon
Farm Type - Ag only: Dairy
Population Feeding Digester - Ag only: 300
Co-Digestion - Ag only: Waste water (from cheese plant)
Biogas Generation Estimate (ft3/day) - Ag only: 25,000
Biogas End Use(s) - Ag only: Cogeneration
Boiler Capacity (Btu/hr) - Ag only:
Baseline System - Ag only: Storage Lagoon

2,200+ biogas-producing sites Currently Operational

- 192 Digesters on Farms (100 MW)
- 1,238 Digesters at Wastewater Treatment Plants (only 860 use the biogas they produce)
- 594 landfill-based energy projects



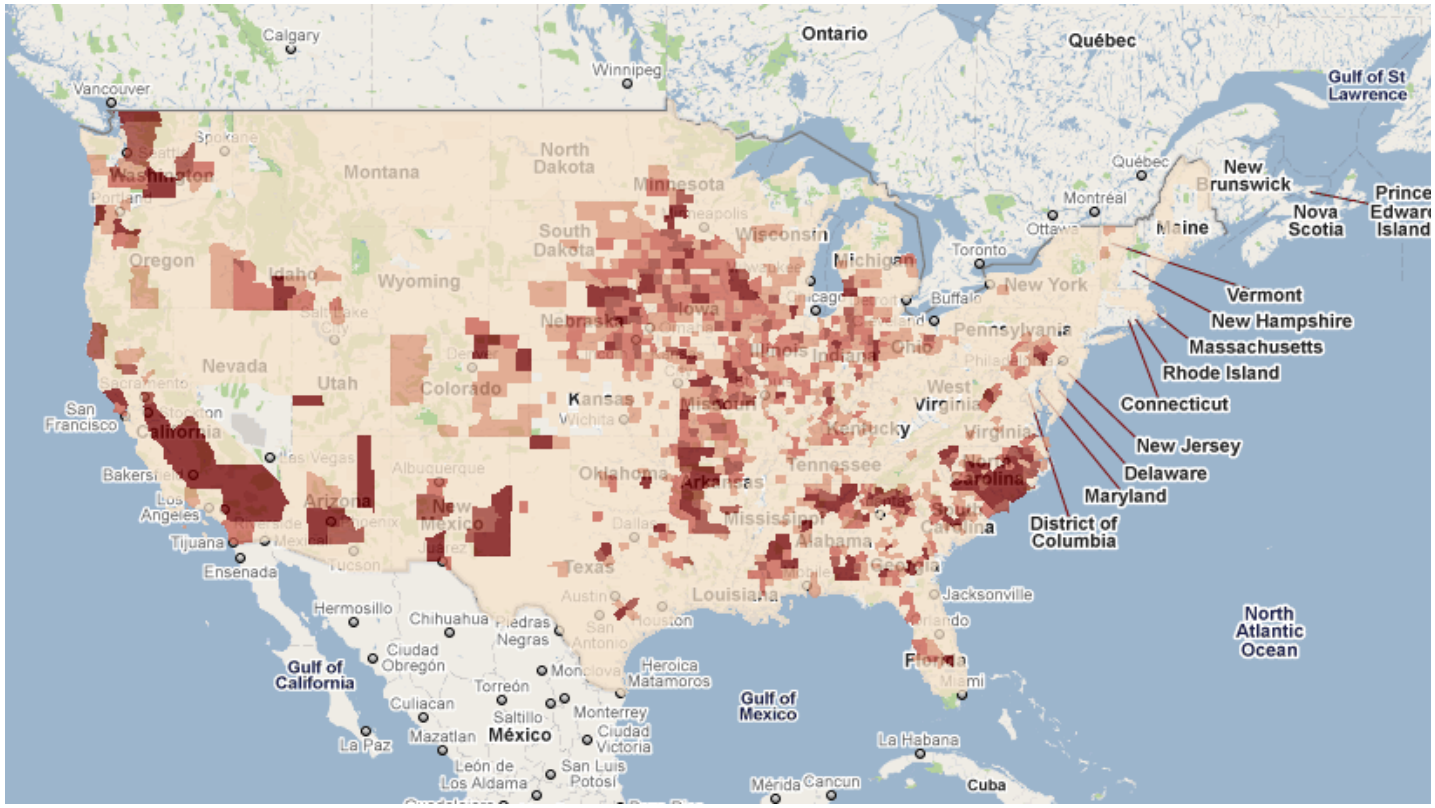
12,000+ sites Available for Development

- Farms: 8,241 (only counting dairy and swine)—1700 MW
- Wastewater Treatment Plants (WWTPs): 3,250—750 MW
  - 2,000+ WWTPs > 1 MGD don't have a digester
  - 1,250 WWTPs producing, but not using biogas
- Landfills: 540
- Private commerical/industrial sites: ?

Potential Methane Production from Agriculture (manure only)

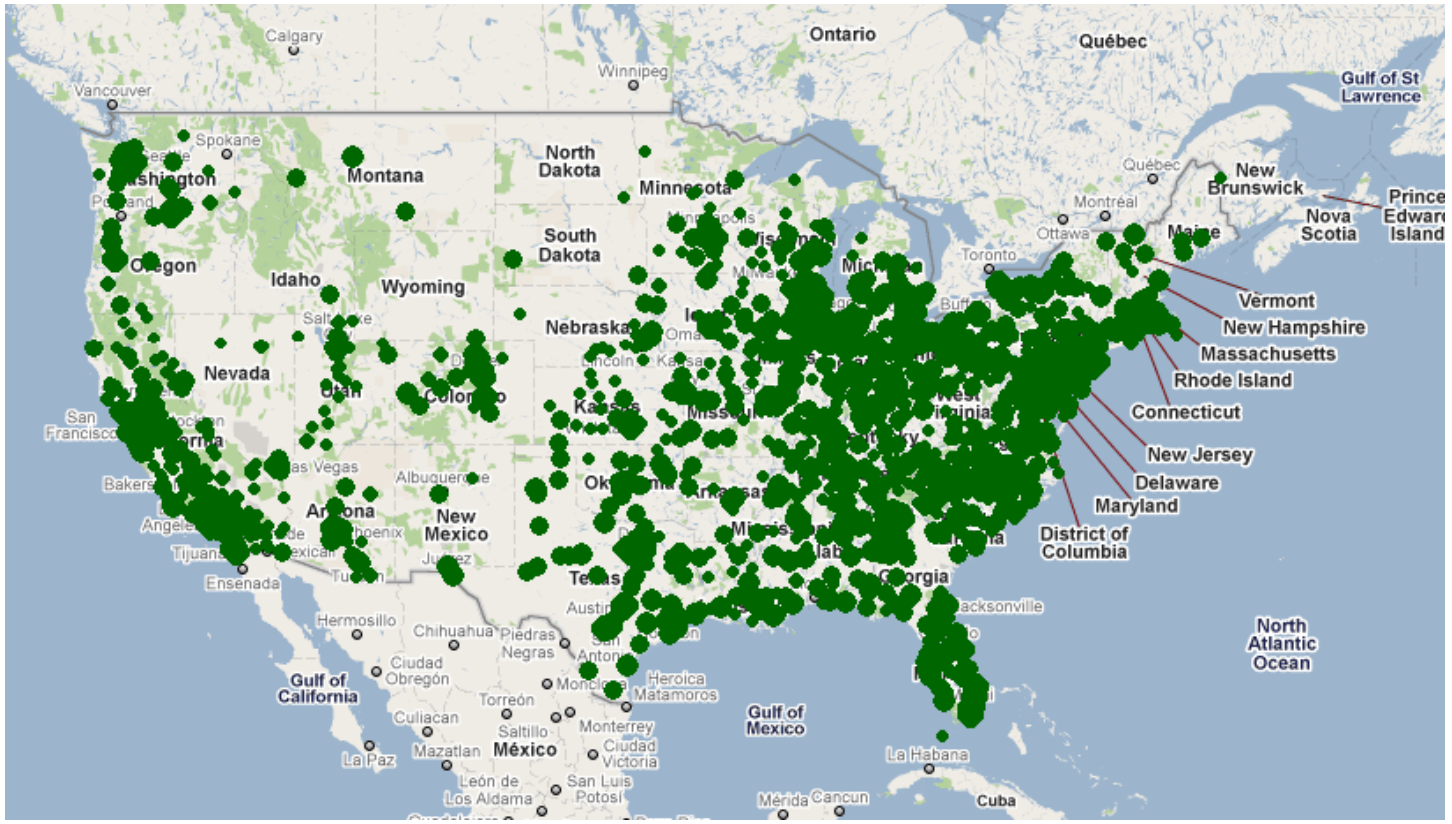
88 billion scf- enough for 894,000 homes or to make 8.8 billion kWh of electricity (NREL)

+ 8,241 farms; 1,667 MW of power; 13.1 million MWh/year of electricity (AgSTAR)



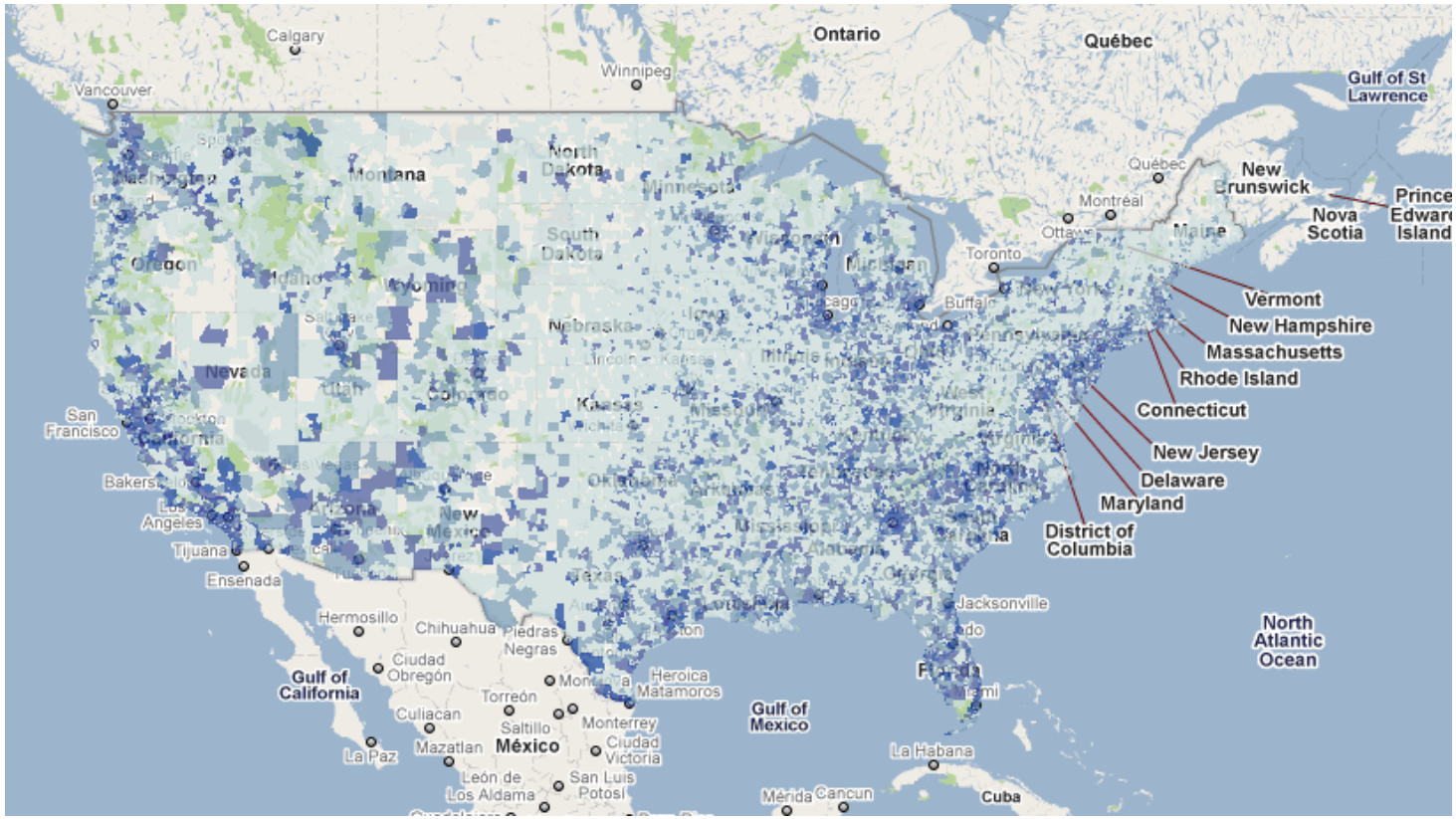
Potential Methane Production from Urban Waste

536 billion scf - enough for 5.5 million homes or to make 54 billion kWh of electricity only counting landfill waste (NREL)



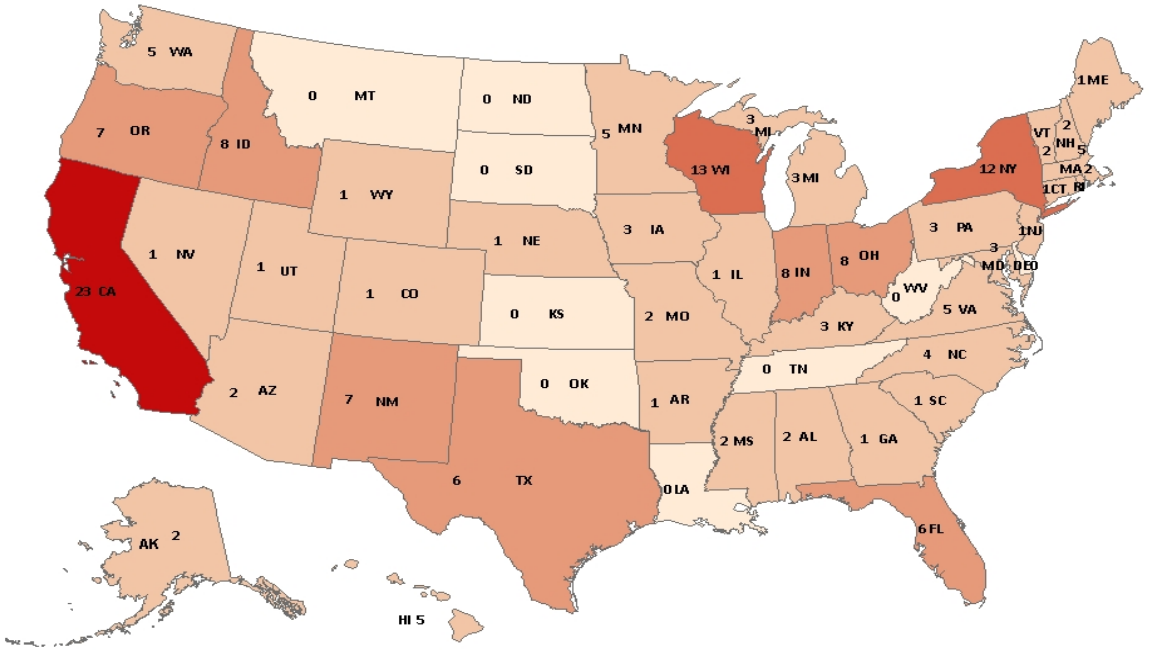
Potential Methane Production from Wastewater

20 billion scf - enough for 200,000 homes or to make 2 billion kWh of electricity (NREL)



Where Companies are Developing Biogas-Electricity Projects

- Total Projects: 324*
- Total Power Capacity: 649 MW*
- Total Industry Investment: $3.5 billion
- Average: $5.74 million/MW
- Average: $12.6 million/project



Number of Companies Developing 1603-Eligible Projects Now
(Avg projects/company/ state: 2.6)

- 0
- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25

*As reported by individual companies to the American Biogas Council, Fall 2011

The U.S. CNG Revolution Has Begun!

- Gasoline and diesel costs continue to rise
- CNG is used worldwide as a vehicle fuel
  - 15,000,000 vehicles worldwide (<200K in US)
  - Powers small and large vehicles (scooters to semis)
  - Well proven and safe
  - Solid waste sector is leading the way

State Level Activity

State Spotlight: Connecticut, Setting an Example

- Public Act No. 11-217
- An Act Concerning the Recycling of Organic Materials by Certain Food Wholesalers, Manufacturers, Supermarkets and Conference Centers.
- Passed late 2011
- Targets commercial operations generating **more than 104 tons** of organic waste per year
- Less than 6 months after CT's 2nd organics recycling facility establishes service, waste generators **must source separate**
- For waste generators that have a recycling facility **within 20 miles,** their **organics must also be recycled** within those 20 miles.

http://www.cga.ct.gov/2011/act/pa/pdf/2011PA-00217-R00SB-01116-PA.pdf

Organic Waste Plans

Identify gap between what exists and what we want in terms of organic waste policy.

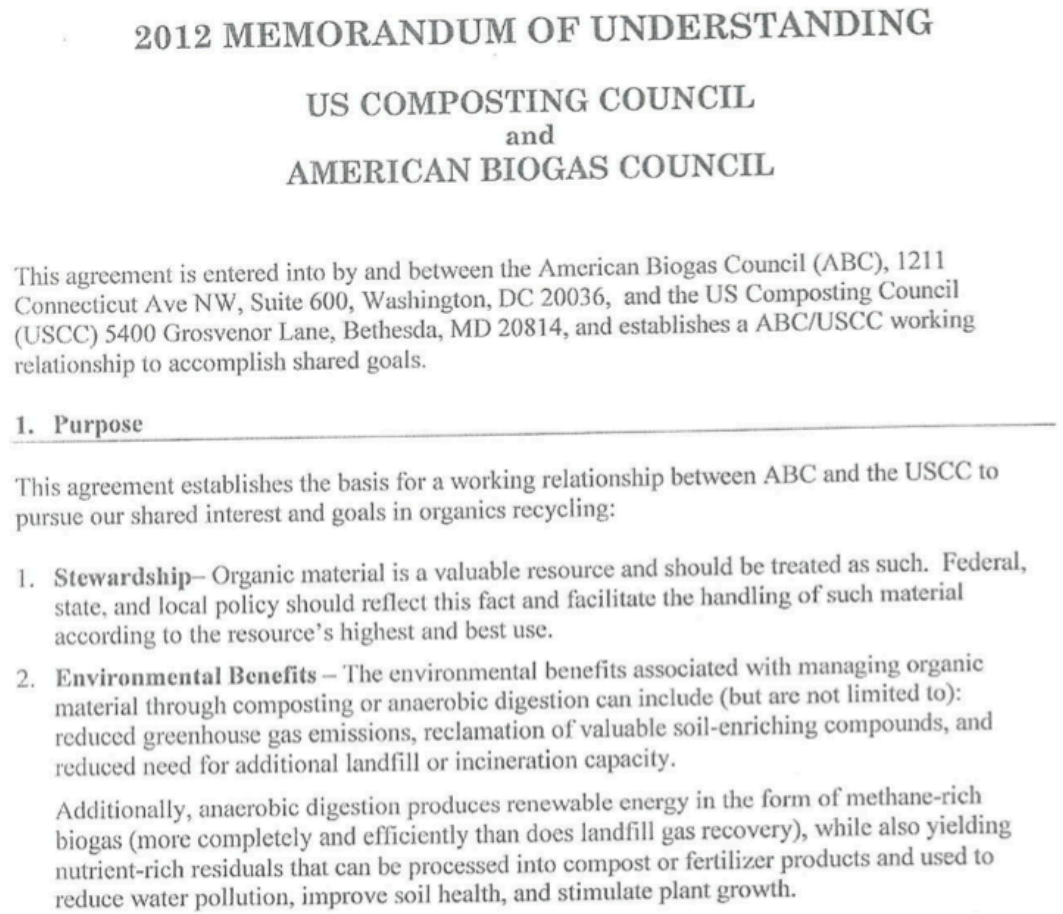
ABC and USCC Sign MOU

Goal:

Organic Waste Plans

Seven Principles:

- Stewardship
- Environmental Benefits
- Economics Benefits
- Complementary and Proven Technologies
- Infrastructure Support
- Regulation



2012 MEMORANDUM OF UNDERSTANDING

US COMPOSTING COUNCIL
and
AMERICAN BIOGAS COUNCIL

This agreement is entered into by and between the American Biogas Council (ABC), 1211 Connecticut Ave NW, Suite 600, Washington, DC 20036, and the US Composting Council (USCC) 5400 Grosvenor Lane, Bethesda, MD 20814, and establishes a ABC/USCC working relationship to accomplish shared goals.

1. **Purpose**

This agreement establishes the basis for a working relationship between ABC and the USCC to pursue our shared interest and goals in organics recycling:

1. **Stewardship**– Organic material is a valuable resource and should be treated as such. Federal, state, and local policy should reflect this fact and facilitate the handling of such material according to the resource's highest and best use.
2. **Environmental Benefits** – The environmental benefits associated with managing organic material through composting or anaerobic digestion can include (but are not limited to): reduced greenhouse gas emissions, reclamation of valuable soil-enriching compounds, and reduced need for additional landfill or incineration capacity.

   Additionally, anaerobic digestion produces renewable energy in the form of methane-rich biogas (more completely and efficiently than does landfill gas recovery), while also yielding nutrient-rich residuals that can be processed into compost or fertilizer products and used to reduce water pollution, improve soil health, and stimulate plant growth.

State Selection Criteria

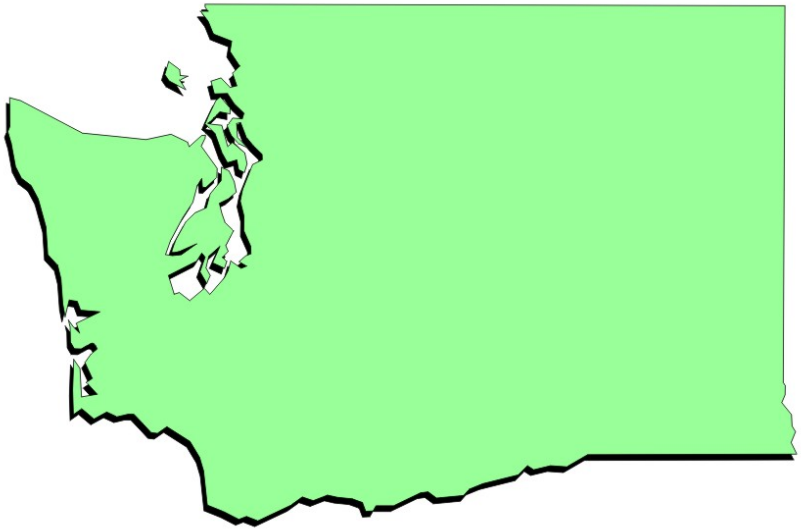
1. Concentration of organics – population - agriculture
2. Organics processing infrastructure exists (as of June '09)
3. Declining landfill space, increasing landfill costs
4. Complementary policies for GHG reduction
5. Commitment to sustainability, etc
6. Existing plans for organic waste

Top Ten States

CA, WI, NY, WA, MA, MN, OR, PA, NC, NJ

State Spotlight: Washington, Incentive Payment Program, Waste Diversion, GHG Reduction

- **Incentive Payment Program:**
  - Payments based on kWh from digester
- **Seattle Waste Diversion:**
  - 69% by 2020 and above 70% by 2030
- **GHG Reduction:**
  - 1990 levels by 2020;
  - 25 pct below 1990 levels by 2035;
  - 50 pct below 1990 levels by 2050 (LAW)



State Spotlight: Massachusetts, Organics Ban, AD Goals, GHG Reduction

- **Organics Ban:**
  - > 1 ton of org/week -> must separate organics (2014)
  - Divert incremental 350,000 tons/year
- **AD Goals:**
  - 3 AD/CHP projects by 2014
  - Increase energy production of aerobic and AD to 50 MW by 2020
- **GHG Reduction (RGGI):**
  - 80 pct below 1990 levels by 2050 (LAW)

Conclusion

- Composting and Biogas Work Together
  - Projects: Fully utilize organic waste
  - Policy: Achieve organic waste plan

Thank You – Get Involved!

- **Take Legislative Action**
  - How? www.AmericanBiogasCouncil.org (click on "Legislative Action")
- **Become a Member** of the American Biogas Council (dues start @ $75-$1,200)
  - How? ABC Website, or call/email me
- Sign up for the **FREE Biogas News**
  - How? ABC Website, or give me your card

Josh Lieberman, Program Coordinator
American Biogas Council
1211 Connecticut Ave NW
Suite 600
Washington, DC 20036

202.640.6595
info@americanbiogascouncil.org (yes, it will come to my inbox)

Goal: Turn all (non-woody) organic waste into BIOGAS

Benefits:

Waste Treatment	Energy	Environmental	Economic
•Biological process •Mature technology •Small footprint •Reduces waste volume •Very efficient and complete decomposition •Nutrient recovery and recycling	•Net-energy producing •Multiple end-uses for biogas: •Heat/electricity/both •Pipeline quality, renewable natural gas •Vehicle fuel •Very reliable •Baseload renewable energy (not intermittent)	•Complete biogas/ methane capture •Dramatic odor reduction •Reduced pathogens •Reduced greenhouse gases •Addresses nutrient run-off •Increased crop yield	•Reduced waste volume, reduces costs •Jobs (temporary and permanent) •Balance sheet: changes an expense to revenue •Works well with composting (biogas first)

State Spotlight: Massachusetts, Organics Ban

- Public Act No. 11-217