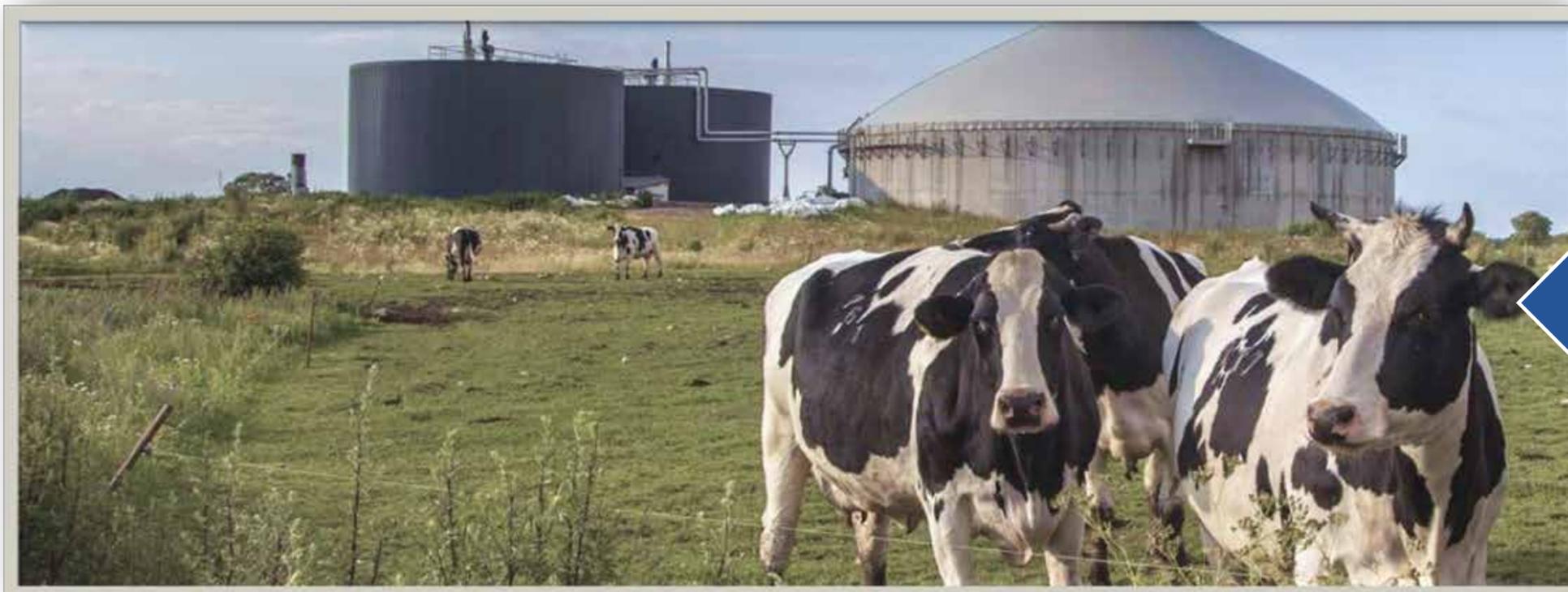


# **ANAEROBIC DIGESTION TRENDS AND SUCCESSSES IN THE U.S.**



Chris Voell, Program Manager, U.S. EPA AgSTAR

# AGSTAR PROGRAM



## VOLUNTARY PROGRAM

Collaborative effort sponsored by EPA and USDA.

**1** Promote AD  
Advancing economically and environmentally sound livestock manure management.

**2** Strong Ties  
Working with industry, government, NGOs and university stakeholders.

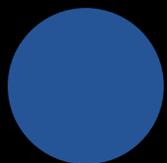
**3** Helping Hand  
Assisting those who enable, purchase, or implement farm anaerobic digestion projects.

[epa.gov/agstar](https://epa.gov/agstar)



# **THE POPULATION IS GROWING**

Our waste has to go somewhere.



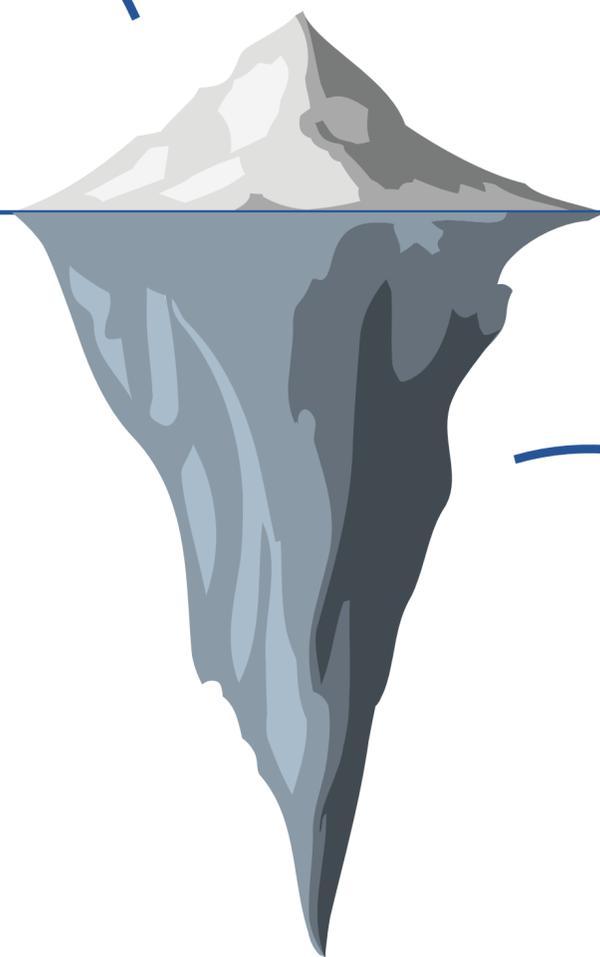
# BIOGAS POTENTIAL

**253**

Existing biogas systems

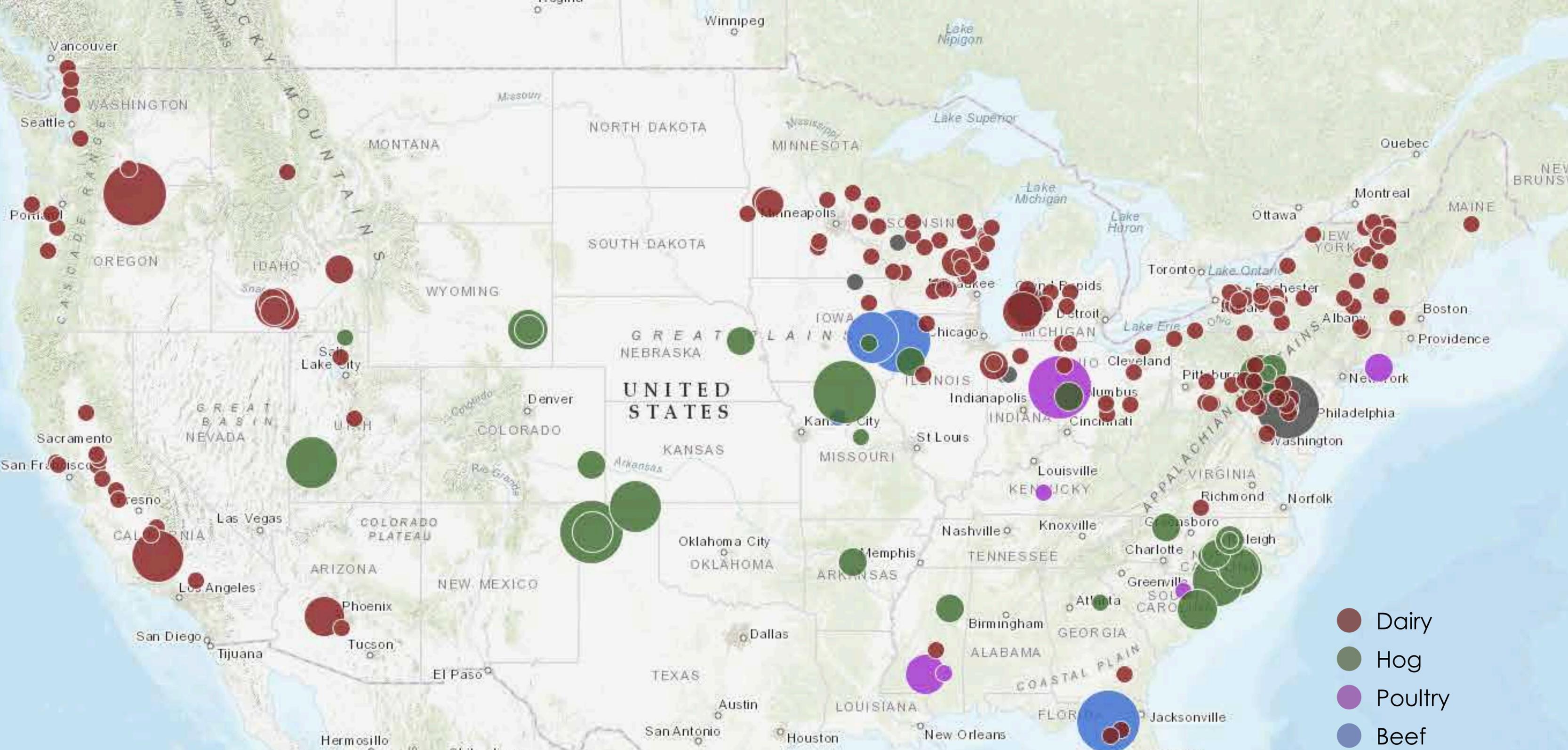
That could produce enough  
**ELECTRICITY**

to power 1,000,000 homes  
or **RENEWABLE NATURAL GAS**  
to fuel 2,000,000 cars



**~8,100**

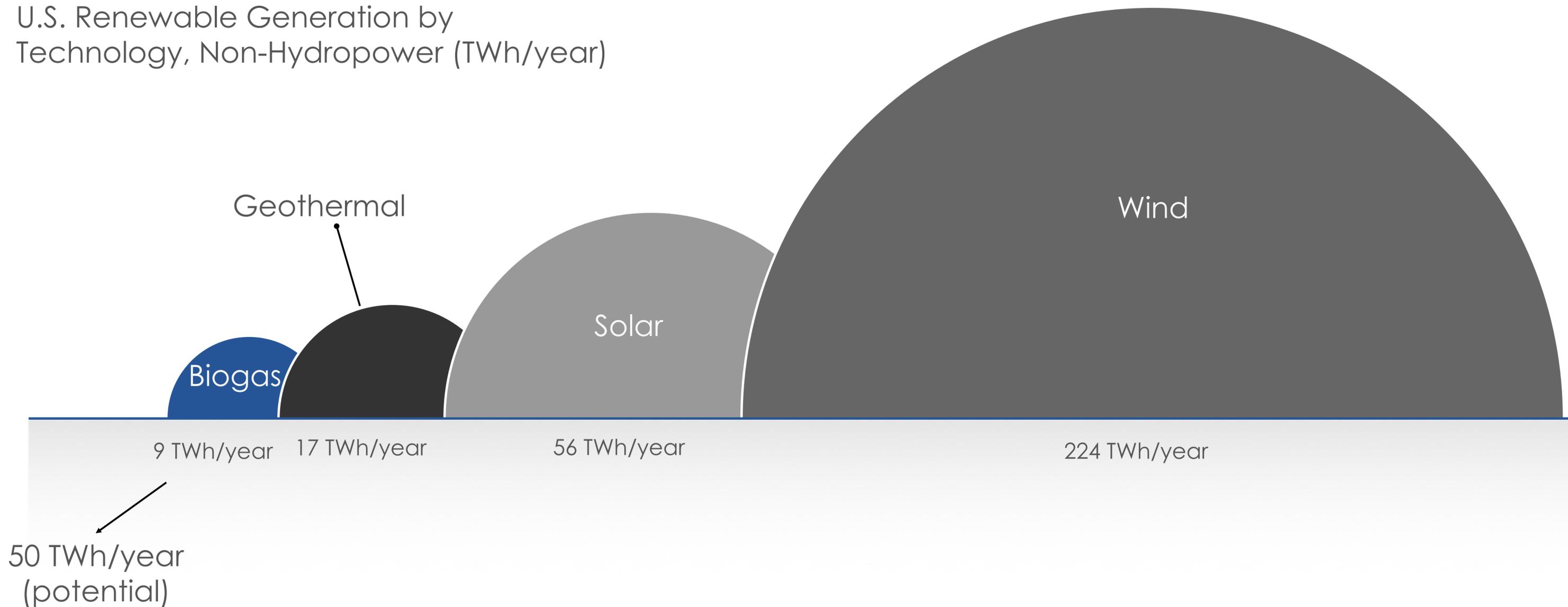
Potential biogas systems



# ANAEROBIC DIGESTER PROJECTS IN THE U.S.

# BIOGAS AND RENEWABLE ENERGY

U.S. Renewable Generation by Technology, Non-Hydropower (TWh/year)

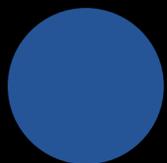


Sources: 2017 Bloomberg Sustainable Energy in America Factbook, AgSTAR Data



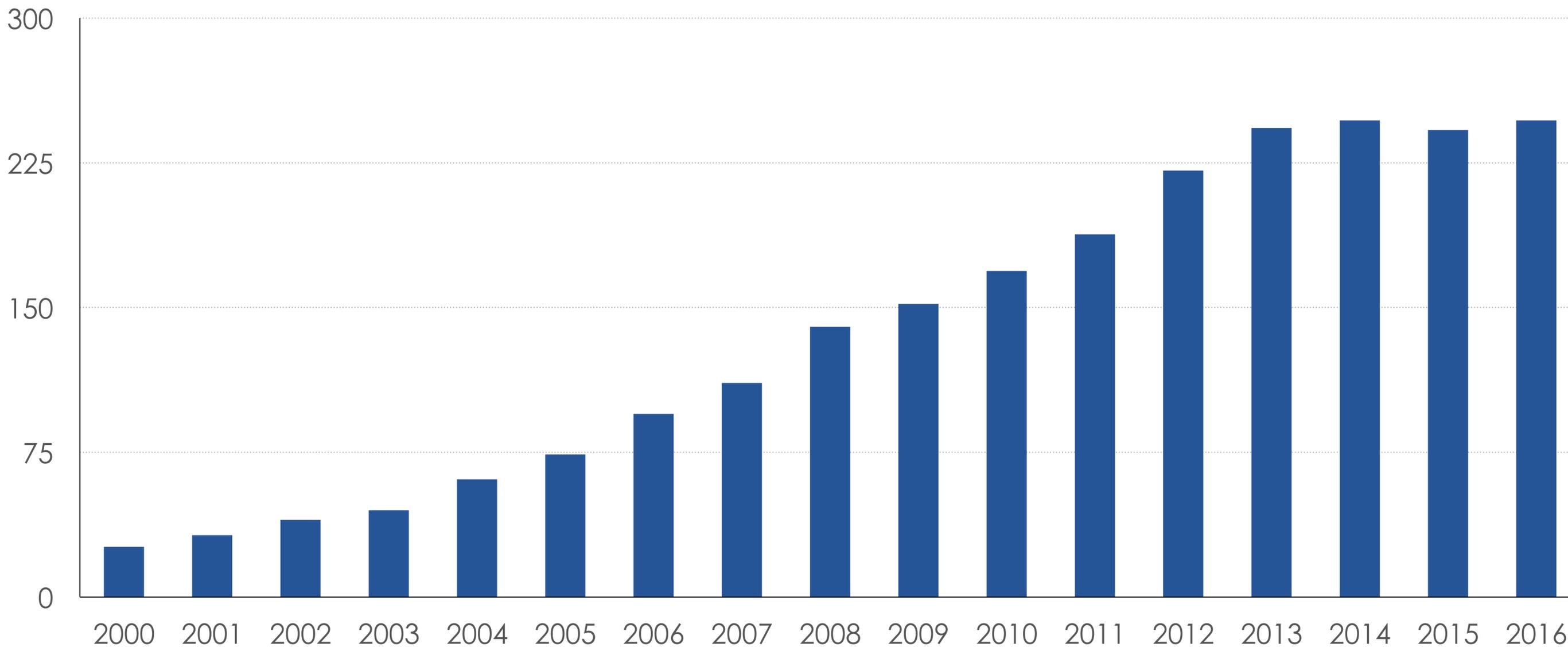
# WHAT'S HAPPENING IN THE U.S. MARKET?



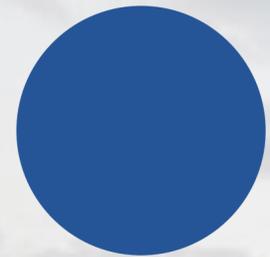


# GROWTH IN FARM DIGESTER MARKET IS SLOWING

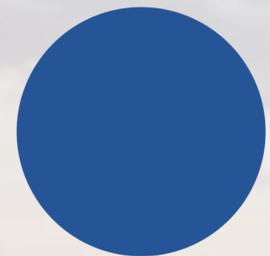
cumulative projects



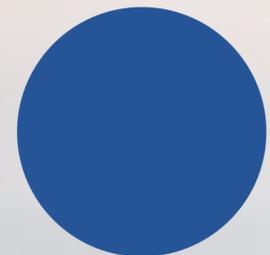
Sources: *AgSTAR Digester Database*



Low milk prices.



Low energy prices and interconnection hurdles.



Market and policy uncertainties.

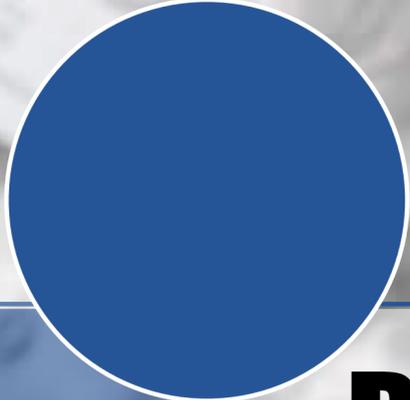
# ADDITIONAL DIGESTER CHALLENGES



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**THIS CALLS FOR SOME INNOVATION**

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# POLICIES

State-level policies create new market incentives.

- 1** Food waste bans  
Creating new incentives and opportunities in the Northeast for food waste co-digestion.
- 2** Renewable natural gas incentives  
Developing low-carbon fuel standard in California for vehicle fuel.

# BUSINESS MODELS

Innovative models help diversify revenue, spread risks, and share rewards.

- 1** Third-party owned and operated systems  
Sharing risks and rewards.
- 2** Eco-markets for coproducts  
Replacing unsustainable peat moss and plastics.
- 3** Renewable natural gas to vehicle fuel  
Taking advantage of economies of scale.

# THIRD-PARTY MODELS

## BAR-WAY FARM

Deerfield, MA

**7700 MWh**

Annual energy output.

**5,500 lbs**

Daily offset of CO2 emissions.



### Farm Facts

- 600-acres
- 250 cows milked daily

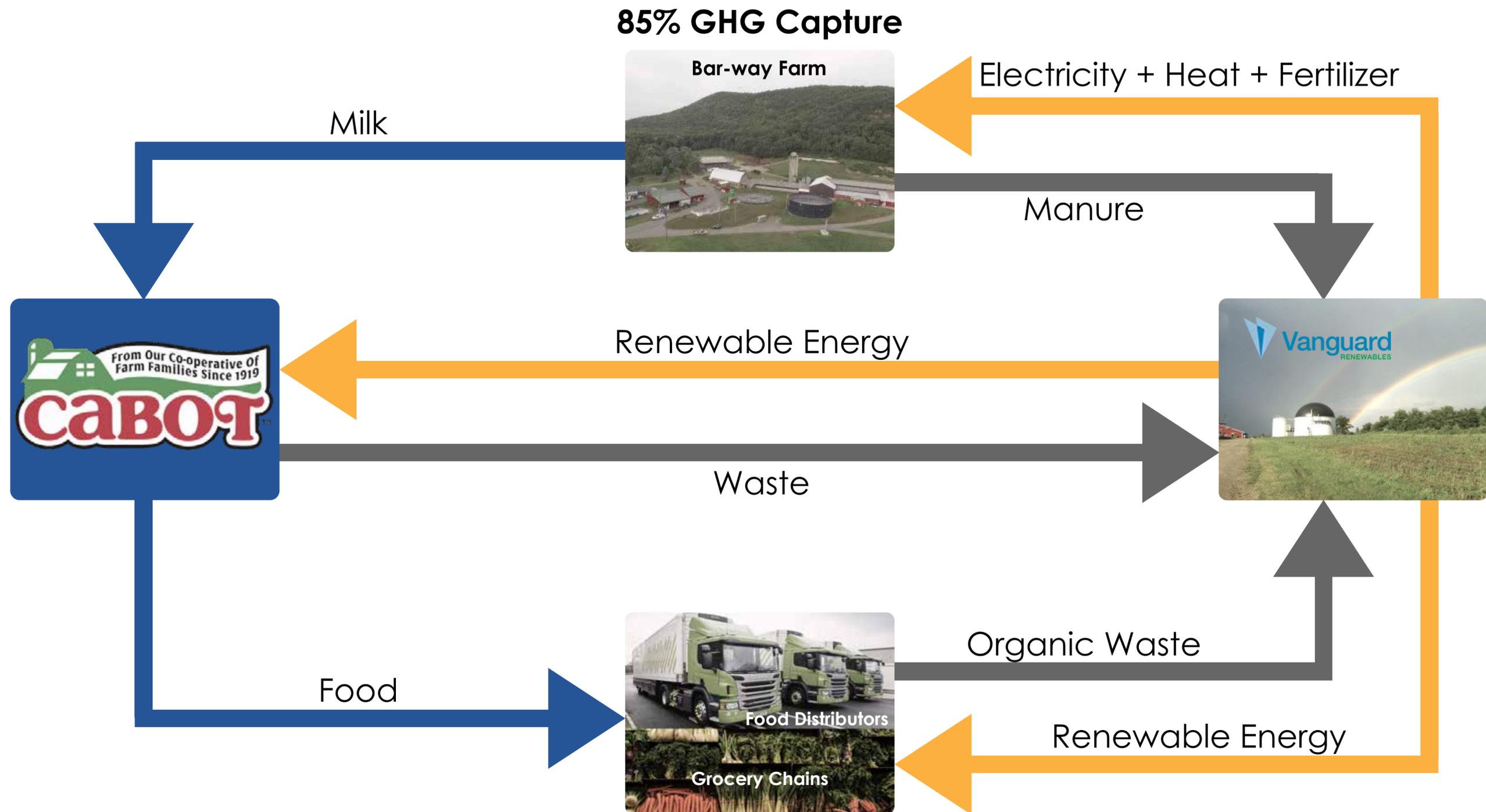
### Digester Facts

- Built in 2016
- 660,000-gallon capacity
- Owned, operated and maintained by Vanguard Renewables

### Annual Digester Input

- 9,200 tons of manure
- 30,000 tons of food waste

# CLOSED LOOP SYSTEM / SHARED RISKS AND REWARDS



# ECO-MARKETS FOR COPRODUCTS

## MAGIC DIRT

Potting soil produced from digested dairy manure.



## PARTNERSHIPS

Magic Dirt sources separated manure fibers from 19 dairy farms across the country.

## AVAILABILITY

By the end of 2017, Magic Dirt plans to be on the shelves of half the Walmart stores in the U.S.

## NUTRITIOUS

Manure soil product has more nutrients than most of its competitors.

## ENVIRONMENTAL

Each cubic yard of Magic Dirt offsets about one ton of CO<sub>2</sub>.

# ECO-MARKETS FOR COPRODUCTS

## FREUND FARM

East Canaan, Connecticut

- Small Family-owned farm
- Horizontal plug flow digester
- 300 dairy cows feeding digester



Displace unsustainable peat moss and plastic planters.

Biodegradable planter pots made from digested manure solids.

# WHY IS RNG SUCH A BIG OPPORTUNITY?

## CLEAN

Renewable natural gas is a low carbon-emitting fuel source.

## CREDITS

RINs and Low Carbon Fuel Standard (LCFS) credits from California help fund projects.

## CERTAINTY

Steady supply means that producers can lock in long-term fuel rates.

## QUIET

Natural gas burns cleaner and quieter, making vehicle operation more pleasant.

# RENEWABLE NATURAL GAS TO VEHICLE FUEL

## PRAIRIE'S EDGE DAIRY

Fair Oaks, Indiana



# RENEWABLE NATURAL GAS TO VEHICLE FUEL

## CALIFORNIA BIOENERGY'S KERN CLUSTER

Kern County, California

Leverages CA  
Dept. of Food  
and Ag grant  
incentives for  
digesters

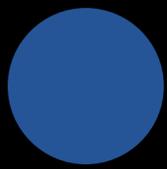
15 large dairies  
participating in  
the cluster



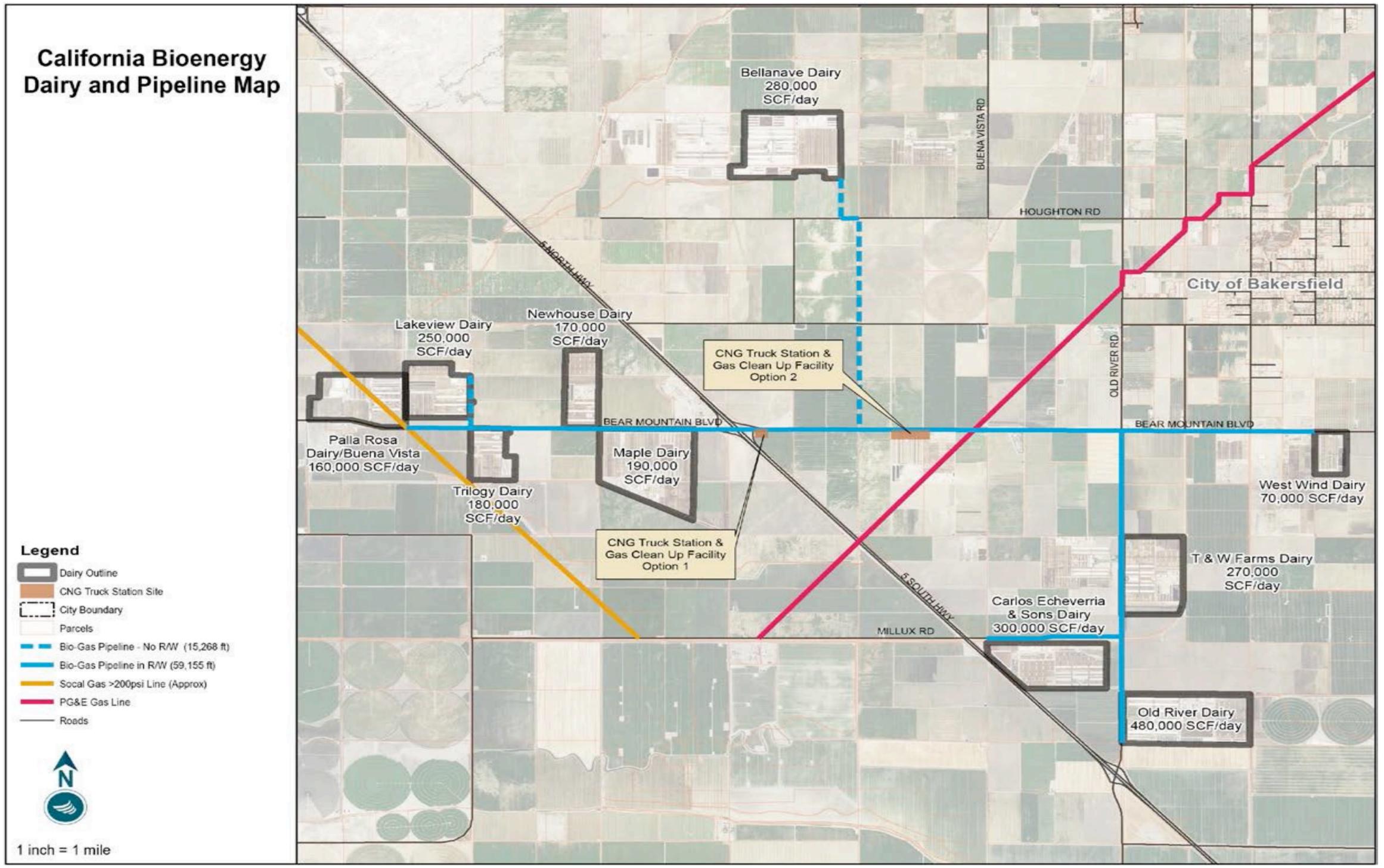
Capacity for 5  
million gallons  
diesel equivalent  
per year

Combines  
compressed  
natural gas and  
electricity  
production

15 MW base  
load (30 MW  
peak) electricity  
production



# MAP OF KERN CLUSTER



# Gemidan SSO Processing



# Orsted Industrial Organics Processing (NovoNordisk / Novozymes)



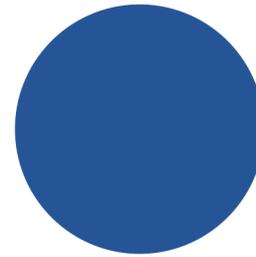
## VISIT US!

Join our mailing list, discuss partnership opportunities, find links to great AD-related planning guides and tools, or just tell us about how you're using AD on your farm.

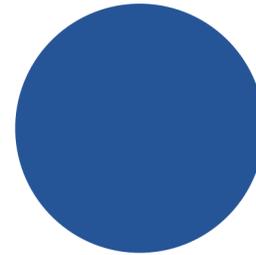
- AD 101
- Fact Sheets
- Tools
- Projects...and much more



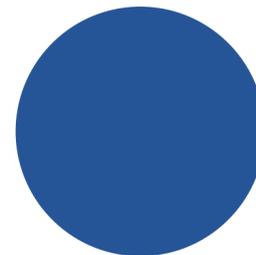
# TAKE AWAYS



Technology choices are important, but a viable business model is critical.



Low energy prices necessitate a diversified revenue portfolio.



Eco-markets for coproducts are driving force for successful AD projects.

**Did you know?** AgSTAR offers dozens of free tools to help you calculate the economic feasibility of AD projects.

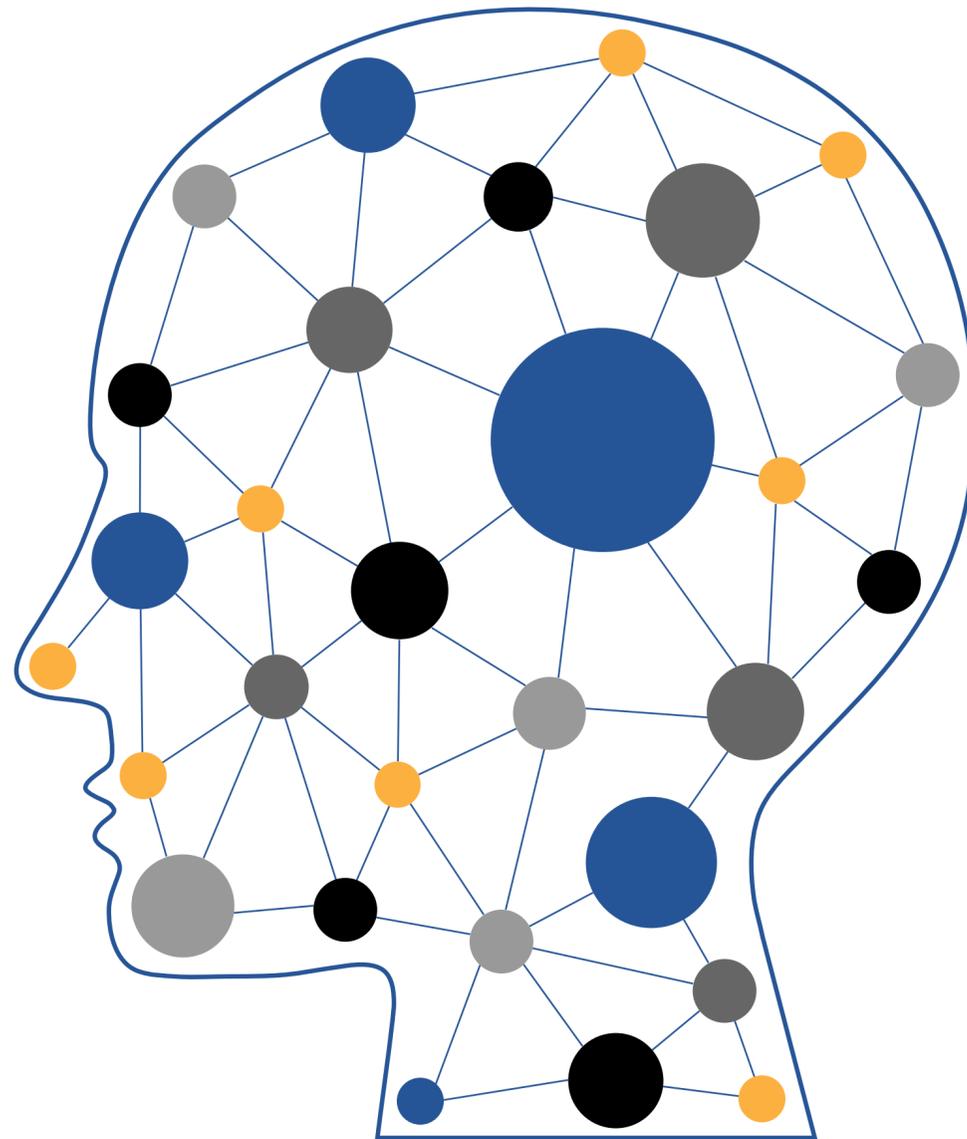
# THINK BIG FOR BIOGAS POTENTIAL

## BIO-METHANE TRUCKS

Haul all the dairy and meat products in the U.S.

## FERTILIZER MARKET

Is at least 50% manure-based organic products.



## DAIRY FIBER PRODUCTS

Surpass peat moss use in the horticulture sector.

## ENERGY INDEPENDENCE

Is reality for 1,000 livestock farms thanks to AD biogas systems.

## WASTED FOOD

Is managed (to the tune of 20M tons) in on-farm AD systems by 2030.



**QUESTIONS?**

[www.epa.gov/agstar](http://www.epa.gov/agstar)

**CHRIS VOELL**

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