

ANAEROBIC DIGESTION TRENDS AND SUCCESSSES IN THE U.S.



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BioCycle REFOR17



WHAT WE'LL SEE TODAY

We're helping farms develop cost-effective, environmentally-friendly biogas programs.

1

Introduction to AgSTAR

Who we are, what we do, and why you should care.

2

Overview of U.S. Biogas Industry

What the market looks like and why that matters.

3

Innovative Business Models

How to build a financially sustainable biogas businesses.



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.

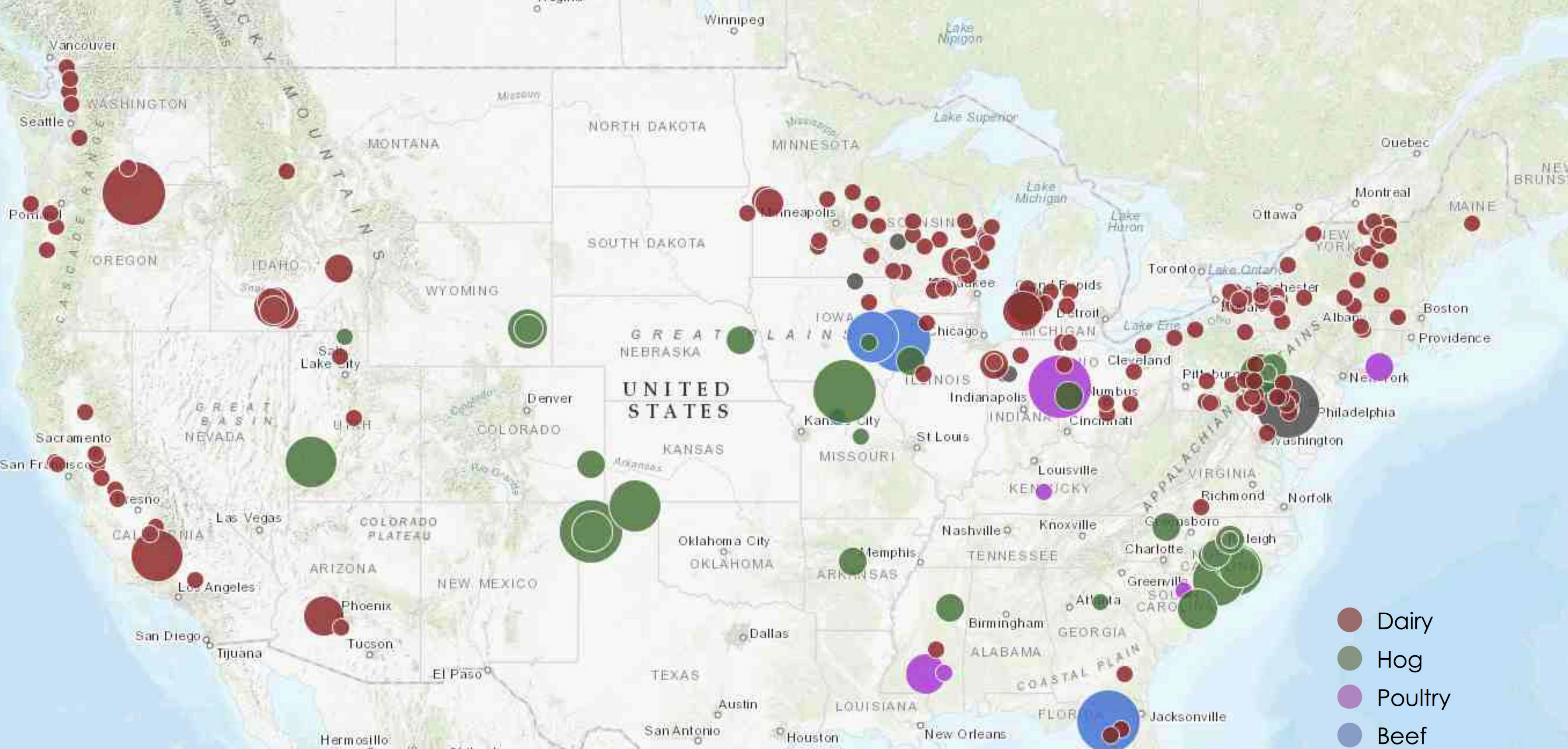


WHY BIOGAS?



THE POPULATION IS GROWING

Our waste has to go somewhere.



- Dairy
- Hog
- Poultry
- Beef
- Mixed

ANAEROBIC DIGESTER PROJECTS IN THE U.S.



BIOGAS POTENTIAL

249

Existing biogas systems

That could produce enough
ELECTRICITY
to power 1,000,000 homes
or **RENEWABLE NATURAL GAS**
to fuel 2,000,000 cars

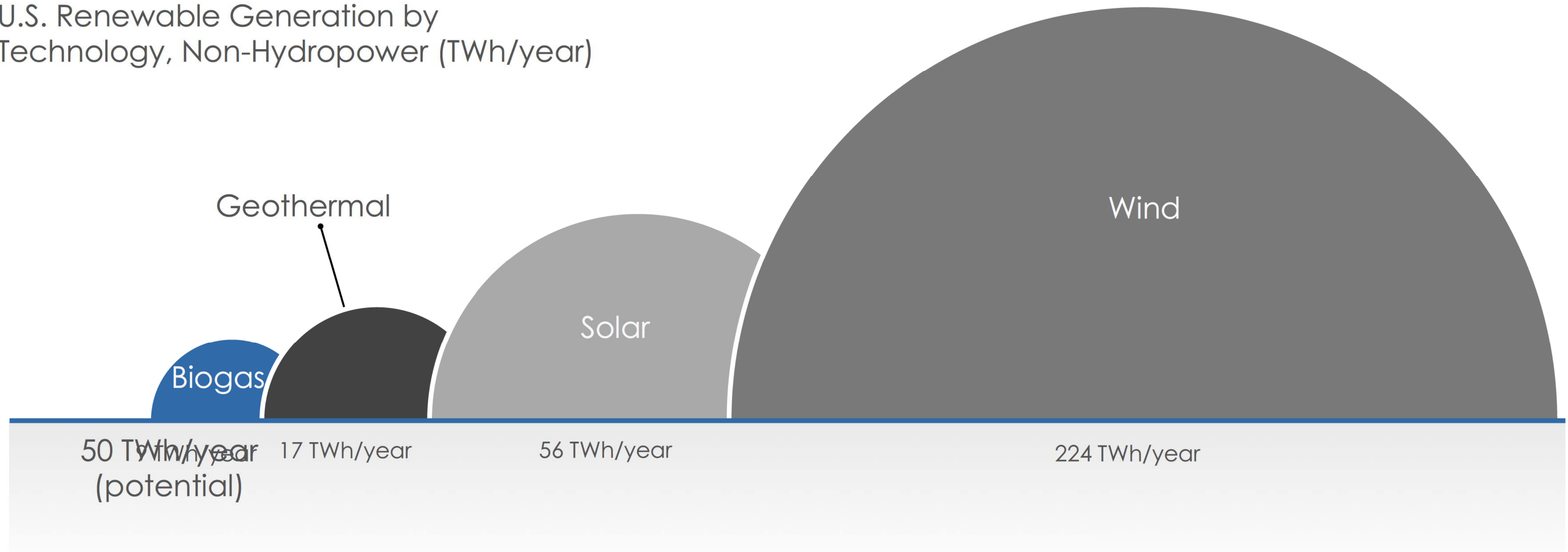
~8,000

Potential biogas systems



BIOGAS AND RENEWABLE ENERGY

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



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



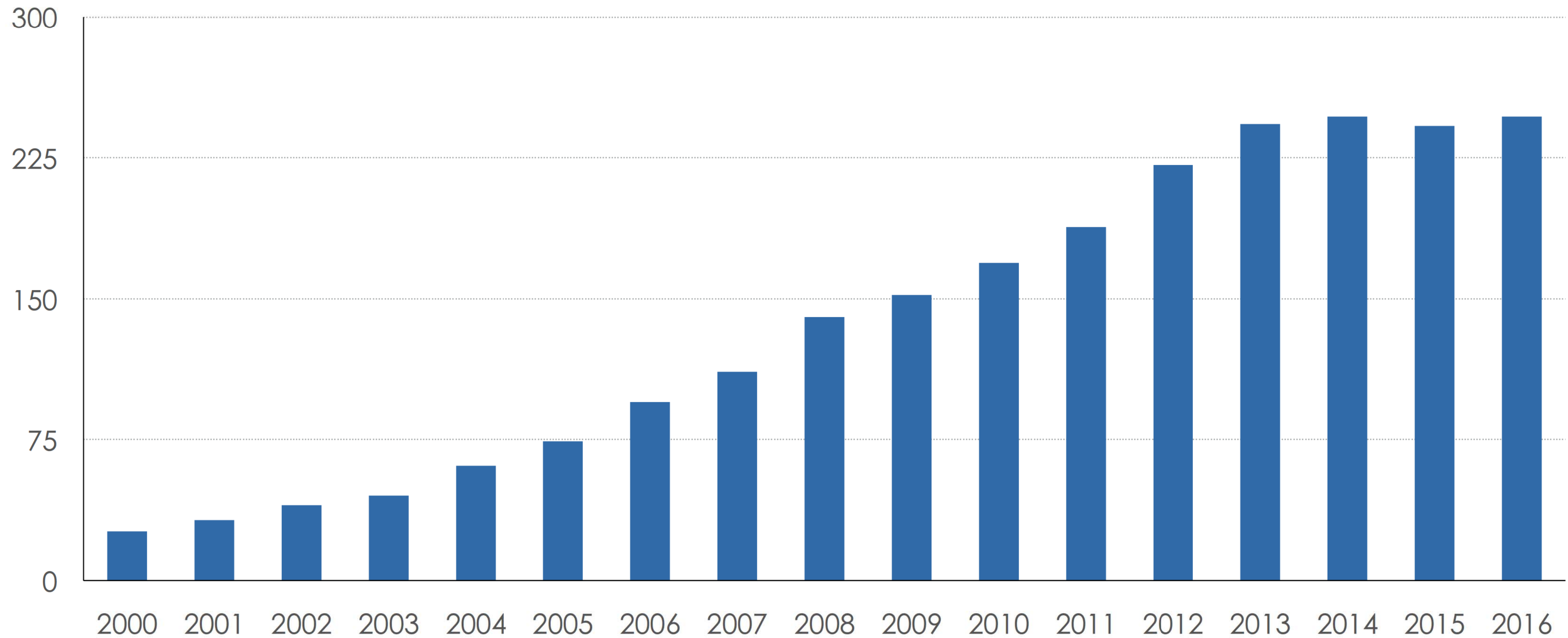
WHAT'S HAPPENING IN THE U.S. MARKET?





GROWTH IN FARM DIGESTER MARKET IS SLOWING

cumulative projects



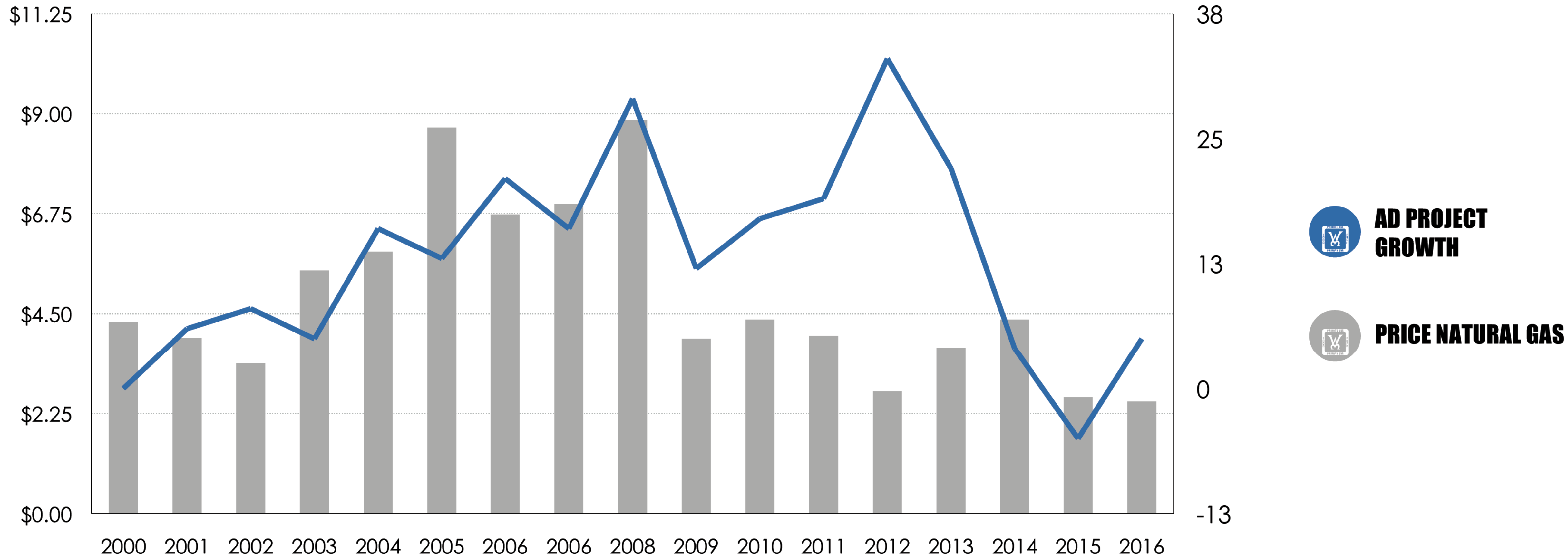
Sources: AgSTAR Digester Database



GROWTH IN FARM DIGESTER MARKET IS SLOWING

per million BTU

new projects



Sources: U.S. Energy Information Administration, Henry Hub Natural Gas Spot Price; AgSTAR Digester Database



Low milk prices.



Interconnection hurdles.



Market and policy uncertainties.

ADDITIONAL DIGESTER CHALLENGES



THIS CALLS FOR SOME INNOVATION



POLICIES

State-level policies create new market incentives.

BUSINESS MODELS

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



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

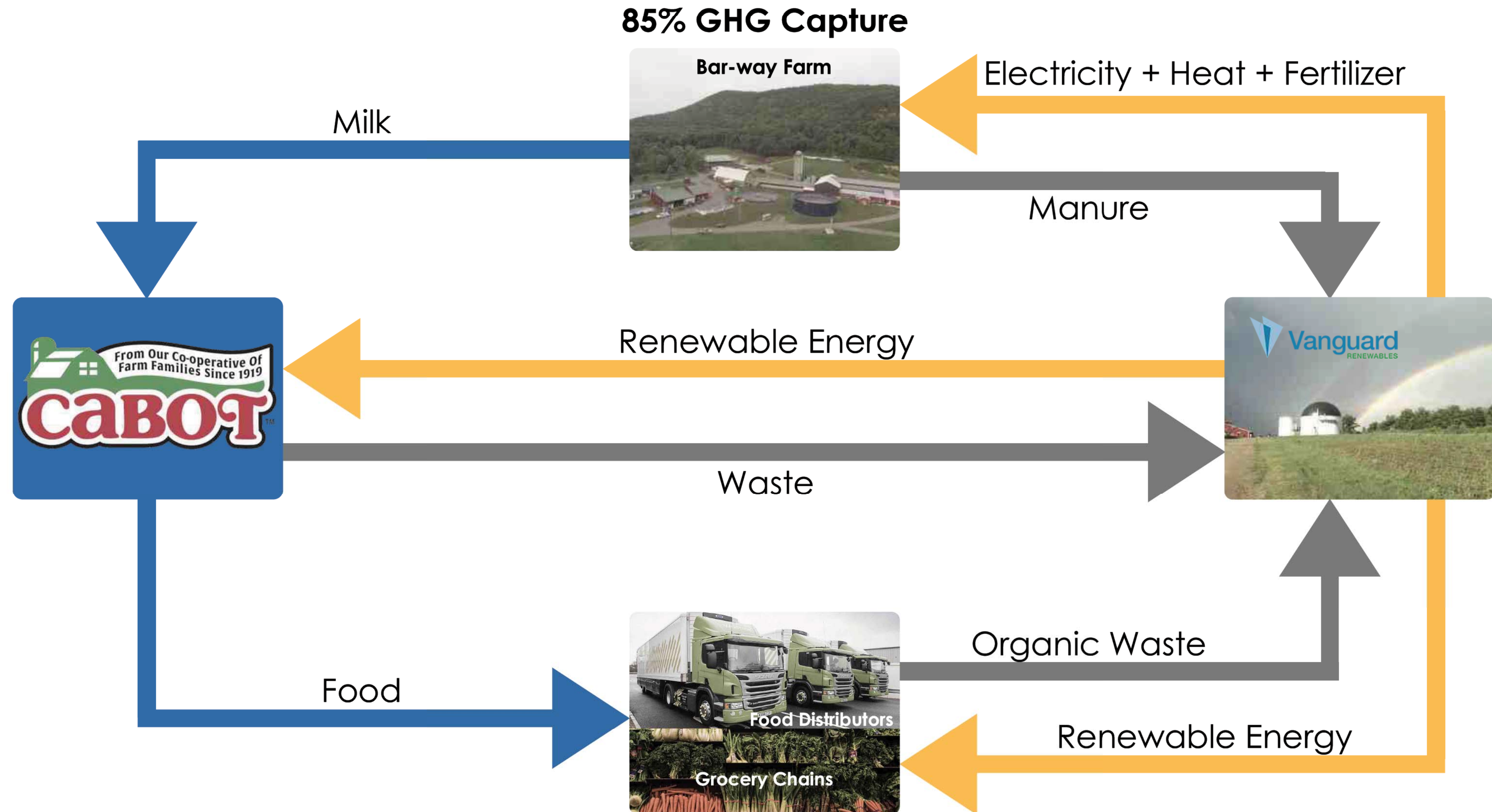
- Built in 2016
- 660,000-gallon capacity
- Owned, operated and maintained by Vanguard Renewables

Annual Digester Input

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



CLOSED LOOP SYSTEM / SHARED RISKS AND REWARDS





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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 CO₂.



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.



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RENEWABLE NATURAL GAS TO VEHICLE FUEL

PRAIRIE'S EDGE DAIRY

Fair Oaks, Indiana

Displaces about 2 million gallons of diesel fuel annually

Agricultural science center hosts 500,000 annual visitors

12 family-run dairies

Feeding digester with manure from 12,000 dairy cows

Digester operational since 2008

Produces compressed natural gas to fuel 42 tractor-trailers





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



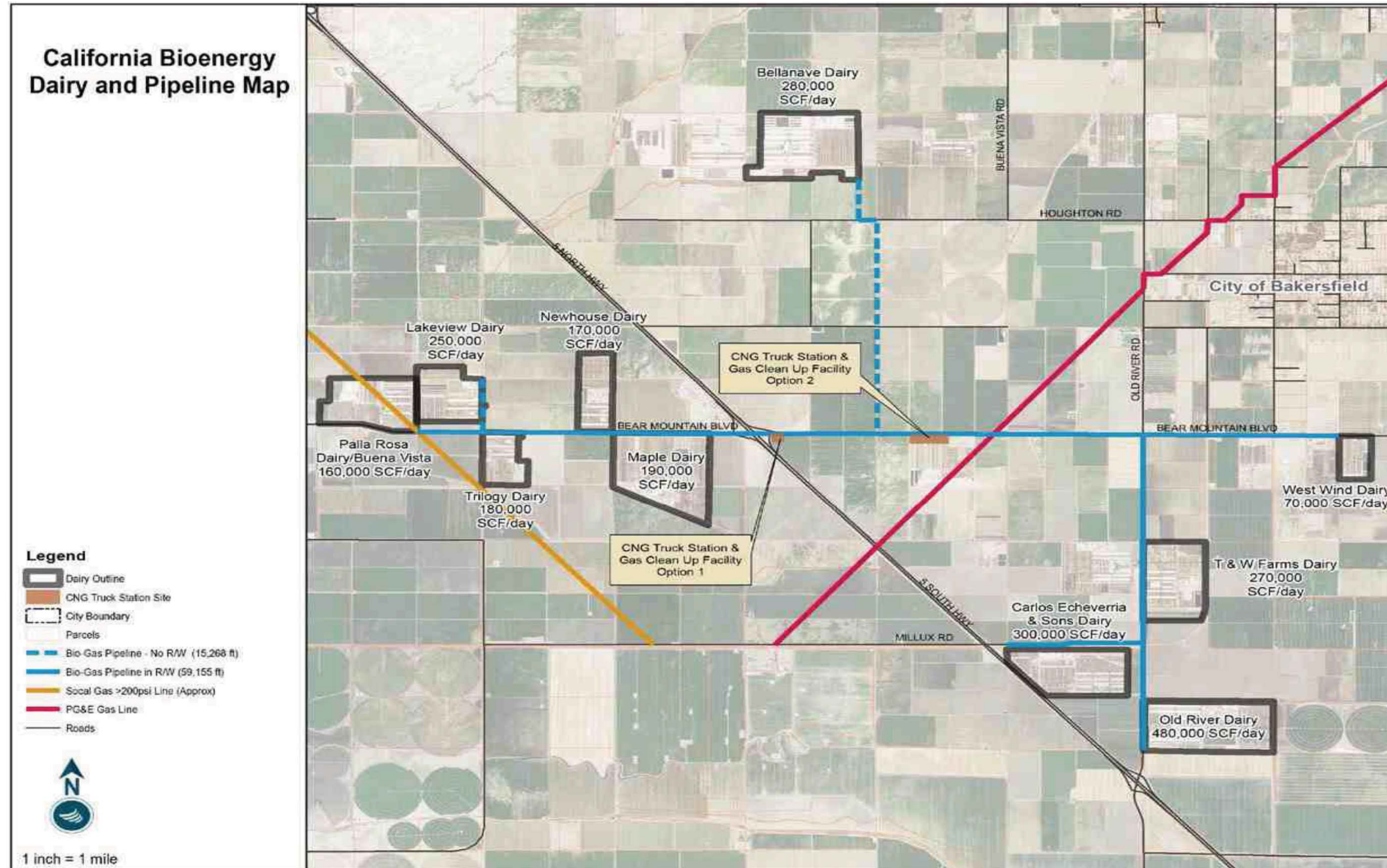
Capacity for 5
million gallons
diesel
equivalent per
year

Combines
compressed
natural gas and
electricity
production

15 MW base
load (30 MW
peak) electricity
production



MAP OF KERN CLUSTER





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.



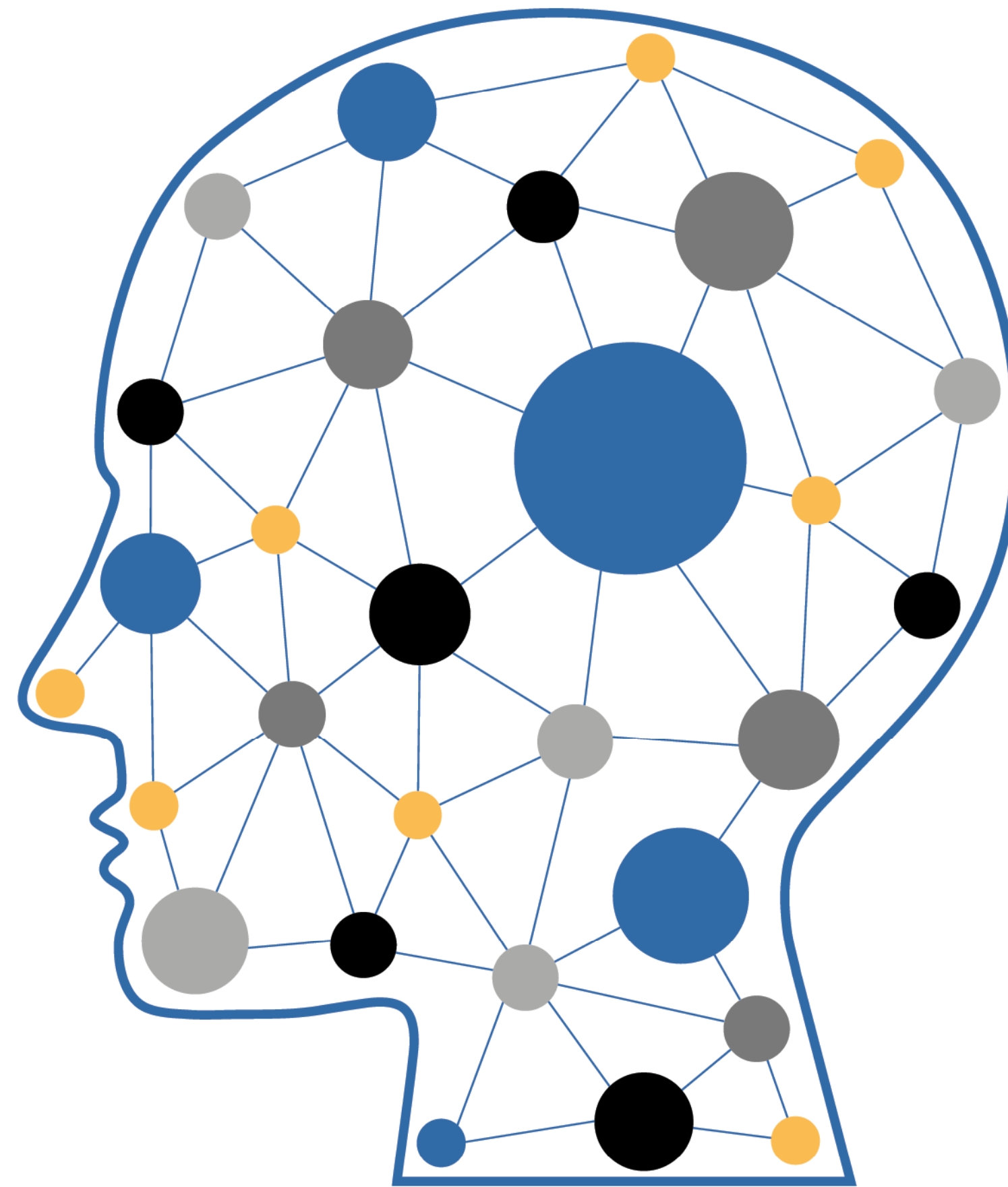
THINK BIG

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.



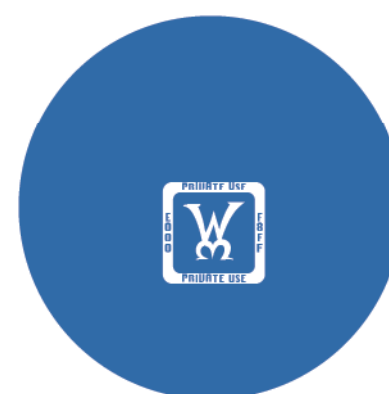
TAKE AWAYS



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.



Get Involved

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

www.epa.gov/agstar





QUESTIONS?

www.epa.gov/agstar

NICK ELGER

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