

# Innovative Business Models for Anaerobic Digestion Projects

March 15, 2017

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CHRIS VOELL - PROGRAM DIRECTOR

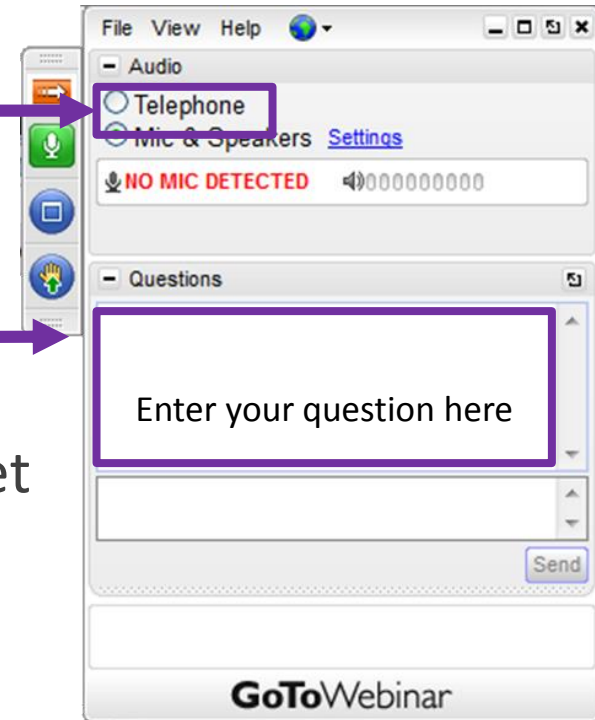
NICK ELGER – PROGRAM MANAGER

AGSTAR PROGRAM, US EPA

# Tips

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- All participants will be muted at the beginning of the webinar
- When you join, audio will be through your computer
  - Use headphones, or
  - Choose telephone and follow the prompts to dial in
- Questions submitted during the webinar will be reviewed at the end of the webinar
  - Type a question here
- If you are experiencing technical difficulties, please let us know using the Questions pane on the right side or contact Jay Gallo at 203-687-9432



# Agenda

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- Opening Remarks on the U.S. Biogas Industry
  - Chris Voell, US EPA AgSTAR
- Elements of Successful AD Systems
  - Nick Elger, US EPA AgSTAR
- Third-Party Models to Develop and Operate AD Projects
  - Carly Filler, Vanguard Renewables, and Ethan Werner, CH4 Biogas
- Establishing Successful Partnerships
  - Daryl Williams, Tulalip Tribes and Qualco Energy Board
- Questions and Answers

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# Changing the Story

Chris Voell, Program Director

USEPA AgSTAR



We've traditionally defined benefits based on the 'outcomes' of AD:

- *Renewable Energy*
- *Odor Control*
- *Clean Air & Water*
- *Improved Manure Management*
- *Methane Reductions*

...and we will continue to promote and better refine these.



Michigan State University, Lansing, MI

But, suggest we have to refocus the narrative on the 'reasons' for AD:

- *Leaving Legacy for Future Generations*
- *Conserving Ag Land*
- *Energy Independence*
- *Safe, Affordable Food Production*
- *Being a Good Neighbor*
- *Growing Business and Local Economy*

...to pull more people in.



Blue Spruce Farm, VT

# Finding the Right Business Model

- Better way to share project risk and reward – not all on farmer
- Involve partners along the value chain – coops, customers, suppliers, processors
- Draw on strengths – marketing, contracting, permitting, energy, design, operations
- Search for common goals – financial, public relations, market expansion
- Evaluate third party investment, ownership, operation
- Look to traditional ‘cooperative’ model – for use with manure solids, nutrients, energy, fuel
- Be creative and open-minded
  - ...and you’re going to hear a lot of that from our speakers today.

# Think Big

(aspirational examples – don't quote me 😊)

- All dairy and meat product hauling in the US will be done using bio-methane fueled trucks.
- 50% of fertilizer market will be manure-based organic products.
- Dairy fiber products will surpass peat moss use in the horticulture sector.
- 1,000 livestock farms will be energy independent based on AD-biogas based energy streams.
- 20M tons of wasted food will be managed in on-farm AD systems by 2030.



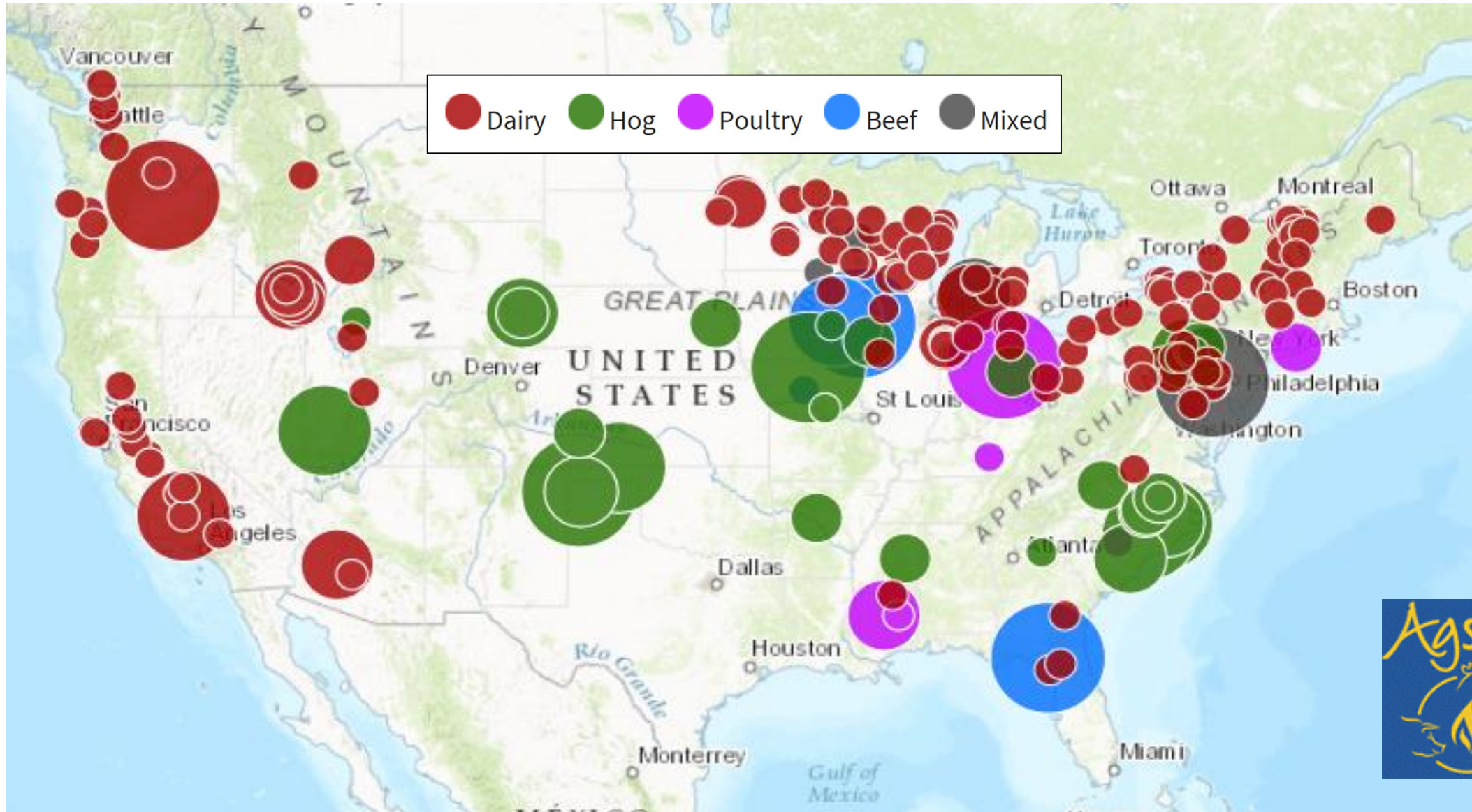
# Elements of Anaerobic Digester System Success

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NICK ELGER, PROGRAM MANAGER  
EPA AGSTAR



# Anaerobic Digester Projects in the U.S.



# Livestock Anaerobic Digester Systems in the United States

There is potential for about

**8,000**

additional livestock anaerobic digester systems in the U.S.



If fully realized, these digesters could produce

**257 billion**

cubic feet per year of biogas

That's enough energy to power



**1 million American homes**

for one year, or provide natural gas to fuel

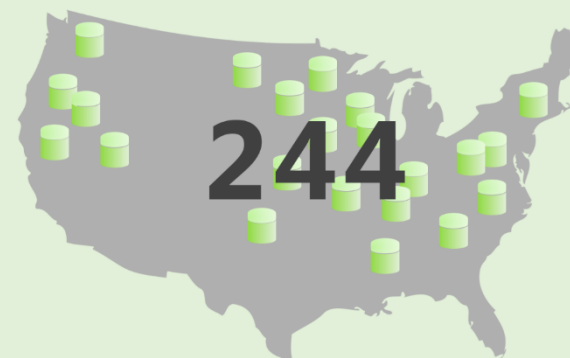


**2 million passenger cars**

for one year



There are currently



livestock anaerobic digester systems across the U.S.



# Elements of AD System Success

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# Feedstock Management

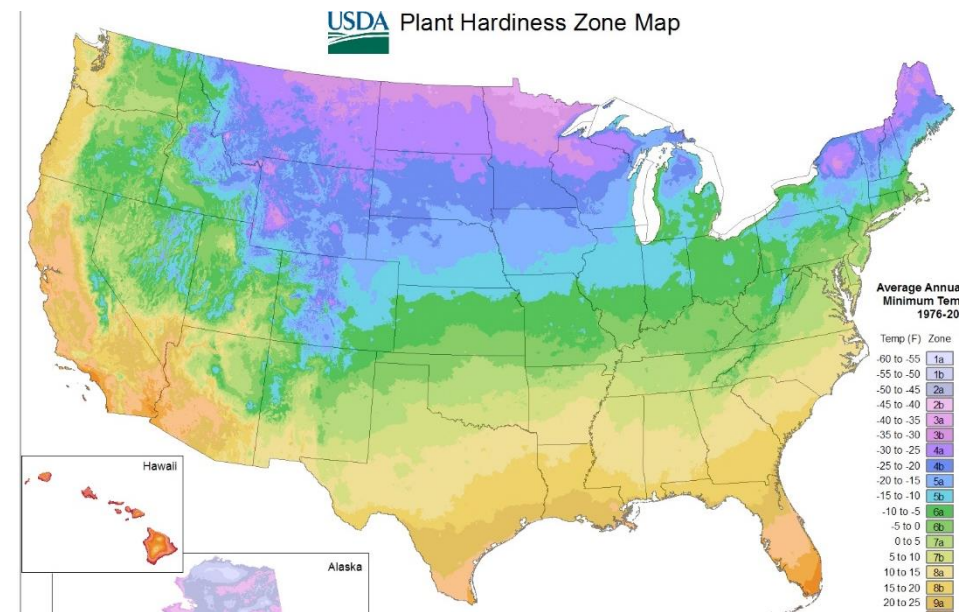
- Manure, food waste, contracts, tipping fees





# AD Technology Selection

- Goals, feedstocks, manure v. co-digestion, climate





# Digestate and Nutrient Use

- Crop nutrients, animal bedding, eco-market products



<http://articles.extension.org/pages/8904/liquid-manure-application-and-irrigation-equipment>



<http://ncsysinc.com/agriculture/>





# Energy Production

- On v. off-farm, electric, heat, fuel





# Odor Control

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- Neighbor relations, business growth





# Operation & Maintenance

- Digester, energy production, farm staff v. 3<sup>rd</sup> party



Photo: Green Mountain Power



Photo: Vanguard Renewables



# Viable Business Model

- Project partners, outside investment



Photo: Vanguard Renewables



Photo: DFA. <http://dfaleader.com/article/cooperatives-form-ov-to-food-waste-noblehurst-farms-inc>

# Funding Opportunities

## USDA

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### Renewable Energy for America Program (REAP)

- Grants available up to \$500,000
- Loan Guarantees

### Environmental Quality Incentives Program (EQIP)

- Up to \$450,000

<https://www.rd.usda.gov/programs-services>

<https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/eqip/>

[https://www.rd.usda.gov/files/RBS\\_StateEnergyCoordinators.pdf](https://www.rd.usda.gov/files/RBS_StateEnergyCoordinators.pdf)



## State and Other Incentives

### Database of State Incentives for Renewables & Efficiency (DSIRE)

<http://www.dsireusa.org/>



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# AgSTAR EPA Innovative Business Models Webinar

## Vanguard Renewables and CH Four Biogas

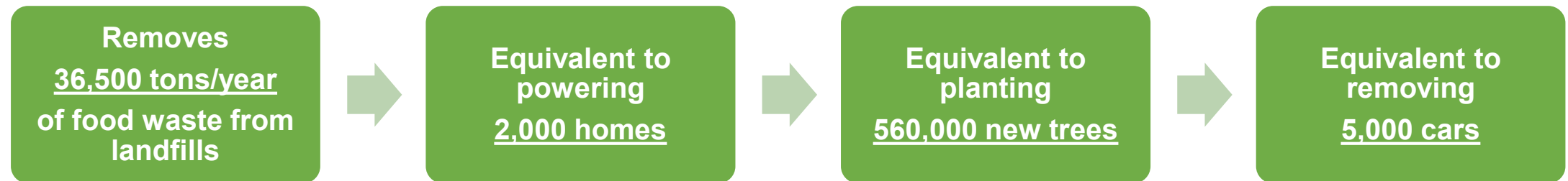
### March 15, 2017



# Who we are

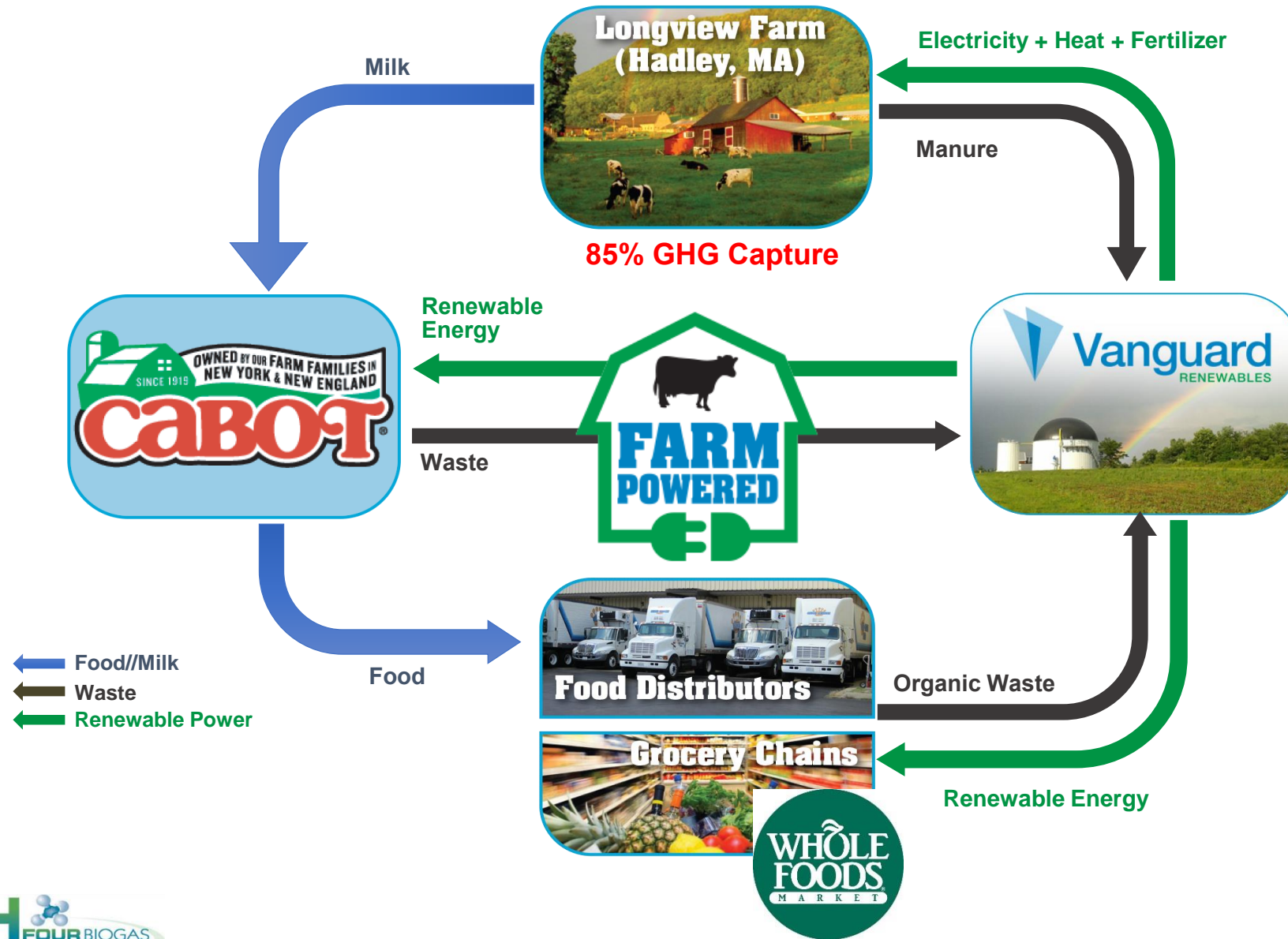
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- ❖ Vanguard Renewables – develops, owns, operates and invests in farm-based anaerobic digesters
- ❖ CH Four Biogas – successfully designs, installs and optimizes anaerobic digesters across US, Canada and South America



- ❖ Collaborate with food producers , waste haulers, utilities, government, supermarkets and farmers to achieve common goals with universal benefits

# Closed-loop Food Supply Chain



# Summary of Benefits



## Farms

- Reduction of GHG emissions
- Reduced electric costs & free heat
- Bedding for cows
- Organic nutrient-rich fertilizer
- Increased crop yields by 40%
- Improved manure & nutrient management
- Improved economic performance with supplemental lease and management income
- Sustaining farms for generations



## Food Industry

- Sustainable waste disposal
- Achievement of internal/external sustainability goals
- Energy credits to reduce electricity costs
- Fulfills core value to “practice and advance environmental stewardship”
- Changes the way people think about the relationship between food supply, the environment and their bodies
- Promotes customer engagement and loyalty





# The digester blends into the farm operation



Deerfield, MA

VanguardRenewables.com

<2 acres; 1 MW

# New Generation of Performance

- Vanguard and CH Four team recently completed a 675,000 gal digester in Deerfield, MA
- Represents the latest CH Four Biogas design, where 10 years of advancements are clearly demonstrated
- Facility produces 1 MW of continuous electricity and heat from a much smaller footprint than other digester constructions
- Deerfield digester incorporates latest improvements and advancements in heating, mixing and gas storage
- It will never be out of date, because the system has been configured seamlessly to integrate additional components and capacity



# Evolving Technology

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- CH Four designed and built their first digester system in 2005/2006
- Each system since has been augmented by the experience and knowledge gained by continuing research and involvement with our finished projects
- A system built in 2015 will outperform one built in 2005 due to continuous improvement policy



# Integrated Reception

- CH Four's industry leading reception tanks ensure the digester is fed by a homogeneous, energy rich slurry, which creates predictable and continuous gas flows
- Using multi-purpose and sealed reception tanks allows operators to take a wide variety of high strength feedstocks, while limiting site odors



Left: Solids receiving tank with chute and steel lid

Above: Liquids receiving tank with cam lock fitting

# Digestate Management

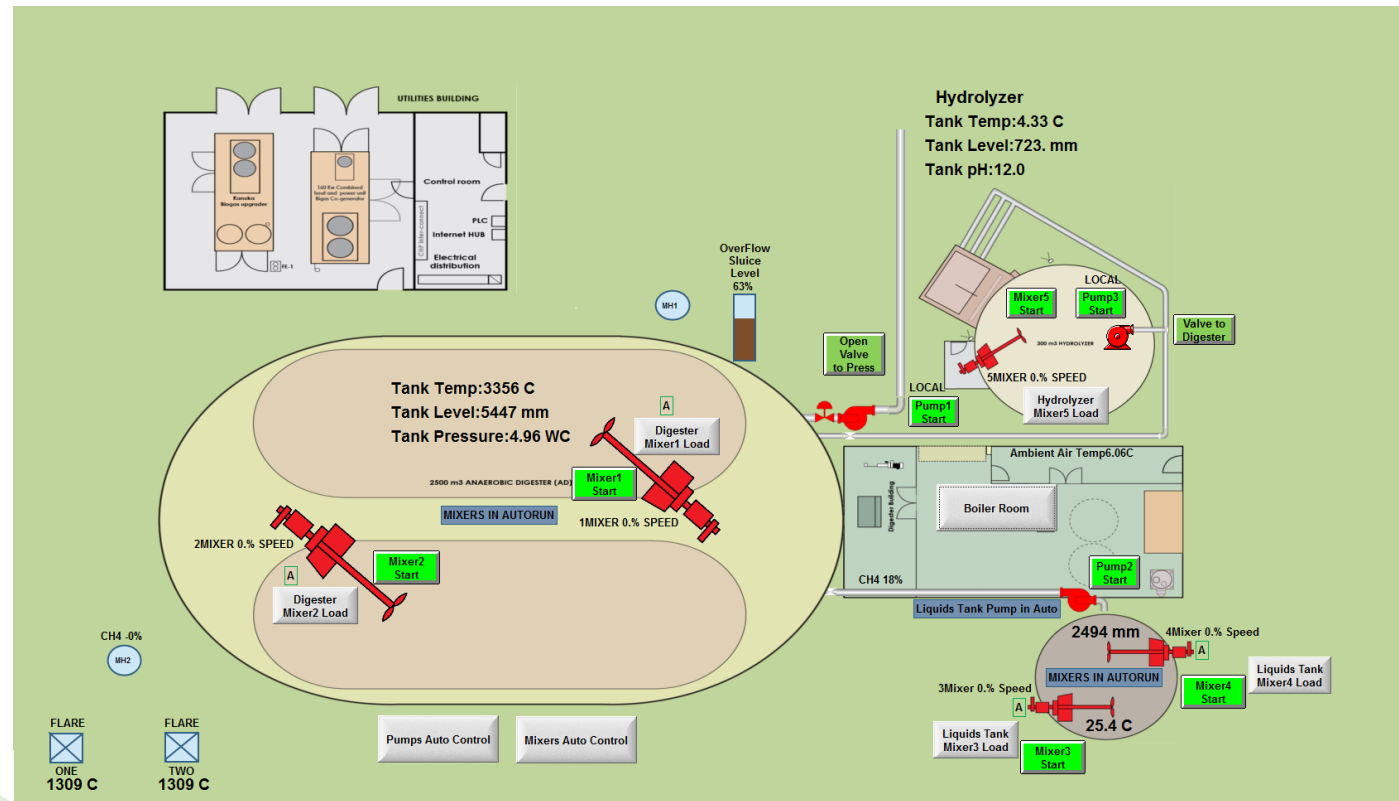
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- From the beginning to latest projects, CH Four has an emphasis on complete system solutions, front end feeding, back end management and everything in between
- Separating fibers for animal bedding, isolating raw nutrients for fertilizers & soil management and effluent treatment are all available with a CH Four system



# System Automation

- A key aspect of our facilities is a high level of automation, which lets us provide ongoing support while allowing for data tracking and ongoing analysis
- Real time monitoring by a team of experienced professionals at our offices enables a smooth operation 24/7



# Professional Support from Development through Operations

- Vanguard and CH Four collaborate on development from permitting and design through construction and start-up
- Vanguard fully staffs the operation of the plants using engineering and recipe expertise from CH Four
- Vanguard and CH Four work with waste haulers to develop long term contracts for consistent off-farm feedstock supply
- CH Four's biochemical team along with Vanguard's logistical/operations team manage feedstock recipe to optimize performance and stability of operations in digester



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# Qualco Energy Bio-Gas Project



## Sno/Sky Ag. Alliance

Dale Reiner  
Secretary

Jennifer Reiner  
Board Member



## NW Chinook Recovery

John Sayre  
Vice-President

Clare Nordquist  
Treasurer



## Tulalip Tribes

Daryl Williams  
President

Bonnie Juneau  
Board Member

<http://www.Qualco-Energy.org>



# Introduction

- ⌘ Description of Project
- ⌘ How We Started (2001)
  - ☑ The Idea
  - ☑ Building our Relationships
  - ☑ Forming a Partnership
  - ☑ Jointly Lobbying for Federal and State Support
- ⌘ Forming Qualco Energy as a three-Way Partnership
- ⌘ Qualco's Mission

# Project Description

## ⌘ Sewage Treatment for Cow Manure

- ☒ Collect Cow Manure from Dairy
- ☒ Collect Ag. Waste and Pre-Consumer food Waste
- ☒ Pump into Anaerobic Digester
- ☒ Capture Methane Gas
- ☒ Burn Gas to Produce Electricity
- ☒ Compost Bio-solids
- ☒ Return Effluent & Compost to Farms

# How We Started The Idea

- ⌘ A Mutual Friend asked for a meeting between the Tulalip Tribes Chairman, NW Chinook Recovery ED, and a Farmer to talk about how we could work out differences and potentially work together.
  
- ⌘ After the first meeting they invited a few more people to participate and look at the feasibility of building a Dairy Digester to:
  - ⌘ Help improve Water Quality in the adjacent River
  - ⌘ Improve Economics for the Dairy
  - ⌘ Generate Renewable Energy

# Building our Relationships

## ⌘ Sharing Long-Term Vision

- ☑ Maintaining a Healthy Environment
- ☑ Farm Sustainability

## ⌘ Sharing Resources and Expertise

## ⌘ Developing Trust

- ☑ Regular Meetings
- ☑ Learning About Each Others Interests and Needs
- ☑ Sharing Responsibilities
- ☑ Traveling Together
- ☑ Promising to Support Each Other and Following Through



# Forming a Partnership

- ⌘ Formed a Partnership to Move Forward with Funding Requests for Construction and Land Acquisition/
  
- ⌘ Partnership Included:
  - ☑ Farmers,
  - ☑ Northwest Chinook Recovery, and
  - ☑ Tulalip Tribes

# Jointly Lobbying for Federal and State Support



- ⌘ The Partnership Travelled Together to D.C. to Lobby for Funding
  - ☒ Met with local Congressional Delegation
  - ☒ Met with Agency Staff to Ask How They Could Help
    - ☒ DOE – Feasibility Grant
    - ☒ USDA Rural Development – Construction Grant
    - ☒ IRS – Clean Renewable Energy Bonds
  - ☒ Met with State Legislature to Ask the State to Transfer Title of the Department of Correction Honor Farm to Tulalip

# Forming Qualco Energy as a Three-Way Partnership



- ⌘ As we Started Construction, We all Decided That We Wanted to Maintain the Partnership (2008)
- ⌘ Although Tulalip Owns the Property and the Equipment for the Project, We Decided to Form Qualco Energy as a Management Company
- ⌘ Qualco is a Non-Profit Corporation Comprised of:
  - ⌘ Northwest Chinook Recovery,
  - ⌘ Sno/Sky Agricultural Alliance, and
  - ⌘ Tulalip Tribes.
- ⌘ Each Organization has 2 Board Members (Consensus Decision Making)



# Qualco's Mission



- ⌘ To Develop and Manage the Biogas Facility.
- ⌘ To Support Salmon Recovery Projects.
- ⌘ To Support Sustainable Agricultural Demonstration Projects.



**Questions?**

**<http://www.Qualco-Energy.org>**

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# Questions



# Wrap Up

- Today's presentation will be posted to AgSTAR's website on the Events page
- To learn more about EPA's AgSTAR program and the benefits of biogas recovery projects, visit AgSTAR's website at [www.epa.gov/AgSTAR](http://www.epa.gov/AgSTAR)
- Please fill out the online webinar evaluation form – your feedback is much appreciated!

The screenshot shows the EPA website page for AgSTAR. At the top is the EPA logo and navigation links for Environmental Topics, Laws & Regulations, and About EPA. A search bar is on the right. The main heading is 'AgSTAR: Biogas Recovery in the Agriculture Sector'. Below this is a featured article titled 'Anaerobic Digestion at Work on Livestock Farms' with a sub-headline 'Check out our [Stories from the Farm](#) for a first-hand account of project operations, lessons learned, benefits and challenges.' The article includes a photo of a farm with a large green biogas digester tank and a group of people. To the right of the article is a sidebar with a list of links: Learn About Biogas Recovery, Browse the AgSTAR Library, Project Database, How AgSTAR Works, Market Data and Trends, Codigestion Guidelines, Frequent Questions, and Events. Below the article is a paragraph explaining that AgSTAR promotes biogas recovery systems to reduce methane emissions. At the bottom, there are three columns of links: 'Learn about Biogas Recovery' (How does anaerobic digestion (AD) work?, Explore stories from the farm, Realize the benefits of biogas, AgSTAR National Mapping Tool), 'Implement AD Projects' (Is AD right for you?, Determine financing options, Review guidelines for AD systems, View the vendor directory, Find data, tools and resources), and 'Connect through AgSTAR' (Want to get regular updates?, Meet our Partners, See AD projects around the world).

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## AgSTAR: Biogas Recovery in the Agriculture Sector

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### Anaerobic Digestion at Work on Livestock Farms

Check out our [Stories from the Farm](#) for a first-hand account of project operations, lessons learned, benefits and challenges.

- [Learn About Biogas Recovery](#)
- [Browse the AgSTAR Library](#)
- [Project Database](#)
- [How AgSTAR Works](#)
- [Market Data and Trends](#)
- [Codigestion Guidelines](#)
- [Frequent Questions](#)
- [Events](#)

AgSTAR promotes the use of biogas recovery systems to reduce methane emissions from livestock waste. In addition to producing biogas, anaerobic digestion systems can also help achieve other social, environmental, agricultural and economic benefits.

- [Learn about Biogas Recovery](#)
  - [How does anaerobic digestion \(AD\) work?](#)
  - [Explore stories from the farm](#)
  - [Realize the benefits of biogas](#)
  - [AgSTAR National Mapping Tool](#)
- [Implement AD Projects](#)
  - [Is AD right for you?](#)
  - [Determine financing options](#)
  - [Review guidelines for AD systems](#)
  - [View the vendor directory](#)
  - [Find data, tools and resources](#)
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