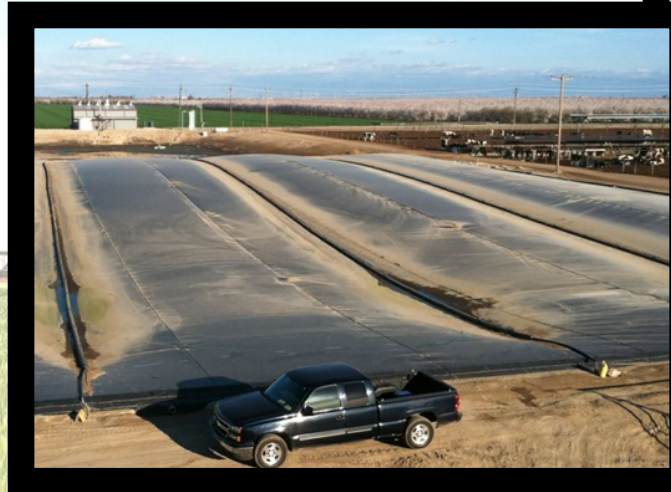


Opportunities and Challenges for reducing methane from manure management at California Dairies

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Overview

■ Voluntary win-win programs

- Projects that recover useful resources
- Projects that avoid costly control measures

■ Methane avoidance

- With flush: solids separation
- Reduced flush: Scape/vacuum, dry storage
 - Composting to add value
- Enteric

■ Methane capture/utilization (digesters)

Implementation Approach

- Goals will only be achieved if ARB and industry work together
 - Public/private partnership
- Family owned and operated businesses
 - @1,400 dairies in California
 - Lost 53 by end of May
- Sustainable projects that can achieve goals without need for regulation



Initial Steps

- Orderly, deliberate and strategic
- Create Stakeholder Working Group (ARB)
 - Identify challenges and barriers to methane reduction
- Conduct research on dairy methane emissions (ARB w/ industry)
 - Scrape
 - Solids separation
 - Livestock sector methane emissions
- Development of additional emission reduction protocols (ARB)
 - Scrape
 - Solids separation
- Get initial \$50 million in funding out early

Current Best Option for Capture

- Multiple uses for captured biogas:
 - Generate electricity
 - Pipeline injection
 - Transportation fuel

Electricity



Renewable Natural Gas (RNG)



Vehicle Fuel (RCNG)

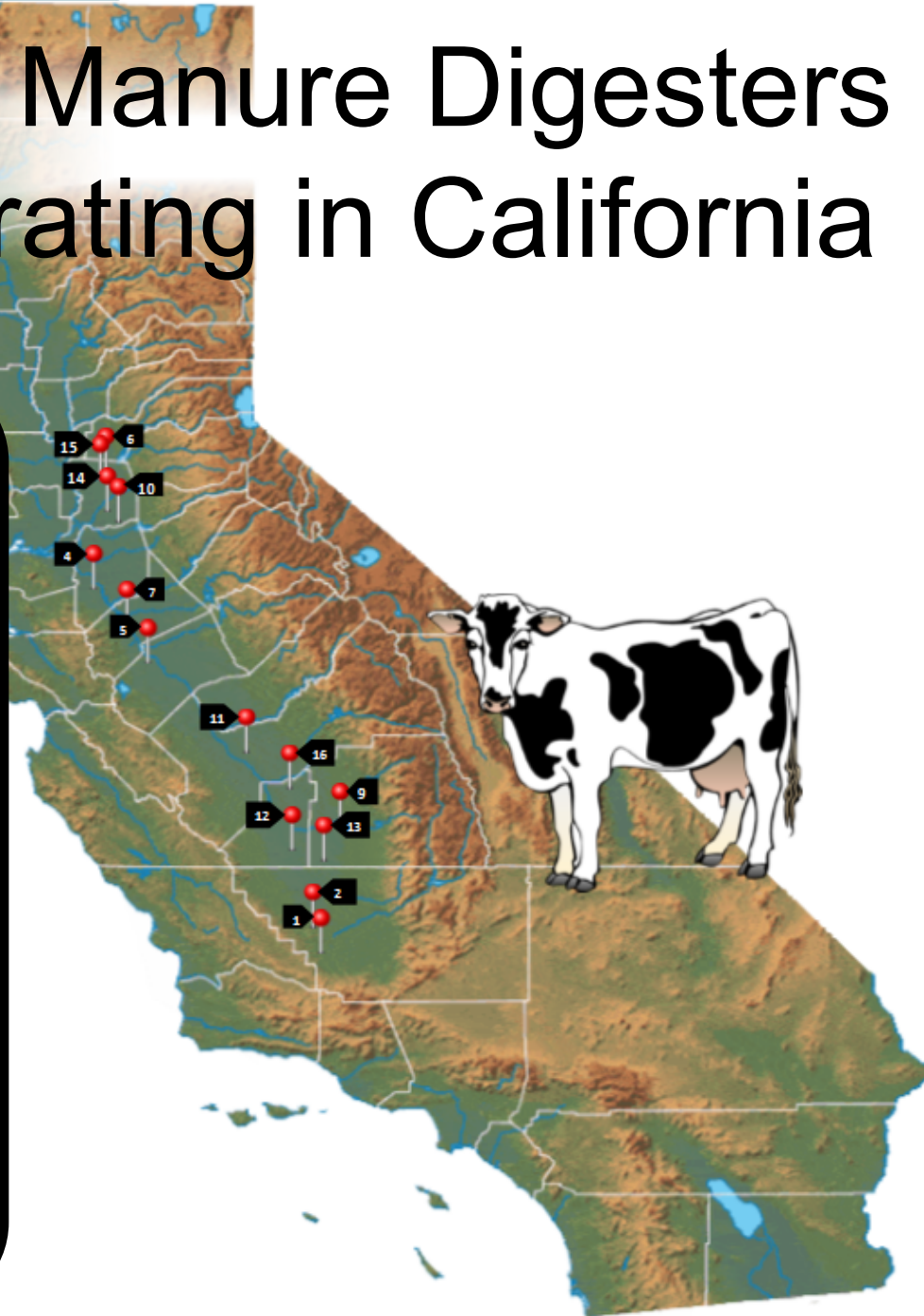


CNG Fuel Station



Dairy Manure Digesters Operating in California

1. ABEC-Bidart-Old River
2. ABEC-Bidart-Stockdale
3. Blakes Landing Farms/Straus Family Creamery
4. Castelanelli Brothers Dairy
5. Cottonwood Dairy/Joseph Gallo Farms
6. Denier Dairy
7. Fiscalini Farms
8. Giacomini Dairy
9. Hilarides Dairy
10. New Hope Dairy
11. Open Sky Ranch
12. Pacific Rim Dairy
13. Pixley Biogas
14. Van Steyn Dairy
15. Van Warmerdam Dairy
16. Verway Dairy



Digesters Must Be Accelerated to Meet State's Goals

- 100 to 200 digesters by 2030
- Significant renewable energy generation
 - 70-100 million DGE of transportation fuel/year
- Significant environmental benefits
 - Reduction of NOx and diesel particulate
 - Water quality
 - Benefits to DACs
- Digester on 5,000 cow dairy can reduce NOx by as much as 32,000 lbs. per year

Critical Need to Address Barriers

- Dairymen acceptability/perception
- Utility interconnection issues
- Project financing
- Energy infrastructure development
- BioMAT FiT
- Project funding
- Market development issues
 - Compost
 - Renewable gas procurement
 - LCFS credit mechanism
- Carbon credit invalidation

Market Development Issues

- Establish policies to develop needed infrastructure
- Develop pilot financial mechanism to reduce economic uncertainty of credits
- Implementation of 5 dairy biomethane pilot projects
 - Maximize value by targeting clusters
- Incentivize heavy duty truck fleet conversions

Project Financing 101

- 3 primary sources of revenue
 - Grants
 - Energy sales
 - Credit sales
- Typical electricity project is
 - 75% energy sales
 - 25% credit sales
- Typical transportation fuel project is
 - 25% fuel sales
 - 75% credit sales

** Establishing a mechanism to provide long-term certainty for credits is key to fuel projects*



Questions?

Discussion

Thank you

