



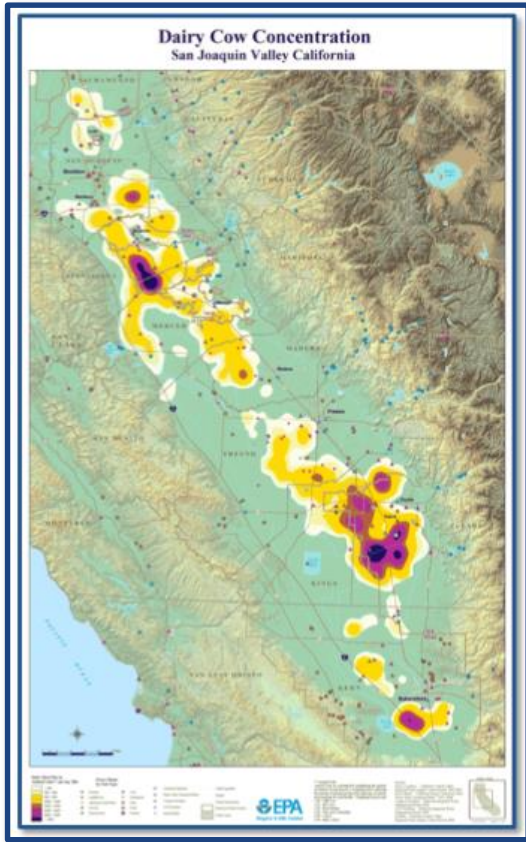
California Dairy Sustainability Summit

November 27-28, 2018

California Dairy Sustainability Summit



California's GHG Law and Dairies' Role



- CA to reduce GHG* by 40% by 2030
 - All GHG by 40% versus 1990 baseline
 - Dairy CH₄ by 40% versus 2013 baseline
- Methane is a significant GHG source
 - 9% of total: 100 year GWP**
 - 22.4% of total: 20 year GWP
- Dairies: a primary source of CA CH₄
 - 55% of CA methane emissions
 - **26% of CA methane from manure lagoon**

*Greenhouse Gases **Global Warming Potential



Dairy Digesters are Cost Effective*

Program	Cost Per Ton ^a
Organics and recycling loans	\$4
Forest health	4
Dairy digester research and development program	8
Organics composting/digestion grants	9
Forest legacy	10
Recycling manufacturing	15
Delta and coastal wetlands restoration	30
State water and efficiency and enhancement program	33
Clean vehicle rebates	46
Sustainable agricultural lands conservation	59
Mountain meadow ecosystems restoration	113
Urban and community forestry	116
Water-energy grant program	141
Affordable housing and sustainable communities	191
Single-family solar photovoltaics ^b	209
Transit and intercity rail capital	259
Single-family energy efficiency and solar water heating ^b	282
Large multifamily energy efficiency and renewables ^b	343
Enhanced fleet modernization program "plus-up"	414
Truck and bus voucher incentives	452
Incentives for public fleets pilot project for DACs	725
Overall Average	\$57



Government Incentive Programs

Construction Incentives (California)

1. CDFA grants (GGRF funding).
2017: \$35M. 2018: \$70M. 2019: \$61-\$75M
2. Pipeline incentives: AB 2313 (50%); SB 1383 (100%)

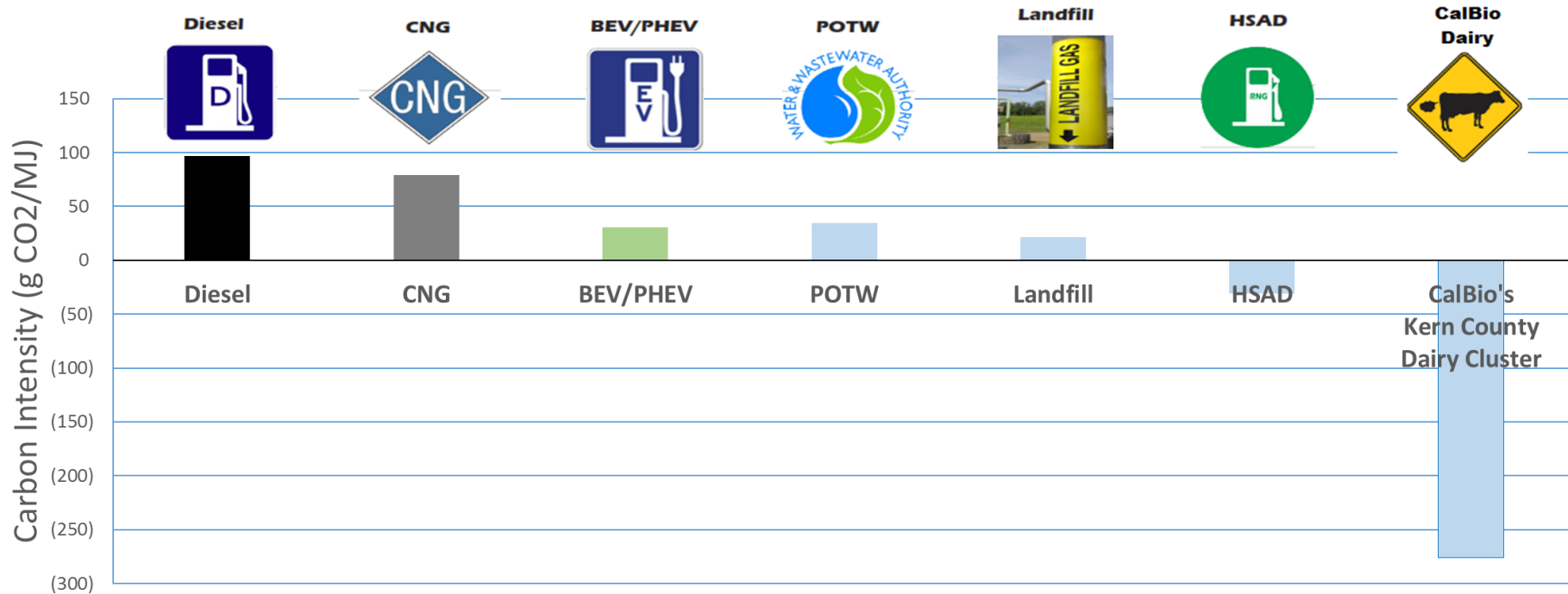
Revenue Incentives (California and U.S.)

1. Vehicle Fuel (R-CNG):
 - California's Low Carbon Fuel Standard (LCFS)
 - U.S. Renewable Fuel Standard RINs (D-3 status)
2. Electricity: California's BioMAT and/or LCFS credits



Dairy Biomethane LCFS Carbon Intensity

Carbon Intensity for Diesel & Substitute Fuels
(g CO₂/MJ)



* California Bioenergy LLC: California Dairy Digester Biogas to CNG GREET 2.0, LCFS FP: CNG056, CI: -276.24



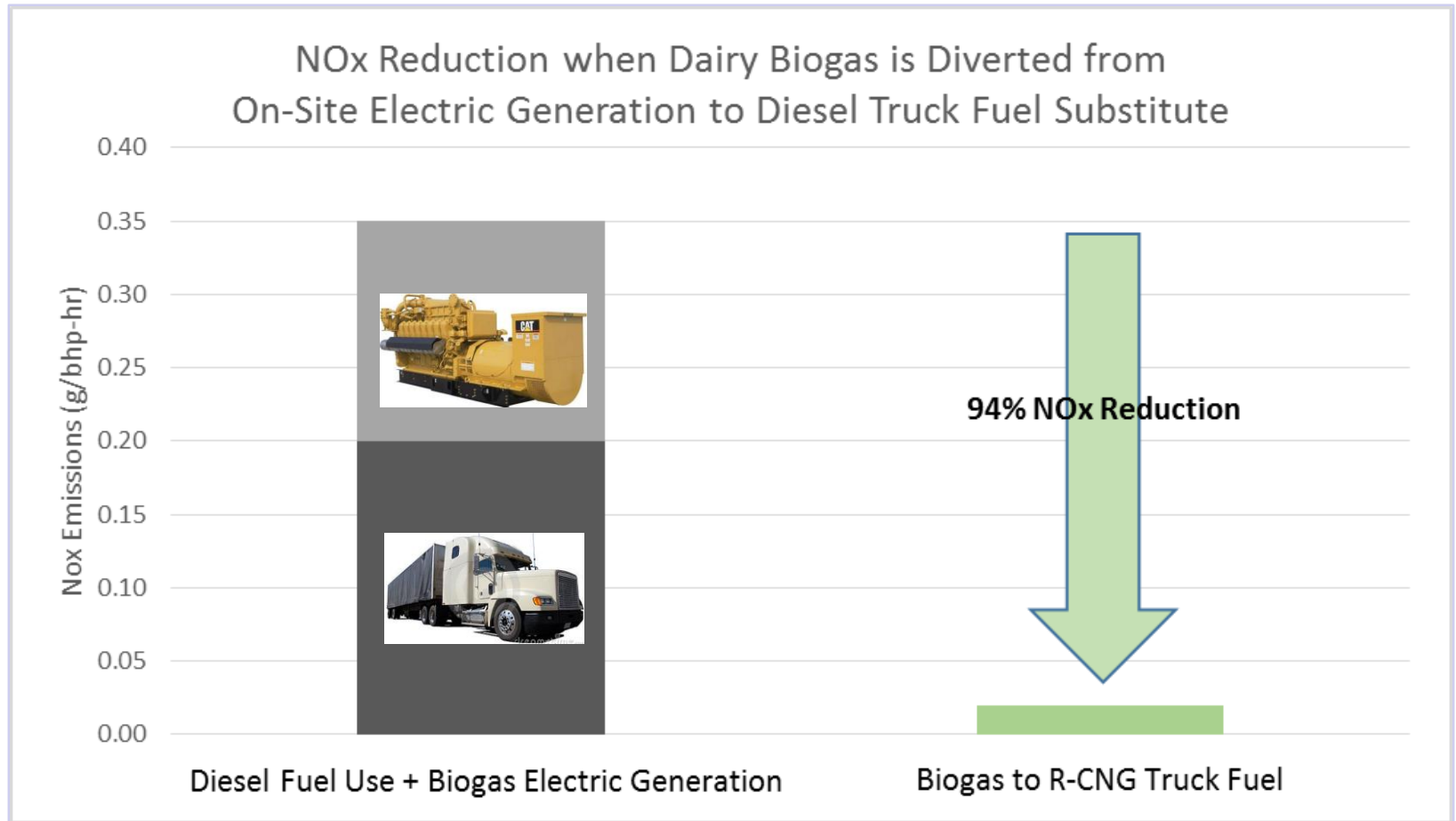
About California Bioenergy LLC (“CalBio”)

- Founded 2006. Focus on dairy biogas in California
- Operating 5, building 15, designing 30 +, in 7 clusters
- Awarded \$75M in grants from CDFA and CEC
- Develop, operate, finance, sell energy + credits, and work on policy issues
- Partner with the dairy farmer
- Goal – advance sustainability
 - (1) Create a new revenue source
 - (2) Enhance environmental footprint
 - (3) Improve dairy operations:
advance nutrient uses and decrease time managing manure

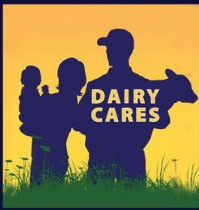




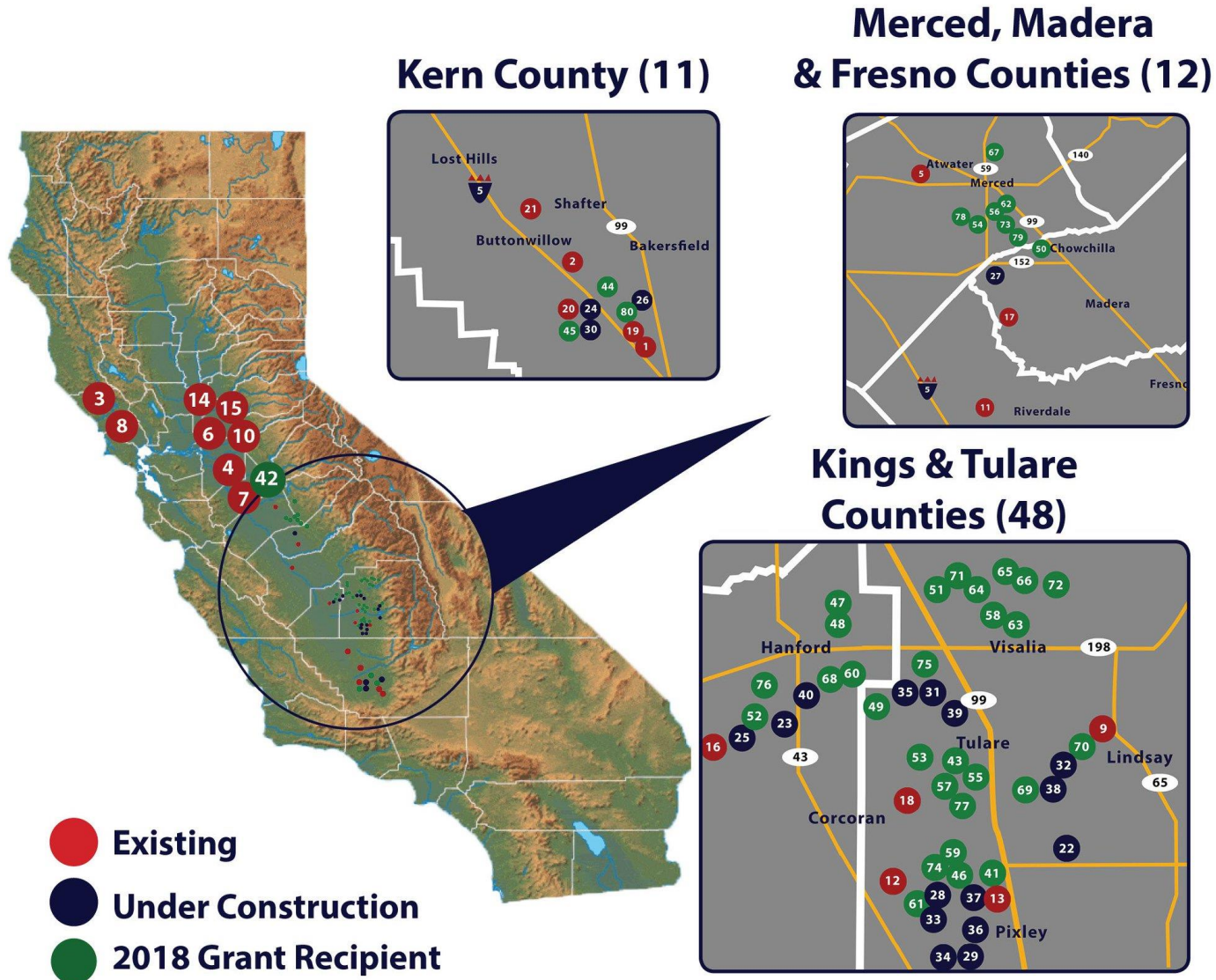
Dairy Biomethane for Fuel Reduces NOx



* Heavy-duty diesel engine at 0.2 g/bhp-hr NOx. Heavy-duty “NZ” NG engine at 0.02 g/bhp-hr Nox. Electric gen. at 0.15 g/bhp-hr BACT

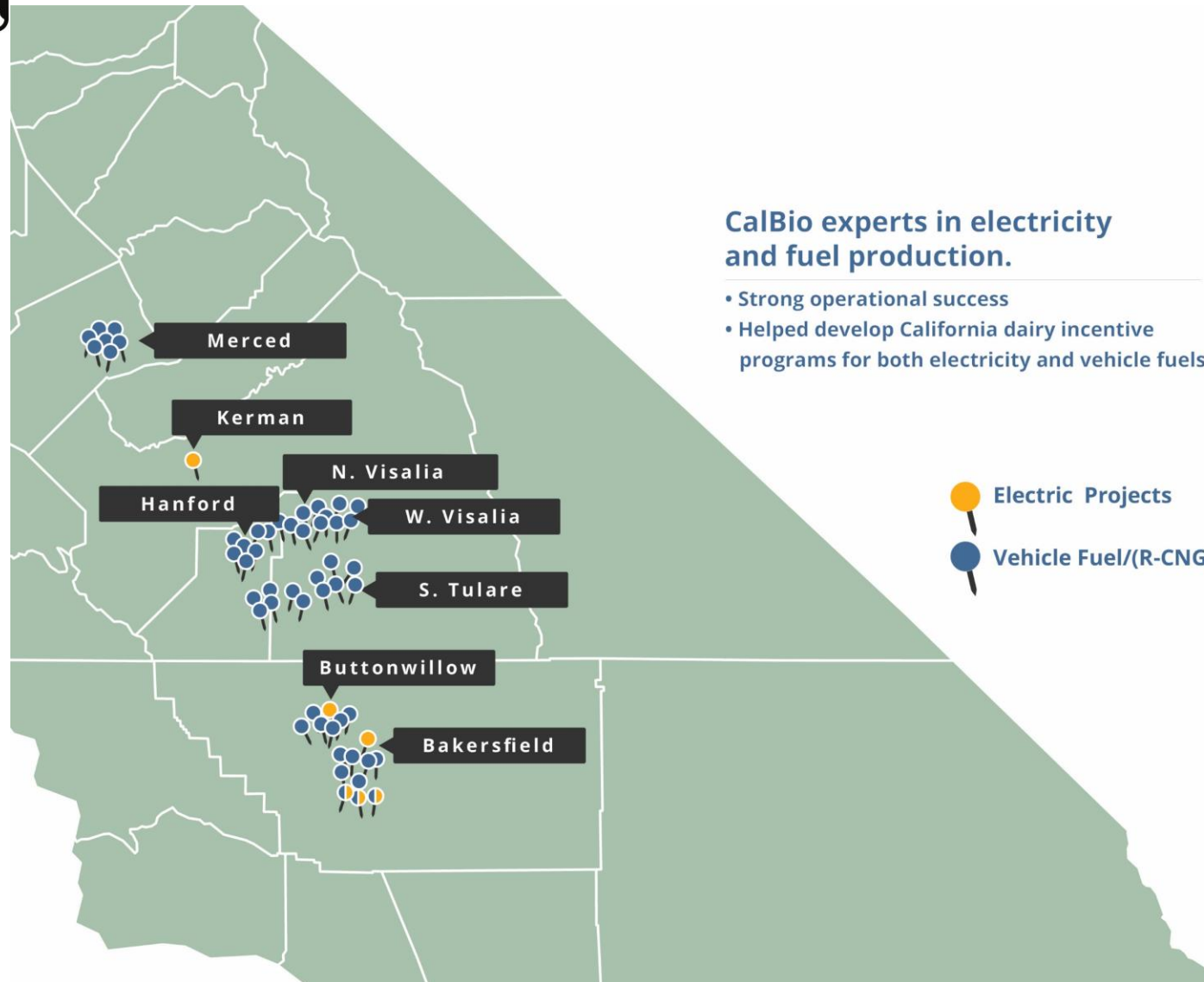


California Dairy Digester Development





CalBio Projects in Development





Dairy Partnership

■ Manure value

- Dairies receive a portion of the cash flows based on their manure-generated methane – no investment needed

■ Investment value

- Dairies have an option to invest - *and receive equity returns*
- Can invest at different times
- Risk spread across dairies and clusters
- Bring in outside equity as needed on the same terms



Sustainability – Triple Bottom Line

- *50 Dairies in Seven Clusters plus Individual Projects*
 - Approximately 165,000 Manure Equivalent Milkers (MEMs)
- Greenhouse gases destroyed
 - Approximately 900,000 metric tons CO₂e per year
- Energy Captured for Beneficial Use
 - Approximately 2.6 million MMBTUs per year
 - Revenue today: 70% CA LCSF; 27% US EPA RIN; 3% NG
- Community Benefits
 - Local air (NO_x reduction), jobs, community investments

The clusters' potential can roughly double with new dairies



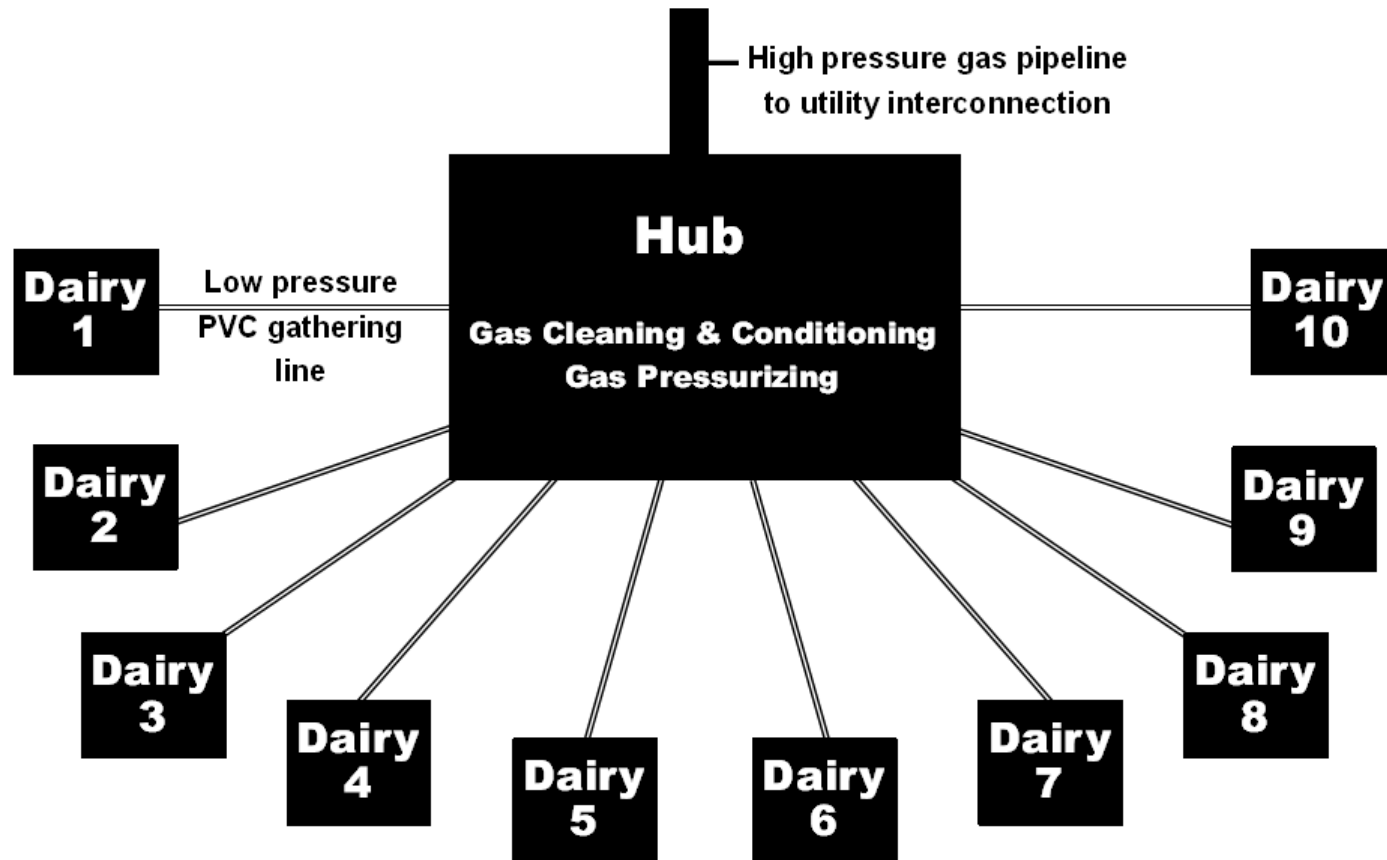
Digester in Construction, Buttonwillow





From Independent to Hub & Spoke

Hub & Spoke Model







Lakeview Farms Dairy Biogas



Lakeview Farms Dairy

The project is located in a cluster of dairies outside of Bakersfield. It is designed to serve as a mini hub for electrical generation and a spoke for gas production.

QUICK FACTS

- Operational February 2018
- 1 MW renewable electricity base load capacity.
- Electricity generation exceeding projections
- Goal 30% contribution to R-CNG transportation fuel

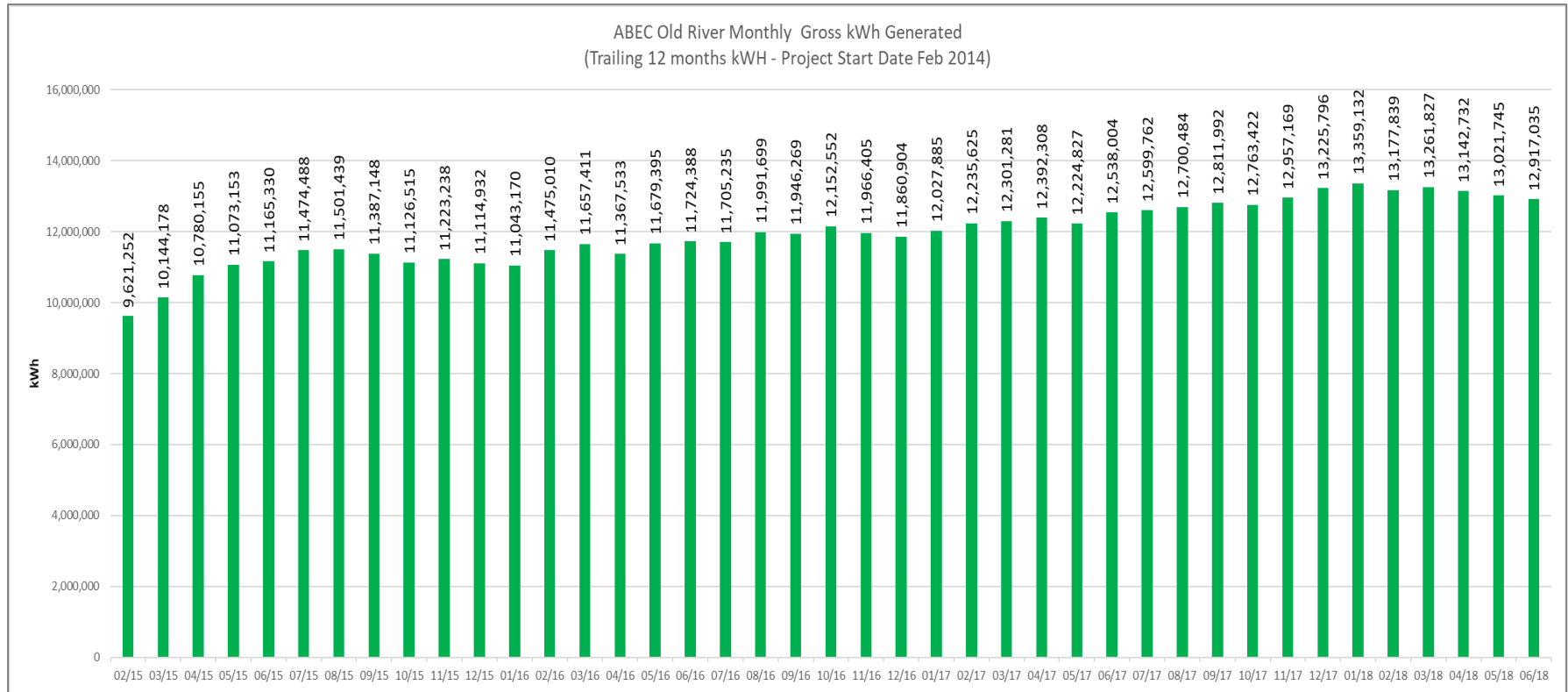


Lakeview Farms – 1MW Gen. + Fuels





Operational Success – Digesters Work





Inflated digester with storage





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