



**The Kern Dairy Biogas Cluster:
A Case Study of Dairy Methane Projects
in California**

**November 8, 2017
Kern Energy Summit**

Government Incentive Programs

California construction incentives

- AB 2313 and SB 1383 – pipeline and gathering line incentives
- CDFA grants (from GGRF funding)
 - 2017: \$35M
 - 2018: \$76M

Revenue incentives

- California: Low Carbon Fuel Standard
- Federal: Renewable Fuel Standard RIN (D-3 status)

Dairy Digesters Are Cost Effective*

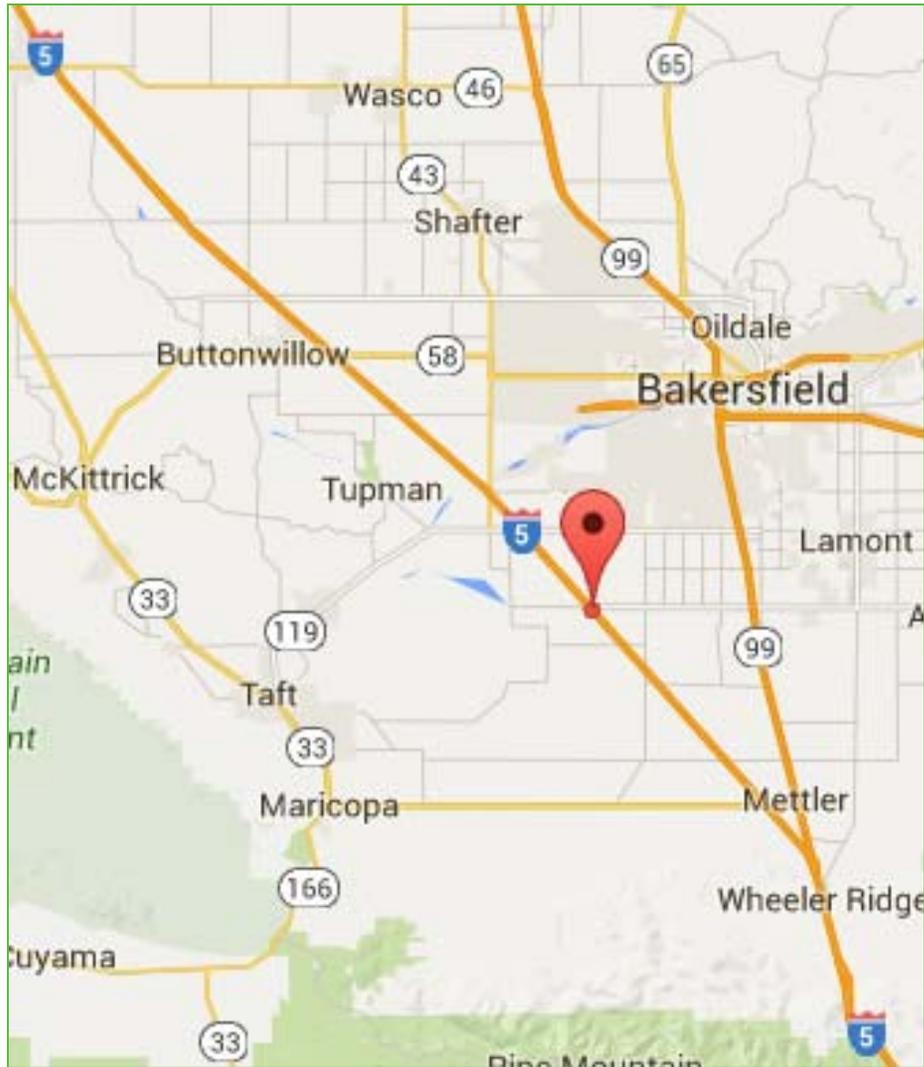
Program	Cost Per Ton ^a
Organics and recycling loans	\$4
Forest health	4
Dairy digester research and development program	8
Organics composting/digestion grants	9
Forest legacy	10
Recycling manufacturing	15
Delta and coastal wetlands restoration	30
State water and efficiency and enhancement program	33
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

About California Bioenergy LLC (“CalBio”)

- Founded 2006. Focus on dairy biogas in California
- Taking knowledge from Kern to rest of San Joaquin Valley
- Built 3, completing 3, beginning 10, designing 25 more
- 5 goals
 - Produce renewable energy
 - Reduce dairy methane emissions
 - Protect local air quality
 - Enhance groundwater protection
 - Add to the local economy and create jobs
- Areas of work
 - Development, operations, finance, energy sales, and policy



Kern County Dairy Biogas Cluster



- 15 modern, large dairies
- 3 operating digesters by year end
- Support CDFA, CEC, USDA. Sustainable Freight Action Plan
- Methane potential:
 - 12 MW base load (30 MW peaking)
 - 5M diesel gallon equivalents
- Combination and migration from Electricity to Fuels

Manure flow: Separator, Sand Lane, Digester



Bakersfield Digester in Operation



Double-Lined Digester



Inflated Digester with Storage



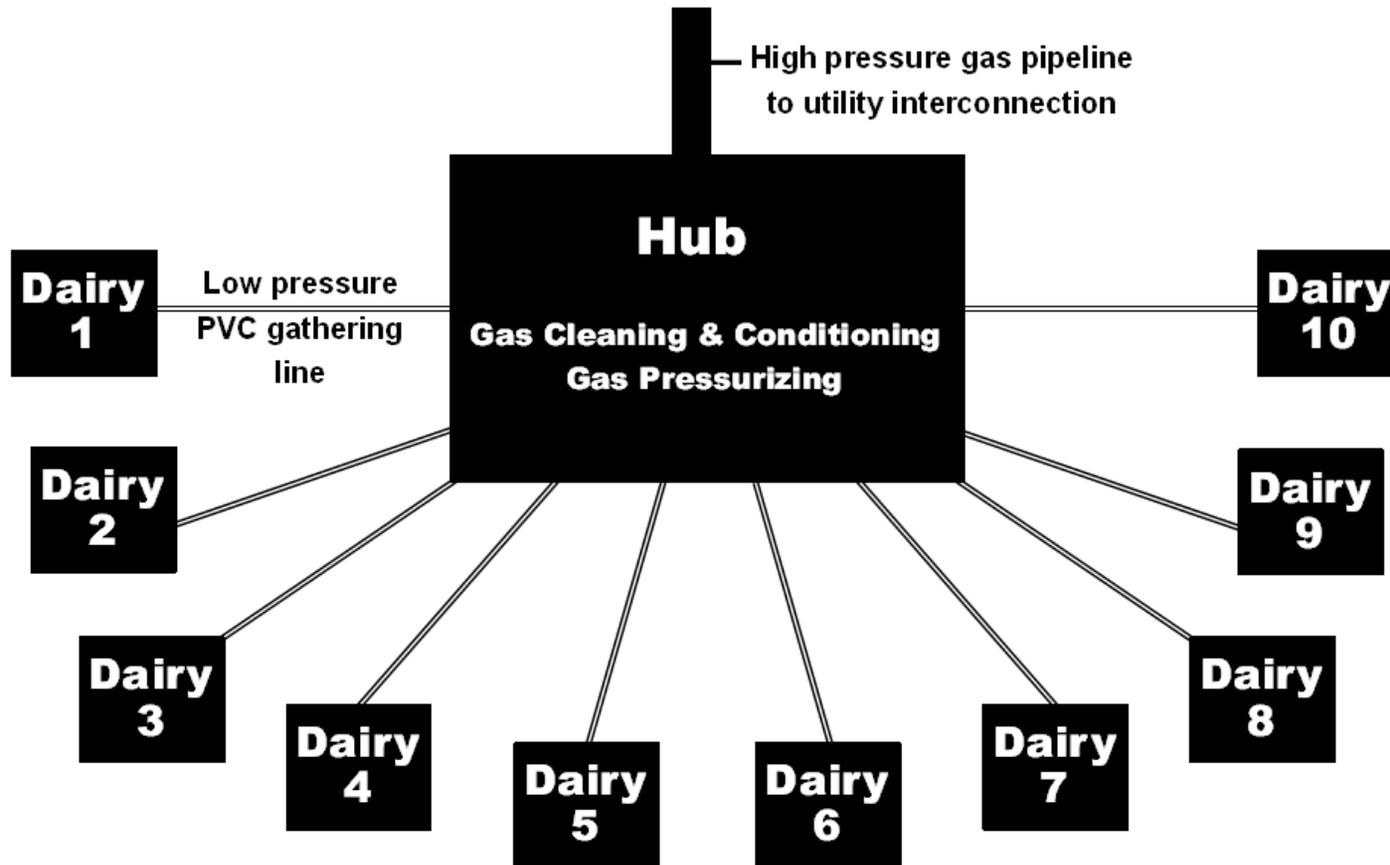
Old River Dairy Biogas

- 2 MW of renewable electricity
- Largest dairy digester in California
- 2-cell structure, co-digestion
- Future R-CNG transportation fuel

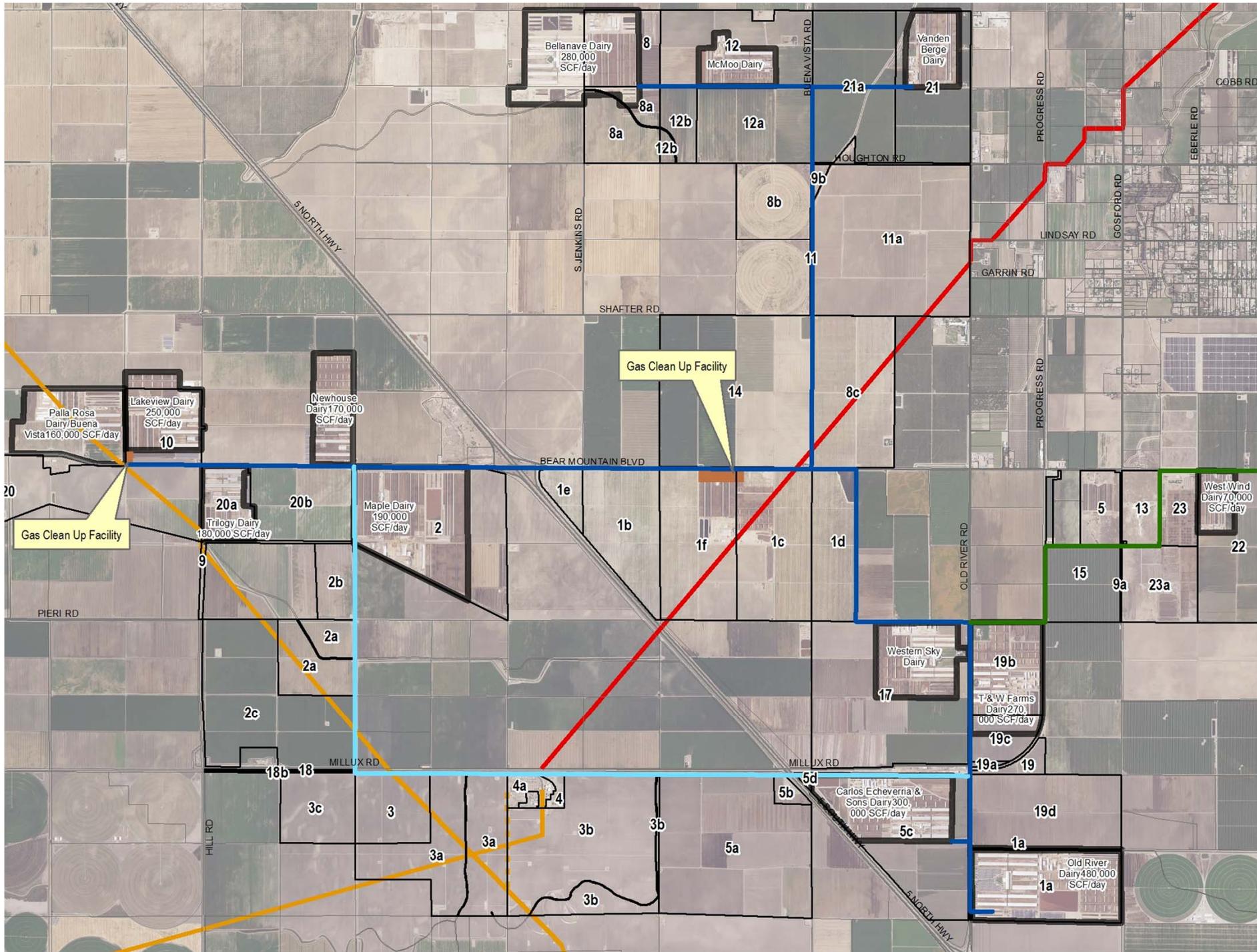


Independent Projects to Hub & Spoke

Hub & Spoke Model



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Electricity Versus Fuel (R-CNG)



Electricity

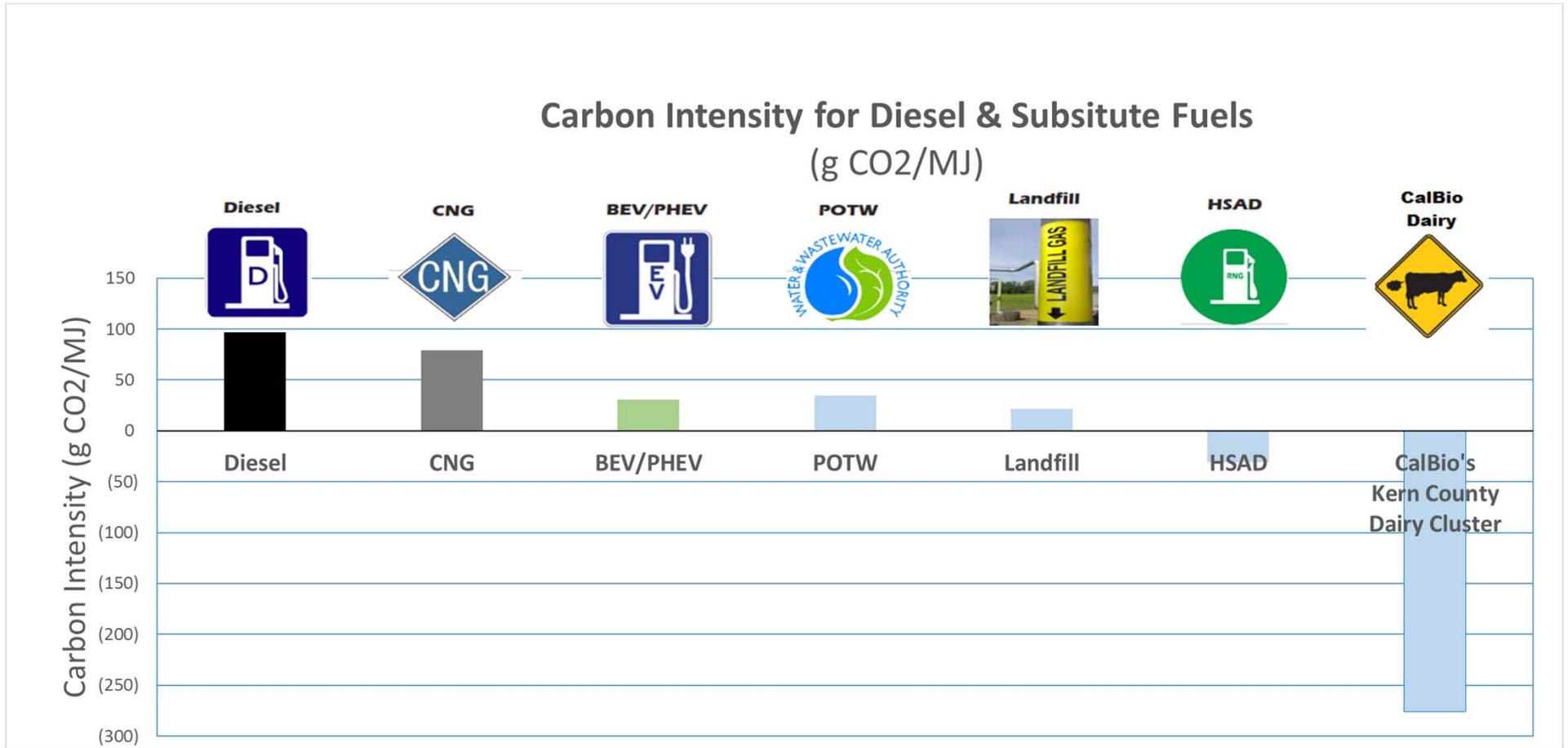
1. Good Price:
\$25/MMBTU with credits
2. Bank financeable:
20 Year BioMAT PPAs
3. Emissions:
NOx from exhaust



Fuel (R-CNG)

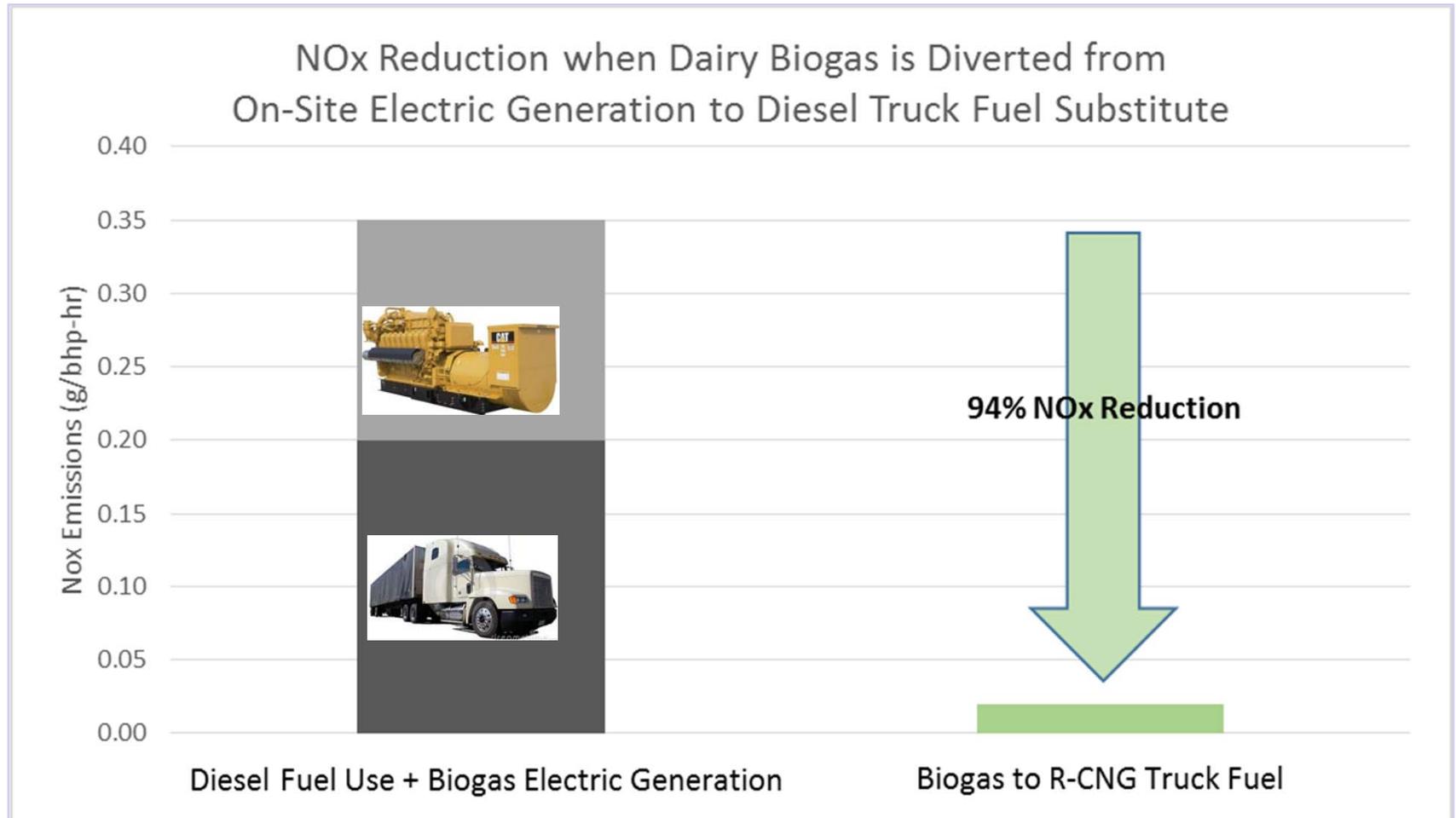
1. Great Price:
\$40-80/MMBTU (LCFS & RIN)
2. Not bank financeable:
Market based volatile pricing
3. Significant Environ. Benefits:
NOx and other reductions

LCFS Dairy 'Carbon Intensity' Value



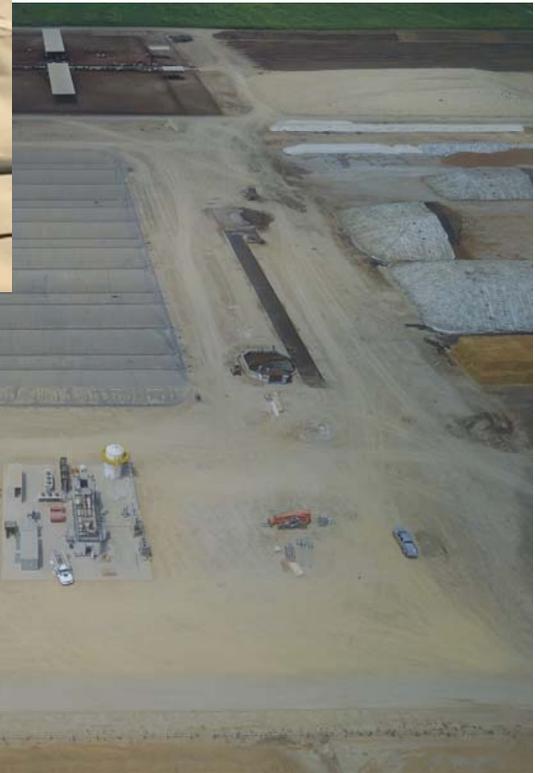
* California Bioenergy LLC: California Dairy Digester Biogas to CNG GREET 2.0, LCFS FP: CNG056, CI: -276.24

Biomethane Used 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

Lakeview Farms – 1MW Gen. + Fuels



Digester in Construction in Buttonwillow



CalBio Contact Information

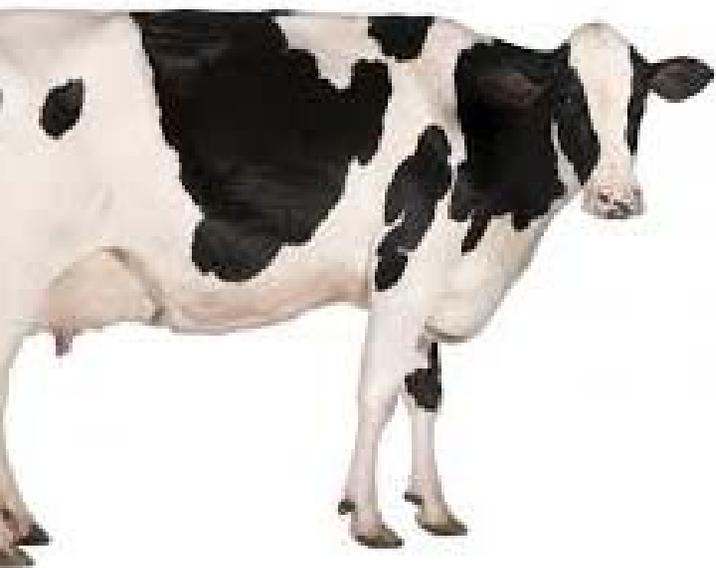
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