



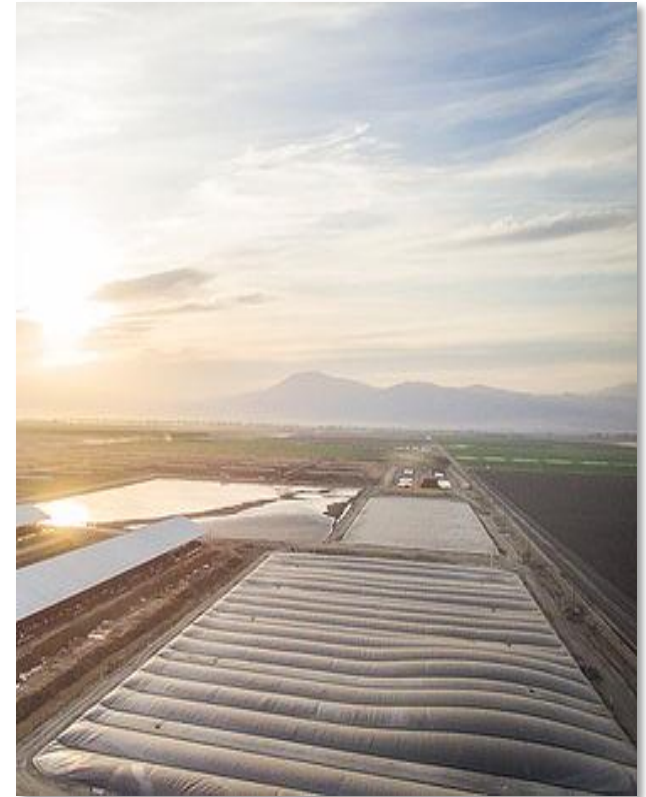
California Air Resources Board Workshop:  
Methane, Dairies and Livestock, and Renewable Natural Gas  
in California

March 29, 2022



# About California Bioenergy (CalBio)

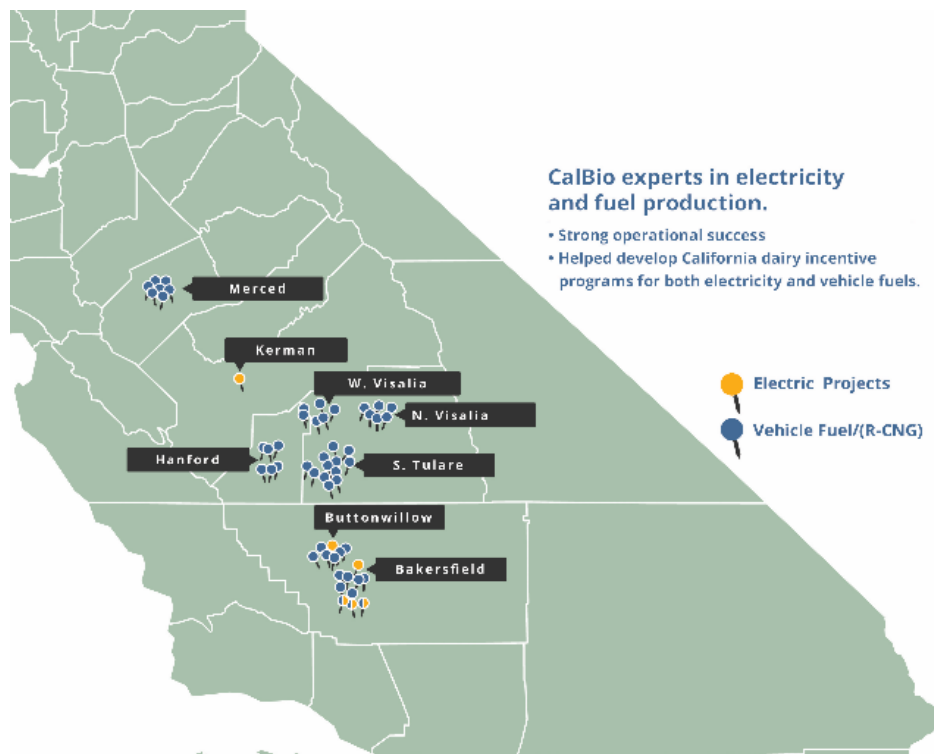
- Founded in 2006
- Finance, engineer, construct, operate dairy digester projects
- Partner with the dairy family
- 100+ projects in development, construction or operations
- Goals:
  - Advance California's climate goals
  - Protect local environment
  - Enhance dairy operations
  - Support the community





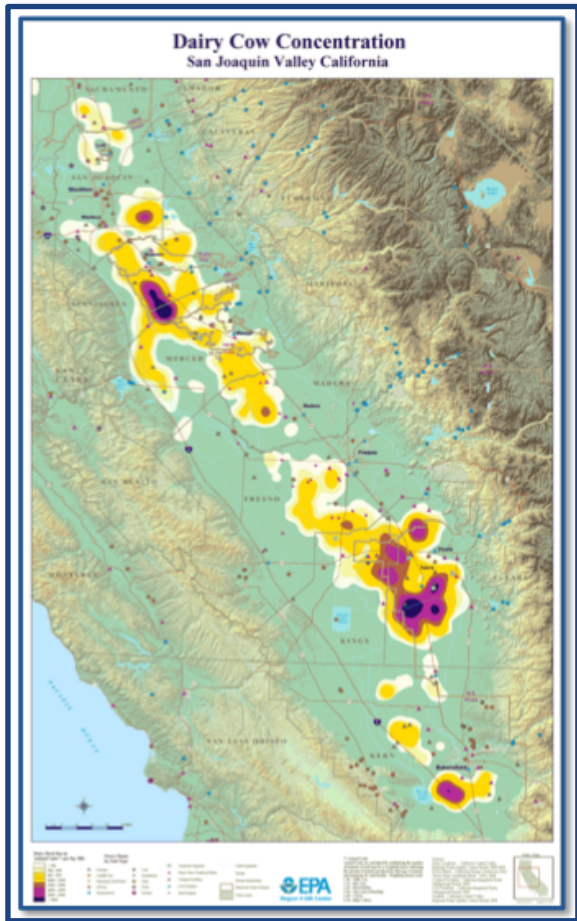
# CalBio Projects

- In 2016: 2 operating projects
- Today: 100+ projects in development.  
44 operating digesters. Result of grants, LCFS program, loans and investors
- 38 operating digesters produce RNG  
9 clusters in development
- 6 digesters generate electricity, including first dairy fuel cell
- Additional future uses of the gas – green hydrogen, residential, commercial, industrial use
- Currently reducing emissions by roughly **1 MM MT of CO<sub>2</sub>e** per year.  
Future **2 MM MT of CO<sub>2</sub>e** per year.





# California Dairies

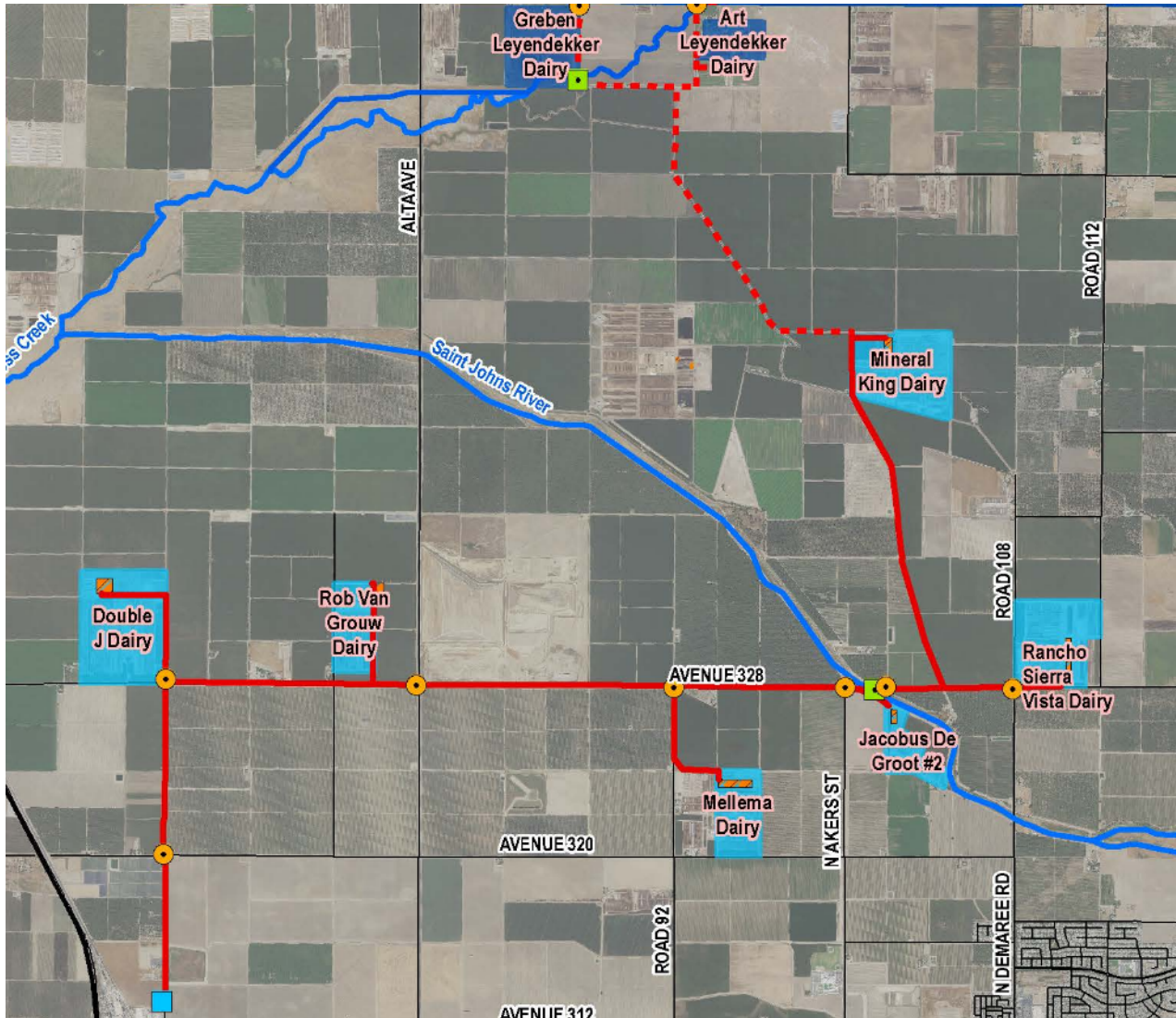


- Dairy is California's #1 ag product
  - \$7+ billion per year in farm sales. \$98B of economic value. 20% of the nation's milk
  - 1,300 dairies, family owned
  - Work with 3 generations in many families
- Economics
  - Revenue from milk: \$5500/milk cow
  - Revenue digester: \$1200/cow (\$150 LCFS; \$2.50 RIN)
  - Digester costs are high: Opex, Capex, Debt and Equity.



# Cluster Map – North Visalia

6 operating digesters, 6 dairies currently being added  
Clusters enable small dairy participation





# On Dairy Conditioning Plant: H<sub>2</sub>S Removal and Biogas Compression

Local benefit: 99% H<sub>2</sub>S removal results in odor reductions and cleaner air





# Gathering Line Construction





# Central Facility Upgrader System

CO2 Removal, Compression for Pipeline Injection  
Capacity to grow and add dairies





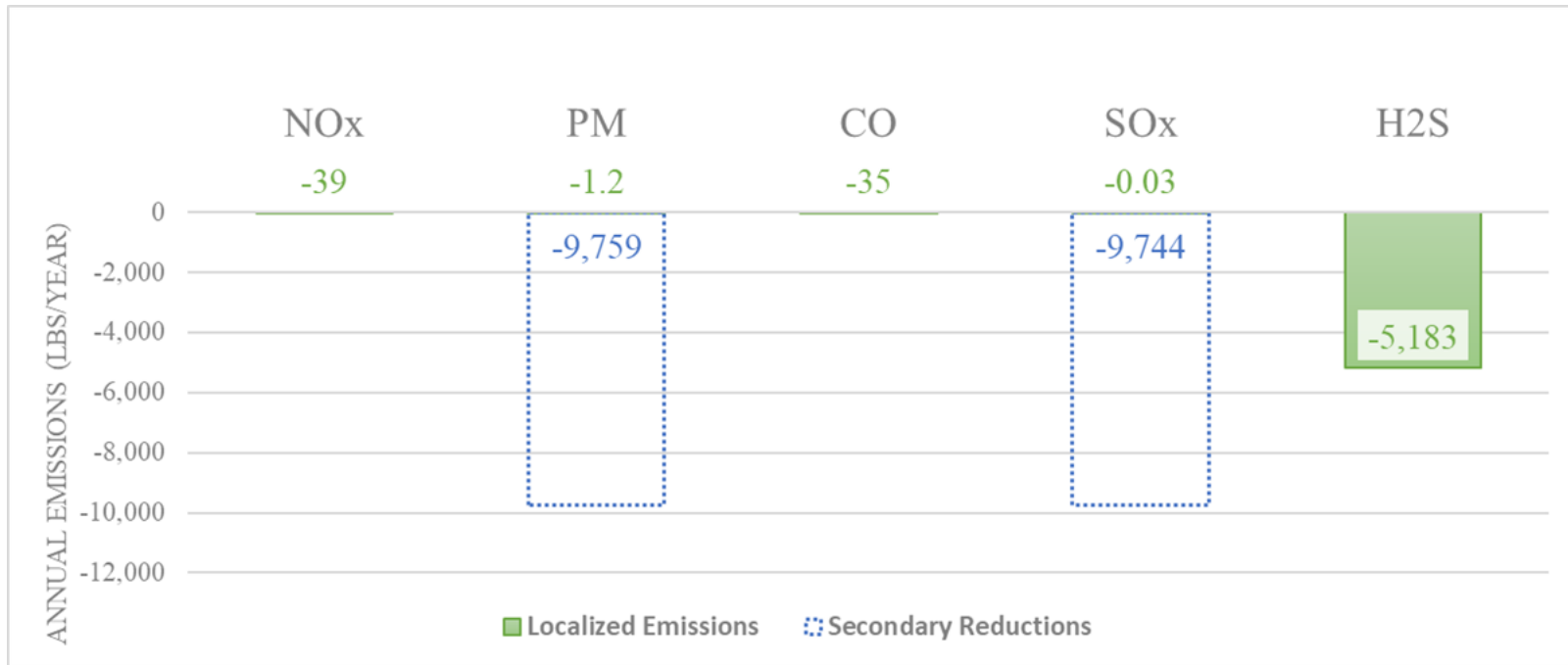


# Local Air Quality Benefits



Example Pipeline Project – A dairy of 1,800 milk cow equivalents

# Local Pollution Emission Benefits



“Localized” refers to emissions that occur at the dairy. “Secondary” refers to reductions in H2S that in turn reduce sulfate particles in the atmosphere (H2S oxidizes into SOx; SOx participates in the formation of PM).

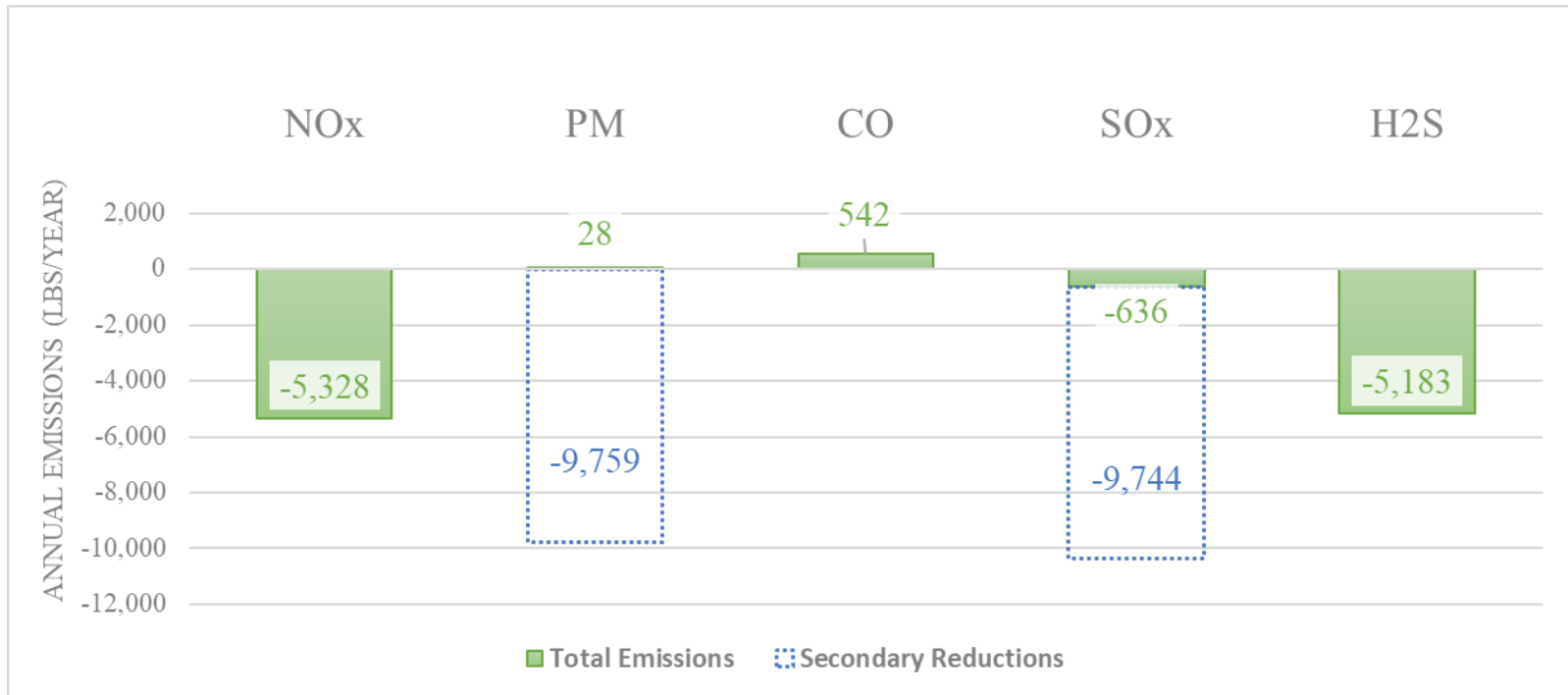
This does not quantify displacement of diesel with R-CNG (next slide).

There are small NOX reductions due to decrease diesel consumption at the dairy due to improvements in waste management made possible by the digester.



Example Pipeline Project – A dairy of 1,800 milk cow equivalents

# Total Pollution Emissions Benefits Includes Truck Conversion





# Converted Fleet at Western Milling Fueled by the North Visalia cluster



RNG trucks reduce NOX 90% versus diesel



Example Pipeline Project – A dairy of 1,800 cow equivalents

# Pollutant Emissions: Car Equivalents

	Emissions (lb/year)				
	NOx	PM	CO	SOx	H2S
<b>Localized Emissions with Secondary Impacts</b>	<b>-39</b>	<b>-9,760</b>	<b>-35</b>	<b>-9,744</b>	<b>-5,183</b>
<b>Total Pathway Emissions with Secondary Impacts</b>	<b>-5,328</b>	<b>-9,731</b>	<b>542</b>	<b>-10,380</b>	<b>-5,183</b>
	<b>Emissions: Reduction in Cars</b>				
<b>Local Emissions: Secondary Impacts, no truck conversion</b>	<b>-12</b>	<b>-6,886</b>	<b>-1</b>	<b>NA</b>	<b>NA</b>
<b>Total Emissions: Secondary Impacts and truck conversions</b>	<b>-1,622</b>	<b>-6,866</b>	<b>14</b>	<b>NA</b>	<b>NA</b>
<b>At 180,000 Cows</b>	<b>-162,168</b>	<b>-686,623</b>	<b>1,387</b>	<b>NA</b>	<b>NA</b>





# Bar 20 Fuel Cell Produces Clean Energy

CARB 2007 DG Certified

SOX and NOX reductions >er than 99% compared to the grid

Electricity powering BMWs and planned hydrogen facility

Dairy has solar, electric feed mixer (replaced diesel)





# Community Engagement and Benefits



# Community Engagement & Benefits

- Public Meetings and Outreach
- Students from Disadvantaged Communities
  - Internships
  - Student participation in academic research
  - Scholarships: helping students stay in community college and/or attend a four-year university
  - Job creation
- Schools/Community Benefit Agreements:
  - College of the Sequoias – over \$300,000 in scholarships. Cal State Bakersfield, Fresno State
- Community Benefit Agreement with Self Help Enterprises



CALIFORNIA STATE UNIVERSITY  
**BAKERSFIELD**







# In Summary



# Delivering on Goals

- **Advance California's climate goals**
  - CalBio's pipeline in 2020 is estimated to reduce 2 million MTs of CO<sub>2</sub>e/year. Dairies on target to meet 2030 requirements. One of country's bi-partisan climate successes.
- **Protect local environment**
  - Impact: as if removing hundreds of thousands of cars
- **Enhance dairy operations**
  - Advance manure handling systems
- **Support the community**
  - Advance students and families in priority populations





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