



CALIFORNIA  
BIOENERGY

Plugging Dairies into a Renewable Future.

## Dairy Digester Overview

July 1, 2014

Prepared for

**MEETING OF THE CALIFORNIA STATE  
BOARD OF FOOD AND AGRICULTURE**



# Dairy Digester Status and Opportunity

- **The numbers: development picking up modestly**
  - 2010-12 no development. 11 active, small, dairy owned
  - 2013: 5 new digesters. Drivers: Fed 1603 grants + PPAs. New business model – 3<sup>rd</sup> party developers
  - New projects in development or waiting for SB 1122
  - State grants expanded: CDFA, EPIC, AB 118 but < Fed 1603
- **Permitting advanced and agencies are partners**
  - Water Board: lined lagoon solutions, co-digestion early
  - Air District: NOX solutions; on-going learning
  - County permitting advanced (e.g., Kern Co. “by right”)
- **Potential is significant – 1,500 dairies; 0.35 to 1 GW**



## About California Bioenergy LLC (“CalBio”)

- Focused on developing dairy biogas in California
- Design, build, finance, own (jointly) and operate projects
- Backgrounds in dairies, sustainability, and finance
- Established in 2006. Commissioned 3 projects in 2013
- We partner with the dairy farmer
  - We provide new revenue to the dairy
  - We enhance flush system and nutrient value of the manure
- We have become by necessity a multifaceted team
  - Project operations and maintenance
  - Project management, finance, energy, environment, policy
  - Dairy and nutrient expertise



# CalBio – Highlights of 3 Completed Projects

<b><i>CalBio Dairy Project</i></b>	<b><u>ABEC Bidart-Stockdale</u></b>	<b><u>ABEC New Hope</u></b>	<b><u>ABEC Bidart-Old River</u></b>
<i>Location</i>	Bakersfield, CA (PG&E)	Galt, CA (SMUD)	Bakersfield, CA (PG&E)
<i>Dairy (Milk Cows)</i>	Bidart dairy (1,200)	New Hope Dairy (1,400)	Bidart dairy (8,400)
<i>Type of Digester</i>	Covered Lagoon	CSTR	Covered Lagoon
<i>Production</i>	1,200 MWh/year	1,300 MWh/year	13,000 MWh/year
<i>Engine Size</i>	600 kW	450kW	2 x 1,000kW
<i>Accomplishments</i>	Innovative H <sub>2</sub> S removal system and engine design	Deployed leading German technology from MT Energie	Assembled strong team and built largest project in CA (30% of dairy MWh)





# Digester Value and Economics

*Focus on three drivers*

## **Program Component**

## **Economic Benefit**

I. Renewable energy generation  
(electricity, pipeline gas, fuel)

Long-term contracts;  
Economic backbone

II. Greenhouse gas, fuel credits

Short term contracts;  
Smaller revenue source

III. Nutrient management/fertilizer

Benefits to dairy;  
Revenue potential



# I. Renewable Resource: Electricity

- **SB 1122 – a critical near-term program**
  - Strengths: counterparties, duration, set contract, volume
  - Price is the issue:
    - Important to implement SB 1122 where dairy digesters will not lose out to other agriculture projects (90 MW)
    - Price needs to be adequate to incubate digester industry
  - Complex: need to make a solar program fit bioenergy
- **Valuable electricity source – storage resource**
  - Not intermittent; solar and wind are
  - Gas can be stored and generation shaped and dispatched
  - Value hasn't been “monetizable”. AB 2514 provides the opportunity and seeking clarification. PG&E interest.



# Renewable Resource: Fuel & Pipeline

## ■ Limitations

- No program analogous to SB 1122. Industry needs credit-worthy counterparties, set contract and incubation price
- Pipeline injection requires multiple projects clustered

## ■ Opportunities

- Air quality advantages: Removes NOx issue. Renewable CNG replaces diesel trucks; potential for farm equipment
- Fuel (RIN and LCFS) credits provide supplemental revenue stream. Markets new, volatile but upside vs carbon credits
- Fuel projects via a pipeline or fueling station. Hybrid solutions. Milk haulers in Midwest.
- Grant programs for fuels



## II. GHG: Potential for Significant Impact

- Reason we formed CalBio: viewed destruction of a GHG, vented as a waste, as an asset of California and its dairies
- Potential for large quantities of high-quality offsets from California projects
  - Estimates vary from 6 to 8 million tonnes CO<sub>2</sub>e at methane 21x. (24 to 32 million tonnes CO<sub>2</sub>e at 80x.)
- Value of fuel credits potentially larger
- Issues with credits: Limited contract period, which decreases use of credits as a “financeable” revenue stream



## III. Nutrient Management and Fertilizer

- Nutrient issues include
  1. Land-constrained dairies: need to export nutrients
  2. Land-enabled dairies: potential to improve use of manure-based nutrients and decrease potential water table impacts. Also decrease use of chemical fertilizer.
  3. Solutions needed for flush (majority) and scrape dairies
  4. Potential new revenue stream from fertilizer export or better onsite use, improving digester economics
- Area in development and additional study needed



# Emerging Nutrient Data and Solutions

## 1. Nutrient removal solutions

- For scrape dairies:
  - Emerging solution digested solids as soil amendment.
  - Future development for liquids as fertilizer (expensive)
- Flush dairies:
  - Solutions difficult. Limited impact on nutrient removal. Potential revenue. Covered lagoon sludge may have value

## 2. Nutrient improvement for farm use

- For flush dairies, data shows covered lagoon digesters increase concentration of plant-ready Nitrogen
- Potential to improve nutrient management,
- Next step – studies needed



# Old River Project – Largest in State



- Dairy bioenergy benefits
  - Address “duck curve” – renewable energy source that can balance intermittent solar cost effectively



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