



**WEBINAR
SERIES**

LCFS Electricity Pathways: Cow Power to Charge Electric Vehicles in SMUD Region

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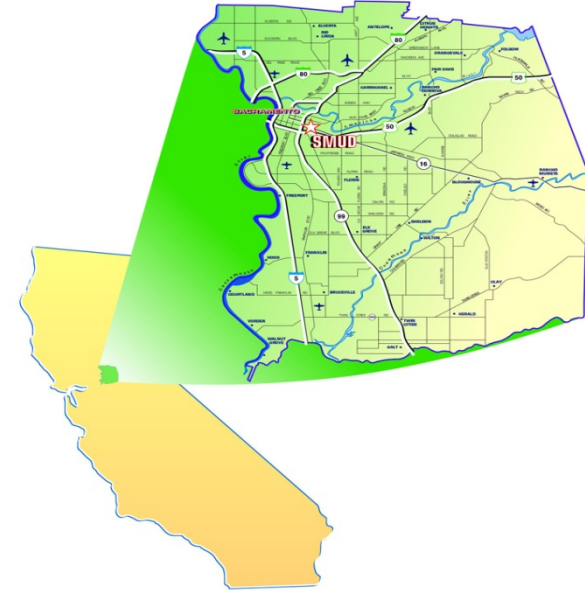


Agenda

- About SMUD
- Why LCFS for Dairy Digester to Charge EVs?
- Accomplishments: Cow Power to charge Electric Vehicles

SMUD – Owned By Customers

- Not for Profit, Publicly Owned Utility
- Sacramento County (small part of Placer County)
- Almost 600,000 Customers; 1.4 Million Population
- Record Peak Demand = 3,300 MW
- 5th Largest in CA and 6th Largest Utility in the U.S.
- **7 Member Board of Directors**
 - Elected by Ratepayers
- Not a Part of the City or the County
- Manage Balancing Authority in Northern California (BANC)
- Low Rates, Innovative & Green
- **1st in customer satisfaction survey for the last 16 consecutive years (J.D. Power & Associates Survey) in USA**



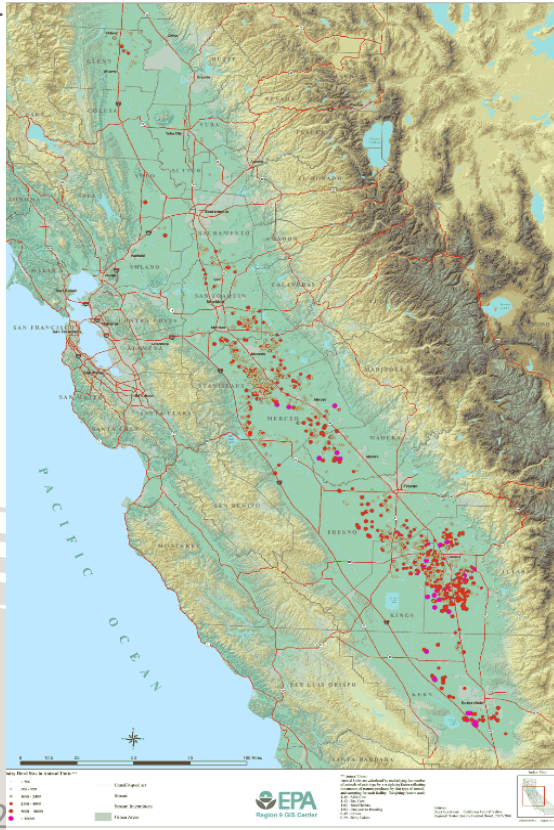
Policy Driver

In July 2020, SMUD Board of Directors adopted a Climate Emergency Resolution that commits to working toward an ambitious goal of delivering carbon neutral electricity by 2030.

The Board's adoption of the Climate Emergency Resolution acknowledges the ambitious steps SMUD has already undertaken and will continue to take to reduce the carbon footprint in our region, while continuing to deliver safe, reliable and affordable power.

Dairy Digesters: Potential MW?

Dairy Locations and Herd Size
Central Valley California



California Dairy Industry Statistics

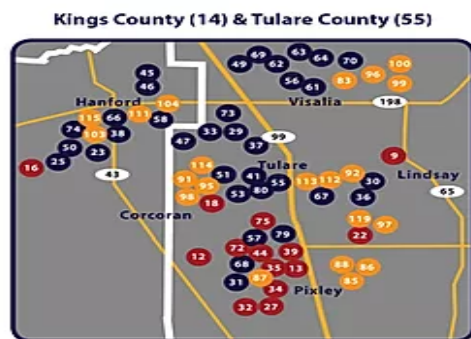
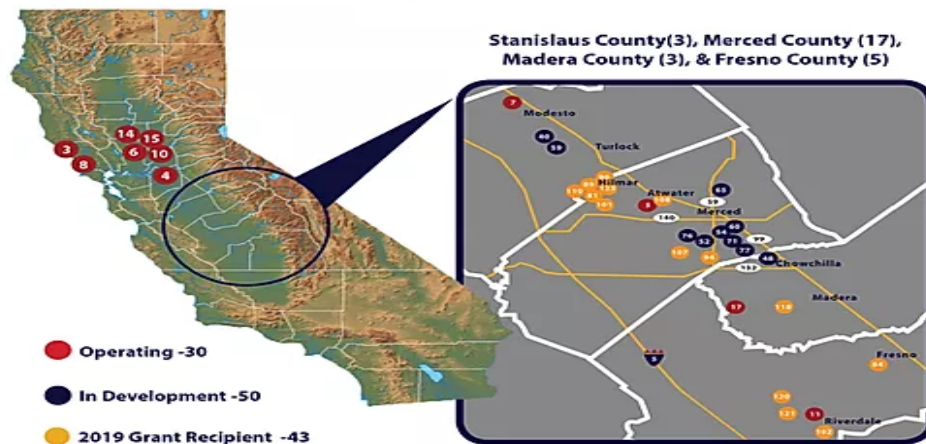
- Largest dairy producing state in the US
- Dairy is the largest ag industry in CA = \$7.34 billion in 2019
- **1.7 Million cows, 1,438 dairies**
- **MW Potential = 400 MW (base load) or 1,000 MW (peaking)**

Dairies in Sacramento County

- 14th largest dairy cows by County in CA
- **14,000 cows, 32 dairies (Ave: 410 cows/dairy)**
- **MW Potential = 3.35 MW (base load) or 8 MW (peaking)**

CDFA Agricultural Production Statistics
<https://www.cdfa.ca.gov/statistics/>

California Dairy Digester Development

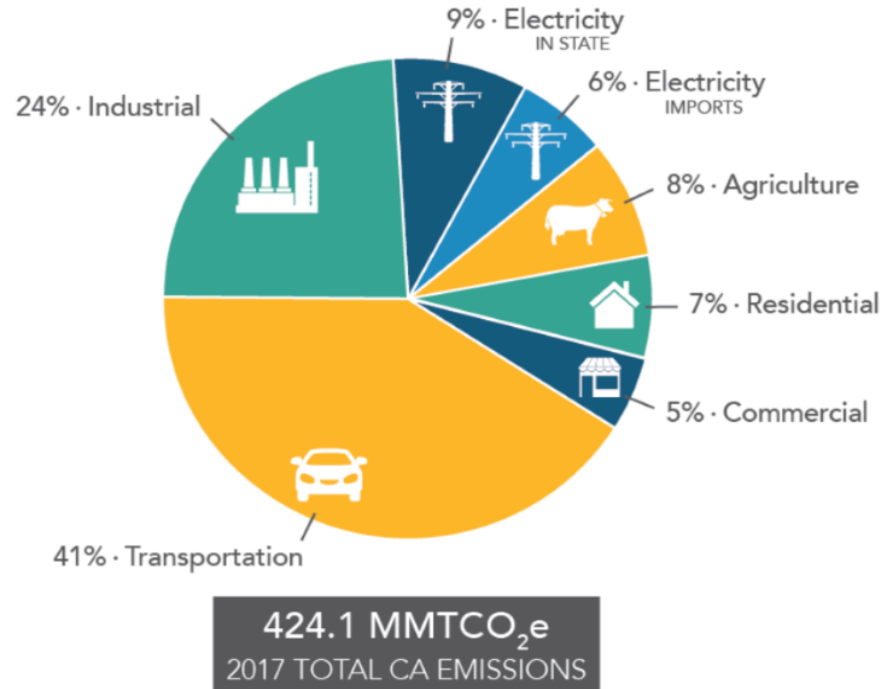


Learn more at DairyCares.com/dairy-digesters



California GHG Emissions by Sector in 2017

2017 GHG Emissions by Main Economic Sector



Source: <https://ww2.arb.ca.gov/ghg-inventory-graphs>

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**Low Carbon Fuel Standard
Tier 2 Pathway Application**

SMUD (S338)
Van Warmerdam Dairy (V4907)
Galt, California

Application No. B0037

Deemed Complete Date: 09/20/2019
Posted for Comment: 12/10/2019
Certified and Posted: 12/31/2019
CI Effective: 7/1/2019

CI = -592.68 gCO₂/MJ

Low Carbon Fuel Standard Tier 2 Pathway Application

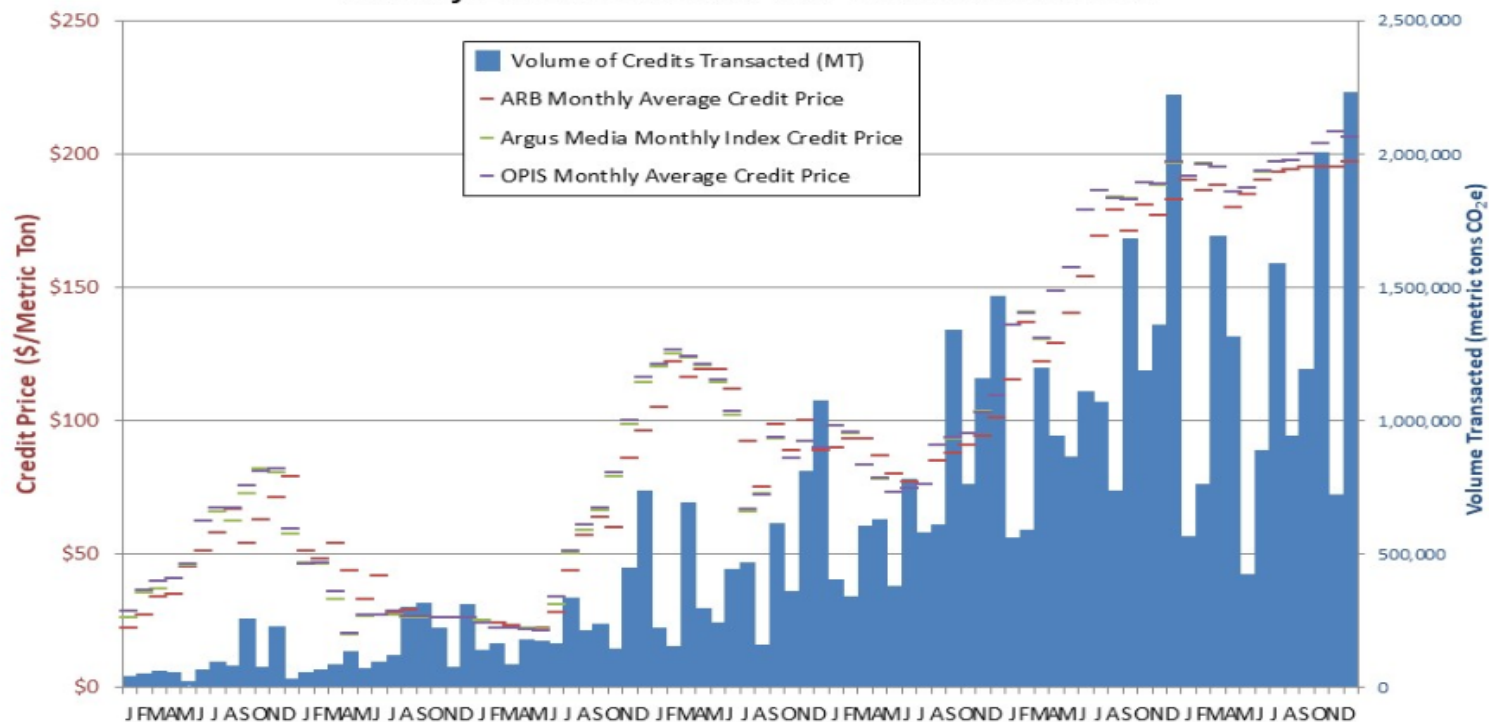
SMUD (S338)
Van Steyn Dairy (V1125)
Elk Grove, California

Application No. B0038

Deemed Complete Date: 09/30/2019
Posted for Comment: 12/10/2019
Certified and Posted: 12/31/2019
CI Effective: 7/1/2019

CI = -630.72 gCO₂/MJ

Monthly LCFS Credit Price and Transaction Volume



Ref: <https://ww3.arb.ca.gov/fuels/lcfs/dashboard/dashboard.htm>

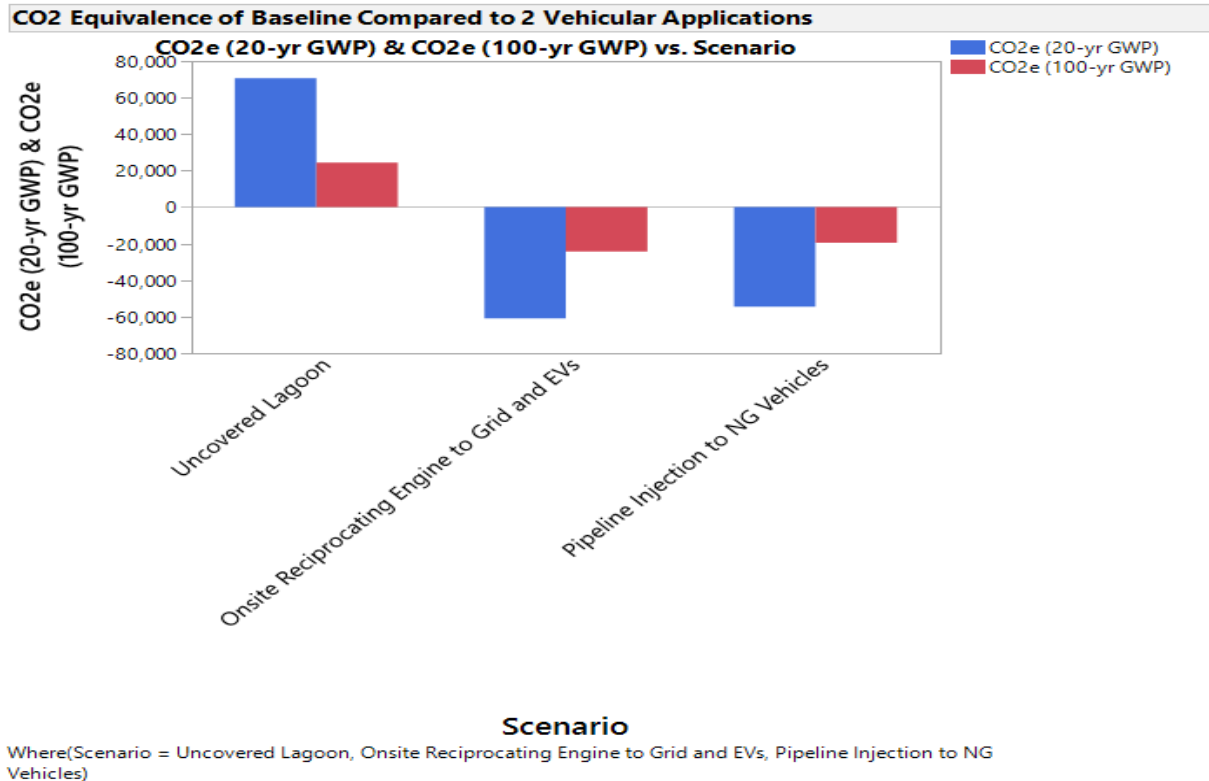
Electricity Pathway Description	Carbon Intensity (gCO ₂ e/MJ)	EER	Values at \$200.61/credit
Tier 2 Pathway: Van Steyn Dairy Digester to Charge EVs in SMUD Service Territory	-630.72	3.4	68 cents/kWh
Tier 2 Pathway: Van Steyn Dairy in Digester to Charge EVs in SMUD Service Territory	-630.72	5.0	79 cents/kWh
Tier 2 Pathway: Van Warmerdam Digester to Charge EVs in SMUD Service Territory	-592.68	3.4	65 cents/kWh
Tier 2 Pathway: Van Warmerdam iDigester to Charge EVs in SMUD Service Territory	-592.68	5.0	76 cents/kWh

Air Quality Benefits

Scenario	Net Benefits							
	CO ₂ e (20-yr GWP)	CO ₂ e (100-yr GWP)	NOx	PM ₁₀	PM _{2.5}	CO	SOx	VOCs
Onsite Reciprocating Engine to Grid and EVs	-60,934	-24,356	-4.9	-0.9	-0.4	3.2	-2.3	-3.4
Pipeline Injection to NG Vehicles	-54,491	-19,402	-4.1	-0.2	<0.1	52.1	-1.0	-14.1
Pipeline Injection to Power Plant, Grid and EVs	-63,190	-26,853	-7.1	-1.5	-0.8	-5.8	-3.1	-4.0
Pipeline Injection to Hydrogen Vehicles	-56,702	-21,066	-1.3	-0.4	0.1	-1.7	0.3	-3.2
Pipeline Injection to Fuel Cell, Grid and Evs	-64,565	-28,073	-7.8	-1.7	-0.9	-6.6	-3.6	-4.2
Uncovered Lagoon	70,581	24,519	0.1	0.1	0.1	0.1	0.1	3.0

Source: <https://ww3.arb.ca.gov/cc/dairy/dsg2/dairy-emissions-matrix-113018.pdf>

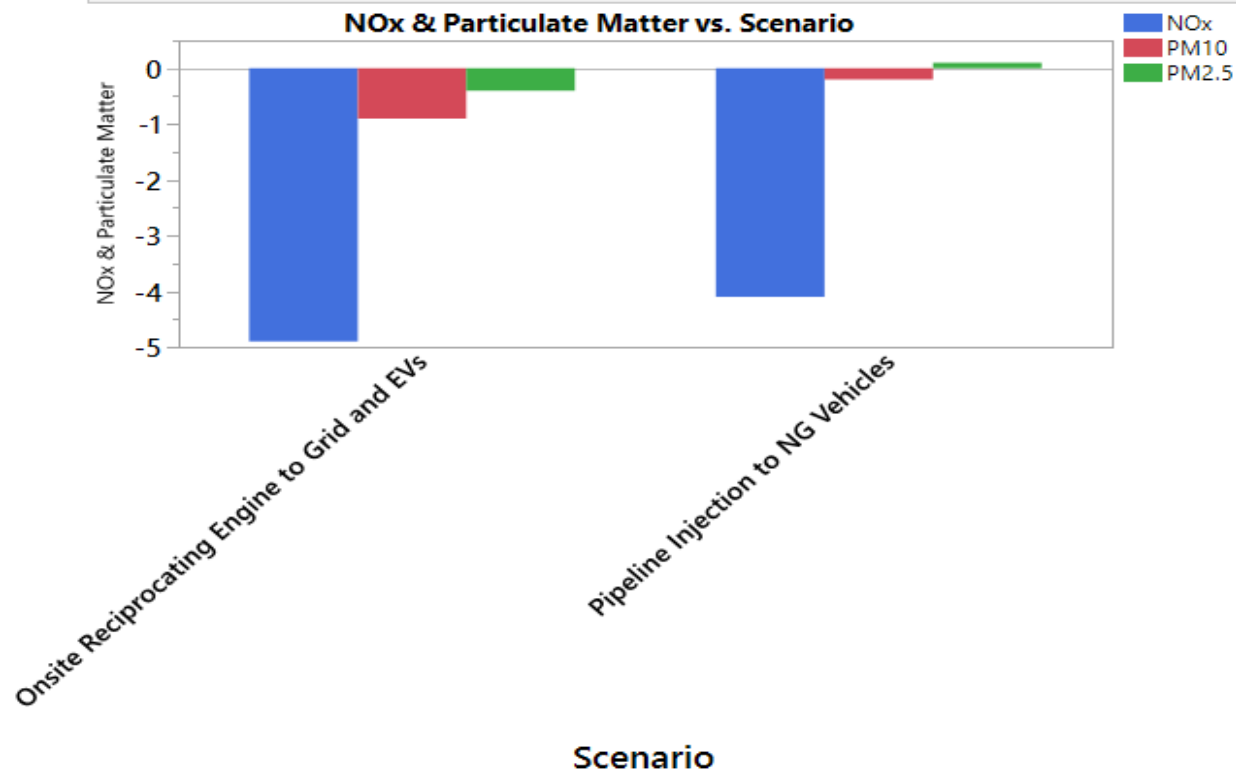
Note: Units are metric tons per year (MT/yr.) for all numerical values.



Source: <https://ww3.arb.ca.gov/cc/dairy/dsg2/dairy-emissions-matrix-113018.pdf>

Note: Units are metric tons per year (MT/yr.) for all numerical values.

NOx and Particulate Matter vs. Scenario



Where(Scenario = Onsite Reciprocating Engine to Grid and EVs, Pipeline Injection to NG Vehicles)

Source: <https://ww3.arb.ca.gov/cc/dairy/dsg2/dairy-emissions-matrix-113018.pdf>

Note: Units are metric tons per year (MT/yr.) for all numerical values.

Summary

- ◆ SMUD is committed to affordable, sustainable and environmentally beneficial energy solutions for our customer-owners.
- ◆ Cow power to charge EV proved to be a super carbon negative electricity pathway.

QUESTIONS?