



Report of Funded Projects (2015 – 2022)



2022 Report to the Joint Legislative Budget Committee

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Executive Summary

The California Department of Food and Agriculture's (CDFA) Dairy Digester Research and Development Program (DDRDP) awards competitive grants to implement dairy digesters that result in long-term methane emission reductions on California dairies and minimize or mitigate adverse environmental impacts.

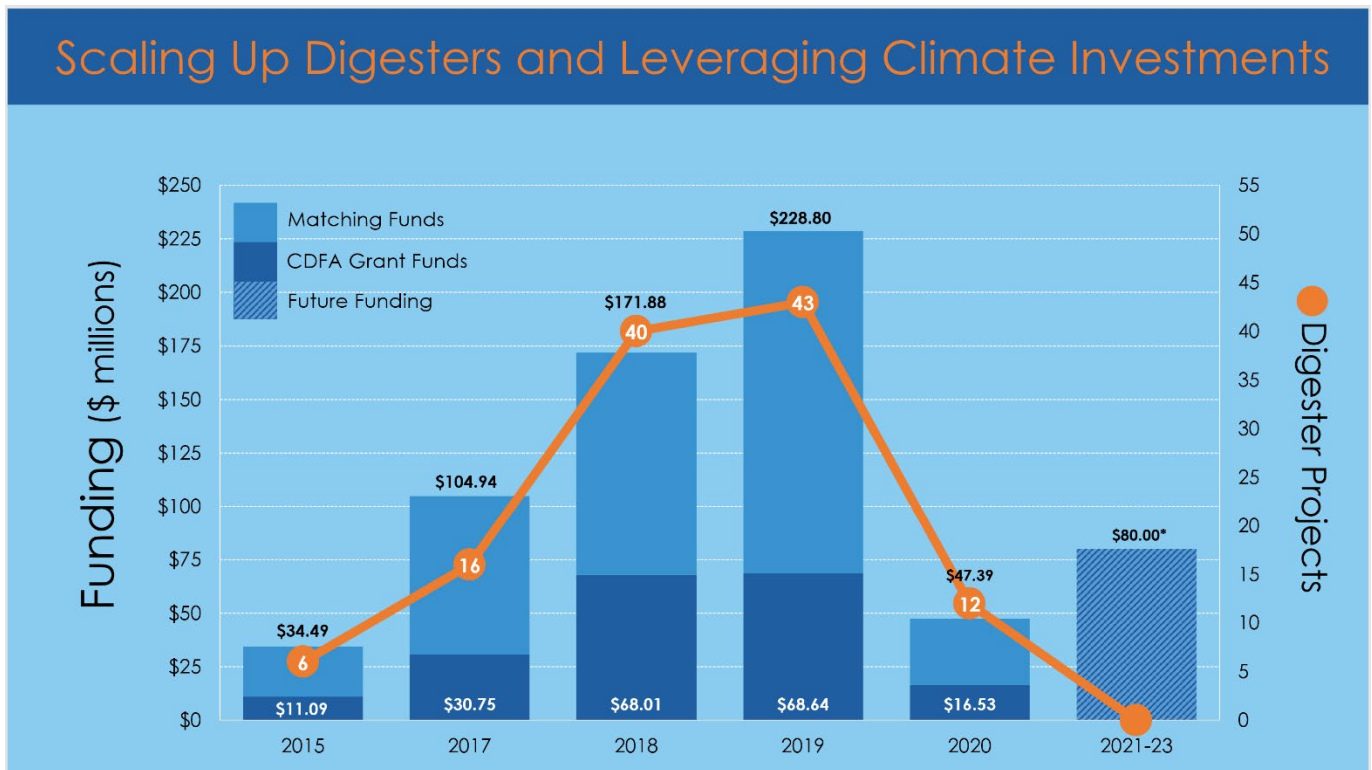


Figure 1. Number of funded digester projects by year, with total investments from CDFA grants and matching funds** for each grant cycle. *The Budget Act of 2021 allocated \$80 million to CDFA for its dairy and livestock methane reduction programs for the fiscal years of 2021/22 and 2022/23, with priority given to Alternative Manure Management Program. These funds have not been awarded yet. **Subject to change.

The Budget Act of 2017-18 (Item 8570-101-3228) requires CDFA to provide ongoing updates on the Department's DDRDP projects in January of each year beginning in 2018 and continuing through 2027. This legislative mandate is designed to evaluate the efficiency and cost-effectiveness of strategies to reduce emissions of short-lived climate pollutants, including methane (a greenhouse gas) from dairy operations. This report includes information on all DDRDP projects funded by CDFA.

CDFA has received \$289 million since 2014 for the DDRDP and Alternative Manure Management Program (AMMP). The Budget Act of 2021 appropriated another \$80 million to CDFA for dairy methane reduction incentives programs, with priority given to the Alternative Manure Management Program.

- DDRDP provides financial assistance for the installation of dairy digesters in California, which will result in reduced greenhouse gas emissions.
- AMMP provides financial assistance for the implementation of non-digester manure management practices in California, which will result in reduced greenhouse gas emissions.

CDFA has awarded a total of \$195 million for 117 dairy digester projects, with approximately \$392 million provided in matching funds by grant awardees ([Figure 1](#)). This funding has been awarded to projects that will result in methane emission reductions from California's agricultural sector. In 2019, agriculture contributed approximately 31.75 million metric tons of carbon dioxide equivalents (MMTCO_{2e}), or 7.6 percent of California's total annual GHG emissions.

Methane emissions resulting from manure management, a subset of these total statewide agricultural methane emissions, account for approximately 2.4 percent of the total statewide GHG emissions, or approximately 32 percent of the agricultural GHG emissions¹. The projects referenced in this report have a cumulative estimated GHG reduction of 21.02 MMTCO_{2e} over ten years, or approximately 2.10 MMTCO_{2e} annually. The funded projects equate to addressing approximately 21 percent of the methane emissions from manure management in California and 6.6 percent of the total GHG emissions from the agriculture sector in California ([Figure 3](#)).

I. Program Background and Award Selection Process

Methane is a potent greenhouse gas (GHG) that has a global warming potential 25 times that of carbon dioxide (using 100-year global warming potential). It is also a Short-lived Climate Pollutant (SLCP). SLCPs are climate gases that remain in the atmosphere for a much shorter period of time than longer-lived climate pollutants such as carbon dioxide. SLCPs are powerful climate forcers that have relatively short atmospheric lifetimes. Because SLCP impacts are especially strong over the

¹ CARB. California Greenhouse Gas Inventory Program. <https://ww2.arb.ca.gov/our-work/programs/ghg-inventory-program>

short term, acting now to reduce their emissions can have an immediate beneficial impact on climate change and public health. In California, the dairy and livestock sector accounts for over half of statewide methane emissions, with half of these emissions coming from enteric fermentation and the rest from manure management. Because no viable enteric methane mitigation option is currently available, the state has focused on methane mitigation strategies related to dairy manure management. With regards to manure management, methane is primarily emitted from manure lagoons on dairy operations. CDFA's DDRDP provides financial assistance for the installation of dairy digesters in California to reduce quantifiable GHG emissions including methane.

- CDFA was appropriated \$12 million in the Budget Act of 2014 to fund dairy digesters; \$11.1 million was awarded to fund six projects in 2015 through the DDRDP competitive grant process. These projects are estimated to reduce 153,870 MTCO₂e of GHG per year.
- CDFA received an additional \$50 million from the Greenhouse Gas Reduction Fund (GGRF), authorized by the Budget Act of 2016, to fund dairy digesters as well as non-digester practices for methane reduction on California's dairy and livestock operations. Non-digester manure management projects are implemented under a separate program, the Alternative Manure Management Program (AMMP), which provides financial assistance to California dairy and livestock operations.
 - \$30.75 million of the FY 2016-17 allocation was awarded to 16 dairy digester projects, which are estimated to reduce 365,676 MTCO₂e of GHG per year, and \$9.9 million was awarded to 18 alternative manure management projects in 2017, which are estimated to reduce 65,655 MTCO₂e of GHG per year.
- The Budget Act of 2017 and the Budget Act of 2018 allocated \$99 million each year to CDFA to support dairy and livestock methane reduction projects.
 - In 2018, \$68 million of the FY 2017-18 allocation was awarded to 40 dairy digester projects, which are estimated to reduce 711,231 MTCO₂e of GHG per year, and \$18.25 million was awarded to 35 non-digester projects, which are estimated to reduce 59,212 MTCO₂e of GHG per year.
 - In 2019, \$68.6 million of the FY 2018-19 allocation was awarded to 43 dairy digester projects through DDRDP and DDRDP Demonstration Projects (DDRDP Demo), which are estimated to reduce 703,754 MTCO₂e of GHG per year. Another \$31.25 million was awarded to 50

non-digester projects through AMMP and AMMP Demonstration Projects, which are estimated to reduce 73,286 MTCO_{2e} of GHG per year. The latter included AMMP New Technologies and Practices (AMMP Demo - NTP) and AMMP Advancing Practices Farmer-To-Farmer (AMMP Demo – APFF).

- The Budget Act of 2019 allocated \$34 million to CDFA to continue funding DDRDP and AMMP. This allocation was reduced to \$29,058,299 due to less than projected Cap and Trade auction proceeds for 2019-20.
 - In 2020, \$16.5 million of the FY 2019-20 was awarded to 12 dairy digester projects, which are estimated to reduce 167,847 MTCO_{2e} of GHG per year, and \$8.93 million was awarded to 13 non-digester projects, which are estimated to reduce 23,513 MTCO_{2e} of GHG per year.
- The Budget Act of 2021 allocated another \$80 million to CDFA to continue supporting dairy and livestock methane reduction programs, with priority given to AMMP. An additional \$10 million (\$5 million for fiscal year 2021/22 and \$5 million for fiscal year 2022/23) was reserved to be used for research grants to measure and verify emissions reductions associated with livestock methane reduction projects. Research shall include an assessment of the cost-effectiveness of various livestock methane reduction strategies on a per ton basis, including a comparison of projects funded under AMMP and DDRDP, as well as alternative methane reduction strategies such as dietary modification, and research on manure-based product development. To the extent feasible, research shall include measurement of emissions of greenhouse gases and criteria pollutants before and after livestock methane reduction projects are implemented.

A summary of funds allocated to the DDRDP is provided in [Table 1](#).

Table 1. Summary of CDFA DDRDP funding to date

Year	Dollar Allocation (millions)	Dairy Methane Reduction Grant Funds Awarded (millions)*			Administrative Cost not to Exceed 5% (millions)
		Dairy Digesters	Dairy Digester Research or Demonstration Projects	Non-digester Practices (Alternative Manure Management Program)	
2014-15	\$12	\$11.09	\$0.2	Not applicable	\$0.68
2016-17	\$50	\$30.75	Not applicable	\$9.9	\$5
2017-18	\$99	\$68.01	Not applicable	\$18.25	\$4.9
2018-19	\$99	\$66.89	\$1.75	\$31.25	\$4.9
2019-20	\$29.06	\$16.53	Not applicable	\$8.9	\$1.45**
2021-23	\$80	-	Not applicable	-	\$4**

*Values have changed from previous reports due to the cancellation of some projects.
 **In 2019-20, \$391,937 of the allocations were utilized to fund Technical Assistance Providers (TAP) under the Climate Smart Agriculture Technical Assistance Grants. In 2021-23, an estimated \$1,330,000 of the allocation is expected to be utilized to fund TAP. AB 2377 (Irwin, 2018) requires CDFA to utilize no less than 5% of the appropriation to provide technical assistance to AMMP applicants and recipients. CDFA funded all applications received by technical assistance providers.

CDFA has awarded a total of \$195 million for 117 dairy digester projects from 2015 through 2021 (Figure 2). Dairy digesters remain one of the most efficient GHG programs in terms of the cost of each ton of GHG reduced.²

- All six funded projects in 2015 have been completed and operational.
- Of the 16 funded projects in 2017, 15 are completed and operational, and one is in the process of verification.
- Of the 40 funded projects in 2018, 29 are completed and operational, nine are in the process of verification, and two are under construction.
- Of the 43 funded projects in 2019, five are complete and operational, and 38 are under construction. In September 2019, CDFA awarded \$1.75 million in one competitive grant to a California dairy operation and digester developer for the implementation of a dairy digester project that demonstrates innovative technology to achieve long-term methane emission reductions on California dairies and minimize or mitigate adverse environmental impacts.
- All 12 funded projects in 2020 are under construction.

² CARB. 2021 Annual Report on Cap and Trade Auction Proceeds.
https://ww3.arb.ca.gov/cc/capandtrade/auctionproceeds/2021_cci_annual_report.pdf

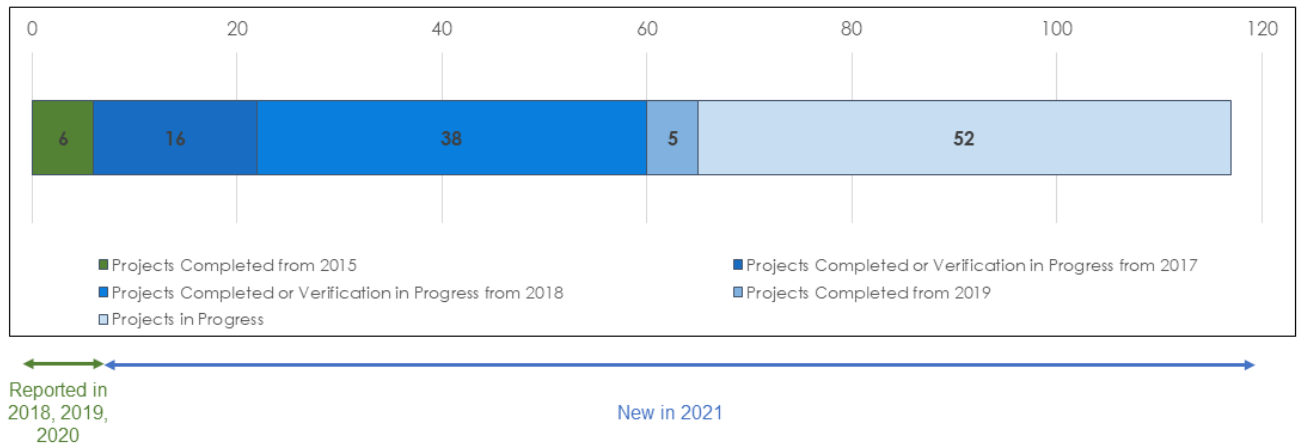


Figure 2. Number of DDRDP funded projects that are complete and in progress since 2015.

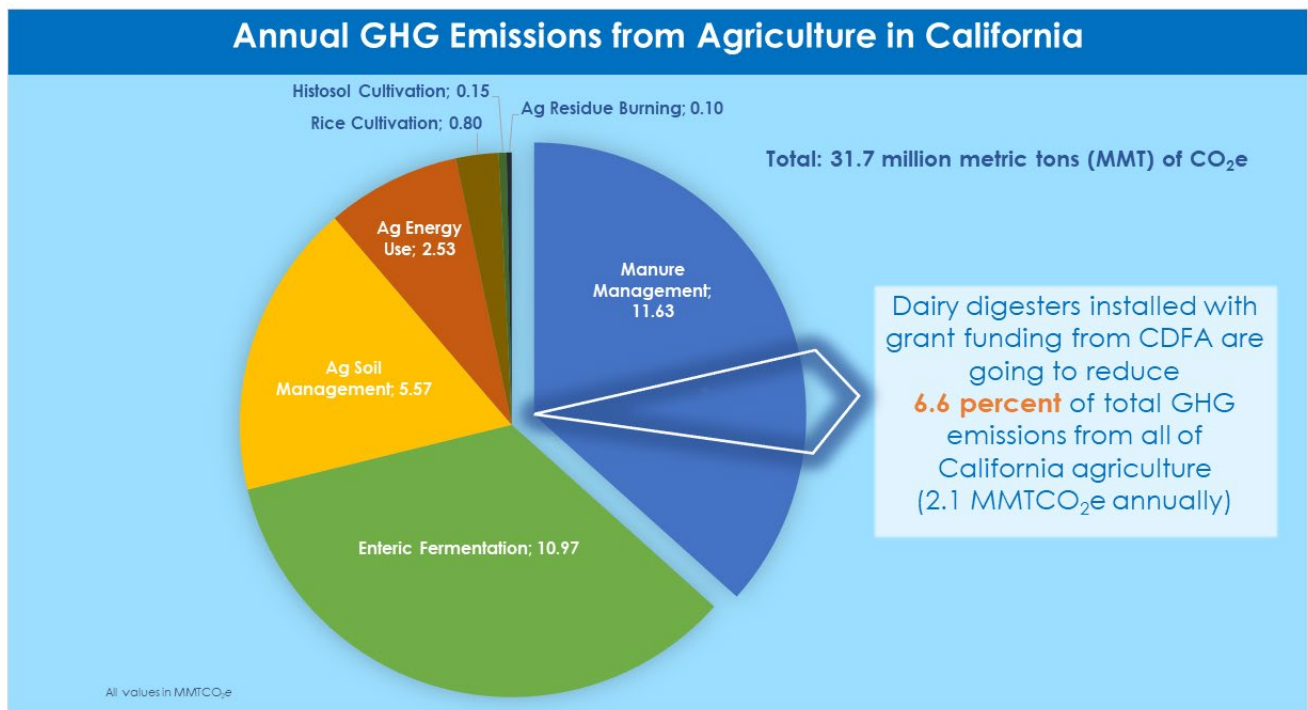


Figure 3. Total GHG emissions from Manure Management as a proportion of the total Agricultural Sector GHG emissions inventory in California in 2019. Source: [California Greenhouse Gas Inventory Program](#).

All funded projects since 2016-17 must comply with SB 859 (2016 Budget Bill), which requires CDFA to review the applicant’s analysis identifying potential adverse impacts of a proposed project prior to awarding grant funds from the GGRF. The requirements specified in the bill prohibit a project from receiving funding from CDFA unless the applicant has conducted outreach in areas that will potentially

be adversely impacted by the project, has determined potential adverse impacts of the project, and has committed to measures to mitigate impacts. The bill requires CDFA to prioritize projects based on the criteria pollutant emission benefits achieved by the project. This is an important component of the program and CDFA has worked diligently to comply with SB 859 requirements.

CDFA has funded \$68.3 million for 116 AMMP projects from 2016 to 2021. Approximately \$10 million has been contributed as matching funds by awardees. These projects achieve a cumulative estimated GHG reduction of 1.11 MMTCO₂e over five years, or 221,667 MTCO₂e annually, and equate to 2.2 percent of the methane emissions from manure management in California. AMMP funds a diverse range of manure management practices that provide options to dairy and livestock operations where digesters may not be economically feasible. These practices include pasture-based management (such as the conversion of a non-pasture operation to pasture or increased time spent by animals on pasture), alternative manure storage options (such as compost bedded pack barn or slatted floor pit storage manure collection), separation of manure solids in conjunction with drying or composting of solids, and conversion of a flush-based system to a scrape system in conjunction with drying or composting of solids.

A. DDRDP Eligibility and Application Process

Under DDRDP, CDFA funds up to 50 percent of the total project cost. The maximum grant award from the 2015-2019 rounds was up-to \$3 million per project and was reduced to up-to \$2 million per project for the 2020 round. Funded projects are expected to be completed within two years of the execution of the grant agreement. To be eligible for funding, the dairy digester project must be located on a commercial California dairy operation. A group of dairy operations may submit one grant application to develop centralized dairy digesters and gas clean-up facilities, known as a “cluster” or “hub and spoke” project. The location of the centralized digester and/or gas clean-up facility can be determined by participating dairy operations. Defunct digesters that were constructed in the past and have become entirely non-functional for a minimum of 12 months due to technical or other issues are also considered eligible for funding through DDRDP. However, CDFA does not fund upgrades to existing functional dairy digesters to boost emission reductions and energy production. Additionally, projects that propose to switch existing management practices on the dairy operation to those that increase baseline GHG emissions such as the increase in herd size are not eligible for DDRDP funding. Projects selected for funding may not change their

herd size beyond the limits established by the dairy operation's existing state issued permits (e.g., State or Regional Water Resources Control Board permits) at the time of application throughout the project term.

DDRDP applicants are required to use the quantification methodology and its associated calculator tool developed by the California Air Resources Board (CARB) to calculate estimated GHG emission reductions achievable from projects. The quantification methodology and calculator tool are available on CARB's [CCI Quantification, Benefits, and Reporting Materials](#) website. Any project benefits provided according to [AB 1550 \(Gomez, 2016\) Priority Populations](#) are determined and reported to CARB using the [methodologies](#) developed by CARB and consistent with the [Funding Guidelines for Administering Agencies](#).

Funded projects must demonstrate the protection of water and air quality. The design and construction of digester vessels (e.g., ponds and tanks) under this program must be demonstrated to be protective of surface and groundwater quality. To meet the DDRDP water quality requirements, one of the following is required: double-lined ponds consistent with the Tier 1 specification of the Dairy General Order (R52013-0122) of the Central Valley Regional Water Quality Control Board, above-ground or below-ground digester vessels that are considered protective of water quality provided they are designed to be watertight (i.e., vinyl water seals at joints, proper rebar density to minimize cracking), or built in accordance with a strict construction quality assurance (CQA) program (i.e., any cracks sealed). The digester system design, construction, and operation must minimize the emission of air pollutants. For power production projects, the total NO_x (mono-nitrogen oxides) emissions must be no greater than 0.50 lb/MW-hr. These represent the most stringent water and air quality protection standards across the state and must be met by a project regardless of its location in California. Funded projects must use commercially available technologies to produce or capture methane for energy production or transportation fuel.

B. DDRDP Review Process

CDFA conducts three levels of review during the grant submission and review process. The first is an administrative review to determine if all grant application requirements are met. The second is a comprehensive financial review to evaluate the merits of the grant applications based on the scoring criteria, conducted by the CDFA Audits Office. The third is a technical review by subject matter experts and the Technical Advisory Committee (TAC). The TAC is a sub-

committee of the [California-Federal Dairy Digester Working Group](#). The scoring criteria for the review process are listed in [Table 2](#). The TAC is assisted in the review process through the following:

- (i) The evaluation of the GHG emission reductions calculations and technical soundness of the project by academic experts associated with California (University of California and California State University systems) and national universities, and
- (ii) The assessment of financial information submitted with the grant application by CDFA's Audit Office.

Table 2. CDFA DDRDP Scoring Criteria for Project Selection.

Criteria	Points
Digester Project Plan and Long-term Viability	20
Budget Worksheet and Financials	10
Estimated Greenhouse Gas Emissions Reduction	35
Project Readiness	10
Environmental Performance	15
Community Impact	10
Total	100

In 2020, the scoring criteria were modified to award five extra points in addition to the criteria listed in [Table 2](#) to new submitting organizations in order to incentivize the distribution of funds to organizations that were not awarded in previous rounds.

II. CDFA Public Outreach for DDRDP

The development of the DDRDP framework and grant solicitation (Request for Grant Applications) involves a stakeholder and public engagement process. Additionally, during the application period, CDFA provides application assistance workshops as well as guidance on conducting community outreach about the projects. A summary of these workshops is provided in [Table 3](#).

Table 3. Summary of CDFA DDRDP Outreach.

Program Development Outreach Public Meetings			
Meeting	Date	Location	Number of Attendees
2015 Digester Grant Development - Stakeholder Input	11/6/2014	Modesto	12
2015 Digester Grant Development - Stakeholder Input	11/10/2014	Tulare	7
2015 Digester Grant Development - Stakeholder Input	11/13/2014	Sacramento	14
2015 Digester Research Development – Stakeholder Input	3/4/2015	Sacramento	0
2016 Environmental Justice Listening Session	11/9/2016	Tulare	9
2017 Digester Grant Development - Stakeholder Input	11/17/2016	Clovis	23
2017 Digester Grant Development - Stakeholder Input	11/21/2016	Sacramento	13
2017 Digester Grant Development - Stakeholder Input	11/22/2016	Modesto	10
2017 Digester Grant Development - Stakeholder Input	11/30/2016	Webinar	40
2017 Digester Grant Development - Stakeholder Input on Draft Solicitation	2/6/2017	Webinar	42
2019 Digester Grant Development – Expanding Access and Enhancing Competitiveness	9/17/2018	Tulare	6
2019 Digester Grant Development – Expanding Access and Enhancing Competitiveness	9/18/2018	Modesto	3
2019 Digester Grant Development – Expanding Access and Enhancing Competitiveness	9/19/2018	Webinar	28
2019 Digester Grant Development – Stakeholder Input	10/23/2018	Tulare	2
2019 Digester Grant Development – Stakeholder Input	10/24/2018	Modesto	2
2019 Digester Grant Development – Stakeholder Input	10/26/2018	Webinar	20
2020 Digester Grant Development – Stakeholder Input	09/17/2019	Tulare/Webinar	19
2020 Digester Grant Development – Stakeholder Input	09/18/2019	Petaluma/ Webinar	16
2020 Digester Grant Development – Stakeholder Input	09/19/2019	Sacramento/ Webinar	24
2020 Digester Grant Development – Expanding Access and Enhancing Competitiveness	01/06/2020	Sacramento/ Webinar	14
2020 Digester Grant Development – Expanding Access and Enhancing Competitiveness	01/09/2020	Sacramento/ Webinar	10
2022 Digester Grant Development – Stakeholder Input	12/08/2021	Webinar	14
Application Assistance Outreach Public Meetings			
Meeting	Date	Location	Number of Attendees
2015 Digester Grant - Application Workshop	1/21/2015	Tulare	13
2015 Digester Grant - Application Workshop	1/27/2015	Webinar	26
2015 Digester Grant - Application Workshop	1/28/2015	Sacramento	12

2015 Digester Research - Application Workshop	4/23/2015	Webinar	8
2017 Digester Grant - Application Workshop	5/12/2017	Sacramento	15
2017 Digester Grant - Application Workshop	5/15/2017	Tulare	20
2017 Digester Grant - Application Workshop	5/16/2017	Webinar	22
2017 Digester Grant – Community Outreach Assistance through UC Davis	May 2017	One-on-one Assistance and Consultation	9
2018 Digester Grant – Application Workshop	1/3/2018	Modesto	9
2018 Digester Grant – Application Workshop	1/4/2018	Tulare	14
2018 Digester Grant – Application Workshop	1/8/2018	Webinar	35
2019 Digester Grant – Application Workshop	1/23/2019	Tulare/ Webinar	12
2019 Digester Grant – Application Workshop	1/24/2019	Modesto/ Webinar	10
2020 Digester Grant – Application Workshop	2/18/2020	Modesto/ Webinar	16
2020 Digester Grant – Application Workshop	2/19/2020	Petaluma/ Webinar	9
2020 Digester Grant – Application Workshop	2/20/2020	Fresno/ Webinar	9

III. Projects Funded by the CDFA DDRDP

A summary of the 117 projects funded to date by CDFA's DDRDP is provided in [Table 4](#). The collective GHG emission reduction estimated from the 117 projects is 21.02 million MTCO₂e over 10 years, and the approximate cost to achieve one MTCO₂e (10-year) reduction is approximately \$27.94. Of this cost, the share of the GGRF funds (i.e., the CDFA grant) is approximately \$9.28 or 33 percent, and the remainder is achieved through matching funds provided by the grant recipient. A map showing the locations of the funded projects can be found in [Figure 4](#). As evident from [Figure 4](#), funded projects are primarily located in the Central Valley, which is home to the majority of large-scale dairy operations in the state. The Cost Effectiveness Summary of the DDRDP is presented in [Table 5](#). In case of canceled projects (see [Table 4](#) and [Section V](#)), no amount of the grant award funds were allocated to projects and/or grant award funds expended were returned to CDFA. CDFA awarded these funds to next-in-line ranked projects when possible.

IV. Community Engagement and Outreach by CDFA DDRDP Award Recipients

California Government Code Section 16428.86(a) (i.e., SB 859 Section 6) requires CDFA to review the applicant's analysis of potential adverse impacts of the

proposed project, including a net increase in criteria pollutants, toxic air contaminants, and hazardous air pollutants; groundwater and surface water impacts; and truck traffic and odor. This must occur prior to awarding DDRDP grant funds. Additionally, the statute states that:

- (i) A digester project shall not receive funding unless the applicant has demonstrated to CDFA that the applicant has done all the following:
 - a. Conducted outreach in areas that will potentially be adversely impacted by the project.
 - b. Determined potential adverse impacts of the project.
 - c. Committed to measures to mitigate impacts.
- (ii) In making awards, CDFA shall prioritize projects based on the criteria pollutant emission benefits achieved by the digester project.
- (iii) A digester project funded by CDFA that results in localized impacts in disadvantaged communities shall not be considered to provide a benefit to disadvantaged communities for the purposes of Section 39713 of the Health and Safety Code.

To meet these requirements, DDRDP applicants are required to conduct community outreach actions and describe community needs. Additionally, they are required to describe how the community was involved in the local planning and environmental review processes for this project, including how neighbors were contacted, public meeting dates, and whether translation was needed and provided. Applicants are required to summarize the results of this outreach; identify the community's concerns, questions, or comments and how they will be addressed, and provide up-to three letters of support from community members demonstrating that outreach was conducted.

Applicants are encouraged to (a) approach residents, community leaders, elected officials, advocacy organizations, local businesses, members of vulnerable or underserved populations (e.g., elderly, youth, physically and/or mentally disabled, members from disadvantaged communities), and government departments, agencies, jurisdictions, etc. potentially impacted by the project such as local health department, schools/school districts, emergency services, law enforcement, metropolitan planning organization, etc., and (b) use various methods to notify the community of outreach efforts, such as local newspapers, county websites, radio and television. The topics of discussion during outreach efforts must include potential adverse impacts of digester projects, including a net increase in criteria pollutants, toxic air contaminants, hazardous

air pollutants, groundwater and surface water impacts, truck traffic, and odor. Additionally, applicants are required to describe what, if any, mitigation measures will be included in the project. This includes, but is not limited to, mitigating the potential impacts mentioned above. Mitigation measures committed to by the applicant must be specific to the digester project and be included in the project work plan.

Applicants are also required to explain economic benefits that will be provided to the community (or communities) where a project is located, such as the number and duration of temporary or permanent jobs, approximate salaries, benefits for each job classification and trade, how long these jobs will last, and how they improve on local unemployment rates.

In order to provide guidance on quantification methods and reporting to administering agencies, CARB developed the [Community Engagement Co-benefit Assessment Methodology](#) in 2018-19. Questions as part of this methodology have been included on the DDRDP application since the 2019 round.

Further, CDFA contracted with the University of California, Davis Extension Collaboration Center in 2017 and 2018, and with California State University, Sacramento in 2019 to assist applicants with planning and executing their community outreach efforts. Since 2020, CDFA provides community outreach guidelines on community engagement strategies for applicants as resources during the solicitation process.

Among the 16 DDRDP applications that were selected for awards in 2017, a total of six letters (supporting 28 projects across seven clusters) from community-based organizations were provided in support of the projects. These included educational institutions such as California State University, Bakersfield's School of Natural Sciences, Mathematics, and Engineering; College of the Sequoias' Tulare College Center; and Lakeside Union School District, as well as local employment-focused nonprofit organizations such as Proteus, Inc. These letters specifically noted the activities that were conducted by the applicants in their community. For example, the College of the Sequoias stated that the applicant for several projects -- Rancho Teresita Dairy Biogas, Bos Farms Dairy Biogas, Moonlight Dairy Biogas, S&S Dairy Biogas, and Hamstra Dairy Biogas -- "reviewed the choice they have in the use of the dairy biogas as a source for electricity generation or vehicle fuel and the relative environmental impacts of the different approaches." In addition, the college acknowledged that the same applicant "developed a

program to advance our students' learning about dairy digesters and provide valuable paid and competitive internship programs, focused on members of disadvantaged communities."

In 2018, among the 40 DDRDP applications that were selected for awards, more than 10 letters (supporting 62 projects across 11 clusters) from community-based organizations were provided in support of the projects. These letters were from environmental justice organizations educational institutions, local employment-focused and training nonprofit organizations, and nonprofit community development organizations. These letters specifically noted the activities that were conducted by the applicants in their community and highlighted the positive impact of these future projects on their local community. For example, the nonprofit organization Project Clean Air stated that the applicant for projects Belonave Dairy Biogas LLC, BV Dairy Biogas, and Western Sky Dairy Biogas "has discussed the economic development and job creation benefits that will arise with the projects' implementation." Moreover, California State University Bakersfield and the College of the Sequoias acknowledged that this same applicant "is continuing their efforts in developing educational opportunities to teach our students about the history, role, and technology of dairy digesters both in classes and field trips, as well as to further expand already established paid and competitive internship programs to students from local disadvantaged communities."

In 2019, among the 42 DDRDP and one DDRDP Demo applications that were selected for awards, more than seven letters (supporting 52 projects across nine clusters) from community-based organizations were provided in support of these projects. These included educational institutions such as College of the Sequoias, the Lakeside Union School District, and the Hilmar Unified School District; and local employment-focused and training nonprofit organizations such as Proteus, Inc, Community Services Employment Training, and Sequoia Community Corps. These letters once again specifically noted the activities that were conducted by the applicants in their community and highlighted the positive impact of these future projects. For example, College of the Sequoias noted that it was developing a scholarship program with the applicant for projects Art Leyendekker Dairy Biogas, Elkhorn Dairy Biogas, Gerben Leyendekker Dairy Biogas, Curtimade Dairy Biogas, Dairyland Farms Dairy Biogas, Elk Creek Dairy Biogas, Friesian Farms Dairy Biogas, Rib-Arrow Dairy Biogas, Ribeiro Dairy Biogas, and Rio Blanco Dairy Biogas. The program, as stated in the letter, "will serve currently enrolled College of the Sequoias students or those students who have met the requirements to transfer to a four-year institution from disadvantaged communities and will focus on students

studying agriculture or programs related to energy and the environment.” In addition, the college asserted that the applicant “has established and continued paid and competitive internship programs to students from local disadvantaged communities” which “will be extended for one to two years.” Proteus, Inc. supports the Double Diamond Dairy Digester Pipeline Project, Homen Dairy Digester Pipeline Project, and Melo Dairy Digester Pipeline Project as these “will generate jobs” and will “create working opportunities and training for low-income populations and minorities” and “that at least 10% of each project’s work hours will be performed by residents of a low-income AB 1550 community.”

Among the 12 applications selected for awards in 2020, six letters (supporting 23 projects across five clusters) from educational institutions and community-based organizations were submitted in support of these projects. Within these letters, there is support from institutions of higher education such as California State University Fresno, and California State University Bakersfield as well as local employment, labor, training, and business organizations, including the International Brotherhood of Electrical Workers (Local Union 684), Proteus Inc., the Fresno Regional Workforce Development Board, Opportunity Stanislaus, and the Kern Economic Development Corporation. These letters specifically noted the activities that were conducted by the applicants in their communities and highlighted the benefits of these future projects to their local communities. The applicants for S&S Dairy, Trinkler Dairy, Wickstrom Jersey Farms, Albert Mendes Dairy, Ahlem Farms Jerseys, and Oliveira Dairy, which are part of the Aemetis Advanced Fuels Keyes cluster, in collaboration with Opportunity Stanislaus (Velocity 7), propose to fund a five-year \$50,000 scholarship program for students from local priority populations pursuing degrees in STEM, or construction trades, or in subjects relevant to the agriculture and renewable fuels industries. Similarly, the applicant for Poso Creek Dairy Biogas and Boschma Dairy Biogas propose to fund support for one student research assistant in financial need, with preference given to AB 1550 Priority Populations, for two terms at CSU Bakersfield for work in areas related to renewable energy, energy conservation, and digester technology.

The breadth of community outreach activities conducted by applicants included conducting public meetings that provided opportunities to learn about the advantages and disadvantages of construction in the community, engagement with local schools and universities to educate students and faculty on dairy digesters, providing paid internships to local students, facilitating interaction with local environmental and other non-profit organizations for feedback on projects, and the facilitation of public digester tours for interested local residents.

V. DDRDP Project Co-Benefits

Dairy digesters have the potential to provide several environmental and agronomic co-benefits, notably reduction in odor and flies due to elimination of open uncovered manure storage lagoons. Additionally, manure solids after digestion can be easier to handle, have a reduction in pathogens, and can have a more stabilized form of nutrients for plant uptake, relative to raw manure. The DDRDP requirements below, as noted previously in [Section 1. A.](#), have set the precedent for dairy digester projects to follow the highest air and water quality protection standards across the state, which in many cases are more stringent than local Air District or Water Board requirements:

1. Double-lined ponds consistent with the Tier 1 specification of the Dairy General Order (R52013-0122) of the Central Valley Regional Water Quality Control Board, above-ground or below-ground digester vessels that are considered protective of water quality provided they are designed to be watertight (i.e., vinyl water seals at joints, proper rebar density to minimize cracking) and built-in accordance with a strict construction quality assurance (CQA) program (i.e., any cracks sealed).
2. For power production projects, the total NO_x (mono-nitrogen oxides) emissions must be no greater than 0.50 lb/MW-hr.

Of the 117 DDRDP funded projects, 9 projects are generating electric power. Of these, six projects funded in 2015 involved internal combustion engines and met the criteria stated above. Three remaining projects have been funded in 2018 and 2019 and propose to employ fuel cells, a technology with lower criteria pollutant emissions than internal combustion engines. Projects awarded in 2016-17, 2017-18, 2018-19, and 2019-20 did not include electricity generation end-use through internal combustion engines. These projects involve end-uses such as renewable natural gas (RNG) production and electricity generation to power electric vehicles through fuel cells. These technologies have minimal local air quality impacts relative to internal combustion engines.

Since the 2019 round of DDRDP, the CARB methodology for calculation of GHG emission reductions has been revised to include quantification of co-benefits such as fossil fuel use reduction; energy and fuel cost savings; renewable fuel and energy generation; compost production; and reductions in local and remote emissions of Reactive Organic Gases (ROG), NO_x, PM 2.5, and diesel PM.

All funded projects are also evaluated for benefits to disadvantaged communities based on the criteria provided in [Funding Guidelines for Administering Agencies](#).

As noted in [Section IV](#), DDRDP grant recipients report economic benefits, including jobs creation. For example, Vander Poel Dairy Digester Pipeline Project, located in Tulare County and funded in 2018, created 56 jobs, 42 of which were provided to priority populations in the region. Another project, the K&M Visser Dairy Digester Fuel Pipeline Project, located in Tulare and funded in 2017, created 46 jobs, 25 of which were provided to priority populations in the region. Since 2019, CARB has developed the [Job Co-Benefit Assessment Methodology and Modeling Tool](#), which was utilized to estimate jobs benefits provided by projects at the time of application. These estimates will be updated with data provided by grant recipients through the term of the grant agreement and reported to CARB for inclusion in the [CARB's CCI Annual Report to the Legislature](#).

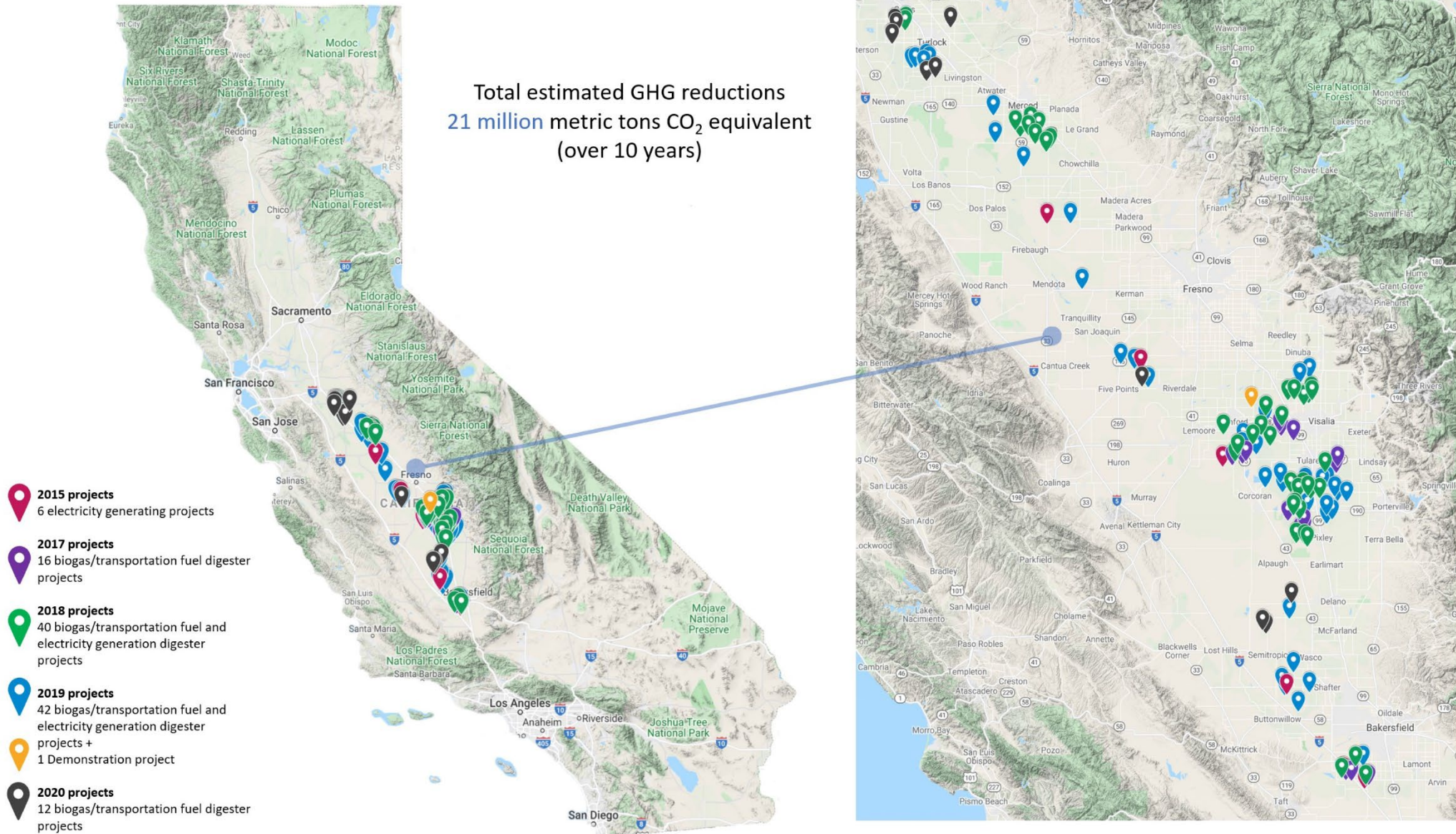


Figure 4. Geographical Distribution of CDFA funded Dairy Digesters in California.

Table 4. Summary of Dairy Digester Projects Funded by CDFA.

Year of Award	Applicant Organization	Project Title	Submitting Organization	Project Location	Cluster	Project Type	Biogas End-Use	Estimated 10 year GHG reductions (MTCO ₂ e)*	Grant Funds	Matching Funds**	Total Project Cost	Status
2015	ABEC #4 LLC, dba Carlos Echeverria & Sons Dairy Biogas	Carlos Echeverria & Sons Dairy Biogas Project	California Bioenergy LLC	Bakersfield, Kern Co.	NA	New covered lagoon digester	Combined heat and electrical power generation	201,200	\$1,000,000	\$5,560,375	\$6,560,375	Complete
2015	ABEC #3 LLC, dba Lakeview Farms Dairy Biogas	Lakeview Dairy Biogas Digester	California Bioenergy LLC	Bakersfield, Kern Co.	NA	New covered lagoon digester	Electrical power generation and RNG	144,090	\$2,000,000	\$5,128,324	\$7,128,324	Complete
2015	Open Sky Ranch Inc.	Open Sky Ranch Dairy Digester	Maas Energy Works Inc	Riverdale, Fresno Co.	NA	Retrofit covered lagoon digester*	Electrical power generation	258,911	\$973,430	\$990,486	\$1,963,916	Complete
2015	Philip Verwey Farms	Verwey-Hanford Dairy Digester	Maas Energy Works Inc	Hanford, Kings Co.	NA	New covered lagoon digester	Electrical power generation	535,770	\$3,000,000	\$3,011,595	\$6,011,595	Complete
2015	Philip Verwey Farms	Verwey-Madera Dairy Digester	Maas Energy Works Inc	Madera, Madera Co.	NA	New covered lagoon digester	Electrical power generation	240,000	\$2,281,091	\$2,331,935	\$4,613,026	Complete
2015	ABEC #2 LLC dba West-Star North Dairy Biogas	West-Star North Dairy Digester	California Bioenergy LLC	Buttonwillow, Kern Co.	NA	New covered lagoon digester	Electrical power generation	158,730	\$1,837,005	\$6,381,069	\$8,218,074	Complete
2017	Bos Farms Dairy Biogas	Bos Farms Dairy Biogas	California Bioenergy LLC	Tulare, Tulare Co.	Kern	New covered lagoon digester	RNG	168,398	\$1,500,000	\$5,199,492	\$6,699,492	Complete
2017	Calgren Dairy Fuels LLC	Circle A Dairy Digester Fuel Pipeline Project	Maas Energy Works Inc	Pixley, Tulare Co.	West Visalia	New covered lagoon digester	Cogeneration (ethanol) and RNG	138,745	\$1,050,000	\$1,429,945	\$2,479,945	Complete
2017	Cloverdale Dairy Biogas	Cloverdale Dairy Biogas	California Bioenergy LLC	Hanford, Kings Co.	Hanford	New covered lagoon digester	RNG	360,851	\$3,000,000	\$5,955,939	\$8,955,939	Complete
2017	Hamstra Dairy Biogas	Hamstra Dairy Biogas	California Bioenergy LLC	Tulare, Tulare Co.	Kern	New covered lagoon digester	RNG	205,115	\$2,000,000	\$6,630,543	\$8,630,543	Complete
2017	Hollandia Farms Dairy Biogas	Hollandia Farms Dairy Biogas	California Bioenergy LLC	Hanford, Kings Co.	Calgren	New covered lagoon digester	RNG	178,426	\$1,500,000	\$6,264,272	\$7,764,272	Complete
2017	Calgren Dairy Fuels LLC	K&M Visser Dairy Digester Fuel Pipeline Project	Maas Energy Works Inc	Pixley, Tulare Co.	Calgren	New covered lagoon digester	Cogeneration (ethanol) and RNG	205,553	\$1,500,000	\$1,902,047	\$3,402,047	Complete
2017	Calgren Dairy Fuels LLC	Legacy Dairy Digester Fuel Pipeline	Maas Energy Works Inc	Pixley, Tulare Co.	Calgren	New covered lagoon digester	Cogeneration (ethanol) and RNG	207,209	\$1,550,000	\$1,887,320	\$3,437,320	Complete
2017	Maple Dairy Biogas	Maple Dairy Biogas	California Bioenergy LLC	Bakersfield, Kern Co.	Kern	New covered lagoon digester	RNG	342,587	\$3,000,000	\$6,568,257	\$9,568,257	Complete
2017	Moonlight Dairy Biogas	Moonlight Dairy Biogas	California Bioenergy LLC	Visalia, Tulare Co.	South Tulare	New covered lagoon digester	RNG	154,834	\$1,500,000	\$6,440,123	\$7,940,123	Complete

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2017	Calgren Dairy Fuels LLC	Pixley Dairy Digester Fuel Pipeline Project	Maas Energy Works Inc	Pixley, Tulare Co.	Calgren	New covered lagoon digester	Cogeneration (ethanol) and RNG	215,321	\$1,600,000	\$1,675,681	\$3,275,681	Verification in Progress
2017	Calgren Dairy Fuels LLC	R Vander Eyk Dairy Digester Fuel Pipeline Project	Maas Energy Works Inc	Pixley, Tulare Co.	NA	New covered lagoon digester	Cogeneration (ethanol) and RNG	132,586	\$1,000,000	\$1,604,440	\$2,604,440	Complete
2017	Rancho Teresita Dairy Biogas	Rancho Teresita Dairy Biogas	California Bioenergy LLC	Tulare, Tulare Co.	Hanford	New covered lagoon digester	RNG	236,251	\$2,100,000	\$5,500,336	\$7,600,336	Complete
2017	Aligned Digester Cooperative LLC	Red Top Madera Dairy Digester Project	Aligned Digester Cooperative LLC	Chowchilla, Madera Co.	Hanford	New covered lagoon digester	RNG	282,475	\$3,000,000	\$3,046,875	\$6,046,875	Canceled ****
2017	S&S Dairy Biogas	S&S Dairy Biogas	California Bioenergy LLC	Visalia, Tulare Co.	West Visalia	New covered lagoon digester	RNG	167,417	\$1,600,000	\$5,238,833	\$6,838,833	Complete
2017	T & W Dairy Biogas	T & W Dairy Biogas	California Bioenergy LLC	Bakersfield, Kern Co.	South Tulare	New covered lagoon digester	RNG	294,982	\$2,600,000	\$6,147,941	\$8,747,941	Complete
2017	Trilogy Dairy Biogas	Trilogy Dairy Biogas	California Bioenergy LLC	Bakersfield, Kern Co.	Calgren	New covered lagoon digester	RNG	254,577	\$2,250,000	\$6,528,090	\$8,778,090	Complete
2017	Calgren Dairy Fuels LLC	Williams Family Dairy Digester Fuel Pipeline	Maas Energy Works Inc	Pixley, Tulare Co.	Calgren	New covered lagoon digester	Cogeneration (ethanol) and RNG	201,208	\$1,500,000	\$2,524,659	\$4,024,659	Canceled ****
2017	Wreden Ranch Dairy Biogas	Wreden Ranch Dairy Biogas	California Bioenergy LLC	Hanford, Kings Co.	South Tulare	New covered lagoon digester	RNG***	393,915	\$3,000,000	\$5,215,483	\$8,215,483	Complete
2018	Calgren Dairy Fuels LLC	4K Dairy Digester Pipeline Project	Maas Energy Works Inc	Pixley, Tulare Co.	Calgren	New covered lagoon digester	RNG	192,143	\$1,780,588	\$1,875,566	\$3,656,154	Complete
2018	Aemetis Advanced Fuels Inc	Ackerman Dairy Digester Pipeline Project	Maas Energy Works Inc	Ceres, Stanislaus Co.	Aemetis	New covered lagoon digester	RNG	89,574	\$1,331,291	\$1,581,769	\$2,913,060	Complete
2018	Aukeman Farms Dairy Biogas	Aukeman Dairy Biogas	California Bioenergy LLC	Tulare, Tulare Co.	South Tulare	New covered lagoon digester	RNG	207,701	\$1,765,457	\$3,072,438	\$4,837,895	Complete
2018	Belonave Dairy Biogas LLC	Belonave Dairy Biogas LLC	California Bioenergy LLC	Bakersfield, Kern Co.	Kern	New covered lagoon digester	RNG	225,659	\$1,918,099	\$3,561,605	\$5,479,704	Complete
2018	BV Dairy LLC	BV Dairy Biogas	California Bioenergy LLC	Bakersfield, Kern Co.	Kern	New covered lagoon digester	RNG	205,835	\$1,749,596	\$5,130,445	\$6,880,041	Complete
2018	Calgren Dairy Fuels LLC	Comerstone Dairy Digester Pipeline Project	Maas Energy Works Inc	Tipton, Tulare Co.	Calgren	New covered lagoon digester	RNG	185,238	\$1,266,053	\$1,275,663	\$2,541,716	Complete
2018	De Groot North Dairy Biogas	De Groot North Dairy Biogas	California Bioenergy LLC	Hanford, Kings Co.	West Visalia	New covered lagoon digester	RNG	169,699	\$1,442,440	\$2,401,778	\$3,844,218	Canceled ****
2018	De Groot South Dairy Biogas	De Groot South Dairy Biogas	California Bioenergy LLC	Hanford, Kings Co.	West Visalia	New covered lagoon digester	Electric Vehicle - Fuel Cell	199,477	\$1,542,697	\$4,230,946	\$5,773,643	In Progress

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2018	Decade Energy LLC	Decade Centralized Dairy Digester Pipeline Project	Maas Energy Works Inc	Tulare, Tulare Co.	Hanford-Lakeside	New covered lagoon digester	RNG	192,558	\$1,773,587	\$2,176,364	\$3,949,951	Complete
2018	DJ South Dairy Biogas LLC	DJ South Dairy Digester Pipeline Project	Maas Energy Works Inc	Chowchilla, Madera Co.	Merced-South	New covered lagoon digester	RNG	150,175	\$1,810,526	\$1,859,833	\$3,670,359	Verification in Progress
2018	Aemetis Advanced Fuels Inc	Double D Dairy Digester Pipeline Project	Maas Energy Works Inc	Ceres, Stanislaus Co.	Aemetis	New covered lagoon digester	RNG	189,850	\$1,822,668	\$2,225,662	\$4,048,330	Complete
2018	Double J Dairy Biogas	Double J Dairy Biogas	California Bioenergy LLC	Visalia, Tulare Co.	North Visalia	New covered lagoon digester	RNG	285,496	\$2,426,716	\$5,051,199	\$7,477,915	Complete
2018	Double L Dairy Biogas LLC	Double L Dairy Digester Pipeline Project	Maas Energy Works Inc	Hanford, Kings Co.	Hanford-Lakeside	New covered lagoon digester	RNG	136,148	\$1,762,347	\$1,767,556	\$3,529,903	Verification in Progress
2018	Dykstra Dairy Biogas	Dykstra Dairy Biogas	California Bioenergy LLC	Tulare, Tulare Co.	South Tulare	New covered lagoon digester	RNG	265,936	\$2,260,454	\$3,276,239	\$5,536,693	Complete
2018	The El Monte Dairy Biogas	El Monte Dairy Biogas	California Bioenergy LLC	Tipton, Tulare Co.	South Tulare	New covered lagoon digester	RNG	118,903	\$1,010,674	\$3,026,715	\$4,037,389	Complete
2018	5H Dairy Biogas LLC	Five H Dairy Digester Pipeline Project	Maas Energy Works Inc	Merced, Merced Co.	Merced-South	New covered lagoon digester	RNG	122,183	\$1,851,297	\$1,859,722	\$3,711,019	Verification in Progress
2018	FM Jersey Biogas LLC	FM Jerseys Dairy Digester Virtual Pipeline Project	Maas Energy Works Inc	Tipton, Tulare Co.	Calgren	New covered lagoon digester	RNG	161,960	\$2,010,747	\$2,017,330	\$4,028,077	Complete
2018	Hoogendam Dairy Biogas LLC	Hoogendam Dairy Digester Pipeline Project	Maas Energy Works Inc	Merced, Merced Co.	Merced-South	New covered lagoon digester	RNG	142,354	\$1,809,452	\$1,820,121	\$3,629,573	Verification in Progress
2018	Horizon Jersey Dairy Biogas	Horizon Jersey Dairy Biogas	California Bioenergy LLC	Tipton, Tulare Co.	South Tulare	New covered lagoon digester	RNG	335,398	\$2,850,886	\$3,788,728	\$6,639,614	Complete
2018	California Bioenergy LLC	Jacobus De Groot #2 Dairy Biogas	California Bioenergy LLC	Visalia, Tulare Co.	North Visalia	New covered lagoon digester	RNG	61,616	\$523,736	\$2,624,086	\$3,147,822	Complete
2018	Calgren Dairy Fuels LLC	Little Rock Centralized Dairy Digester Pipeline Project	Maas Energy Works Inc	Tipton, Tulare Co.	Calgren	New covered lagoon digester	RNG	146,839	\$2,096,578	\$2,268,895	\$4,365,473	Complete
2018	Lone Oak Energy LLC	Lone Oak #1 Dairy Digester Pipeline Project	Maas Energy Works Inc	Hanford, Kings Co.	Hanford-Lakeside	New covered lagoon digester	RNG	247,703	\$1,869,269	\$2,395,596	\$4,264,865	Complete
2018	Meirinho Dairy Biogas LLC	Meirinho Dairy Digester Pipeline Project	Maas Energy Works Inc	Merced, Merced Co.	Merced-South	New covered lagoon digester	RNG	147,352	\$1,832,358	\$1,975,914	\$3,808,272	Verification in Progress
2018	Mellema Dairy Biogas	Mellema Dairy Biogas	California Bioenergy LLC	Visalia, Tulare Co.	North Visalia	New covered lagoon digester	RNG	152,057	\$1,292,485	\$3,342,228	\$4,634,713	Complete
2018	Milky Way Dairy Biogas	Milky Way Dairy Biogas	California Bioenergy LLC	Visalia, Tulare Co.	North Visalia	New covered lagoon digester	RNG	347,462	\$2,953,427	\$4,244,734	\$7,198,161	Canceled ****

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2018	Mineral King Dairy Biogas	Mineral King Dairy Biogas	California Bioenergy LLC	Visalia, Tulare Co.	North Visalia	New covered lagoon digester	RNG	194,751	\$1,655,384	\$3,078,995	\$4,734,379	Complete
2018	Rancho Sierra Vista Dairy Biogas	Rancho Sierra Vista Dairy Biogas	California Bioenergy LLC	Visalia, Tulare Co.	North Visalia	New covered lagoon digester	RNG	172,958	\$1,470,143	\$3,045,546	\$4,515,689	Complete
2018	Red Rock Dairy Biogas LLC	Red Rock Dairy Digester Pipeline Project	Maas Energy Works Inc	Merced, Merced Co.	Merced-South	New covered lagoon digester	RNG	156,242	\$2,031,126	\$2,039,438	\$4,070,564	Verification in Progress
2018	River Ranch Farms LLC	River Ranch Dairy Digester Pipeline Project	Maas Energy Works Inc	Hanford, Kings Co.	Hanford-Lakeside	New covered lagoon digester	RNG	187,884	\$1,994,860	\$2,115,158	\$4,110,018	Complete
2018	Riverbend Dairy Biogas	Riverbend Dairy Biogas	California Bioenergy LLC	Tulare, Tulare Co.	South Tulare	New covered lagoon digester	RNG	245,930	\$2,090,404	\$2,664,638	\$4,755,042	Complete
2018	Calgren Dairy Fuels LLC	Riverview Dairy Digester Pipeline Project	Maas Energy Works Inc	Pixley, Tulare Co.	Calgren	New covered lagoon digester	RNG	90,093	\$1,332,070	\$1,386,350	\$2,718,420	Complete
2018	Rob Van Grouw Dairy Biogas	Rob Van Grouw Dairy Biogas	California Bioenergy LLC	Visalia, Tulare Co.	North Visalia	New covered lagoon digester	RNG	140,442	\$1,193,757	\$3,366,012	\$4,559,769	Complete
2018	Rocking Horse Dairy Biogas	Rocking Horse Dairy Biogas	California Bioenergy LLC	Hanford, Kings Co.	Hanford	New covered lagoon digester	RNG	119,540	\$1,016,091	\$2,771,539	\$3,787,630	In Progress
2018	Rockshar Dairy Biogas LLC	Rockshar Dairy Digester Pipeline Project	Maas Energy Works Inc	Merced, Merced Co.	Merced-South	New covered lagoon digester	RNG	124,664	\$1,679,093	\$1,679,620	\$3,358,713	Verification in Progress
2018	Scheenstra Dairy Biogas	Scheenstra Dairy Biogas	California Bioenergy LLC	Tulare, Tulare Co.	South Tulare	New covered lagoon digester	RNG	220,360	\$1,873,064	\$3,393,707	\$5,266,771	Complete
2018	Calgren Dairy Fuels LLC	Sousa & Sousa Dairy Digester Pipeline Project	Maas Energy Works Inc	Tipton, Tulare Co.	Calgren	New covered lagoon digester	RNG	68,700	\$886,934	\$892,931	\$1,779,865	Complete
2018	Udder Dairy Biogas	Udder Dairy Biogas	California Bioenergy LLC	Visalia, Tulare Co.	West Visalia	New covered lagoon digester	RNG	135,706	\$1,153,459	\$2,126,156	\$3,279,615	Complete
2018	Valadao Dairy Biogas	Valadao Dairy Biogas	California Bioenergy LLC	Hanford, Kings Co.	Hanford	New covered lagoon digester	RNG	121,005	\$1,028,545	\$2,061,008	\$3,089,553	Complete
2018	Calgren Dairy Fuels LLC	Vander Poel Dairy Digester Pipeline Project	Maas Energy Works Inc	Pixley, Tulare Co.	Calgren	New covered lagoon digester	RNG	290,060	\$1,972,485	\$2,222,073	\$4,194,558	Complete
2018	Vander Woude Dairy	Vander Woude Dairy Digester Pipeline Project	Maas Energy Works Inc	Merced, Merced Co.	Merced-South	New covered lagoon digester	RNG	188,575	\$1,863,562	\$1,863,864	\$3,727,426	Verification in Progress
2018	Vista Verde Dairy Biogas LLC	Vista Verde Dairy Digester Pipeline Project	Maas Energy Works Inc	Chowchilla, Madera Co.	Merced-South	New covered lagoon digester	RNG	140,653	\$1,594,109	\$1,643,656	\$3,237,765	Verification in Progress
2018	Western Sky Dairy Biogas	Western Sky Dairy Biogas	California Bioenergy LLC	Bakersfield, Kern Co.	Kern	New covered lagoon digester	RNG	352,595	\$2,820,762	\$5,315,518	\$8,136,280	Complete

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2019	Ahlem Farms Dairy Biogas	Ahlem Farms Dairy Biogas	California Bioenergy LLC	Hilmar, Merced Co.	Hilmar	New covered lagoon digester	RNG	153,151	\$1,546,738	\$4,557,504	\$6,104,242	In Progress
2019	Albert Goyenette Dairy Biogas	Albert Goyenette Dairy Biogas	California Bioenergy LLC	Buttonwillow, Kern Co.	Buttonwillow	New covered lagoon digester	RNG	199,706	\$1,609,316	\$6,993,567	\$8,602,883	In Progress
2019	Art Leyendekker Dairy Biogas	Art Leyendekker Dairy Biogas	California Bioenergy LLC	Visalia, Tulare Co.	North Visalia	New covered lagoon digester	RNG	77,697	\$769,784	\$2,915,284	\$3,685,068	In Progress
2019	DG Energy LLC	Avalon Dairy Digester Project	Maas Energy Works Inc	Wasco, Kern Co.	Calgren	New covered lagoon digester	RNG	159,758	\$1,917,757	\$1,917,757	\$3,835,514	In Progress
2019	Bar 20 Dairy Biogas, LLC	Bar 20 Dairy Biogas	California Bioenergy LLC	Kerman, Fresno Co.	NA	New covered lagoon digester	Electric Vehicle - Fuel Cell	374,390	\$3,000,000	\$6,345,131	\$9,345,131	Complete
2019	Charles Ahlem Ranch Dairy Biogas	Charles Ahlem Ranch Dairy Biogas	California Bioenergy LLC	Hilmar, Merced Co.	Hilmar	New covered lagoon digester	RNG	136,018	\$1,373,697	\$5,758,275	\$7,131,972	In Progress
2019	Clauss and Sunwest Dairy Biogas	Clauss and Sunwest Dairy Biogas	California Bioenergy LLC	Hilmar, Merced Co.	Hilmar	New covered lagoon digester	RNG	155,682	\$1,572,301	\$4,780,296	\$6,352,597	In Progress
2019	Curtimade Dairy Biogas	Curtimade Dairy Biogas	California Bioenergy LLC	Tulare, Tulare Co.	South Tulare	New covered lagoon digester	RNG	174,734	\$1,747,336	\$3,025,858	\$4,773,194	In Progress
2019	Dairyland Farms Dairy Biogas	Dairyland Farms Dairy Biogas	California Bioenergy LLC	Tipton, Tulare Co.	South Tulare	New covered lagoon digester	RNG	177,475	\$1,760,347	\$3,140,466	\$4,900,813	In Progress
2019	Tipton Pipeline LLC	De Boer Dairy Digester Pipeline Project	Maas Energy Works Inc	Tulare, Tulare Co.	Calgren	New covered lagoon digester	RNG	191,647	\$1,825,261	\$1,825,262	\$3,650,523	In Progress
2019	Lone Oak Energy LLC	Dixie Creek Dairy Digester Pipeline Project	Maas Energy Works Inc	Hanford, Kings Co.	Lakeside	New covered lagoon digester	RNG	271,176	\$2,436,030	\$2,473,632	\$4,909,662	Complete
2019	El Nido Biogas LLC	Double Diamond Dairy Digester Pipeline Project	Maas Energy Works Inc	El Nido, Merced Co.	Merced	New covered lagoon digester	RNG	290,633	\$2,037,766	\$2,037,766	\$4,075,532	In Progress
2019	Elk Creek Dairy Biogas	Elk Creek Dairy Biogas	California Bioenergy LLC	Tulare, Tulare Co.	South Tulare	New covered lagoon digester	RNG	59,555	\$512,706	\$3,596,502	\$4,109,208	In Progress
2019	Elkhorn Dairy Biogas	Elkhorn Dairy Biogas	California Bioenergy LLC	Dinuba, Tulare Co.	North Visalia	New covered lagoon digester	RNG	211,940	\$2,125,882	\$4,520,035	\$6,645,917	In Progress
2019	Tipton Pipeline LLC	Fern Oaks Dairy Digester Pipeline Project	Maas Energy Works Inc	Porterville, Tulare Co.	Calgren	New covered lagoon digester	RNG	169,370	\$1,688,894	\$1,688,894	\$3,377,788	In Progress
2019	ENV-TWO LLC	Flint Dairy Biogas Project (Demonstration Project)	ENV-TWO LLC	Hanford, Kings Co.	NA	Demonstration Project: New up flow anaerobic sludge blanket digester	RNG	126,990	\$1,750,000	\$3,374,782	\$5,124,782	In Progress
2019	Friesian Farms Dairy Biogas	Friesian Farms Dairy Biogas	California Bioenergy LLC	Tulare, Tulare Co.	South Tulare	New covered lagoon digester	RNG	63,145	\$639,602	\$3,175,183	\$3,814,785	In Progress

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2019	Gerben Leyendekker Dairy Biogas	Gerben Leyendekker Dairy Biogas	California Bioenergy LLC	Visalia, Tulare Co.	North Visalia	New covered lagoon digester	RNG	85,419	\$845,589	\$2,902,768	\$3,748,357	In Progress
2019	GP Dairy Biogas	GP Dairy Biogas	California Bioenergy LLC	Visalia, Tulare Co.	North Visalia	New covered lagoon digester	RNG	50,722	\$502,554	\$2,915,623	\$3,418,177	Canceled ****
2019	Calgren Dairy Fuels LLC	Hettinga Centralized Dairy Digester Pipeline Project	Maas Energy Works Inc	Pixley, Tulare Co.	Calgren	New covered lagoon digester	RNG	167,339	\$2,352,909	\$2,352,909	\$4,705,818	In Progress
2019	River Ranch Farms LLC	High Roller Dairy Digester Pipeline Project	Maas Energy Works Inc	Hanford, Kings Co.	Lakeside	New covered lagoon digester	RNG	105,257	\$1,412,136	\$1,412,136	\$2,824,272	In Progress
2019	Merced Pipeline LLC	Homen Dairy Digester Pipeline Project	Maas Energy Works Inc	Merced, Merced Co.	Merced	New covered lagoon digester	RNG	124,000	\$1,640,419	\$1,640,420	\$3,280,839	In Progress
2019	James Ahlem Dairy Biogas	James Ahlem Dairy Biogas	California Bioenergy LLC	Hilmar, Merced Co.	Hilmar	New covered lagoon digester	RNG	82,216	\$830,349	\$4,861,351	\$5,691,700	In Progress
2019	Lakeside Energy LLC	Lakeside Dairy Digester Pipeline Project	Maas Energy Works Inc	Hanford, Kings Co.	Lakeside	New covered lagoon digester	RNG	218,679	\$2,213,063	\$2,213,063	\$4,426,126	In Progress
2019	Maya Dairy Biogas	Maya Dairy Biogas	California Bioenergy LLC	Buttonwillow, Kern Co.	Buttonwillow	New covered lagoon digester	RNG	250,090	\$2,015,393	\$6,954,582	\$8,969,975	In Progress
2019	McMoo Farms Dairy Biogas	McMoo Farms Dairy Biogas	California Bioenergy LLC	Bakersfield, Kern Co.	Kern	New covered lagoon digester	RNG	164,384	\$1,598,893	\$3,013,668	\$4,612,561	Complete
2019	Merced Pipeline LLC	Melo Dairy Digester Pipeline Project	Maas Energy Works Inc	Merced, Merced Co.	Merced	New covered lagoon digester	RNG	272,690	\$2,910,554	\$2,910,555	\$5,821,109	In Progress
2019	Newhouse Dairy Biogas	Newhouse Dairy Biogas	California Bioenergy LLC	Bakersfield, Kern Co.	Kern	New covered lagoon digester	RNG	171,098	\$1,665,037	\$3,982,045	\$5,647,082	Complete
2019	Calgren Dairy Fuels LLC	Northstar Dairy Digester Pipeline Project	Maas Energy Works Inc	Tipton, Tulare Co.	Calgren	New covered lagoon digester	RNG	170,658	\$1,576,438	\$1,576,438	\$3,152,876	In Progress
2019	Nyman Brothers Dairy Biogas	Nyman Brothers Dairy Biogas	California Bioenergy LLC	Hilmar, Merced Co.	Hilmar	New covered lagoon digester	RNG	68,026	\$687,006	\$4,654,902	\$5,341,908	In Progress
2019	Poplar Lane Dairy Biogas LLC	Poplar Lane Dairy Digester Pipeline Project	Maas Energy Works Inc	Hanford, Kings Co.	Lakeside	New covered lagoon digester	RNG	131,195	\$1,756,966	\$1,756,966	\$3,513,932	In Progress
2019	Rib-Arrow Dairy Biogas	Rib-Arrow Dairy Biogas	California Bioenergy LLC	Tulare, Tulare Co.	South Tulare	New covered lagoon digester	RNG	76,343	\$657,231	\$3,517,919	\$4,175,150	In Progress
2019	Ribeiro Dairy Biogas	Ribeiro Dairy Biogas	California Bioenergy LLC	Tulare, Tulare Co.	South Tulare	New covered lagoon digester	RNG	132,348	\$1,124,962	\$1,613,882	\$2,738,844	Complete
2019	Rio Blanco Dairy Biogas	Rio Blanco Dairy Biogas	California Bioenergy LLC	Tulare, Tulare Co.	South Tulare	New covered lagoon digester	RNG	100,886	\$1,002,797	\$2,556,018	\$3,558,815	In Progress
2019	Calgren Dairy Fuels LLC	Schott Dairy Digester Pipeline Project	Maas Energy Works Inc	Tipton, Tulare Co.	Calgren	New covered lagoon digester	RNG	129,082	\$1,444,592	\$1,444,592	\$2,889,184	In Progress

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2019	Calgren Dairy Fuels LLC	Simoes Centralized Digester Pipeline Project	Maas Energy Works Inc	Tipton, Tulare Co.	Calgren	New covered lagoon digester	RNG	161,275	\$2,036,460	\$2,036,460	\$4,072,920	In Progress
2019	Skyview Dairy Biogas	Skyview Dairy Biogas	California Bioenergy LLC	Shafter, Kern Co.	Buttonwillow	New covered lagoon digester	RNG	85,174	\$686,620	\$7,686,172	\$8,372,792	In Progress
2019	Southern Cross Dairy Biogas	Southern Cross Dairy Biogas	California Bioenergy LLC	Buttonwillow, Kern Co.	Buttonwillow	New covered lagoon digester	RNG	125,872	\$1,019,121	\$8,072,067	\$9,091,188	In Progress
2019	Southpoint Ranch Dairy Biogas	Southpoint Ranch Dairy Biogas	California Bioenergy LLC	Madera, Madera Co.	NA	New covered lagoon digester	Electric Vehicle - Fuel Cell	484,999	\$3,000,000	\$13,642,393	\$16,642,393	In Progress
2019	Van Der Hoek Dairy Biogas LLC	Van Der Hoek Dairy Digester Pipeline Project	Maas Energy Works Inc	Helm, Fresno Co.	Five Points	New covered lagoon digester	RNG	168,447	\$2,061,968	\$2,061,968	\$4,123,936	In Progress
2019	Van Der Kooi Power LLC	Van Der Kooi Dairy Digester Pipeline Project	Maas Energy Works Inc	Riverdale, Fresno Co.	Five Points	New covered lagoon digester	RNG	170,089	\$1,897,438	\$1,897,438	\$3,794,876	In Progress
2019	L&J Vanderham Dairy	Vanderham Dairy Digester Pipeline Project	Maas Energy Works Inc	Riverdale, Fresno Co.	Five Points	New covered lagoon digester	RNG	186,037	\$1,984,951	\$1,984,951	\$3,969,902	In Progress
2019	Whiteside Dairy Biogas	Whiteside Dairy Biogas	California Bioenergy LLC	Wasco, Kern Co.	Buttonwillow	New covered lagoon digester	RNG	119,137	\$960,043	\$7,190,202	\$8,150,245	In Progress
2019	Yosemite Jersey Dairy Biogas	Yosemite Jersey Dairy Biogas	California Bioenergy LLC	Hilmar, Merced Co.	Hilmar	New covered lagoon digester	RNG	93,734	\$946,644	\$4,097,690	\$5,044,334	In Progress
2020	Denair Biogas LLC	Ahlem Farms Dairy Digester Project	Maas Energy Works Inc	Denair, Stanislaus Co.	Merced	New covered lagoon digester	RNG	167,761	\$1,195,000	\$3,130,536	\$4,325,536	In Progress
2020	Aemetis Biogas LLC	Ahlem Farms Jerseys - AAFK Central Dairy Digester Cluster	Aemetis Biogas LLC	Crows Landing, Stanislaus Co.	Aemetis Central	New covered lagoon digester	RNG	113,979	\$1,592,287	\$1,672,003	\$3,264,290	In Progress
2020	Aemetis Biogas LLC	Albert Mendes Dairy - AAFK Central Dairy Digester Cluster	Aemetis Biogas LLC	Crows Landing, Stanislaus Co.	Aemetis Central	New covered lagoon digester	RNG	99,372	\$1,388,241	\$1,735,754	\$3,123,995	In Progress
2020	Boschma Biogas LLC	Boschma Dairy Biogas	California Bioenergy LLC	Wasco, Kern Co.	NA	New covered lagoon digester	RNG	189,947	\$1,723,302	\$4,819,704	\$6,543,006	In Progress
2020	Maas Energy Works Inc	JDS Ranch Digester Project	Maas Energy Works Inc	Wasco, Kern Co.	Calgren	New covered lagoon digester	RNG	159,082	\$1,600,000	\$3,044,536	\$4,644,536	In Progress
2020	Calgren Dairy Fuels LLC	JR Dairy Digester Project	Maas Energy Works Inc	Tipton, Tulare Co.	Calgren	New covered lagoon digester	RNG	191,049	\$1,300,000	\$1,873,859	\$3,173,859	In Progress
2020	Aemetis Biogas LLC	Oliveira Dairy - AAFK Central Dairy Digester Cluster	Aemetis Biogas LLC	Hilmar, Merced Co.	Aemetis Central	New covered lagoon digester	RNG	80,857	\$1,056,977	\$2,103,160	\$3,160,137	In Progress
2020	Poso Creek Biogas LLC	Poso Creek Dairy Biogas	California Bioenergy LLC	Wasco, Kern Co.	NA	New covered lagoon digester	RNG	171,854	\$1,464,930	\$5,344,556	\$6,809,486	In Progress

2020	Aemetis Biogas LLC	S&S Dairy - AAFK Central Dairy Digester Cluster	Aemetis Biogas LLC	Ceres, Stanislaus Co.	Aemetis Central	New covered lagoon digester	RNG	90,946	\$1,271,396	\$1,988,964	\$3,260,360	In Progress
2020	Aemetis Biogas LLC	Trinkler Dairy - AAFK Central Dairy Digester Cluster	Aemetis Biogas LLC	Ceres, Stanislaus Co.	Aemetis Central	New covered lagoon digester	RNG	85,529	\$1,194,840	\$1,451,336	\$2,646,176	In Progress
2020	Aemetis Biogas LLC	Wickstrom Jersey Farms - AAFK Central Dairy Digester Cluster	Aemetis Biogas LLC	Hilmar, Merced Co.	Aemetis Central	New covered lagoon digester	RNG	121,350	\$1,342,980	\$1,383,737	\$2,726,717	In Progress
2020	Wilson Dairy Biogas LLC	Wilson Dairy Digester Project	Maas Energy Works Inc	Riverdale, Fresno Co.	Five Points	New covered lagoon digester	RNG	206,745	\$1,400,000	\$2,309,120	\$3,709,120	In Progress
Totals								21,023,793	195,025,884	392,480,367	587,506,251	

*Estimated reductions calculated using the CARB Quantification Methodology and calculator tool. MTCO_{2e}: Metric tonnes of carbon dioxide equivalent.

**Matching funds are subject to change.

***RNG: Renewable Natural Gas

****Project canceled due to substantive changes to project scope.

*Defunct digester was non-functional for a minimum of 12 consecutive months.

Table 5. Cost Effectiveness Summary of Dairy Digester Projects Funded by CDFA.

Year Awarded	Project Title	Total cost of 1 MTCO ₂ e GHG reduction (GGRF + Matching Funds)	GGRF cost of per 1 MTCO ₂ e GHG reduction	% of 1 MTCO ₂ e reduction supported cost by GGRF
2015	Carlos Echeverria & Sons Dairy Biogas Project	\$32.61	\$4.97	15
2015	Lakeview Dairy Biogas Digester	\$49.47	\$13.88	28
2015	Open Sky Ranch Dairy Digester	\$7.59	\$3.76	50
2015	Verwey-Hanford Dairy Digester	\$11.22	\$5.60	50
2015	Verwey-Madera Dairy Digester	\$19.22	\$9.50	49
2015	West-Star North Dairy Digester	\$51.77	\$11.57	22
2017	Bos Farms Dairy Biogas	\$39.78	\$8.91	22
2017	Circle A Dairy Digester Fuel Pipeline Project	\$17.87	\$7.57	42
2017	Cloverdale Dairy Biogas	\$24.82	\$8.31	33
2017	Hamstra Dairy Biogas	\$42.08	\$9.75	23
2017	Hollandia Farms Dairy Biogas	\$43.52	\$8.41	19
2017	K&M Visser Dairy Digester Fuel Pipeline Project	\$16.55	\$7.30	44
2017	Legacy Dairy Digester Fuel Pipeline	\$16.59	\$7.48	45
2017	Maple Dairy Biogas	\$27.93	\$8.76	31
2017	Moonlight Dairy Biogas	\$51.28	\$9.69	19
2017	Pixley Dairy Digester Fuel Pipeline Project	\$15.21	\$7.43	49
2017	R Vander Eyk Dairy Digester Fuel Pipeline Project	\$19.64	\$7.54	38
2017	Rancho Teresita Dairy Biogas	\$32.17	\$8.89	28
2017	Red Top Madera Dairy Digester Project	\$21.41	\$10.62	50
2017	S&S Dairy Biogas	\$40.85	\$9.56	23
2017	T & W Dairy Biogas	\$29.66	\$8.81	30
2017	Trilogy Dairy Biogas	\$34.48	\$8.84	26
2017	Williams Family Dairy Digester Fuel Pipeline	\$20.00	\$7.45	37
2017	Wreden Ranch Dairy Biogas	\$20.86	\$7.62	37
2018	4K Dairy Digester Pipeline Project	\$19.03	\$9.27	49
2018	Ackerman Dairy Digester Pipeline Project	\$32.52	\$14.86	46

2018	Aukeman Dairy Biogas	\$23.29	\$8.50	36
2018	Belonave Dairy Biogas LLC	\$24.28	\$8.50	35
2018	BV Dairy Biogas	\$33.43	\$8.50	25
2018	Cornerstone Dairy Digester Pipeline Project	\$13.72	\$6.83	50
2018	De Groot North Dairy Biogas	\$22.65	\$8.50	38
2018	De Groot South Dairy Biogas	\$28.94	\$7.73	27
2018	Decade Centralized Dairy Digester Pipeline Project	\$20.51	\$9.21	45
2018	DJ South Dairy Digester Pipeline Project	\$24.44	\$12.06	49
2018	Double D Dairy Digester Pipeline Project	\$21.32	\$9.60	45
2018	Double J Dairy Biogas	\$26.19	\$8.50	32
2018	Double L Dairy Digester Pipeline Project	\$25.93	\$12.94	50
2018	Dykstra Dairy Biogas	\$20.82	\$8.50	41
2018	El Monte Dairy Biogas	\$33.96	\$8.50	25
2018	Five H Dairy Digester Pipeline Project	\$30.37	\$15.15	50
2018	FM Jerseys Dairy Digester Virtual Pipeline Project	\$24.87	\$12.42	50
2018	Hoogendam Dairy Digester Pipeline Project	\$25.50	\$12.71	50
2018	Horizon Jersey Dairy Biogas	\$19.80	\$8.50	43
2018	Jacobus De Groot #2 Dairy Biogas	\$51.09	\$8.50	17
2018	Little Rock Centralized Dairy Digester Pipeline Project	\$29.73	\$14.28	48
2018	Lone Oak #1 Dairy Digester Pipeline Project	\$17.22	\$7.55	44
2018	Meirinho Dairy Digester Pipeline Project	\$25.84	\$12.44	48
2018	Mellema Dairy Biogas	\$30.48	\$8.50	28
2018	Milky Way Dairy Biogas	\$20.72	\$8.50	41
2018	Mineral King Dairy Biogas	\$24.31	\$8.50	35
2018	Rancho Sierra Vista Dairy Biogas	\$26.11	\$8.50	33
2018	Red Rock Dairy Digester Pipeline Project	\$26.05	\$13.00	50
2018	River Ranch Dairy Digester Pipeline Project	\$21.88	\$10.62	49
2018	Riverbend Dairy Biogas	\$19.33	\$8.50	44
2018	Riverview Dairy Digester Pipeline Project	\$30.17	\$14.79	49
2018	Rob Van Grouw Dairy Biogas	\$32.47	\$8.50	26
2018	Rocking Horse Dairy Biogas	\$31.69	\$8.50	27
2018	Rockshar Dairy Digester Pipeline Project	\$26.94	\$13.47	50

2018	Scheenstra Dairy Biogas	\$23.90	\$8.50	36
2018	Sousa & Sousa Dairy Digester Pipeline Project	\$25.91	\$12.91	50
2018	Udder Dairy Biogas	\$24.17	\$8.50	35
2018	Valadao Dairy Biogas	\$25.53	\$8.50	33
2018	Vander Poel Dairy Digester Pipeline Project	\$14.46	\$6.80	47
2018	Vander Woude Dairy Digester Pipeline Project	\$19.77	\$9.88	50
2018	Vista Verde Dairy Digester Pipeline Project	\$23.02	\$11.33	49
2018	Western Sky Dairy Biogas	\$23.08	\$8.00	35
2019	Ahlem Farms Dairy Biogas	\$39.86	\$10.10	25
2019	Albert Goyenette Dairy Biogas	\$43.08	\$8.06	19
2019	Art Leyendekker Dairy Biogas	\$47.43	\$9.91	21
2019	Avalon Dairy Digester Project	\$24.01	\$12.00	50
2019	Bar 20 Dairy Biogas	\$24.96	\$8.01	32
2019	Charles Ahlem Ranch Dairy Biogas	\$52.43	\$10.10	19
2019	Clauss and Sunwest Dairy Biogas	\$40.80	\$10.10	25
2019	Curtimade Dairy Biogas	\$27.32	\$10.00	37
2019	Dairyland Farms Dairy Biogas	\$27.61	\$9.92	36
2019	De Boer Dairy Digester Pipeline Project	\$19.05	\$9.52	50
2019	Dixie Creek Dairy Digester Pipeline Project	\$18.11	\$8.98	50
2019	Double Diamond Dairy Digester Pipeline Project	\$14.02	\$7.01	50
2019	Elk Creek Dairy Biogas	\$69.00	\$8.61	12
2019	Elkhorn Dairy Biogas	\$31.36	\$10.03	32
2019	Fern Oaks Dairy Digester Pipeline Project	\$19.94	\$9.97	50
2019	Flint Dairy Biogas Project (Demonstration Project)	\$40.36	\$13.78	34
2019	Friesian Farms Dairy Biogas	\$60.41	\$10.13	17
2019	Gerben Leyendekker Dairy Biogas	\$43.88	\$9.90	23
2019	GP Dairy Biogas	\$67.39	\$9.91	15
2019	Hettinga Centralized Dairy Digester Pipeline Project	\$28.12	\$14.06	50
2019	High Roller Dairy Digester Pipeline Project	\$26.83	\$13.42	50
2019	Homen Dairy Digester Pipeline Project	\$26.46	\$13.23	50
2019	James Ahlem Dairy Biogas	\$69.23	\$10.10	15
2019	Lakeside Dairy Digester Pipeline Project	\$20.24	\$10.12	50

2019	Maya Dairy Biogas	\$35.87	\$8.06	22
2019	McMoo Farms Dairy Biogas	\$28.06	\$9.73	35
2019	Melo Dairy Digester Pipeline Project	\$21.35	\$10.67	50
2019	Newhouse Dairy Biogas	\$33.00	\$9.73	29
2019	Northstar Dairy Digester Pipeline Project	\$18.47	\$9.24	50
2019	Nyman Brothers Dairy Biogas	\$78.53	\$10.10	13
2019	Poplar Lane Dairy Digester Pipeline Project	\$26.78	\$13.39	50
2019	Rib-Arrow Dairy Biogas	\$54.69	\$8.61	16
2019	Ribeiro Dairy Biogas	\$20.69	\$8.50	41
2019	Rio Blanco Dairy Biogas	\$35.28	\$9.94	28
2019	Schott Dairy Digester Pipeline Project	\$22.38	\$11.19	50
2019	Simoos Centralized Digester Pipeline Project	\$25.25	\$12.63	50
2019	Skyview Dairy Biogas	\$98.30	\$8.06	8
2019	Southern Cross Dairy Biogas	\$72.23	\$8.10	11
2019	Southpoint Ranch Dairy Biogas	\$34.31	\$6.19	18
2019	Van Der Hoek Dairy Digester Pipeline Project	\$24.48	\$12.24	50
2019	Van Der Kooi Dairy Digester Pipeline Project	\$22.31	\$11.16	50
2019	Vanderham Dairy Digester Pipeline Project	\$21.34	\$10.67	50
2019	Whiteside Dairy Biogas	\$68.41	\$8.06	12
2019	Yosemite Jersey Dairy Biogas	\$53.82	\$10.10	19
2020	Ahlem Farms Dairy Digester Project	\$25.78	\$7.12	28
2020	Ahlem Farms Jerseys - AAFK Central Dairy Digester Cluster	\$28.64	\$13.97	49
2020	Albert Mendes Dairy - AAFK Central Dairy Digester Cluster	\$31.44	\$13.97	44
2020	Boschma Dairy Biogas	\$34.45	\$9.07	26
2020	JDS Ranch Digester Project	\$29.20	\$10.06	34
2020	JR Dairy Digester Project	\$16.61	\$6.80	41
2020	Oliveira Dairy - AAFK Central Dairy Digester Cluster	\$39.08	\$13.07	33
2020	Poso Creek Dairy Biogas	\$39.62	\$8.52	22
2020	S&S Dairy - AAFK Central Dairy Digester Cluster	\$35.85	\$13.98	39
2020	Trinkler Dairy - AAFK Central Dairy Digester Cluster	\$30.94	\$13.97	45

VI. Individual Project Information

Information on individual projects funded through the CDFA DDRDP from 2015-2022.

*Verwey-Hanford Dairy Digester
Funded: 2015
Completion: September 2016
Status: Operational*

The Verwey-Hanford Dairy Digester project is a new covered lagoon digester at Philip Verwey Farms #2 dairy. The biogas from the digester is used to produce approximately 7.6 million kWh of renewable electricity per year.

- Location – Hanford, California (Kings County)
- CDFA DDRDP Funding - \$3 million
- Matching funds - \$3,011,595
- Total Project costs - \$ 6,011,595
- Estimated 10-year GHG reductions - 535,770 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.18 MTCO_{2e}
- GHG reductions per total project dollars - 0.09 MTCO_{2e}
- Total cost per MTCO_{2e} - \$11.22



Image 1. View of the covered lagoon digester at Verwey-Hanford Dairy.

Open Sky Ranch Dairy Digester

Funded: 2015

Completion: August 2016

Status: Operational

The Open Sky Ranch Dairy Digester project recommissioned a defunct covered lagoon digester at Open Sky Ranch. The biogas from the digester is used to produce approximately 6.4 million kWh of renewable electricity per year.

- Location – Riverdale, California (Fresno County)
- CDFA DDRDP Funding - \$973,430
- Matching funds - \$990,486
- Total Projects costs - \$1,963,916
- Estimated 10-year GHG reductions - 258,911 MTCO_{2e}
- GHG reductions per CDFA grant dollars – 0.27 MTCO_{2e}
- GHG reductions per total projects dollars 0.13 MTCO_{2e}
- Total cost per MTCO_{2e} - \$7.59



Image 2. A view of the Open Sky Ranch Dairy digester.

Verwey-Madera Dairy Digester
Funded: 2015
Completion: May 2017
Status: Operational

The Verwey-Madera Dairy Digester project is a new covered lagoon digester to be installed at Philip Verwey Farms #1. The biogas from the digester is used to produce approximately 4.8 million kWh of renewable electricity per year.

- Location – Madera, California (Madera County)
- CDFA DDRDP Funding - \$2,281,091
- Matching funds - \$2,331,935
- Total Project costs - \$4,613,026
- Estimated 10-year GHG reductions - 240,000 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.11 MTCO_{2e}
- GHG reductions per total project dollars - 0.05 MTCO_{2e}
- Total cost per MTCO_{2e} - \$19.22



Image 3. Covered lagoon digester at Verwey-Madera Dairy.



Image 4. Installed electrical genset at Verwey-Madera Dairy.

West-Star North Dairy Digester
Funded: 2015
Completion: February 2018
Status: Operational

The West-Star North Dairy digester is a covered lagoon digester project. This project will capture biogas from two covered lagoons at the dairy. Biogas from the digester produces 7.6 million kWh of renewable electricity per year.

- Location – Buttonwillow, California (Kern County)
- CDFA DDRDP Funding - \$1,837,005
- Matching funds - \$6,381,069
- Total Project costs - \$8,218,114
- Estimated 10-year GHG reductions - 158,370 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.09 MTCO_{2e}
- GHG reductions per total project dollars - 0.02 MTCO_{2e}
- Total cost per MTCO_{2e} - \$51.78



Image 5. Biogas conditioning and electric generation equipment (foreground) with covered lagoon digester (background) at the West-Star North Dairy.

Lakeview Dairy Biogas Digester

Funded: 2015

Completion: February 2018

Status: Operational

Lakeview Dairy Biogas Digester is a covered lagoon digester system. The biogas generated by this project generates 6.7 million kWh of electricity per day.

- Location – Bakersfield, California (Kern County)
- CDFA DDRDP Funding - \$2 million
- Matching funds - \$5,128,324
- Total Project costs - \$7,128,324
- Estimated 10-year GHG reductions - 144,090 MTCO_{2e}
- GHG reductions per grant dollar - 0.07 MTCO_{2e}
- GHG reductions per total project dollars - 0.02 MTCO_{2e}
- Total cost per MTCO_{2e} - \$49.47

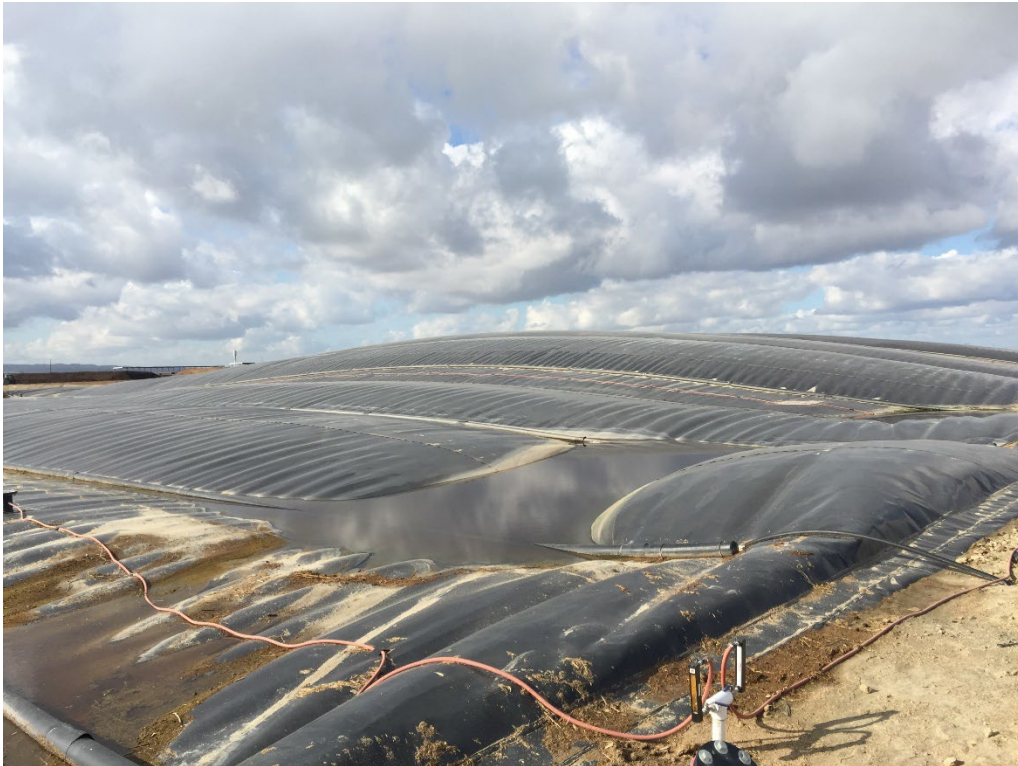


Image 6. Covered lagoon digester at Lakeview Dairy.

Carlos Echeverria & Sons Dairy Biogas Project

Funded: 2015

Completion: February 2018

Status: Operational

ABEC #4 LLC dba Carlos Echeverria & Sons Dairy Biogas is a new covered lagoon dairy digester system and a biogas-fueled combined heat and power (CHP). An estimated 7.6 million kWh of renewable electricity per year.

- Location – Bakersfield, California (Kern County)
- CDFA DDRDP Funding - \$1 million
- Matching funds - \$5,560,375
- Total Project costs - \$6,560,375
- Estimated 10-year GHG reductions - 201,200 MTCO_{2e}
- GHG reductions per CDFA grant dollars - 0.2 MTCO_{2e}
- GHG reductions per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$32.61



Image 7. Electric generation equipment at the Carlos Echeverria & Sons Dairy Biogas Project.

Circle A Dairy Digester Fuel Pipeline Project

Funded: 2017

Completion: September 2018

Status: Operational

The Circle A Dairy Digester Fuel Pipeline Project is a covered lagoon anaerobic digester. The project is part of the Calgren Dairy Fuels Cluster. Transported via private pipeline, the biogas from the digester supplies fuel to two 5MW gas turbines that power the Calgren ethanol refinery. The cluster will install an RCNG station and later connect to the utility pipeline to supply more RCNG stations.

- Location – Pixley, California (Tulare County)
- CDFA DDRDP Funding - \$1.05 million
- Matching funds - \$1,429,744
- Total Project costs - \$2,479,744
- Estimated 10-year GHG reductions - 138,745 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.13 MTCO_{2e}
- GHG reductions per total project dollars - 0.06 MTCO_{2e}
- Total cost per MTCO_{2e} - \$17.87



Image 8. View of biogas handling building (foreground) and covered lagoon digester (background) at Circle A Dairy.

R Vander Eyk Dairy Digester Fuel Pipeline Project

Funded: 2017

Completion: December 2018

Status: Operational

The Robert Vander Eyk Dairy Digester Fuel Pipeline Project is a covered lagoon anaerobic digester. The project is part of the Calgren Dairy Fuels Cluster. Transported via private pipeline, the biogas from the digester supplies fuel to two 5MW gas turbines that power the Calgren ethanol refinery. The cluster will install an RCNG station and later connect to the utility pipeline to supply more RCNG stations.

- Location – Pixley, California (Tulare County)
- CDFA DDRDP Funding - \$1 million
- Matching funds - \$1,604,440
- Total Projects costs - \$2,604,440
- Estimated 10-year GHG reductions - 132,586 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.13 MTCO_{2e}
- GHG reductions per total project dollars - 0.05 MTCO_{2e}
- Total cost per MTCO_{2e} - \$19.64



Image 9. Covered lagoon digester at R Vander Eyk Dairy

Legacy Dairy Digester Fuel Pipeline Project

Funded: 2017

Completion: January 2019

Status: Operational

The Legacy Dairy Digester Fuel Pipeline Project is a covered lagoon anaerobic digester. The project is part of the Calgren Dairy Fuels Cluster. Transported via private pipeline, the biogas from the digester supplies fuel to two 5MW gas turbines that power the Calgren ethanol refinery. The cluster will install an RCNG station and later connect to the utility pipeline to supply more RCNG stations.

- Location – Pixley, California (Tulare County)
- CDFA DDRDP Funding - \$1.55 million
- Matching funds - \$1,887,320
- Total Project costs - \$3,437,320
- Estimated 10-year GHG reductions - 207,209 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.13 MTCO_{2e}
- GHG reductions per total project dollars - 0.06 MTCO_{2e}
- Total cost per MTCO_{2e} - \$16.59



Image 10. Covered lagoon digester (foreground) and solid separator (background) at Legacy Dairy.

Cornerstone Dairy Digester Pipeline Project
Funded: 2018
Completion: April 2019
Status: Operational

Cornerstone Dairy Digester Pipeline Project is a new covered lagoon digester. Biomethane from the digester is transported via a private, low-pressure pipeline to the cluster's central hub near the Calgren ethanol refinery. Once at the hub, it will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the adjacent SoCalGas utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Pixley, California (Tulare County)
- CDFA DDRDP Funding - \$1,266,053
- Matching funds - \$1,275,663
- Total Projects costs - \$2,541,716
- Estimated 10-year GHG reductions – 185,238 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.15 MTCO_{2e}
- GHG reduction per total project dollars - 0.07 MTCO_{2e}
- Total cost per MTCO_{2e} - \$13.72



Image 11. Biogas conditioning equipment (foreground) and covered lagoon digester (background) at Cornerstone Dairy.

Sousa & Sousa Dairy Digester Pipeline Project

Funded: 2018

Completion: July 2019

Status: Operational

Sousa & Sousa Dairy Digester Pipeline Project is a new covered lagoon digester processing dairy manure. Biomethane from the digester is transported via a private, low-pressure pipeline to the cluster's central hub at the Calgren ethanol refinery. Once at the hub, it will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the adjacent SoCalGas utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Tipton, California (Tulare County)
- CDFA DDRDP Funding - \$886,934
- Matching funds - \$1,779,865
- Total Projects costs - \$2,666,799
- Estimated 10-year GHG reductions – 68,700 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.08 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$38.82



Image 12. Covered lagoon dairy digester at Sousa & Sousa Dairy.

Vander Poel Dairy Digester Pipeline Project

Funded: 2018

Completion: August 2019

Status: Operational

Vander Poel Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. Biomethane from the digester will be transported via a private, low-pressure pipeline to the cluster's central hub at the Calgren ethanol refinery. Once at the hub, it will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the adjacent SoCalGas utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Pixley, California (Tulare County)
- CDFA DDRDP Funding - \$1,972,485
- Matching funds - \$2,222,073
- Total Projects costs - \$4,194,558
- Estimated 10-year GHG reductions – 290,060 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.15 MTCO_{2e}
- GHG reduction per total project dollars - 0.07 MTCO_{2e}
- Total cost per MTCO_{2e} - \$14.46



Image 13. Covered lagoon digester filled with biogas at the Vander Poel Dairy.

K&M Visser Dairy Digester Fuel Pipeline Project

Funded: 2017

Completion: September 2019

Status: Operational

The K&M Visser Dairy Digester Fuel Pipeline Project is a covered lagoon anaerobic digester. The project is part of the Calgren Dairy Fuels Cluster. Transported via private pipeline, the biogas from the digester supplies fuel to two 5MW gas turbines that power the Calgren ethanol refinery. The cluster will install an RCNG station and later connect to the utility pipeline to supply more RCNG stations.

- Location – Pixley, California (Tulare County)
- CDFA DDRDP Funding - \$1.5 million
- Matching funds - \$1,902,047
- Total Project costs - \$3,402,047
- Estimated 10-year GHG reductions - 203,416 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.14 MTCO_{2e}
- GHG reductions per total dollars - 0.06 MTCO_{2e}
- Total cost per MTCO_{2e} - \$16.72



Image 14. Details of the digester lagoon cover at K&M Visser Dairy showing welded liners to prevent biogas leakage.

Riverview Dairy Digester Pipeline Project

Funded: 2018

Completion: November 2019

Status: Operational

Riverview Dairy Digester Pipeline Project built a new covered lagoon digester processing dairy manure. Biomethane from the digester is transported via a private, low-pressure pipeline to the cluster's central hub at the Calgren ethanol refinery. Once at the hub, it is used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas is injected into the adjacent SoCalGas utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Pixley, California (Tulare County)
- CDFA DDRDP Funding - \$1,332,070
- Matching funds - \$1,386,350
- Total Projects costs - \$2,718,420
- Estimated 10-year GHG reductions – 90,093 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.07 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$30.17



Image 15. Biogas conditioning equipment (foreground) and covered lagoon digester (background) at Riverview Dairy.

4K Dairy Digester Pipeline Project
Funded: 2018
Completion: January 2020
Status: Operational

4K Dairy Digester Pipeline Project built a new covered lagoon digester. Biomethane from the digester is transported via a private, low-pressure pipeline to the cluster's central hub near the Calgren ethanol refinery. Once at the hub, it is used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas is injected into the adjacent SoCalGas utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Pixley, California (Tulare County)
- CDFA DDRDP Funding - \$1,780,588
- Matching funds - \$1,875,566
- Total Projects costs - \$3,656,154
- Estimated 10-year GHG reductions – 192.143 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.11 MTCO_{2e}
- GHG reduction per total project dollars - 0.05 MTCO_{2e}
- Total cost per MTCO_{2e} - \$190.3



Image 16. Aerial view of the covered lagoon digester at 4K Dairy.

Little Rock Centralized Dairy Digester Pipeline Project
Funded: 2018
Completion: February 2020
Status: Operational

Little Rock Centralized Dairy Digester Pipeline Project built a new covered lagoon digester processing dairy manure from two smaller dairies. Biomethane from the digester is transported via a private, low-pressure pipeline to the cluster's central hub at the Calgren ethanol refinery. Once at the hub, it is used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas is injected into the adjacent SoCalGas utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Tipton, California (Tulare County)
- CDFA DDRDP Funding - \$2,096,578
- Matching funds - \$2,268,895
- Total Projects costs - \$4,365,473
- Estimated 10-year GHG reductions – 146,839 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.07 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$29.73



Image 17. Biogas conditioning equipment at Little Rock Dairy.

Maple Dairy Biogas
Funded: 2017
Completion: August 2020
Status: Operational

Maple Dairy built a covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project added a pre-digester sand lane and screens for solid separation pre-digester. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and is used for vehicle fuel use.

- Location – Bakersfield, California (Kern County)
- CDFA DDRDP Funding - \$3 million
- Matching funds – \$6,568,257
- Total Project costs - \$9,568,257
- Estimated 10-year GHG reductions – 342,587 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.11 MTCO_{2e}
- GHG reductions per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$27.93



Image 18. Weir box and a weir box meter (foreground) and covered lagoon digester and biogas conditioning equipment (background) at Maple Dairy.

Trilogy Dairy Biogas
Funded: 2017
Completion: August 2020
Status: Operational

Trilogy Dairy built a covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and is used for vehicle fuel use.

- Location – Bakersfield, California (Kern County)
- CDFA DDRDP Funding - \$2.25 million
- Matching funds - \$6,528,090
- Total Project costs - \$8,778,090
- Estimated 10-year GHG reductions - 254,577 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.11 MTCO_{2e}
- GHG reductions per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$34.48



Image 19. An oxygen generator skid for biological control of hydrogen sulfide (H₂S) at Trilogy Dairy.

T&W Dairy Biogas
Funded: 2017
Completion: August 2020
Status: Operational

T & W Farms built a covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project added a sand lane and screens for pre-digester solid separation. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and is used for vehicle fuel use.

- Location – Bakersfield, California (Kern County)
- CDFA DDRDP Funding – \$2.6 million
- Matching funds - \$6,147,941
- Total Project costs - \$8,747,941
- Estimated 10-year GHG reductions - 294,892 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.11 MTCO_{2e}
- GHG reductions per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$29.66



Image 20. Gathering line array (foreground) and covered lagoon digester (background) at T&W Dairy.

Ackerman Dairy Digester Pipeline Project
Funded: 2018
Completion: August 2020
Status: Operational

Ackerman Dairy Digester Pipeline Project built a new covered lagoon digester. Biomethane from the digester is transported via a private, low-pressure pipeline to the cluster's central hub at the Aemetis ethanol refinery. Once at the hub, it is used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas is used on-site to fuel boilers at the Aemetis ethanol refinery to make very low carbon vehicle fuel.

- Location – Ceres, California (Stanislaus County)
- CDFA DDRDP Funding - \$1,331,291
- Matching funds - \$1,581,769
- Total Projects costs - \$2,913,060
- Estimated 10-year GHG reductions – 89,574 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.07 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$32.52



Image 21. Sand lane and covered lagoon digester at Ackerman Dairy.

BV Dairy Biogas
Funded: 2018
Completion: September 2020
Status: Operational

BV Dairy Biogas built a new covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project includes a sand lane, screens, and mechanical separator with a screw press for solid separation pre-digester. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and is used for vehicle fuel use.

- Location – Bakersfield, California (Kern County)
- CDFA DDRDP Funding - \$1,749,596
- Matching funds - \$5,130,445
- Total Projects costs - \$6,880,041
- Estimated 10-year GHG reductions – 205,835 MTCO₂e
- GHG reductions per CDFA grant dollar - 0.12 MTCO₂e
- GHG reduction per total project dollars - 0.03 MTCO₂e
- Total cost per MTCO₂e - \$33.43



Image 22. Gas compressor equipment at BV Dairy.

Double D Dairy Digester Pipeline Project

Funded: 2018

Completion: September 2020

Status: Operational

Double D Dairy Digester Pipeline Project built a new covered lagoon digester. Biomethane from the digester is transported via a private, low-pressure pipeline to the cluster's central hub at the Aemetis ethanol refinery. Once at the hub, it is used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas is used on-site to fuel boilers at the Aemetis ethanol refinery to make very low carbon vehicle fuel.

- Location – Ceres, California (Stanislaus County)
- CDFA DDRDP Funding - \$1,822,668
- Matching funds - \$2,225,662
- Total Projects costs - \$4,048,330
- Estimated 10-year GHG reductions – 189,850 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.05 MTCO_{2e}
- Total cost per MTCO_{2e} - \$21.32



Image 23. Aerial view of the covered lagoon digester and the biogas conditioning equipment at Double D Dairy.

S&S Dairy Biogas
Funded: 2017
Completion: September 2020
Status: Operational

S&S Dairy built a covered lagoon with enhanced gas storage, gas pre-treatment, and effluent distribution. The project added a sand lane and screens for pre-digester solid separation. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Visalia, California (Tulare County)
- CDFA DDRDP Funding – \$1.6 million
- Matching funds - \$4,916,846
- Total Project costs - \$6,516,846
- Estimated 10-year GHG reductions - 167,417 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.10 MTCO_{2e}
- GHG reductions per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$38.93



Image 24. Upgrader equipment at the CalBioGas West Visalia Cluster, which receives biogas from S&S Dairy.

Moonlight Dairy
Biogas Funded: 2017
Completion: September 2020
Status: Operational

Moonlight Dairy built a covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project added a sand lane and screens for pre-digester solid separation. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Visalia, California (Tulare County)
- CDFA DDRDP Funding - \$1.5 million
- Matching funds - \$6,440,123
- Total Projects costs - \$7,940,123
- Estimated 10-year GHG reductions - 154,834 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.10 MTCO_{2e}
- GHG reductions per total project dollars - 0.02 MTCO_{2e}
- Total cost per MTCO_{2e} - \$51.28



Image 25. Sand lane at Moonlight Dairy.

Hamstra Dairy Biogas
Funded: 2017
Completion: September 2020
Status: Operational

Hamstra Dairy built a covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project added a sand lane and screens for pre-digester solid separation. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Tulare, California (Tulare County)
- CDFA DDRDP Funding – \$2 million
- Matching funds - \$6,630,543
- Total Project costs - \$8,630,543
- Estimated 10-year GHG reductions 205,115 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.10 MTCO_{2e}
- GHG reductions per total project dollars - 0.02 MTCO_{2e}
- Total cost per MTCO_{2e} - \$42.08



Image 26. Covered lagoon digester at Hamstra Dairy.

Western Sky Dairy Biogas
Funded: 2018
Completion: January 2021
Status: Operational

Western Sky Dairy Biogas built a new covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project includes a sand lane, screens, and mechanical separator with a screw press for solid separation pre-digester. Biogas is now conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Bakersfield, California (Kern County)
- CDFA DDRDP Funding - \$2,820,762
- Matching funds - \$5,315,518
- Total Projects costs - \$8,136,280
- Estimated 10-year GHG reductions – 352,595 MTCO₂e
- GHG reductions per CDFA grant dollar - 0.12 MTCO₂e
- GHG reduction per total project dollars - 0.04 MTCO₂e
- Total cost per MTCO₂e - \$23.08



Image 27. Biogas compressor skid at Western Sky Dairy.

FM Jerseys Dairy Digester Virtual Pipeline Project

Funded: 2018

Completion: March 2021

Status: Operational

FM Jerseys Dairy Digester Virtual Pipeline Project built a new covered lagoon digester processing dairy manure. Biomethane from the digester is hauled using clean-burning renewable CNG-fueled trucks and compressed natural gas tube trailers to create a virtual pipeline to the cluster's central hub at the Calgren ethanol refinery. At the hub, it is used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas is injected into the adjacent SoCalGas utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Tipton, California (Tulare County)
- CDFA DDRDP Funding - \$2,010,747
- Matching funds - \$2,017,330
- Total Projects costs - \$4,028,077
- Estimated 10-year GHG reductions – 161,960 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.08 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$24.87



Image 28. Biogas conditioning system at FM Jerseys Dairy

River Ranch Dairy Digester Pipeline Project

Funded: 2018

Completion: March 2021

Status: Operational

River Ranch Dairy Digester Pipeline Project built a new covered lagoon digester processing dairy manure. Biomethane from the digester is transported via a private, low-pressure pipeline to the cluster's central hub at the center of the dairy. Once at the hub, it is used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas is injected into the adjacent SoCalGas utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Hanford, California (Kings County)
- CDFA DDRDP Funding - \$1,994,860
- Matching funds - \$2,115,158
- Total Projects costs - \$4,110,018
- Estimated 10-year GHG reductions – 187,884 MTCO₂e
- GHG reductions per CDFA grant dollar - 0.09 MTCO₂e
- GHG reduction per total project dollars - 0.05 MTCO₂e
- Total cost per MTCO₂e - \$21.88



Image 29. Emergency vent stack at River Ranch Dairy Digester Pipeline Project.

Dixie Creek Dairy Digester Pipeline Project
Funded: 2019
Completion: March 2021
Status: Operational

Dixie Creek Dairy Digester Pipeline Project built a new covered lagoon digester processing dairy manure. The methane-rich biogas from the digester is transported via a private, low-pressure pipeline to the cluster's central hub near River Ranch dairy. There, the biogas is used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas is injected into the SoCalGas utility pipeline for delivery to contracted CNG fueling stations around the state.

- Location – Hanford, California (Kings County)
- CDFA DDRDP Funding - \$2,436,030
- Matching funds - \$2,473,632
- Total Projects costs - \$4,909,662
- Estimated 10-year GHG reductions – 271,176 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.11 MTCO_{2e}
- GHG reduction per total project dollars - 0.06 MTCO_{2e}
- Total cost per MTCO_{2e} - \$18.11



Image 30. New covered dairy digester at Dixie Creek Dairy.

Lone Oak #1 Dairy Digester Pipeline Project
Funded: 2018
Completion: March 2021
Status: Operational

Lone Oak #1 Dairy Digester Pipeline Project built a new covered lagoon digester processing dairy manure. Biomethane from the digester is transported via a private, low-pressure pipeline to the cluster's central hub near River Ranch. Once at the hub, it is used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas is injected into the adjacent SoCalGas utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Hanford, California (Kings County)
- CDFA DDRDP Funding - \$1,869,269
- Matching funds - \$2,395,596
- Total Projects costs - \$4,264,865
- Estimated 10-year GHG reductions – 247,703 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.13 MTCO_{2e}
- GHG reduction per total project dollars - 0.06 MTCO_{2e}
- Total cost per MTCO_{2e} - \$17.22



Image 31. Installation of a mixer in the covered lagoon digester at Lone Oak#1 Dairy.

Double J Dairy Biogas
Funded: 2018
Completion: April 2021
Status: Operational

Double J Dairy Biogas built a new covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project includes a sand lane, screens, and mechanical separator with a screw press for solid separation pre-digester. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Visalia, California (Tulare County)
- CDFA DDRDP Funding - \$2,426,716
- Matching funds - \$5,051,199
- Total Projects costs - \$7,477,915
- Estimated 10-year GHG reductions – 285,496 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$26.19



Image 32. Activated Carbon Vessel at Double J Dairy.

Rob Van Grouw Dairy Biogas
Funded: 2018
Completion: April 2021
Status: Operational

Rob Van Grouw Dairy Biogas built a new covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project includes a sand lane, screens, and mechanical separator with a screw press for solid separation pre-digester. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Visalia, California (Tulare County)
- CDFA DDRDP Funding - \$1,193,757
- Matching funds - \$3,366,012
- Total Projects costs - \$4,559,769
- Estimated 10-year GHG reductions – 140,442 MTCO₂e
- GHG reductions per CDFA grant dollar - 0.12 MTCO₂e
- GHG reduction per total project dollars - 0.03 MTCO₂e
- Total cost per MTCO₂e - \$32.47



Image 33. Weir box and new covered lagoon digester at Rob Van Grouw Dairy.

Aukeman Dairy Biogas
Funded: 2018
Completion: April 2021
Status: Operational

Aukeman Dairy Biogas built a new covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project includes a sand lane, screens, and mechanical separator with a screw press for solid separation pre-digester. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Tulare, California (Tulare County)
- CDFA DDRDP Funding - \$1,765,457
- Matching funds - \$3,072,438
- Total Projects costs - \$4,837,895
- Estimated 10-year GHG reductions – 207,701 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$23.29



Image 34. Chillers in the biogas conditioning skid at Aukeman Dairy.

Dykstra Dairy Biogas
Funded: 2018
Completion: April 2021
Status: Operational

Dykstra Dairy Biogas built a new covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project includes a sand lane, screens, and mechanical separator with a screw press for solid separation pre-digester. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Tulare, California (Tulare County)
- CDFA DDRDP Funding - \$2,260,454
- Matching funds - \$3,276,239
- Total Projects costs - \$5,536,693
- Estimated 10-year GHG reductions – 265,936 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.05 MTCO_{2e}
- Total cost per MTCO_{2e} - \$20.82



Image 35. Dehydration skid at Dykstra Dairy.

Horizon Jersey Dairy Biogas
Funded: 2018
Completion: April 2021
Status: Operational

Horizon Jersey Dairy Biogas built a new covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project includes a sand lane, screens, and mechanical separator with a screw press for solid separation pre-digester. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Tipton, California (Tulare County)
- CDFA DDRDP Funding - \$2,850,886
- Matching funds - \$3,788,728
- Total Projects costs - \$6,639,614
- Estimated 10-year GHG reductions – 335,398 MTCO₂e
- GHG reductions per CDFA grant dollar - 0.12 MTCO₂e
- GHG reduction per total project dollars - 0.05 MTCO₂e
- Total cost per MTCO₂e - \$19.80



Image 36. Biogas build up in the new covered lagoon digester at Horizon Jerseys Dairy.

Udder Dairy Biogas
Funded: 2018
Completion: May 2021
Status: Operational

Udder Dairy Biogas built a new covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project includes a sand lane, screens, and mechanical separator with a screw press for solid separation pre-digester. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Visalia, California (Tulare County)
- CDFA DDRDP Funding - \$1,153,459
- Matching funds - \$2,126,156
- Total Projects costs - \$3,279,615
- Estimated 10-year GHG reductions – 135,701 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$24.17

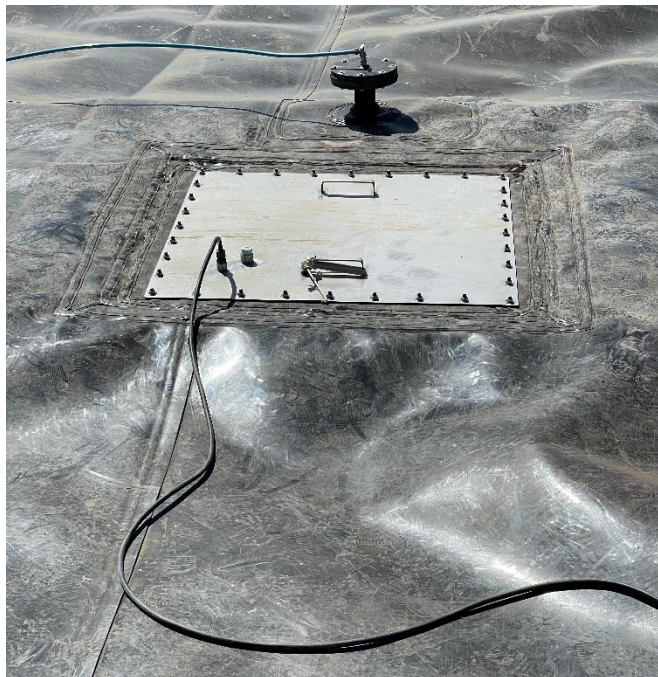


Image 37. Mixer and oxygen port in the covered lagoon digester at Udder Dairy.

Mineral King Dairy Biogas
Funded: 2018
Completion: May 2021
Status: Operational

Mineral King Dairy Biogas built a new covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project includes a sand lane, screens, and mechanical separator with a screw press for solid separation pre-digester. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Visalia, California (Tulare County)
- CDFA DDRDP Funding - \$1,655,384
- Matching funds - \$3,078,995
- Total Projects costs - \$4,734,379
- Estimated 10-year GHG reductions – 194,751 MTCO₂e
- GHG reductions per CDFA grant dollar - 0.12 MTCO₂e
- GHG reduction per total project dollars - 0.04 MTCO₂e
- Total cost per MTCO₂e - \$24.31



Image 38. Metering equipment at Mineral King Dairy.

Mellema Dairy Biogas
Funded: 2018
Completion: May 2021
Status: Operational

Mellema Dairy Biogas built a new covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project includes a sand lane, screens, and mechanical separator with a screw press for solid separation pre-digester. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Visalia, California (Tulare County)
- CDFA DDRDP Funding - \$1,292,485
- Matching funds - \$3,342,228
- Total Projects costs - \$4,634,713
- Estimated 10-year GHG reductions – 152,057 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$30.48



Image 39. Solid separator at Mellema Dairy.

Cloverdale Dairy Biogas
Funded: 2017
Completion: May 2021
Status: Operational

Cloverdale Dairy built a covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project added a sand lane and screens for pre-digester solid separation. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Hanford, California (Kings County)
- CDFA DDRDP Funding - \$3 million
- Matching funds - \$5,955,939
- Total Project costs - \$8,955,939
- Estimated 10-year GHG reductions - 360,851 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.12 MTCO_{2e}
- GHG reductions per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$24.82



Image 40. Gas compressor equipment at Cloverdale Dairy.

*Hollandia Farms Dairy Biogas
Funded: 2017
Completion: May 2021
Status: Operational*

Hollandia Farms built a covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project added a sand lane and screens for pre-digester solid separation. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Hanford, California (Kings County)
- CDFA DDRDP Funding - \$1.5 million
- Matching funds - \$6,264,272
- Total Project costs - \$7,764,272
- Estimated 10-year GHG reductions - 178,426 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.12 MTCO_{2e}
- GHG reductions per total project dollars - 0.02 MTCO_{2e}
- Total cost per MTCO_{2e} - \$43.52



Image 41. Oxygen rotameter in a covered dairy digester at Hollandia Dairy.

Wreden Ranch Dairy Biogas
Funded: 2017
Completion: May 2021
Status: Operational

Wreden Ranch built a covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project added a sand lane and screens for pre-digester solid separation. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Hanford, California (Kings County)
- CDFA DDRDP Funding - \$3 million
- Matching funds – \$5,215,483
- Total Project costs - \$8,215,483
- Estimated 10-year GHG reductions - 393,915 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.13 MTCO_{2e}
- GHG reductions per total project dollars - 0.05 MTCO_{2e}
- Total cost per MTCO_{2e} - \$20.86



Image 42. H₂S scrubber at Wreden Ranch Dairy.

Valadao Dairy Biogas
Funded: 2018
Completion: May 2021
Status: Operational

Valadao Dairy Biogas built a new covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project included a sand lane, screens, and mechanical separator with a screw press for solid separation pre-digester. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Hanford, California (Kings County)
- CDFA DDRDP Funding - \$1,028,545
- Matching funds - \$2,061,008
- Total Projects costs - \$3,089,553
- Estimated 10-year GHG reductions – 121,005 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$25.53



Image 43. Oxygen and air compressor at Valadao Dairy.

Jacobus De Groot #2 Dairy Biogas
Funded: 2018
Completion: May 2021
Status: Operational

Jacobus De Groot #2 Dairy Biogas built a new covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project includes a sand lane, screens, and mechanical separator with a screw press for solid separation pre-digester. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Visalia, California (Tulare County)
- CDFA DDRDP Funding - \$523,736
- Matching funds - \$2,624,086
- Total Projects costs - \$3,147,822
- Estimated 10-year GHG reductions – 61,616 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.02 MTCO_{2e}
- Total cost per MTCO_{2e} - \$51.09



Image 44. Power Distribution Center room at Jacobus De Groot #2 Dairy.

Rancho Sierra Vista Dairy Biogas
Funded: 2018
Completion: May 2021
Status: Operational

Rancho Sierra Vista Dairy Biogas built a new covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project includes a sand lane, screens, and mechanical separator with a screw press for solid separation pre-digester. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Visalia, California (Tulare County)
- CDFA DDRDP Funding - \$1,470,143
- Matching funds - \$3,045,546
- Total Projects costs - \$4,515,689
- Estimated 10-year GHG reductions – 172,958 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$26.11



Image 45. Close up of the new covered lagoon digester at Rancho Sierra Dairy.

Rancho Teresita Dairy Biogas
Funded: 2017
Completion: May 2021
Status: Operational

Rancho Teresita Dairy built a covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project added a sand lane and screens for pre-digester solid separation. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Tulare, California (Tulare County)
- CDFA DDRDP Funding - \$2.1 million
- Matching funds - \$5,500,336
- Total Projects costs - \$7,600,336
- Estimated 10-year GHG reductions - 236,251 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.11 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$32.17



Image 46. Biogas flowmeter at Rancho Teresita Dairy.

Riverbend Dairy Biogas
Funded: 2018
Completion: May 2021
Status: Operational

Riverbend Dairy Biogas built a new covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project includes a sand lane, screens, and mechanical separator with a screw press for solid separation pre-digester. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Tulare, California (Tulare County)
- CDFA DDRDP Funding - \$2,090,404
- Matching funds - \$2,664,638
- Total Projects costs - \$4,755,042
- Estimated 10-year GHG reductions – 245,930 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.05 MTCO_{2e}
- Total cost per MTCO_{2e} - \$19.33



Image 47. Activated carbon vessel at Riverbend Dairy.

*Bos Farms Dairy Biogas
Funded: 2017
Completion: May 2021
Status: Operational*

Bos Farms is a covered lagoon digester project with enhanced gas storage, gas pre-treatment, and effluent distribution. The project added a sand lane and screens for pre-digester solid separation. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Tulare, California (Tulare County)
- CDFA DDRDP Funding - \$1.5 million
- Matching funds - \$5,199,492
- Total Project costs - \$6,699,492
- Estimated 10-year GHG reductions - 168,398 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.11 MTCO_{2e}
- GHG reductions per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$39.78



Image 48. Digester wastewater flowmeter at Bos Farms Dairy.

El Monte Dairy Biogas
Funded: 2018
Completion: June 2021
Status: Operational

El Monte Dairy Biogas built a new covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project includes a sand lane, screens, and mechanical separator with screw press for solid separation pre-digester. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Tipton, California (Tulare County)
- CDFA DDRDP Funding - \$1,010,674
- Matching funds - \$3,026,715
- Total Projects costs - \$4,037,389
- Estimated 10-year GHG reductions – 118,903 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$33.96



Image 49. New sand lane at El Monte Dairy.

Scheenstra Dairy Biogas
Funded: 2018
Completion: June 2021
Status: Operational

Scheenstra Dairy Biogas built a new covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project includes a sand lane, screens, and mechanical separator with a screw press for solid separation pre-digester. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Tulare, California (Tulare County)
- CDFA DDRDP Funding - \$1,873,064
- Matching funds - \$3,393,707
- Total Projects costs - \$5,266,771
- Estimated 10-year GHG reductions – 220,360 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$23.90



Image 50. New solid separators at Scheenstra Dairy.

Decade Centralized Dairy Digester Pipeline Project

Funded: 2018

Completion: July 2021

Status: Operational

Decade Centralized Dairy Digester Pipeline Project built a new covered lagoon digester processing dairy manure from two dairies. Biomethane from the digester is transported via a private, low-pressure pipeline to the cluster's central hub near River Ranch. Once at the hub, it is used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas is injected into the adjacent SoCalGas utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Tulare, California (Tulare County)
- CDFA DDRDP Funding - \$1,773,587
- Matching funds - \$2,176,364
- Total Projects costs - \$3,949,951
- Estimated 10-year GHG reductions – 192,558 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.11 MTCO_{2e}
- GHG reduction per total project dollars - 0.05 MTCO_{2e}
- Total cost per MTCO_{2e} - \$20.51



Image 51. New covered lagoon digester at Decade Dairy.

McMoo Farms Dairy Biogas
Funded: 2019
Completion: July 2021
Status: Operational

McMoo Farms Dairy Biogas installed a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane is delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting SoCalGas Rule 30, is injected into the co-located point of receipt.

- Location – Bakersfield, California (Kern County)
- CDFA DDRDP Funding - \$1,598,893
- Matching funds - \$3,013,668
- Total Projects costs - \$4,612,561
- Estimated 10-year GHG reductions – 164,384 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$28.06

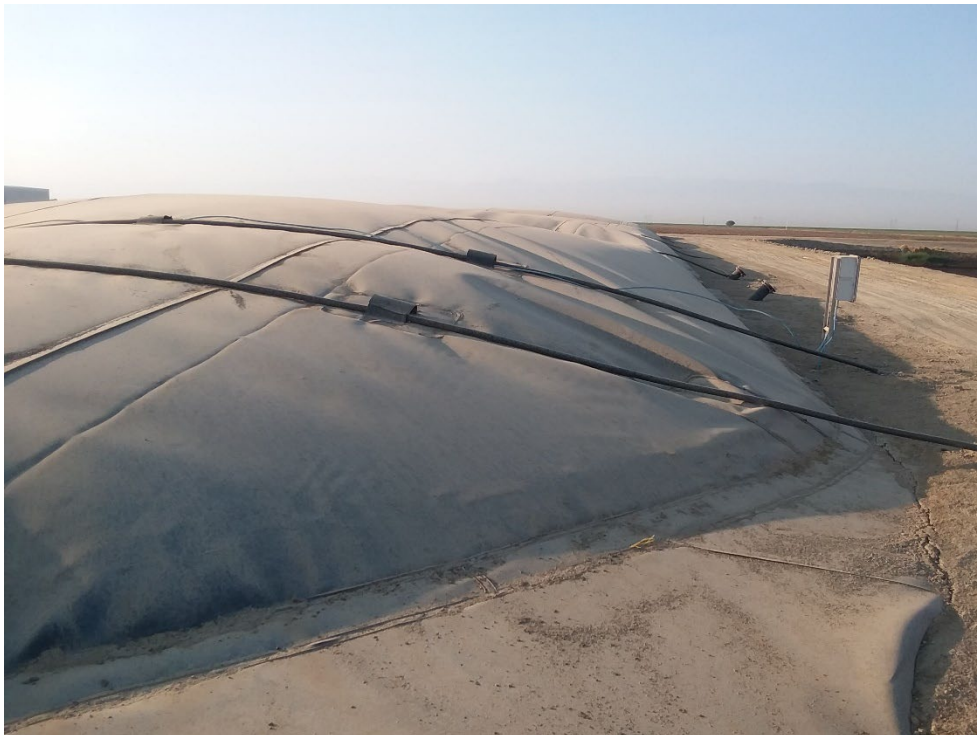


Image 52. New covered lagoon digester at McMoo Farms Dairy.

Newhouse Dairy Biogas

Funded: 2019

Completion: July 2021

Status: Operational

Newhouse Dairy Biogas installed a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane is delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting SoCalGas Rule 30, is injected into the co-located point of receipt.

- Location – Bakersfield, California (Kern County)
- CDFA DDRDP Funding - \$1,665,037
- Matching funds - \$3,982,045
- Total Projects costs - \$5,647,082
- Estimated 10-year GHG reductions – 171,098 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$33.00



Image 53. Biogas conditioning equipment at Newhouse Dairy.

Belonave Dairy Biogas LLC
Funded: 2018
Completion: September 2021
Status: Operational

Belonave Dairy Biogas LLC built a new covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution. The project includes a sand lane, screens, and mechanical separator with a screw press for solid separation pre-digester. Biogas is conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Bakersfield, California (Kern County)
- CDFA DDRDP Funding - \$1,918,099
- Matching funds - \$3,561,605
- Total Projects costs - \$5,479,704
- Estimated 10-year GHG reductions – 225,659 MTCO₂e
- GHG reductions per CDFA grant dollar - 0.12 MTCO₂e
- GHG reduction per total project dollars - 0.04 MTCO₂e
- Total cost per MTCO₂e - \$24.28



Image 54. Heat exchanger equipment at Belonave Dairy.

*Bar 20 Dairy Biogas
Funded: 2019
Completion: October 2021
Status: Operational*

Bar 20 Dairy Biogas installed a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. An on-dairy biogas conditioning station removes hydrogen sulfide and meter and moves the clean biogas directly into a co-located, ultra-clean, high efficiency 2.0 MW Bloom Energy fuel cell interconnected to PG&E. CalBio will generate LCFS credits by directly matching generation and supplying the renewable energy credits to in-state electric vehicle re-charging load.

- Location – Kerman, California (Fresno County)
- CDFA DDRDP Funding - \$3 million
- Matching funds - \$6,345,131
- Total Projects costs - \$9,345,131
- Estimated 10-year GHG reductions – 374,390 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$24.96



Image 55. Fuel cells at Bar 20 Dairy.

Ribeiro Dairy Biogas
Funded: 2019
Completion: November 2021
Status: Operational

Ribeiro Dairy Biogas installed a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane is delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting SoCalGas Rule 30, is injected into the co-located point of receipt.

- Location – Tulare, California (Tulare County)
- CDFA DDRDP Funding - \$1,124,962
- Matching funds - \$1,613,882
- Total Projects costs - \$2,738,844
- Estimated 10-year GHG reductions – 132,348 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.05 MTCO_{2e}
- Total cost per MTCO_{2e} - \$20.69



Image 56. Biogas conditioning equipment at Ribeiro Dairy.

Pixley Dairy Digester Fuel Pipeline Project
Funded: 2017
Status: Verification in Progress

The Pixley Dairy Digester Fuel Pipeline Project is a covered lagoon anaerobic digester. The project is part of the Calgren Dairy Fuels Cluster. The biogas from the digester will be supplied via a private pipeline to fuel two 5MW gas turbines that power the Calgren ethanol refinery. The cluster will install an RCNG station and later connect to the utility pipeline to supply more RCNG stations.

- Location – Pixley, California (Tulare County)
- CDFA DDRDP Funding - \$1.6 million
- Matching funds - \$1,675,681
- Total Project costs - \$3,275,681
- Estimated 10-year GHG reductions – 215,251 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.13 MTCO_{2e}
- GHG reductions per total project dollars - 0.07 MTCO_{2e}
- Total cost per MTCO_{2e} - \$15.21

DJ South Dairy Digester Pipeline Project
Funded: 2018
Status: Verification in Progress

DJ South Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. Biomethane from the digester will be transported via a private, low-pressure pipeline to the cluster's central hub at the center of the dairy group. Once at the hub, it will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the adjacent PG&E utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Chowchilla, California (Madera County)
- CDFA DDRDP Funding - \$1,810,526
- Matching funds - \$1,859,833

- Total Projects costs - \$3,670,359
- Estimated 10-year GHG reductions – 150,175 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.08 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$24.44

Double L Dairy Digester Pipeline Project

Funded: 2018

Status: Verification in Progress

Double L Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. Biomethane from the digester will be transported via a private, low-pressure pipeline to the cluster's central hub near River Ranch. Once at the hub, it will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the adjacent SoCalGas utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Hanford, California (Kings County)
- CDFA DDRDP Funding - \$1,762,347
- Matching funds - \$1,767,556
- Total Projects costs - \$3,529,903
- Estimated 10-year GHG reductions – 136,148 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.08 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$25.93

Five H Dairy Digester Pipeline Project

Funded: 2018

Status: Verification in Progress

Five H Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. Biomethane from the digester will be transported via a private, low-pressure pipeline to the cluster's central hub at the center of the dairy group. Once at the hub, it will be used to fuel

partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the adjacent PG&E utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Merced, California (Merced County)
- CDFA DDRDP Funding - \$1,851,297
- Matching funds - \$1,859,722
- Total Projects costs - \$3,711,019
- Estimated 10-year GHG reductions – 122,183 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.07 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$30.37

Hoogendam Dairy Digester Pipeline Project
Funded: 2018
Status: Verification in Progress

Hoogendam Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. Biomethane from the digester will be transported via private, low-pressure pipeline to the cluster's central hub at the center of the dairy group. Once at the hub, it will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the adjacent PG&E utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Merced, California (Merced County)
- CDFA DDRDP Funding - \$1,809,452
- Matching funds - \$1,820,121
- Total Projects costs - \$3,629,573
- Estimated 10-year GHG reductions – 142,354 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.08 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$25.50

Meirinho Dairy Digester Pipeline Project
Funded: 2018
Status: Verification in Progress

Meirinho Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. Biomethane from the digester will be transported via a private, low-pressure pipeline to the cluster's central hub at the center of the dairy group. Once at the hub, it will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the adjacent PG&E utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Merced, California (Merced County)
- CDFA DDRDP Funding - \$1,832,358
- Matching funds - \$1,975,914
- Total Projects costs - \$3,808,272
- Estimated 10-year GHG reductions – 147,352 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.08 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$25.84

Red Rock Dairy Digester Pipeline Project
Funded: 2018
Status: Verification in Progress

Red Rock Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. Biomethane from the digester will be transported via a private, low-pressure pipeline to the cluster's central hub at the center of the dairy group. Once at the hub, it will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the adjacent PG&E utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Merced, California (Merced County)
- CDFA DDRDP Funding - \$2,031,126

- Matching funds - \$2,039,438
- Total Projects costs - \$4,070,564
- Estimated 10-year GHG reductions – 156,242 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.08 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$26.05

Rockshar Dairy Digester Pipeline Project

Funded: 2018

Status: Verification in Progress

Rockshar Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. Biomethane from the digester will be transported via a private, low-pressure pipeline to the cluster's central hub at the center of the dairy group. Once at the hub, it will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the adjacent PG&E utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Merced, California (Merced County)
- CDFA DDRDP Funding - \$1,679,093
- Matching funds - \$1,679,620
- Total Projects costs - \$3,358,713
- Estimated 10-year GHG reductions – 124,664 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.07 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$26.94

Vander Woude Dairy Digester Pipeline Project

Funded: 2018

Status: Verification in Progress

Vander Woude Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. Biomethane from the digester will be transported via a private, low-pressure pipeline to the cluster's central

hub at the center of the dairy group. Once at the hub, it will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the adjacent PG&E utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Merced, California (Merced County)
- CDFA DDRDP Funding - \$1,863,562
- Matching funds - \$1,863,864
- Total Projects costs - \$3,727,426
- Estimated 10-year GHG reductions – 188,575 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.05 MTCO_{2e}
- Total cost per MTCO_{2e} - \$19.77

Vista Verde Dairy Digester Pipeline Project
Funded: 2018
Status: Verification in Progress

Vista Verde Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. Biomethane from the digester will be transported via a private, low-pressure pipeline to the cluster's central hub at the center of the dairy group. Once at the hub, it will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the adjacent PG&E utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Chowchilla, California (Madera County)
- CDFA DDRDP Funding - \$1,594,109
- Matching funds - \$1,643,656
- Total Projects costs - \$3,237,765
- Estimated 10-year GHG reductions – 140,653 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.09 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$23.02

Hettinga Centralized Dairy Digester Pipeline Project

Funded: 2019

Status: In Progress

Expected Completion Date: January 2022

Hettinga Centralized Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. The biogas from this new digester will be transported via a private, low-pressure pipeline to the cluster's hub near the Calgren ethanol refinery. Once there, it will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the SoCalGas pipeline for delivery to contracted CNG fueling stations around the Central Valley and the state.

- Location – Pixley, California (Tulare County)
- CDFA DDRDP Funding - \$2,352,909
- Matching funds - \$2,352,909
- Total Projects costs - \$4,705,818
- Estimated 10-year GHG reductions – 167,339 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.07 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$28.12

Lakeside Dairy Digester Pipeline Project

Funded: 2019

Status: In Progress

Expected Completion Date: January 2022

Lakeside Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. The methane-rich biogas from the digester will be transported via a private, low-pressure pipeline to the cluster's central hub near River Ranch dairy. There, the biogas will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the SoCalGas utility pipeline for delivery to contracted CNG fueling stations around the state.

- Location – Hanford, California (Kings County)
- CDFA DDRDP Funding - \$2,213,063

- Matching funds - \$2,21,063
- Total Projects costs - \$4,426,126
- Estimated 10-year GHG reductions – 218,679 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.05 MTCO_{2e}
- Total cost per MTCO_{2e} - \$20.24

Northstar Dairy Digester Pipeline Project

Funded: 2019

Status: In Progress

Expected Completion Date: January 2022

Northstar Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. The biogas from this new digester will be transported via a private, low-pressure pipeline to the cluster's hub near the Calgren ethanol refinery. Once there, it will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the SoCalGas pipeline for delivery to contracted CNG fueling stations around the Central Valley and the state.

- Location – Tipton, California (Tulare County)
- CDFA DDRDP Funding - \$1,576,438
- Matching funds - \$1,576,438
- Total Projects costs - \$3,152,876
- Estimated 10-year GHG reductions – 170,658 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.11 MTCO_{2e}
- GHG reduction per total project dollars - 0.05 MTCO_{2e}
- Total cost per MTCO_{2e} - \$18.47

Rib-Arrow Dairy Biogas

Funded: 2019

Status: In Progress

Expected Completion Date: January 2022

Rib-Arrow Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The

project's biomethane will be delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting SoCalGas Rule 30, will be injected into the co-located point of receipt.

- Location – Tulare, California (Tulare County)
- CDFA DDRDP Funding - \$657,231
- Matching funds - \$3,517,919
- Total Projects costs - \$4,175,150
- Estimated 10-year GHG reductions – 76,343 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.02 MTCO_{2e}
- Total cost per MTCO_{2e} - \$54.69

Schott Dairy Digester Pipeline Project
Funded: 2019
Status: In Progress
Expected Completion Date: January 2022

Schott Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. The biogas from this new digester will be transported via a private, low-pressure pipeline to the cluster's hub near the Calgren ethanol refinery. Once there, it will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the SoCalGas pipeline for delivery to contracted CNG fueling stations around the Central Valley and the state.

- Location – Tipton, California (Tulare County)
- CDFA DDRDP Funding - \$1,444,592
- Matching funds - \$1,444,592
- Total Projects costs - \$2,889,184
- Estimated 10-year GHG reductions – 129,082 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.09 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$22.38

Van Der Kooi Dairy Digester Pipeline Project
Funded: 2019
Status: In Progress
Expected Completion Date: January 2022

Van Der Kooi Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. The methane-rich biogas from the digester will be transported via a private, low-pressure pipeline to the cluster's central hub near the operational Open Sky Ranch digester. Once at the hub, the biogas will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the adjacent PG&E utility pipeline for delivery to contracted CNG fueling stations around the Central Valley and the state.

- Location – Riverdale, California (Fresno County)
- CDFA DDRDP Funding - \$1,897,438
- Matching funds - \$1,897,438
- Total Projects costs - \$3,794,876
- Estimated 10-year GHG reductions – 170,089 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.09 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$22.31

Vanderham Dairy Digester Pipeline Project
Funded: 2019
Status: In Progress
Expected Completion Date: January 2022

Vanderham Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. The methane-rich biogas from the digester will be transported via a private, low-pressure pipeline to the cluster's central hub near the operational Open Sky Ranch digester. Once at the hub, the biogas will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the adjacent PG&E utility pipeline for delivery to contracted CNG fueling stations around the Central Valley and the state.

- Location – Riverdale, California (Fresno County)
- CDFA DDRDP Funding - \$1,984,951
- Matching funds - \$1,984,951
- Total Projects costs - \$3,969,902
- Estimated 10-year GHG reductions – 186,037 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.09 MTCO_{2e}
- GHG reduction per total project dollars - 0.05 MTCO_{2e}
- Total cost per MTCO_{2e} - \$21.34

Elk Creek Dairy Biogas
Funded: 2019
Status: In Progress
Expected Completion Date: February 2022

Elk Creek Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane will be delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting SoCalGas Rule 30, will be injected into the nearby point of receipt.

- Location – Tulare, California (Tulare County)
- CDFA DDRDP Funding - \$512,706
- Matching funds - \$3,596,502
- Total Projects costs - \$4,109,208
- Estimated 10-year GHG reductions – 59.555 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.01 MTCO_{2e}
- Total cost per MTCO_{2e} - \$69.00

De Groot South Dairy Biogas
Funded: 2018
Status: In Progress
Expected Completion Date: March 2022

De Groot South Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment.

An on-dairy biogas conditioning station will remove hydrogen sulfide, and meter and move the clean biogas directly into a co-located, ultra-clean, high efficiency 2.0 MW Bloom Energy fuel cell.

- Location – Hanford, California (Kings County)
- CDFA DDRDP Funding - \$1,542,697
- Matching funds - \$4,230,946
- Total Projects costs - \$5,773,643
- Estimated 10-year GHG reductions – 199,477 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.13 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$28.94

Rocking Horse Dairy Biogas
Funded: 2018
Status: In Progress
Expected Completion Date: March 2022

Rocking Horse Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project will include a sand lane, screens, and mechanical separator with screw press for solid separation pre-digester. Biogas will be conditioned to meet the SoCalGas standards for natural gas fuel and will be used for vehicle fuel use.

- Location – Hanford, California (Kings County)
- CDFA DDRDP Funding - \$1,016,091
- Matching funds - \$2,771,539
- Total Projects costs - \$3,787,630
- Estimated 10-year GHG reductions – 119,540 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$31.69

Flint Dairy Biogas Project
Dairy Digester Research and Development Program –
Demonstration Projects
Funded: 2019
Status: In Progress
Expected Completion Date: November 2022

The Flint Dairy Biogas Project will build a two-stage anaerobic digester system to treat manure effluent. The digester system includes four up-flow anaerobic sludge blanket (UASB) reactors. The reactors allow for the conversion of approximately 80% of the organic material to biogas with methane concentrations of 80-85%. Biogas will be upgraded to renewable natural gas on-site and transported via virtual pipeline to an injection point. The system reduces the nitrogen levels in the effluent by approximately 30%, providing new tools for compliance with the Dairy General Order and SGMA. The project features a scalable and modular future second phase consisting of Moving Bed Biofilm Reactor (MBBR) aerobic tanks paired with algae raceways that can cost-effectively reduce total nitrogen levels in the water by up to 90%.

- Location – Hanford, California (Kings County)
- CDFA DDRDP Demo Funding - \$1.75 million
- Matching funds - \$3,374,782
- Total Projects costs - \$5,124,782
- Estimated 10-year GHG reductions – 126,988 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.07 MTCO_{2e}
- GHG reduction per total project dollars - 0.02 MTCO_{2e}
- Total cost per MTCO_{2e} - \$40.36

Avalon Dairy Digester Pipeline
Project Funded: 2019
Status: In Progress
Expected Completion Date: December 2022

Avalon Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. The project will deliver biogas to the

Calgren Dairy Fuels cluster. This Cluster is operational, producing biogas from other digesters and injecting renewable natural gas into the SoCalGas pipeline. The methane-rich biogas from the digester will be compressed on-site and then hauled using clean-burning renewable CNG-fueled trucks and compressed natural gas tube trailers to create a virtual pipeline to the cluster's central hub. Once at the hub, it will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the adjacent SoCalGas utility pipeline for delivery to other CNG fueling stations around the Central Valley and the state.

- Location – Wasco, California (Kern County)
- CDFA DDRDP Funding - \$1,917,757
- Matching funds - \$1,917,757
- Total Projects costs - \$3,835,514
- Estimated 10-year GHG reductions – 159,758 MTCO₂e
- GHG reductions per CDFA grant dollar - 0.08 MTCO₂e
- GHG reduction per total project dollars - 0.04 MTCO₂e
- Total cost per MTCO₂e - \$24.01

*De Boer Dairy Digester Pipeline Project
Funded: 2019*

Status: In Progress

Expected Completion Date: December 2022

De Boer Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. The biogas from this new digester will be transported via a private, low-pressure pipeline to the cluster's hub near the Calgren ethanol refinery. Once there, it will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the SoCalGas pipeline for delivery to contracted CNG fueling stations around the Central Valley and the state.

- Location – Tulare, California (Tulare County)
- CDFA DDRDP Funding - \$1,825,261
- Matching funds - \$1,825,262
- Total Projects costs - \$3,650,523
- Estimated 10-year GHG reductions – 191,647MTCO₂e

- GHG reductions per CDFA grant dollar - 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.05 MTCO_{2e}
- Total cost per MTCO_{2e} - \$19.05

Double Diamond Dairy Digester Pipeline Project

Funded: 2019

Status: In Progress

Expected Completion Date: December 2022

Double Diamond Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. The methane-rich biogas from the digester will be transported via a private, low-pressure pipe to the cluster's hub near Vander Woude Dairy. Once there, the biogas will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be conditioned and injected into the PG&E utility pipeline for delivery to contracted CNG fueling stations around the Central Valley and the state.

- Location – El Nido, California (Merced County)
- CDFA DDRDP Funding - \$2,037,766
- Matching funds - \$2,037,766
- Total Projects costs - \$4,075,532
- Estimated 10-year GHG reductions – 290,633 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.14 MTCO_{2e}
- GHG reduction per total project dollars - 0.07 MTCO_{2e}
- Total cost per MTCO_{2e} - \$14.02

Fern Oaks Dairy Digester Pipeline Project

Funded: 2019

Status: In Progress

Expected Completion Date: December 2022

Fern Oaks Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. The biogas from this new digester will be transported via a private, low-pressure pipeline to the cluster's hub near the

Calgren ethanol refinery. Once there, it will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the SoCalGas pipeline for delivery to contracted CNG fueling stations around the Central Valley and the state.

- Location – Porterville, California (Tulare County)
- CDFA DDRDP Funding - \$1,688,894
- Matching funds - \$1,688,894
- Total Projects costs - \$3,377,788
- Estimated 10-year GHG reductions – 169,370 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.05 MTCO_{2e}
- Total cost per MTCO_{2e} - \$19.94

High Roller Dairy Digester Pipeline Project

Funded: 2019

Status: In Progress

Expected Completion Date: December 2022

High Roller Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. The methane-rich biogas from the digester will be transported via a private, low-pressure pipeline to the cluster's central hub near River Ranch dairy. There, the biogas will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the SoCalGas utility pipeline for delivery to contracted CNG fueling stations around the state.

- Location – Hanford, California (Kings County)
- CDFA DDRDP Funding - \$1,412,136
- Matching funds - \$1,412,136
- Total Projects costs - \$2,824,272
- Estimated 10-year GHG reductions – 105,257 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.07 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$26.83

Poplar Lane Dairy Digester Pipeline Project

Funded: 2019

Status: In Progress

Expected Completion Date: December 2022

Poplar Lane Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. The methane-rich biogas from the digester will be transported via a private, low-pressure pipe to the cluster's central hub near River Ranch dairy. There, the biogas will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the SoCalGas utility pipeline for delivery to contracted CNG fueling stations around the state.

- Location – Hanford, California (Kings County)
- CDFA DDRDP Funding - \$1,756,966
- Matching funds - \$1,756,966
- Total Projects costs - \$3,513,932
- Estimated 10-year GHG reductions – 131,195 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.07 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$26.78

Simoes Centralized Digester Pipeline Project

Funded: 2019

Status: In Progress

Expected Completion Date: December 2022

Simoes Centralized Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. The biogas from this new digester will be transported via a private, low-pressure pipeline to the cluster's hub near the Calgren ethanol refinery. Once there, it will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the SoCalGas pipeline for delivery to contracted CNG fueling stations around the Central Valley and the state.

- Location – Tipton, California (Tulare County)
- CDFA DDRDP Funding - \$2,036,460
- Matching funds - \$2,036,460
- Total Projects costs - \$4,072,920
- Estimated 10-year GHG reductions – 161,275 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.08 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$25.25

Van Der Hoek Dairy Digester Pipeline Project
Funded: 2019
Status: In Progress
Expected Completion Date: December 2022

Van Der Hoek Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. The methane-rich biogas from the digester will be transported via a private, low-pressure pipeline to the cluster's central hub near the operational Open Sky Ranch digester. Once at the hub, the biogas will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be injected into the adjacent PG&E utility pipeline for delivery to contracted CNG fueling stations around the Central Valley and the state.

- Location – Helm, California (Fresno County)
- CDFA DDRDP Funding - \$2,061,968
- Matching funds - \$2,061,968
- Total Projects costs - \$4,123,936
- Estimated 10-year GHG reductions – 168,447 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.08 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$24.48

Ahlem Farms Dairy Digester Project
Funded: 2020
Status: In Progress
Expected Completion Date: January 2023

Ahlem Farms Dairy Digester Project is a new covered lagoon digester at Ahlem Farms Vista in Stanislaus County, California. The biogas from this new digester will be transported via the private, low-pressure pipeline to a new nearby gas upgrading satellite hub. Once there, it will be upgraded to pipeline quality. Then the biogas will be compressed and delivered to the Merced Pipeline injection site via a CNG-fueled truck. The fuel will be used for onsite CNG fueling or injected into the CEEC-PG&E pipeline.

- Location – Denair, California (Stanislaus County)
- CDFA DDRDP Funding - \$1.195 million
- Matching funds - \$3,130,536
- Total Projects costs - \$4,325,536
- Estimated 10-year GHG reductions – 167.761 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.14 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$25.78

Ahlem Farms Jerseys - AAFK Central Dairy Digester Cluster
Funded: 2020
Status: In Progress
Expected Completion Date: January 2023

Ahlem Farms Jerseys – AAFK Central Dairy Digester Cluster is a new covered lagoon digester that will produce biogas, which after being processed to remove hydrogen sulfide (H₂S), will be conveyed via private pipeline to the Aemetis Advanced Fuels Keyes facility. It will further be upgraded to negative-carbon-intensity renewable natural gas (RNG) suitable for use as transportation fuel. Aemetis will sell a portion of the RNG to local fleets via its onsite RNG fueling station and will direct the remainder to sale to larger fleets via the PG&E pipeline, or for use as energy at AAFK to produce renewable ethanol.

- Location – Crows Landing, California (Stanislaus County)
- CDFA DDRDP Funding - \$1,592,287
- Matching funds - \$1,672,003
- Total Projects costs - \$3,264,290
- Estimated 10-year GHG reductions – 113,979 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.07 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$28.64

Albert Mendes Dairy - AAFK Central Dairy Digester Cluster

Funded: 2020

Status: In Progress

Expected Completion Date: January 2023

Albert Mendes Dairy – AAFK Central Dairy Digester Cluster is a new covered lagoon digester that will produce biogas, which after being processed to remove hydrogen sulfide (H₂S), will be conveyed via private pipeline to the Aemetis Advanced Fuels Keyes facility. It will further be upgraded to negative-carbon-intensity renewable natural gas (RNG) suitable for use as transportation fuel. Aemetis will sell a portion of the RNG to local fleets via its onsite RNG fueling station and will direct the remainder to sale to larger fleets via the PG&E pipeline, or for use as energy at AAFK to produce renewable ethanol.

- Location – Crows Landing, California (Stanislaus County)
- CDFA DDRDP Funding - \$1,388,241
- Matching funds - \$1,735,754
- Total Projects costs - \$3,123,995
- Estimated 10-year GHG reductions – 99,372 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.07 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$28.64

Boschma Dairy Biogas
Funded: 2020
Status: In Progress
Expected Completion Date: January 2023

Boschma Dairy Biogas is committed to building a tier 1 double-lined, covered lagoon digester, a biogas conditioning system (iron sponge and activated carbon-based H₂S scrubber), a biogas to biomethane upgrader (skid mounted and located on-site), and a high-pressure tube trailer truck loading station. The system will be shared with the neighboring Poso Creek Dairy. The produced RNG will be tube-trailer down to the CalBioGas Buttonwillow interconnection location, or alternatively other nearby CalBio facilities, for off-loading and metering into the SoCalGas pipeline.

- Location – Wasco, California (Kern County)
- CDFA DDRDP Funding - \$1,723,302
- Matching funds - \$4,819,704
- Total Projects costs - \$6,543,006
- Estimated 10-year GHG reductions – 189,947 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.11 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$34.45

JDS Ranch Digester Project
Funded: 2020
Status: In Progress
Expected Completion Date: January 2023

JDS Ranch Digester Project is a new covered lagoon digester. The Calgren Dairy Fuels Cluster is operational, producing biogas from 10 connected digesters and injecting renewable natural gas into the SoCalGas pipeline. The biogas from this new digester will be transported via the private, low-pressure pipeline to a gas upgrading hub at an adjacent dairy. Once there, it will be upgraded to pipeline quality. Then the biogas will be compressed and delivered to the Calgren Dairy Fuels injection site via a CNG-fueled truck. The fuel will be used for onsite CNG fueling or injected into the SoCalGas pipeline.

- Location – Wasco, California (Kern County)
- CDFA DDRDP Funding - \$1.6 million
- Matching funds - \$3,044,536
- Total Projects costs - \$4,644,536
- Estimated 10-year GHG reductions – 159,082 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$29.20

JR Dairy Digester Project

Funded: 2020

Status: In Progress

Expected Completion Date: January 2023

JR Dairy Digester Project is a new covered lagoon digester. The Calgren Dairy Fuels Cluster is operational, producing biogas from 10 connected digesters and injecting renewable natural gas into the SoCalGas pipeline. The biogas from this new digester will be transported via the private, low-pressure pipeline to a gas upgrading hub at an adjacent dairy. Once there, it will be upgraded to pipeline quality. Then the biogas will be compressed and delivered to the Calgren Dairy Fuels injection site via a CNG-fueled truck. The fuel will be used for onsite CNG fueling or injected into the SoCalGas pipeline.

- Location – Tipton, California (Tulare County)
- CDFA DDRDP Funding - \$1.3 million
- Matching funds - \$1,873,859
- Total Projects costs - \$3,173,859
- Estimated 10-year GHG reductions – 191,049 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.15 MTCO_{2e}
- GHG reduction per total project dollars - 0.06 MTCO_{2e}
- Total cost per MTCO_{2e} - \$16.61

Oliveira Dairy - AAFK Central Dairy Digester Cluster

Funded: 2020

Status: In Progress

Expected Completion Date: January 2023

Oliveira Dairy – AAFK Central Dairy Digester Cluster is a new covered lagoon digester that will produce biogas, which after being processed to remove hydrogen sulfide (H₂S), will be conveyed via private pipeline to the Aemetis Advanced Fuels Keyes facility. It will further be upgraded to negative-carbon-intensity renewable natural gas (RNG) suitable for use as transportation fuel. Aemetis will sell a portion of the RNG to local fleets via its onsite RNG fueling station and will direct the remainder to sale to larger fleets via the PG&E pipeline, or for use as energy at AAFK to produce renewable ethanol.

- Location – Hilmar, California (Merced County)
- CDFA DDRDP Funding - \$1,056,977
- Matching funds - \$2,103,160
- Total Projects costs - \$3,160,137
- Estimated 10-year GHG reductions – 80,857 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.08 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$39.08

Poso Creek Dairy Biogas

Funded: 2020

Status: In Progress

Expected Completion Date: January 2023

Poso Creek Dairy Biogas is committed to building a tier 1 double-lined, covered lagoon digester, a biogas conditioning system (iron sponge and activated carbon-based H₂S scrubber), a biogas to biomethane upgrader (skid mounted and located on-site), and a high-pressure tube trailer truck loading station. The system will be shared with the neighboring Boschma and Sons Dairy. The produced RNG will be tube-trailer down to the CalBioGas Buttonwillow interconnection location, or alternatively other nearby CalBio facilities, for off-loading and metering into the SoCalGas pipeline.

- Location – Wasco, California (Kern County)
- CDFA DDRDP Funding - \$1,464,930
- Matching funds - \$5,344,556
- Total Projects costs - \$6,809,486
- Estimated 10-year GHG reductions – 171,854 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$39.62

S&S Dairy - AAFK Central Dairy Digester Cluster

Funded: 2020

Status: In Progress

Expected Completion Date: January 2023

S&S Dairy – AAFK Central Dairy Digester Cluster is a new covered lagoon digester that will produce biogas, which after being processed to remove hydrogen sulfide (H₂S), will be conveyed via private pipeline to the Aemetis Advanced Fuels Keyes facility. It will further be upgraded to negative-carbon-intensity renewable natural gas (RNG) suitable for use as transportation fuel. Aemetis will sell a portion of the RNG to local fleets via its onsite RNG fueling station and will direct the remainder to sale to larger fleets via the PG&E pipeline, or for use as energy at AAFK to produce renewable ethanol.

- Location – Ceres, California (Stanislaus County)
- CDFA DDRDP Funding - \$1,271,396
- Matching funds - \$1,988,964
- Total Projects costs - \$3,260,360
- Estimated 10-year GHG reductions – 90,946 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.07 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$35.85

Trinkler Dairy - AAFK Central Dairy Digester Cluster

Funded: 2020

Status: In Progress

Expected Completion Date: January 2023

Trinkler Dairy – AAFK Central Dairy Digester Cluster is a new covered lagoon digester that will produce biogas, which after being processed to remove hydrogen sulfide (H₂S), will be conveyed via private pipeline to the Aemetis Advanced Fuels Keyes facility. It will further be upgraded to negative-carbon-intensity renewable natural gas (RNG) suitable for use as transportation fuel. Aemetis will sell a portion of the RNG to local fleets via its onsite RNG fueling station and will direct the remainder to sale to larger fleets via the PG&E pipeline, or for use as energy at AAFK to produce renewable ethanol.

- Location – Ceres, California (Stanislaus County)
- CDFA DDRDP Funding - \$1,194,840
- Matching funds - \$1,451,336
- Total Projects costs - \$2,646,176
- Estimated 10-year GHG reductions – 85,529 MTCO₂e
- GHG reductions per CDFA grant dollar - 0.07 MTCO₂e
- GHG reduction per total project dollars - 0.03 MTCO₂e
- Total cost per MTCO₂e - \$30.94

Wickstrom Jersey Farms - AAFK Central Dairy Digester Cluster

Funded: 2020

Status: In Progress

Expected Completion Date: January 2023

Wickstrom Jersey Farms – AAFK Central Dairy Digester Cluster is a new covered lagoon digester that will produce biogas, which after being processed to remove hydrogen sulfide (H₂S), will be conveyed via private pipeline to the Aemetis Advanced Fuels Keyes facility. It will further be upgraded to negative-carbon-intensity renewable natural gas (RNG) suitable for use as transportation fuel. Aemetis will sell a portion of the RNG to local fleets via its onsite RNG fueling station and will direct the remainder to sale to larger fleets via the PG&E pipeline, or for use as energy at AAFK to produce renewable

ethanol.

- Location – Hilmar, California (Merced County)
- CDFA DDRDP Funding - \$1,342,980
- Matching funds - \$1,383,737
- Total Projects costs - \$2,726,717
- Estimated 10-year GHG reductions – 121,350 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.09 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$22.47

Wilson Dairy Digester Project
Funded: 2020
Status: In Progress
Expected Completion Date: January 2023

Wilson Dairy Digester Project is a new covered lagoon digester that will be a part of the Five Points Pipeline Cluster. This cluster is under development and will deliver biogas to the PG&E pipeline. The biogas from this new digester will be transported via the cluster's private, low-pressure pipeline to the gas upgrading hub. Once there, it will fuel partner and public trucks at an on-site CNG fueling station. The remainder of the biogas will be injected into the PG&E pipeline for delivery to contracted CNG fueling stations in the Central Valley and the state.

- Location – Riverdale, California (Fresno County)
- CDFA DDRDP Funding - \$1.4 million
- Matching funds - \$2,309,120
- Total Projects costs - \$3,709,120
- Estimated 10-year GHG reductions – 206,745 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.15 MTCO_{2e}
- GHG reduction per total project dollars - 0.06 MTCO_{2e}
- Total cost per MTCO_{2e} - \$17.94

Ahlem Farms Dairy Biogas
Funded: 2019
Status: In Progress
Expected Completion Date: March 2023

Ahlem Farms Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane will be delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting PG&E specifications, will be injected into the nearby point of receipt.

- Location – Hilmar, California (Merced County)
- CDFA DDRDP Funding - \$1,546,738
- Matching funds - \$4,557,504
- Total Projects costs - \$6,104,242
- Estimated 10-year GHG reductions – 153,151 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$39.86

Albert Goyenette Dairy Biogas
Funded: 2019
Status: In Progress
Expected Completion Date: March 2023

Albert Goyenette Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane will be delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting SoCalGas Rule 30, will be injected into the co-located point of receipt.

- Location – Buttonwillow, California (Kern County)
- CDFA DDRDP Funding - \$1,609,316
- Matching funds - \$6,993,567
- Total Projects costs - \$8,602,883
- Estimated 10-year GHG reductions – 199,706 MTCO_{2e}

- GHG reductions per CDFA grant dollar – 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.02 MTCO_{2e}
- Total cost per MTCO_{2e} - \$43.08

Art Leyendekker Dairy Biogas
Funded: 2019
Status: In Progress
Expected Completion Date: March 2023

Art Leyendekker Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane will be delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting SoCalGas Rule 30, will be injected into the co-located point of receipt.

- Location – Visalia, California (Tulare County)
- CDFA DDRDP Funding - \$769,784
- Matching funds - \$2,915,284
- Total Projects costs - \$3,685,068
- Estimated 10-year GHG reductions – 77,697 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.02 MTCO_{2e}
- Total cost per MTCO_{2e} - \$47.43

Charles Ahlem Ranch Dairy Biogas
Funded: 2019
Status: In Progress
Expected Completion Date: March 2023

Charles Ahlem Ranch Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane will be delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting PG&E specifications, will be injected into the nearby point of receipt.

- Location – Hilmar, California (Merced County)

- CDFA DDRDP Funding - \$1,373,697
- Matching funds - \$5,758,275
- Total Projects costs - \$7,131,972
- Estimated 10-year GHG reductions – 136,018 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.02 MTCO_{2e}
- Total cost per MTCO_{2e} - \$52.43

Clauss and Sunwest Dairy Biogas
Funded: 2019
Status: In Progress
Expected Completion Date: March 2023

Clauss and Sunwest Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane will be delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting SoCalGas Rule 30, will be injected into the nearby point of receipt.

- Location – Hilmar, California (Merced County)
- CDFA DDRDP Funding - \$1,572,301
- Matching funds - \$4,780,296
- Total Projects costs - \$6,352,597
- Estimated 10-year GHG reductions – 155,682 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.02 MTCO_{2e}
- Total cost per MTCO_{2e} - \$40.80

Curtimade Dairy Biogas
Funded: 2019
Status: In Progress
Expected Completion Date: March 2023

Curtimade Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The

project's biomethane will be delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting SoCalGas Rule 30, will be injected into the nearby point of receipt.

- Location – Tulare, California (Tulare County)
- CDFA DDRDP Funding - \$1,747,336
- Matching funds - \$3,025,858
- Total Projects costs - \$4,773,194
- Estimated 10-year GHG reductions – 174,734 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$27.32

Dairyland Farms Dairy Biogas
Funded: 2019
Status: In Progress
Expected Completion Date: March 2023

Dairyland Farms Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane will be delivered as R-CNG to fleets and CNG fueling stations in California. Biomethane, meeting SoCalGas Rule 30, will be injected into the nearby point of receipt.

- Location – Tipton, California (Tulare County)
- CDFA DDRDP Funding - \$1,760,347
- Matching funds - \$3,140,466
- Total Projects costs - \$4,900,813
- Estimated 10-year GHG reductions – 177,475 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$27.61

Elkhorn Dairy Biogas
Funded: 2019
Status: In Progress
Expected Completion Date: March 2023

Elkhorn Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane will be delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting SoCalGas Rule 30, will be injected into the nearby point of receipt.

- Location – Dinuba, California (Tulare County)
- CDFA DDRDP Funding - \$2,125,882
- Matching funds - \$4,520,035
- Total Projects costs - \$6,645,917
- Estimated 10-year GHG reductions – 211,940 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$31.36

Friesian Farms Dairy Biogas
Funded: 2019
Status: In Progress
Expected Completion Date: March 2023

Friesian Farms Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane will be delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting SoCalGas Rule 30, will be injected into the nearby point of receipt.

- Location – Tulare, California (Tulare County)
- CDFA DDRDP Funding - \$639,602
- Matching funds - \$3,175,183
- Total Projects costs - \$3,814,785
- Estimated 10-year GHG reductions – 63,145 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.10 MTCO_{2e}

- GHG reduction per total project dollars - 0.02 MTCO_{2e}
- Total cost per MTCO_{2e} - \$60.41

Gerben Leyendekker Dairy Biogas
Funded: 2019
Status: In Progress
Expected Completion Date: March 2023

Gerben Leyendekker Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane will be delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting SoCalGas Rule 30, will be injected into the nearby point of receipt.

- Location – Visalia, California (Tulare County)
- CDFA DDRDP Funding - \$845,589
- Matching funds - \$2,902,768
- Total Projects costs - \$3,748,357
- Estimated 10-year GHG reductions – 85,419 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.02 MTCO_{2e}
- Total cost per MTCO_{2e} - \$43.88

Homen Dairy Digester Pipeline Project
Funded: 2019
Status: In Progress
Expected Completion Date: March 2023

Homen Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. The methane-rich biogas from the digester will be transported via a private, low-pressure pipe to the cluster's central hub near Vander Woude Dairy. Once there, the biogas will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be conditioned and injected into the PG&E utility pipeline for delivery to contracted CNG fueling stations

around the Central Valley and the state.

- Location – Merced, California (Merced County)
- CDFA DDRDP Funding - \$1,640,419
- Matching funds - \$1,640,420
- Total Projects costs - \$3,280,839
- Estimated 10-year GHG reductions – 124,000 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.08 MTCO_{2e}
- GHG reduction per total project dollars - 0.04 MTCO_{2e}
- Total cost per MTCO_{2e} - \$26.46

James Ahlem Dairy Biogas
Funded: 2019
Status: In Progress
Expected Completion Date: March 2023

James Ahlem Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane will be delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting PG&E specifications, will be injected into the nearby point of receipt.

- Location – Hilmar, California (Merced County)
- CDFA DDRDP Funding - \$830,349
- Matching funds - \$4,861,351
- Total Projects costs - \$5,691,700
- Estimated 10-year GHG reductions – 82,216 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.01 MTCO_{2e}
- Total cost per MTCO_{2e} - \$69.23

Maya Dairy Biogas
Funded: 2019
Status: In Progress
Expected Completion Date: March 2023

Maya Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane will be delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting SoCalGas Rule 30, will be injected into the co-located point of receipt.

- Location – Buttonwillow, California (Kern County)
- CDFA DDRDP Funding - \$2,015,393
- Matching funds - \$6,954,582
- Total Projects costs - \$8,969,975
- Estimated 10-year GHG reductions – 250,090 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$35.87

Melo Dairy Digester Pipeline Project
Funded: 2019
Status: In Progress
Expected Completion Date: March 2023

Melo Dairy Digester Pipeline Project will build a new covered lagoon digester processing dairy manure. The methane-rich biogas from the digester will be transported via a private, low-pressure pipeline to the cluster's central hub near Vander Woude Dairy. Once there, the biogas will be used to fuel partner and public trucks at an on-site compressed natural gas fueling station. The remainder of the gas will be conditioned and injected into the PG&E utility pipeline for delivery to contracted CNG fueling stations around the Central Valley and the state.

- Location – Merced, California (Merced County)
- CDFA DDRDP Funding - \$2,910,554
- Matching funds - \$2,910,555
- Total Projects costs - \$5,821,109
- Estimated 10-year GHG reductions – 272,690 MTCO_{2e}
- GHG reductions per CDFA grant dollar - 0.09 MTCO_{2e}
- GHG reduction per total project dollars - 0.05 MTCO_{2e}
- Total cost per MTCO_{2e} - \$21.35

Nyman Brothers Dairy Biogas
Funded: 2019
Status: In Progress
Expected Completion Date: March 2023

Nyman Brothers Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane will be delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting SoCalGas Rule 30, will be injected into the co-located point of receipt.

- Location – Hilmar, California (Merced County)
- CDFA DDRDP Funding - \$687,006
- Matching funds - \$4,654,902
- Total Projects costs - \$5,341,908
- Estimated 10-year GHG reductions – 68,026 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.01 MTCO_{2e}
- Total cost per MTCO_{2e} - \$78.53

Rio Blanco Dairy Biogas
Funded: 2019
Status: In Progress
Expected Completion Date: March 2023

Rio Blanco Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane will be delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting SoCalGas Rule 30, will be injected into the co-located point of receipt.

- Location – Tulare, California (Tulare County)
- CDFA DDRDP Funding - \$1,002,797
- Matching funds - \$2,556,018
- Total Projects costs - \$3,558,815
- Estimated 10-year GHG reductions – 100,886 MTCO_{2e}

- GHG reductions per CDFA grant dollar – 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$35.28

Skyview Dairy Biogas
Funded: 2019
Status: In Progress
Expected Completion Date: March 2023

Skyview Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane will be delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting SoCalGas Rule 30, will be injected into the co-located point of receipt.

- Location – Shafter, California (Kern County)
- CDFA DDRDP Funding - \$686,620
- Matching funds - \$7,686,172
- Total Projects costs - \$8,372,792
- Estimated 10-year GHG reductions – 85,174 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.01 MTCO_{2e}
- Total cost per MTCO_{2e} - \$98.30

Southern Cross Dairy Biogas
Funded: 2019
Status: In Progress
Expected Completion Date: March 2023

Southern Cross Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane will be delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting SoCalGas Rule 30, will be injected into the co-located point of receipt.

- Location – Buttonwillow, California (Kern County)
- CDFA DDRDP Funding - \$1,019,121

- Matching funds - \$8,072,067
- Total Projects costs - \$9,091,188
- Estimated 10-year GHG reductions – 125,872 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.01 MTCO_{2e}
- Total cost per MTCO_{2e} - \$72.23

Southpoint Ranch Dairy Biogas

Funded: 2019

Status: In Progress

Expected Completion Date: March 2023

Southpoint Ranch Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. An on-dairy biogas conditioning station will remove hydrogen sulfide and meter and move the clean biogas directly into a co-located, ultra-clean, high efficiency 2.0 MW Bloom Energy fuel cell interconnected to PG&E. CalBio will generate LCFS credits by directly matching generation and supplying the renewable energy credits to in-state electric vehicle re-charging load.

- Location – Madera, California (Madera County)
- CDFA DDRDP Funding - \$3 million
- Matching funds - \$13,642,393
- Total Projects costs - \$16,642,393
- Estimated 10-year GHG reductions – 484,999 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.16 MTCO_{2e}
- GHG reduction per total project dollars - 0.03 MTCO_{2e}
- Total cost per MTCO_{2e} - \$34.31

Whiteside Dairy Biogas

Funded: 2019

Status: In Progress

Expected Completion Date: March 2023

Whiteside Dairy Biogas will install a Tier 1 designed manure-only covered

lagoon digester with integrated gas storage and pre-treatment. The project's biomethane will be delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting SoCalGas Rule 30, will be injected into the co-located point of receipt.

- Location – Wasco, California (Kern County)
- CDFA DDRDP Funding - \$960,043
- Matching funds - \$7,190,202
- Total Projects costs - \$8,150,245
- Estimated 10-year GHG reductions – 119,137 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.12 MTCO_{2e}
- GHG reduction per total project dollars - 0.01 MTCO_{2e}
- Total cost per MTCO_{2e} - \$68.41

Yosemite Jersey Dairy Biogas
Funded: 2019
Status: In Progress
Expected Completion Date: March 2023

Yosemite Jersey Dairy Biogas will install a Tier 1 designed manure-only covered lagoon digester with integrated gas storage and pre-treatment. The project's biomethane will be delivered as RCNG to fleets and CNG fueling stations in California. Biomethane, meeting PG&E specifications, will be injected into the nearby point of receipt.

- Location – Hilmar, California (Merced County)
- CDFA DDRDP Funding - \$960,644
- Matching funds - \$4,097,690
- Total Projects costs - \$5,044,334
- Estimated 10-year GHG reductions – 93,734 MTCO_{2e}
- GHG reductions per CDFA grant dollar – 0.10 MTCO_{2e}
- GHG reduction per total project dollars - 0.02 MTCO_{2e}
- Total cost per MTCO_{2e} - \$53.82

Aligned Digester Cooperative LLC
Funded: 2018
Status: Canceled

Aligned Digester Co., LLC (dba Aligned Digester Cooperative LLC) partnered with Red Top Jerseys Dairy to develop a covered lagoon digester that would have produced up to 63,000 MMBtu of RNG expanding the market for near-zero emission natural gas vehicles in the San Joaquin Valley.

- Location – Chowchilla, California (Madera County)
- CDFA DDRDP Funding – \$3 million
- Project canceled due to substantial changes in project scope.

Williams Family Dairy Digester Fuel Pipeline
Funded: 2018
Status: Canceled

The Williams Family Dairy Digester Fuel Pipeline Project is a covered lagoon anaerobic digester. The project was proposed as part of the Calgren Dairy Fuels Cluster to power the Calgren ethanol refinery.

- Location – Pixley, California (Tulare County)
- CDFA DDRDP Funding - \$1.5 million
- Project canceled due to substantial change in project objectives and scope.

De Groot North Dairy Biogas
Funded: 2018
Status: Canceled

De Groot North Dairy Biogas would have built a new covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution.

- Location – Hanford, California (Kings County)
- CDFA DDRDP Funding - \$1,442,440
- Project canceled due to substantial change in project objectives and scope.

Milky Way Dairy Biogas
Funded: 2018
Status: Canceled

Milky Way Dairy Biogas would have built a new covered lagoon digester with enhanced gas storage, gas pre-treatment, and effluent distribution.

- Location – Visalia, California (Tulare County)
- CDFA DDRDP Funding - \$2,953,427
- Project canceled due to substantial change in project objectives and scope.

GP Dairy Biogas
Funded: 2019
Status: Canceled

GP Dairy Biogas would have installed a new covered lagoon digester with integrated gas storage and pre-treatment.

- Location – Visalia, California (Tulare County)
- CDFA DDRDP Funding - \$502,554
- Project canceled due to substantial change in project objectives and scope.

*Research Project: Converting Manure to Reduce
Greenhouse Gas Emissions, Minimize Environmental Impacts,
and Enhance the Economic Feasibility of Dairy Operations*

Prof. William Horwath, University of California

Davis

Funded: 2016

Status: Canceled

The UC Davis Manure Conversion Research Project was funded with \$225,909 through the 2014-15 DDRDP. The project was designed to evaluate a new method capable of converting large amounts of manure and/or urine from dairy operations into a more stable, sterile soil amendment with a predictable nitrogen mineralization response that reduces greenhouse gas (GHG) emissions. This project targeted a 25 percent GHG reduction in overall CO₂e emission rates from manure and subsequently amended soils, which could have been scaled to intensive livestock operations throughout the state of California and beyond.

The objectives of the lab and field research were to measure the effects of 'converted' manure on N₂O, CH₄, and CO₂ emissions, as well as the effects of the converted manure on crop productivity, compared to conventionally handled manure and cropland fertility management. The 'conversion' process for manure involved the hydrodynamic cavitation of homogenized solid or liquid livestock waste slurry, which was pumped through attenuating tubules that suddenly opened. The over-arching goal of this research was to provide an alternative to business as usual waste management in dairy operations to reduce GHGs while maximizing economic and environmental benefits. The project was canceled due to substantial changes to the project timeline.

Appendix A

Greenhouse Gas Calculations– Report of Funded Projects (2015 – 2022) for the Dairy Digester Research and Development Program (DDRDP)

All emissions data were extracted from the CARB Greenhouse Gas Emission Inventory – Query Tool for years 2000 to 2019 (14th Edition) available at https://www.arb.ca.gov/app/ghg/2000_2019/ghg_sector.php

1) Greenhouse Gas (GHG) Emissions from California Agriculture as a portion of California's Total Annual GHG Emissions

In 2019, agriculture contributed approximately **31.75 million metric tons** of carbon dioxide equivalents (MMTCO₂e), or **7.6 percent** of California's total annual GHG emissions.

- California Total GHG emissions (all GHGs) in 2019 = 418.150 MMTCO₂e
- CA Agriculture GHG emissions (all GHGs) in 2019 = 31.754 MMTCO₂e
- Thus,

$$\left(\frac{\text{CA Agriculture GHG Emission}}{\text{CA Total GHG Emission}} \right) \times 100 = \left(\frac{31.754}{418.150} \right) \times 100 = 7.594 \approx 7.6\%$$

2) Methane Emissions from Manure Management relative to California's Total Annual GHG Emissions (A), and California's Agricultural GHG Emissions (B)

Methane emissions resulting from manure management, a subset of these total statewide agricultural methane emissions, account for approximately **2.4 percent of the total statewide GHG emissions**, or approximately **32 percent of the agricultural GHG emissions**.

- In 2019, manure management methane emissions from all livestock were equivalent to 10.167 MMTCO₂e
- Thus,

$$\text{(A)} \left(\frac{\text{Manure Methane Emission (livestock)}}{\text{CA Total GHG Emission}} \right) \times 100 = \left(\frac{10.167}{418.150} \right) \times 100 \approx 2.4\%$$

of all California GHG emissions come from the methane emissions from manure management and;

$$\text{(B)} \left(\frac{\text{Manure Methane Emission (livestock)}}{\text{CA Agriculture GHG Emission}} \right) \times 100 = \left(\frac{10.167}{31.754} \right) \times 100 \approx 32\%$$

of all agricultural GHG emissions in CA comes from the methane emissions from manure management.

3) Estimated GHG Emissions Reductions Achieved by DDRDP Funded Projects relative to California's Methane Emissions from Manure Management (in 2019, C and 2013, D), and California's Agricultural GHG Emissions (in 2019, E)

The projects referenced in the report^{Error! Bookmark not defined.} have a cumulative estimated GHG reduction of **21.02 MMTCO₂e over ten years**, or approximately **2.1 MMTCO₂e annually**. The funded projects equate to addressing approximately **21 percent** of the methane emissions from manure management in California and **6.6 percent** of the total GHG emissions from the agriculture sector in California.

- DDRDP has 117 funded digester projects (complete and in progress) and those are equivalent to 21.02 MMTCO₂e (over 10 years) or 2.1 MMTCO₂e/year. This value does not include Alternative Manure Management Program (AMMP) funded projects, which is approximately 0.221 MMTCO₂e/year.
- Methane emissions from manure management in 2019 = 10.167 MMTCO₂e
- Methane emissions from manure management in 2013 = 10.227 MMTCO₂e.
- Thus,

$$(C) \left(\frac{\text{DDRDP GHG Annual Emission Reduction}}{\text{Manure Methane Emission (livestock) in 2019}} \right) \times 100 = \left(\frac{2.1}{10.167} \right) \times 100 = 20.65\%$$

and

$$(D) \left(\frac{\text{DDRDP GHG Annual Emission Reduction}}{\text{Manure Methane Emission (livestock) in 2013}} \right) \times 100 = \left(\frac{2.10}{10.227} \right) \times 100 = 20.53\%$$

Therefore, ≈ 21 percent of methane emissions reduction from manure management are achieved by DDRDP projects.

- And,

$$(E) \left(\frac{\text{DDRDP GHG Annual Emission Reduction}}{\text{CA Agriculture GHG Emission}} \right) \times 100 = \left(\frac{2.10}{31.754} \right) \times 100 = 6.61 \approx 6.6\%$$

of GHG emissions reduction from agriculture are achieved by DDRDP projects.

4) GHG Emissions Reduction Achieved from Projects funded through CDFA's AMMP and DDRDP Relative to Methane Reduction Goals Identified in SB 1383 (Lara, 2016)³.

- Estimated annual GHG reduction achieved by DDRDP and AMMP funded projects = 2.102 MMTCO₂e + 0.221 MMTCO₂e = 2.323 MMTCO₂e/year
- Manure management methane emissions in 2013 = 10.227 MMTCO₂e
- 40% of 2013 level of methane emissions from manure management to be reduced by 2030 = 4.09 MMTCO₂e.

Methane Emissions from Manure Management in 2013 × 40% = 10.227 × 40% = **4.09 MMTCO₂e**

- DDRDP and AMMP funded projects would contribute to **57 percent** toward the 40% reduction by 2030 goal per SB 1383 when accounting for methane emissions specifically from manure management.

$$\left(\frac{\text{DDRDP+AMMP Projects Estimated Annual GHG Reduction}}{\text{40\% of Manure Management Methane Emissions from 2013 levels}} \right) \times 100 = \left(\frac{2.323}{4.09} \right) \times 100 = 56.79 \approx \mathbf{57\%}$$

- DDRDP and AMMP funded projects would contribute **23 percent** toward the reduction of total manure management methane emissions in 2013.

$$\left(\frac{\text{DDRDP+AMMP Projects Estimated Annual GHG Reduction}}{\text{Manure Methane Emission (livestock) in 2013}} \right) \times 100 = \left(\frac{2.323}{10.227} \right) \times 100 = 22.7 \approx \mathbf{23\%}$$

³ SB-1383 Short-lived climate pollutants: methane emissions: dairy and livestock: organic waste: landfills (Lara, 2016):
https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB1383