

Findings and Recommendations

Subgroup 2: Dairy Digesters

Senate Bill 1383 Dairy and Livestock Working Group

October 12, 2018

Introduction

California's Short-Lived Climate Pollutant Strategy and Senate Bill 1383 (Lara, 2016) call for 40% reduction in methane from dairy and livestock manure management by 2030. To help achieve that goal, SB 1383 required the formation of a dairy and livestock sector Working Group to identify and address technical, market, regulatory, and other barriers to the development of dairy and livestock methane reduction projects. Created in mid-2017, the SB 1383 Dairy and Livestock Working Group includes three subgroups focused on: (1) digesters, which capture methane generated from anaerobic manure storage for use as an energy source; (2) other alternative manure management practices (which do not include digesters), which usually seek to avoid methane production by reducing anaerobic store of manure; and (3) research needs related to improving measurements and modeling of dairy and livestock methane inventories, validating reductions from existing practices and technologies, and developing more and better methods for reducing methane emissions from dairy and livestock manure while achieving other environmental and economic benefits and minimizing impacts.

Subgroup 2: Dairy Digesters was convened to review circumstances, identify barriers and make recommendations toward advancing digester development to further reduce dairy manure methane emissions. Dairy digesters are a proven and highly effective means of reducing dairy manure methane and the primary method of achieving a 40% reduction by 2030.

Meeting 10 times between June 2017 and September 2018, Subgroup 2 solicited and gathered information about current experiences, barriers, and opportunities for advancing additional dairy digester projects to further reduce methane emissions from dairies. The subgroup's 25 members brought diverse expertise and perspectives to the discussion. Presentations by additional experts were utilized to add to that knowledge. The subgroup recommendations are organized into 4 categories, with the overall goal of further advancing dairy digester development in California, while maximizing the environmental co-benefits of these projects.

List of Subgroup Members:

Co-Chairs:

Michael Boccadoro, West Coast Advisors
Jim Lucas, Southern California Gas Company
Ryan Schuchard, CALSTART

Other Members and Their Organizations:

Kevin Abernathy, Milk Producers Council
Fariya Ali, Pacific Gas and Electric
Neil Black, California Bioenergy
Rebecca Boudreaux, Oberon Fuels
Peter Drasher, Black Bear Assets
Genevieve Gale, Central Valley Air Quality Coalition

Brian Gannon, BioGas Energy
Bonnie Holmes-Gen, American Lung Association
Cliff Gladstein, Gladstein, Neandross & Associates
Kevin Hamilton, Central California Asthma Collaborative
Kristen Kleiman and Peter Weisberg, Climate Trust
Steve Larsen, Ruan
Thomas Lawson, California Natural Gas Vehicle Coalition
Daryl Maas, Maas Energy
Lynne McBride, California Dairy Campaign
Graham Noyes, Low Carbon Fuels Coalition
Lorelei Oviatt, Kern County-Planning and Development Department
John Shears, Center for Energy Efficiency and Renewable Technologies
Chris Shimoda, California Trucking Association
Moses Stites, Fresno County Rural Transit Agency
Grant Zimmerman, ampCNG
Bill Zobel, Trillium CNG

Deliverable #1: Dairy Methane Digester Project Expansion: Recommendations to expand dairy digesters, which represent a proven and highly cost-effective way of reducing dairy methane emissions in California. Removing barriers to ongoing dairy digester development and improving incentives for ongoing project development is critical to achieving a 40% reduction in dairy manure methane emissions as sought under the state’s Short-Lived Climate Pollution (SLCP) Plan.

Issue	Discussion	Recommendation
<p>A) As many as 200 digesters may need to be built in order to contribute to the reduction of manure methane by 40% from dairies. Further research can help determine the number of digesters needed vs. other methane reduction practices. To make investments in these digesters attractive to farmers, incentive funding may continue to be needed.</p>	<p>a) Digesters allow for the initial collection of raw biogas. Digesters are a critical component of the state’s SLCP plan along with other methane reduction options.</p> <p>b) CDFA has estimated that \$500M is needed to encourage and incentivize dairy methane reduction efforts in California. \$260 million has been allocated to CDFA to date through the state Climate Investment Portfolio (GGRF) for dairy methane reduction efforts. Approximately \$150 million has been made available to date for dairy methane reduction projects (AAMP & CDDRDP). An additional \$94 million is expected to be made available in December 2018.</p> <p>c) CDFA is currently funding a research project through the California Dairy Research Foundation to further assess strategies for methane emission reduction effectiveness and appropriateness in small and large dairies in California. The project is expected to be completed in 2019 and will further inform the state’s dairy methane reduction efforts.</p>	<ol style="list-style-type: none"> 1) The legislature should continue to allocate GGRF incentive funding to encourage and incentivize dairy methane reduction efforts, including digesters, in accordance with CARB and CDFA’s recommendations. 2) Consistent with 2017-2018 and 2018-2019 fiscal years, the Governor and legislature should continue appropriating at least \$100 million annually from GGRF for each of the next several years. 3) California should further encourage sustainable dairy methane reduction projects through outreach and education to dairy farms. 4) Projects eligible for CDFA digester funding should include all low-carbon fuels, including but not limited to, renewable natural gas, renewable hydrogen, renewable DME, and other low-carbon fuels with viable offtake agreements.

Issue	Discussion	Recommendation
<p>B) Currently, a large majority of RNG supplied to California originates from out of state and this out of state supply is growing rapidly. It is unclear how RNG derived from in-state dairy biomethane will remain competitive with these sources in the future. Equally important, few opportunities currently exist for long-term dairy biomethane contracts.</p>	<p>a) Additional incentives or rules may be needed to help in-state RNG production remain competitive with out-of-state sources. Approaches to insure robust demand for CA dairy biomethane is key. The legislature recently passed SB 1440 (Hueso) which requires the CPUC, in consultation with ARB, to consider development of a biomethane procurement program, including its cost effectiveness.</p> <p>b) The CPUC is also currently considering a number of issues to improve access for pipeline biomethane projects in California (OIR 13-02-008), including critical gas quality requirements and ongoing incentives for pipeline interconnection.</p> <p>c) Other approaches are being discussed, including adoption of pilot financial mechanism to reduce LCFS volatility for dairy biomethane projects. It is critical that there is adequate demand at a sufficient price for California dairy R-CNG in order to encourage ongoing digester development and ensure the state achieves its goals for dairy methane reduction.</p>	<ol style="list-style-type: none"> 1) ARB should finalize development of a pilot financial mechanism. The state should adopt, implement, and fund the pilot financial mechanism for dairy digester projects. 2) The CPUC should implement SB 1440 in an expeditious manner to create long-term markets for biomethane, prioritizing dairy biomethane. 3) The CPUC should extend and increase funding for the existing pipeline biomethane incentive program and implement a queue program to better enable effective utilization of the program, as per AB 2313. 4) ARB should increase and prioritize its funding of investments and incentives, as well as explore the use of other authorities it has, to foster in-state biomethane production, refueling, and consumption. This should include the LCFS program prioritizing the direct benefits of methane capture and environmental co-benefits.

Issue	Discussion	Recommendation
<p>C) Community health, air quality and environmental benefits should accrue, and impacts should be avoided, in the communities where dairy methane reduction projects are implemented.</p>	<p>a) California’s dairy industry continues to evolve with fewer, larger dairies. Over the past 70 years the total number of dairies has steadily declined and the average size of dairies in the state has continued to increase. The total number of dairy cows in California reached a peak of just over 1.8 million milk cows around 2008 and has declined slightly over the past decade. These overall trends are expected to continue in the near term.</p> <p>b) Environmental justice representatives have raised concerns about dairy “clusters” potentially increasing impacts to some local communities through increased herd size driven by digester development. While some limited consolidation may be occurring naturally, dairy “clusters” are being created from existing dairies with existing cows to improve the economies of scale necessary for pipeline biomethane development and injection. Individual dairies, particularly small ones, are not well-suited for pipeline biomethane. By working together as a “cluster” existing dairies benefit from shared expenses related to biogas cleaning and conditioning (upgrading) as well as a single point, and cost, of interconnection. In this “cluster” or “hub-and-spoke” model, raw biogas is collected from individual digesters on existing dairies in a network of biogas collection lines where it can then be centrally upgraded and injected into pipeline or used onsite for transportation fuel. Smaller local dairies also benefit from this model as they can more easily connect to the existing network.</p> <p>c) Dairy digesters add to environmental protection by decreasing ammonia, H₂S, and other emissions. As a result, digesters improve local air quality.</p>	<ol style="list-style-type: none"> 1) CARB should encourage development of LCFS pathways for on- and off-road farm equipment using low carbon fuels. In addition, fleet conversion funding should include programs targeting dairy and agricultural heavy-duty trucks, resulting in benefits to San Joaquin Valley air quality. Truck funding should be prioritized for fleets using in-state renewable low-carbon fuels. 2) CARB, CDFA and partners should implement a program to increase awareness in impacted communities of the benefits that RNG production will bring to those regions, including the reduction of local impacts by dairy operations 3) Local permitting agencies should continue to act as the authority for the handling dairy digester permit applications and conducting review, as required under CEQA. 4) The state should create incentive enhancements to help smaller dairies to better participate in digester development programs. 5) The legislature should allocate funding to identify approaches that integrate covered lagoon digesters and other solutions with nutrient export.

Issue	Discussion	Recommendation
	<p data-bbox="483 216 993 321">Further, dairy R-CNG projects advance air quality improvement by replacing diesel truck fleets with NZE vehicles.</p> <p data-bbox="435 363 993 468">d) Programs that integrate digester deployment with on-going water quality requirements will be important.</p>	

Deliverable #2: Electricity Generation and Grid Interconnectivity

Recommendations for cost effective ways to further mitigate criteria pollutant emissions for on-site electricity generation projects, including market development incentives, policy development, removing barriers, and regulatory or legislative action.

Issue	Discussion	Recommendation
<p>A) Electricity production and sales, including programs like the BioMAT FiT program, provides an important revenue stream and financial diversification for dairy digesters.</p>	<p>a) In March 2018, CPUC adopted a decision to continue the BioMAT FiT program, which expires in 2021.</p> <p>b) CPUC staff is currently conducting a program review and plans on releasing draft recommendations in the near future. CPUC may open a new phase of the proceeding to consider staff’s recommendations and other proposals to revise the program</p>	<p>1) The BioMAT Fit program provides an important revenue stream for financing dairy digester projects and should be extended by the CPUC.¹</p> <p>2) As part of the BioMAT FiT program review and any follow-up proceeding, the CPUC should ensure public discussion and consideration of the following program revisions:</p> <p>a. Explore possible ways to modify the BioMAT FiT program that will provide greater flexibility for project operations to migrate to and from electric generation, onsite vehicle fueling and/or pipeline injection.</p> <p>b. Explore possible ways to capture value from LCFS electric pathway opportunities for both procuring and producing parties.</p>

¹ PG&E recognizes the importance of electric generation contracts in diversifying dairy digester project financing opportunities but does not support extension of the BioMat FiT program at this time. PG&E prefers dairy digester biomethane be utilized for pipeline injection.

Deliverable #3: Pipeline injected Biomethane

Recommendations that can increase pipeline injection of biomethane, including market development incentives, cluster identification, policy development, regulatory or legislative action, removing barriers, and support the SB 1383 pilot project process.

Issue	Discussion	Recommendation
<p>A) The Low Carbon Fuel Standard (LCFS) provides substantial value for digester projects, and the perceived stability of credit prices is essential to project financing.</p>	<p>a) Since the group's formation, the LCFS has been statutorily protected by AB 398. Now the CARB Board is currently considering rulemaking for the 2020-30 period including a carbon intensity reduction target of 20% by 2030. Note: SB 1383 requires that CARB establish a pilot financial mechanism (PFM) to promote certainty and stability of credit prices.</p>	<ol style="list-style-type: none"> 1) CARB should develop and propose a pilot financial mechanism (PFM) by the end of 2018. 2) The legislature and State policymakers should ensure the PFM program is fully funded and implemented no later than January 1, 2020.
<p>B) Interconnection costs can be a significant portion of total project costs, depending on size (biogas volume) of project and location to the nearest pipeline having capacity.</p>	<p>a) CPUC 's Biomethane Interconnection Incentive Program ends in 2021. This program, based on AB 2313, provides a 50% reimbursement up to \$5M for dairy digester clusters (3 or more dairies) and up to \$3M for other biogas sources.</p>	<p>CPUC should:</p> <ol style="list-style-type: none"> 1) Extend the program from 2021to 2030 and increase the funding cap from \$40M to NTE \$400M. 2) Put in place eligibility criteria and establish a transparent queue process to enable developers to be certain of funding. 3) Allow the utilities to rate-base interconnection incentives for the interconnection facilities that are owned and operated by the utility
<p>C) Some dairies may not have access to a nearby utility pipeline due to cost and/or location to a nearby pipeline having capacity.</p>	<p>a) There may be an attractive use case for moving renewable gas via tube trucks and delivering via "wet fueling" (remote sites). Such an approach may potentially provide a lower cost solution compared to interconnecting to the utility pipeline.</p>	<ol style="list-style-type: none"> 1) The CPUC should explore and address in their current OIR the option for trucking of renewable gas in order to spur exploration of this approach.

Deliverable #4: Transportation Fuel Markets: Recommendations to increase dairy biogas access to all vehicle fuel markets, including market development incentives, policy development, regulatory or legislative action, and strategies to identify potential fleets and fuel networks/retailers.

Issue	Discussion	Recommendation
<p>A) Many current and emerging attractive pathways exist to replace conventional vehicle fossil fuels with sustainable alternatives derived from dairy manure outputs and emissions.</p>	<p>a) CARB has established a three-year investment plan for Medium- and Heavy-Duty Vehicles (MHDV) in the Low Carbon Transportation which calls for approximately \$685 million/year. Such funding covers demos, pilots, and commercial incentives and includes ZE and NZE technologies CARB, 2017.</p>	<ol style="list-style-type: none"> 1) The legislature should allocate approximately \$700 million annually in a multi-year application for MHDVs in the Low Carbon Transportation program consistent with CARB’s investment plan 2) The legislature should provide additional funding to support near-zero and zero-emission trucks that can use local dairy biogas for fuel consistent with the San Joaquin Air Pollution Control District’s proposed deployments to meet its air quality attainment goals 3) Funding for vehicles that use renewable fuels should first benefit fuels that are developed from in-state projects. 4) Scrappage and outgoing vehicle age requirements should be relaxed when possible.

Issue	Discussion	Recommendation
<p>B) The conversion of dairy biomethane to transport fuel is an essential strategy for expanding dairy digesters due to the financial conversion of LCFS credits and Renewable Identification Number (RIN) credits. At this time, the revenue from the sale of the credits associated with vehicle fuel is required in order to develop projects not reliant on state subsidization of energy prices. However, this</p>	<ol style="list-style-type: none"> a) Commercializing the market for NG trucks requires establishing a “fully functioning” NG truck market. This means a market that has the same elements as the market it is intending to replace. b) The NG truck market currently lacks both a well-functioning secondary market and state programs that support the maintenance of NG truck assets on a broad and programmatic scale. Each of these market elements must be considered and accounted for by regulators 	<ol style="list-style-type: none"> 1) CARB should ensure that funding for Low NOx trucks fully covers the incremental cost premium over new diesel trucks for in-state fleets from diesel to NG. 2) CARB and other state agencies should establish a multiyear investment framework to expand the market for California-produced dairy RNG in the transportation sector, and encourage that RNG used for transportation fuel in California be sourced from California. Such a framework should aim to expand market demand to at least match the volume of RNG that can be produced by

<p>strategy requires expanding the market for RNG in transportation in California, which today can be done by increasing the use of CNG/LNG trucks. Such trucks come with an initial purchase “premium” over and above diesel which discourages fleet operators from converting their operations from diesel to much cleaner NGVs. To ensure that the market for RNG in transportation expands, which must occur if Dairy biomethane projects are to succeed, fleet operators should be compensated for the premium associated with the first-time purchase of CNG/LNG vehicles.</p>	<p>to ensure the successful long-term commercialization of the NG truck market.</p> <p>c) Commercial vehicle operators must provide competitive transportation rates to be successful. If forced to absorb the premium associated with the purchase of medium and heavy-duty NGVs, it is difficult for commercial fleets to charge competitive shipping rates compared to their diesel-fueled competitors. To ensure that commercial fleets that choose RNG remain competitive, thus increasing the demand for dairy RNG, a mechanism should be established to level the purchase costs of NGVs.</p>	<p>the California Dairy industry as soon as possible.</p> <p>3) Such funding should be restricted to only funding NG trucks equipped with engines that meet or exceed the ARB Optional Low NOx standard. Priority should be given to the lowest emission technologies available for each vehicle category.</p>
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Issue	Discussion	Recommendation
<p>C) Expanded use of fuels derived from dairy biogas which are capable of achieving zero- and near-zero emissions in vehicles are possible with current technology. These technologies, for which LCFS credits are available, should be given further public investment and support.</p>	<p>a) It is important to build out advanced technology to make further improvements in the later years of the regulation period.</p> <p>b) CEC has issued various grants under the: 1) Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP) and 2) California Energy Commission’s Research and Development Program (EPIC and PIER funding) for low carbon fuels production facilities (both for commercial and for pilot/demonstration scale projects).</p> <p>c) Recently, annual ARFVTP funding for biofuel and biogas fuel production plants has been</p>	<p>1) Strategies should be developed to incentivize investments for the production and delivery of dairy-manure-derived renewable electricity, hydrogen, DME, and other biofuels, as well as to allow those technologies to generate LCFS credits if and when they become sufficiently commercialized.</p> <p>2) The legislature should allocate funding to expand research and demonstration for process technologies and biomethane delivery alternatives capable of producing clean, low carbon renewable fuels from dairy manure,</p> <p>3) The legislature should allocate funding to expand and enhance the commercialization of technology that has completed the research and development phase, but which has not yet been brought to market because of</p>

	<p>~\$25M and R&D funding has been ~\$4M. Starting July 1, 2018, ARFVTP funds will no longer be allocated for biofuel and biogas fuel production plants, but the FY 2018-19 state budget allocated \$12.5M from GGRF for these purposes (\$25M AFTVT funds being moved to support zero emission vehicles).</p>	<p>cost/economy of scale barriers. Particular emphasis should be placed on technologies that have received public funding from California and successfully completed research and developments.</p>
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Issue	Discussion	Recommendation
<p>D) Currently, NZE and ZE trucks weigh up to around 2,000 pounds more than conventional diesel trucks</p>	<p>a) The Governor has signed legislation granting a 2,000-pound weight exemption for ZE and NZE trucks (AB 2061, Frazier)</p>	<p>1) The state should expeditiously implement a 2,000-pound statutory weight exemption for ZE and NZE trucks.</p>

Issue	Discussion	Recommendation
<p>E) RNG markets in California are approaching saturation. In order to further increase utilization and foster the capture of dairy manure emissions and conversion into fuel in the near term, more demand is needed. However, the state is pursuing policies that are depressing NG demand markets in transportation. For example, ARB is considering a 100% zero-emission procurement requirement for transit bus purchases that, if approved, would reduce the current demand for RNG from natural gas buses.</p>	<p>a) Heavy-duty diesel trucks are responsible for a vast portion of NOx and particulate pollution in the SJV. NZE 12L trucks are commercially available now and can reduce this problem by 90%. ZE alternatives with the same range are not yet commercially available.</p> <p>b) The ultimate goal is to reduce NOx emissions and improve air quality in California. It is important to act quickly and adopt available and commercially viable clean technologies (Near-Zero CNG engines with RNG fuel) now. This does not eliminate the need for continued investment in other technologies, but does provide the most air quality benefits today.</p>	<p>1) If and when the state requires MHDVs using natural gas to become zero-emission, and if that transition causes significant loss of RNG demand, the state shall seek opportunities to make up the lost RNG demand with other vehicle categories or uses that create beneficial emissions reductions.</p> <p>2) CARB shall bolster demand for RNG in transportation in the near term by supporting funding to cover the incremental cost of NZE MHD NGVs, and over the long term by supporting the development of policies and strategies to enable dairy RNG to produce LCFS and RIN credits when the RNG is used to generate electricity or hydrogen for transportation applications in the long term</p> <p>3) CARB shall encourage the transition to a higher proportion of biogas from in-state sources versus sources from out of state.</p>

	<p>c) This issue is very important as incentivizing supply through digester grants without incentivizing demand could have negative consequences for the RNG market.</p> <p>d) Incentivizing demand through conversions from diesel to CNG is an obvious solution. Taking it a step further, new CNG equipment vouchers could stipulate locally sourced RNG. More conversion funding through the local air districts with this stipulation could be helpful.</p>	
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Issue	Discussion	Recommendation
<p>F) Investors discount the potentially high value of LCFS credits for fuels derived from dairy manure, citing market uncertainty. This diminishes prospects for in-state projects to capture dairy emissions and generate renewable fuels. The issue is addressed in deliverable 3.</p>	<p>See deliverable 3.</p>	<p>See deliverable 3.</p>