



***A Working Paper on the
CDFA Dairy Digester Research and Development Program***

April 3, 2019

Leadership Counsel for Justice and Accountability seeks to fundamentally shift the dynamics that have created the stark inequality that impacts California's low income, rural regions. Based in the San Joaquin and Eastern Coachella valleys, we work alongside the most impacted communities to advocate for sound policy and eradicate injustice to secure equal access to opportunity regardless of wealth, race, income, and place.

California Bioenergy and Maas Energy Works are the sole beneficiaries of the more than \$100 million that the California Department of Food and Agriculture granted to dairy digesters in 2017 and 2018. Plus, the California Public Utilities Commission gave these companies nearly 100 percent (95.5%) of \$319 million in subsidies for six digester projects.

Why is the State of California pouring hundreds of millions of dollars into the coffers of these two dairy digester developers? And what is the impact on some of the most environmentally burdened communities in the state?

For more than two years, Leadership Counsel for Justice and Accountability has pursued these answers, and information learned from a Public Records Act (PRA) request confirmed our concerns that in fact digester investments threaten environmental quality in some of the most vulnerable regions of the state and, despite industry claims to the contrary, do not benefit disadvantaged communities.

This paper uncovers many troubling findings, but one of the most disturbing is that the state will not provide information necessary to assess the potential environmental impacts of dairy digester investments based on the assertion that relevant data are protected trade secrets.

The digester applications we reviewed make it impossible to provide a true analysis of environmental impacts. The applications lack information related to either baseline or projected dairy-wide environmental impacts resulting from digester projects. Instead, applicants focus on the limited scope of the digester and manure pits incorporated into the digester, ignoring most other sources of emissions and discharges from the dairy, including land-applied manure, silage, and dust. What's more, digesters do nothing to address almost half the methane that cows produce in the form of intestinal emissions.

Furthermore, digester applications fail to consider a potential increase in herd sizes at dairies with or near dairy digesters, and the likely concentration of dairies near gas pipelines as dairy operators seek profits from manure-to-energy revenues. Increased herd sizes and increased concentration of dairies will only exacerbate environmental degradation from greater quantities and concentrations of pollution sources including cows themselves, manure, and feed.

Digester investments already favor larger dairies. Based on data we were able to obtain, dairies that received funding for digester awards in 2017 and 2018 averaged 7,000 cows, though we suspect that if given access to herd size data, we would find that average closer to 9,000 cows. The relationship between digesters and large dairy operations is thus two-fold: they favor larger operations and thus disproportionately support the economic sustainability of larger dairies, and incentivize further dairy growth and consolidation in search of greater revenue for gas production and sale.

The greatest concern for us is the health of families. The inadequate and incomplete identification and analysis of negative environmental and quality of life impacts on nearby communities, and the failure to

consider mitigation measures to address those impacts despite direction in state law to do so is simply unacceptable.

We are similarly concerned that awarded projects were deemed beneficial to disadvantaged communities despite applicants' failure to demonstrate any meaningful or verifiable benefits to disadvantaged neighborhoods.

Much of the purported environmental benefits of digesters in the DDRDP (dairy digester research and development program) applications is at best aspirational and at worst fabricated. Projected air quality improvements rely on biomethane from the facilities replacing diesel in trucks, yet there is scant evidence that trucks—much less those in the San Joaquin Valley—will switch from diesel to natural gas-powered engines and purchase gas produced by the funded digesters. The one likely commitment to purchase biomethane for vehicle fuel came from a Southern California dairy producer and retailer.

Applicants claim benefits to groundwater from lining manure pits, yet admit that the vast majority of nitrate contamination comes from land application of manure, a practice that will not change with the use of a digester. (One applicant relies on a study that has been discredited and points to likely fabricated data to argue that the material that comes out of a digester is less likely to contaminate water.)

We submit this working paper in the interest of residents who live in the most pollution-impacted communities of the San Joaquin Valley.

INTRODUCTION

In the interest of residents living in areas of the San Joaquin Valley engaged in advocacy day after day for clean air, clean water, and equitable investment policies, Leadership Counsel for Justice and Accountability (Leadership Counsel) submitted a Public Records Act (PRA) request in October of 2017 seeking portions of successful applications to the 2017 round of the California Department of Food and Agriculture's (CDFA) Dairy Digester Research and Development Program (DDRDP).¹ In March of 2018 Leadership Counsel received the majority of documents requested in the PRA, however critical data was redacted in the response.

Leadership Counsel's primary goal in requesting 2017 applications was to review the DDRDP's adherence to the requirements of SB 859² which called for consideration and mitigation of local environmental impacts related to dairy digester development and operations and greater scrutiny of claims that projects benefit disadvantaged communities.

The 2016 law provided, in part:

Prior to awarding [GGRF] grant funds . . . [CDFA] shall review the applicant's analysis identifying 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. (Gov. Code, § 16428.86(a))

A project shall not receive funding unless an applicant has demonstrated...that the applicant has...conducted outreach in areas that will potentially be adversely impacted by the project, determined potential impact of the project [and] committed to measures to mitigate impacts. (Gov. Code, § 16428.86(b).)³

¹ Specifically, on October 30, 2017, Leadership Counsel requested the "Environmental Performance" and "Community Impact" sections of successful 2017 DDRDP applications. In response, CDFA produced the requested sections of all but two successful 2017 applications on March 19, 2018. CDFA produced the last two successful 2017 applications on December 27, 2018 pursuant to a second PRA, but has not yet produced the remaining sections of the 2017 applications from its March 19, 2018 production.

² SB 859, https://leginfo.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB859

³ SB 859 further provides that "A project shall not receive funding unless the applicant has demonstrated to the Department of Food and Agriculture that the applicant has done all of the following: (1) Conducted outreach in areas that will potentially be adversely impacted by the project[;] (2) Determined potential adverse impacts of the project[;] (3) Committed to measures to mitigate impacts[;] (c) In making awards, the Department of Food and Agriculture shall prioritize projects based on the criteria pollutant emission benefits achieved by the project[;] (d) A project funded by the Department of Food and Agriculture 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.

The bill further stated that "[CDFA] must prioritize projects based on [their] criteria pollutant emission benefits" (16428.86(c)) and that a project funded by [CDFA] that results in localized impacts in disadvantaged communities shall not be considered to provide a benefit to disadvantaged communities... (Gov. Code § 16428.86(d)).

Our analysis revealed that successful DDRDP applicants did not adequately identify the potential negative impacts of their proposed projects, identify or commit to measures to mitigate negative impacts, or conduct adequate outreach. Furthermore, CDFa did not appear to consider relative air emission benefits when making awards. Finally, several funded projects were deemed beneficial to a disadvantaged community despite showing no significant benefit to a disadvantaged community while in fact threatening negative impacts.

Lack of data transparency and access to information made a complete analysis of successful applications impossible. Given the extensive redactions in the documents provided by CDFa in response to Leadership Counsel's PRA, residents of impacted communities lack a full picture of several critical data points needed to assess environmental benefits and negative impacts of funded projects, including baseline information on herd sizes, pollution levels, traffic, and other indicators. This working paper will be updated if Leadership Counsel can later access redacted data.

We focused on 2017 awards for this report because it was the most recent year available at the time the PRA request was submitted.⁴ The year also marked a significant shift in the type and quantity of DDRDP-funded projects. Previously, only six dairy digesters had been funded under the DDRDP, all of which were stand-alone digesters built to generate electricity or produce biogas for compressed natural gas (CNG) fueling stations.⁵ Starting in 2017 the DDRDP and other state incentive programs have targeted biomethane production and, in particular, biogas cluster projects that include multiple dairies.

In addition to the 2017 DDRDP applications produced in response to the PRA requests, this working paper draws from background and contextual information from: (a) DDRDP awards announcements for 2015, 2017, and 2018;⁶ and (b) CDFa reports to the legislature regarding funded DDRDP projects from February 2018 and January 2019.⁷

⁴ The August 23, 2018 PRA also included a request for successful applications to the 2018 round of the DDRDP. Those applications may be discussed in a subsequent working paper.

⁵ Two grants awarded in 2017 have since been cancelled due to changes in project scope, objectives and/or timelines. Additionally, two grantees have declined DDRDP grants (one in 2017 and one in 2018). As this working paper analyzes CDFa's process for funding DDRDP applications, both cancelled and declined grants are discussed.

⁶ Relevant documents available at <https://www.cdfa.ca.gov/oefi/ddrdp/>

⁷ *Ibid.*

BRIEF BACKGROUND ON DDRDP AND PUBLIC INVESTMENT IN DAIRY DIGESTERS

As part of the statewide effort to address climate change, the legislature has appropriated funding from the Greenhouse Gas Reduction Fund (GGRF) for CDFA's manure management program on an annual basis. CDFA in turn awards grants for manure management through both the DDRDP and the Alternative Manure Management Program (AMMP).⁸ The stated intent of CDFA's bifurcated program is "to evaluate the efficiency and cost-effectiveness of strategies to reduce emissions of short-lived climate pollutants, such as methane gas from dairy operations."⁹ The more than 1.7 million milking cows (89% of which are in the San Joaquin Valley) plus non-milking cows and calves on dairies produce 45 percent of California's methane emissions.¹⁰ Our research has focused on the Digester program, which has received almost four times more funding than AMMP to date.¹¹

Dairy digesters serve two functions: they capture methane produced by wet manure stored in waste pits and they create natural gas. Dairy digesters rely on anaerobic digestion - a process whereby bacteria break down organic materials in an oxygen free environment - to convert wet manure into biogas and byproducts. Biogas may be combusted to create electricity or refine ethanol, it may be used as vehicle fuel, and it may be upgraded to biomethane and injected into utilities' pipeline networks to provide natural gas for homes, businesses, and transportation fuel.

CDFA has awarded a total of \$122.96 million in DDRDP grants from 2015-2018.^{12,13} CDFA directed over \$11 million to six electricity-generating digesters in its initial round of grant making in 2015. In the subsequent two DDRDP funding rounds, in 2017 and 2018, CDFA did not fund digesters designed to generate electricity exclusively.^{14,15} Instead, \$111.87 million worth of grant awards

⁸ California Climate Investments. <https://www.cdfa.ca.gov/oefi/AMMP/>

⁹ A Report to The Joint Legislative Budget Committee, California Department of Food and Agriculture Dairy Digester Research and Development Program and Alternative Manure Management Program, July 2018, available at https://www.cdfa.ca.gov/oefi/ddrdp/docs/MethaneReduction_July2018.pdf

¹⁰ <https://www.arb.ca.gov/cc/inventory/slcp/slcp.htm>

¹¹ See pages, 5 and 6, *infra*

¹² CDFA, January 2019 DDRDP Report of Funded Projects (2015-2018), available at https://www.cdfa.ca.gov/oefi/ddrdp/docs/DDRDP_Report_January2019.pdf

¹³ After subtracting cancellations and declinations, this current total amounts to \$114.25 million in commitments

¹⁴ As discussed in further detail below, several digesters include an option to operate as 1 MW electricity generators.

¹⁵ CDFA, 2017 DDRDP Projects Selected for Award of Funds (updated Dec. 24, 2018), available at

https://www.cdfa.ca.gov/oefi/ddrdp/docs/2017_DDRDP_ProjectsAwarded.pdf; CDFA, 2018 DDRDP Projects Selected for Award of Funds (updated Dec. 24, 2018). https://www.cdfa.ca.gov/oefi/ddrdp/docs/2018_DDRDP_ProjectsAwarded.pdf.

were awarded to 62 biogas and biomethane-producing digesters.¹⁶ Sixty-one of the 62 projects funded through the DDRDP in 2017 and 2018 are designed to support dairy cluster projects¹⁷ whereby biogas is used to power ethanol refining, provide transportation fuel, or heat homes and buildings. Specifically, 61 of 62 digester projects funded since 2017 take one of two forms: (1) the digester will be installed in clusters of multiple dairies and connected by pipes to a centralized interconnection sites where the gas will be cleansed and injected into a gas utility's pipeline; or (2) the digester will be installed as part of a cluster and connected by pipeline to one of two central hubs to provide fuel for ethanol refineries, transportation fuel, and / or injection into a gas utility's pipeline.

Summary of 2017 and 2018 DDRDP Grant Awards

	2017 grant awards	2018 grant awards	2017-18 grant awards
Maas Energy Works	\$10,215,498 \$6,700,00*	\$ 38,562,655 \$ 36,371,000*	\$48,778,153 \$43,071,000*
California Bioenergy	\$ 24,050,000	\$ 36,038,276	\$60,088,276
Aligned Digester Co.	\$ 3,000,000 \$0*		\$3,000,000 \$0*
Total	\$ 37,265,498 \$30,750,000*	\$ 74,600,931 \$ 72,409,276*	\$111,866,429 \$103,159,276*

*This figure represents grant totals after subtracting declined or cancelled grants.

Two companies -- California Bioenergy LLC (CalBio) of Dallas, Texas and Maas Energy Works, Inc. (Maas Energy) of Redding, California -- are responsible for all but one of the 62 digester projects receiving DDRDP awards in 2017 and 2018 and all 58 of the still active 2017 and 2018 digester grant awards.¹⁸ CDFA will award an additional \$61-75 million to digesters in 2019.¹⁹ Thus, over the 5-year period from 2015 through

¹⁶ As noted in footnote 5, *supra*, four of these awards were subsequently cancelled or declined.

¹⁷ The sole stand-alone dairy digester was to be installed at Red Top Jersey Dairy by Aligned Digester Co., LLC, but the grant has since been cancelled due to a change in scope of the project. Thus, every project funded since 2017 is designed to inject biomethane into the utility pipeline and / or form part of a dairy cluster.

¹⁸ California Secretary of State, 200628510021 - California Bioenergy LLC; C3307151 - Maas Energy Works, Inc.; 201712210076 - Aligned Digester Co. LLC, <https://businesssearch.sos.ca.gov/>

¹⁹ CDFA, 2019 Dairy Digester and Research Development Program, Request for applications, available at https://www.cdfa.ca.gov/oe/efi/ddrdp/docs/2019_DDRDP_Request_for_Grant_Applications.pdf

2019, it's possible if not likely that CDFA will have awarded nearly \$200 million for dairy digester projects almost exclusively to two digester developers.

Other state programs provide grant funds to support dairy digester development and operations,²⁰ and most of these funds support the same two developers: CalBio and Maas Energy. The California Public Utilities Commission (CPUC) recently awarded \$319 million in subsidies for development and operation of dairy digesters. More than 95% of those \$319 million in subsidies was awarded to CalBio and Maas Energy digester cluster projects.²¹

Additionally, the state negotiated a mitigation agreement with Southern California Gas Company (SoCalGas) for the Aliso Canyon methane crisis of October 2015 to February 2016. The mitigation agreement requires SoCalGas to invest at least \$26.5 million to finance at least 12 dairy digesters that are part of three CalBio dairy digester clusters.²² Nine of these 12 funded dairies also received DDRDP grants in 2017. The mitigation agreement calls for an additional \$7.6 million for additional mitigation projects if the initial dairy digester clusters cannot achieve anticipated methane reductions. Several dairy digester projects are slated to receive those additional funds as well.²³

CDFA has also invested — to a significantly lesser extent — in projects that increase the capacity of dairy farms to prevent methane production through “dry handling” of manure through AMMP. CDFA allocations to that program began in 2017, with \$11.35 million awarded.^{24,25} For 2018, CDFA awarded \$21.64 million in AMMP grants.^{26,27} In 2019, between \$19 and \$33 million in AMMP grant awards is likely.²⁸

²⁰ For example, the CEC awarded \$9 million in 2017 in support of cluster interconnection systems, and in 2018 the CPUC announced a budget of \$319 million to be spent over 20 years on infrastructure and operation expenses for 45 dairies in “pilot projects” in six clusters. (CPUC, CARB, and Department Of Food And Agriculture Select Dairy Biomethane Projects To Demonstrate Connection To Gas Pipelines, Docket #: D.17-12-004, PUC, 3 Dec 2018. <http://docs.cpuc.ca.gov/PublishedDocs/Published/Go00/M246/K748/246748640.PDF>.)

²¹ Ibid, http://www.cpuc.ca.gov/uploadedFiles/CPUC_Website/Content/Utilities_and_Industries/Energy/Energy_Programs/Gas/Natural_Gas_Market/FinalSelectionComScoreCardSum.pdf

²² “Aliso Canyon Mitigation Agreement First Project – Dairy Projects”, available at https://www.arb.ca.gov/html/aliso-canyon/aliso-canyon-mitigation-project-dairy-sites.pdf?_ga=2.115563654.1233141470.1536614855-1059320692.1522165897

²³ Aliso Canyon Methane Leak Climate Impacts Mitigation Program, CARB, 31 Mar 2016, available at: https://www.arb.ca.gov/research/aliso_canyon/arb_aliso_canyon_methane_leak_climate_impacts_mitigation_program.pdf

²⁴ CDFA, Alternative Manure Management Program, <https://www.cdfa.ca.gov/oefi/AMMP/>

²⁵ Due to cancellation of some AMMP awards, 2017 funds supporting AMMP projects now total \$9.94 million

²⁶ 2018 Alternative Manure Management Program Projects Selected for Award of Funds, CDFA.

DDRDP and other Greenhouse Gas Reduction Fund (GGRF) manure management programs address only about half of the dairy industry's methane emissions. No dairies have received funding to address the other half of the problem -- enteric (intestinal) emissions²⁹ -- which accounts for about half of the GHG emissions from California's dairies.^{30,31} A California Air Resources Board (CARB) working group has recommended research to determine emission factors and inventories for enteric emissions based on California-specific inputs.³²

REVIEW of 2017 DDRDP APPLICATIONS

Leadership Counsel requested relevant sections of successful applications from the 2017 round of funding for dairy digesters to assess the role SB 859 has had in project selection and to further our understanding of the links between digester investments and environmental justice, environmental quality, and disadvantaged communities. Through our review of the partial applications we identified several concerns and areas that require further inquiry. Some major issues include:

- Incomplete data available regarding baseline environmental impacts and projected environmental impacts across the dairy's or multiple dairies' operations
- Incomplete identification of potential adverse impacts of projects, especially given likely increased concentration of cows due to larger herd sizes and clustering of dairies near pipeline connection sites
- Lack of information regarding measures to mitigate potential environmental impacts

https://www.cdfa.ca.gov/oefi/AMMP/docs/2018_AMMP_ProjectsAwarded.pdf

²⁷ Due to cancellation of one grant, 2018 AMMP awards now account for \$21.29 million in commitments

²⁸ CDFA, 2019 Alternative Manure Management Program, Request for applications.

https://www.cdfa.ca.gov/oefi/AMMP/docs/2019_AMMP_RGA.pdf

²⁹ Enteric fermentation takes place in the digestive systems of ruminant animals, like cows. Microbial fermentation breaks down food into soluble products that can be utilized by the animal. Methane is produced as a by-product of the fermentation process. Methane is exhaled or belched by the animal.

³⁰ <https://www.arb.ca.gov/cc/inventory/slcp/slcp.htm>

³¹ Greenhouse Gas Emission Inventory - Query Tool for years 2000 to 2016 (11th Edition), CARB.

https://www.arb.ca.gov/app/ghg/2000_2016/ghg_sector.php

³² Dairy Research Prospectus to Achieve California's SB 1383 Climate Goals

https://arb.ca.gov/cc/dairy/dsg3/dsg3_draft_final_research_prospectus_9-26-18.pdf

- *Lack of demonstration that grant awards were based on criteria pollutant emission benefits*
- *Inadequate or unsubstantiated benefits claimed for disadvantaged communities*

We first identify broad concerns with respect to lack of transparency in DDRDP implementation. Then, we turn to an analysis of conformity with SB 859, specifically directives related to outreach, analysis of adverse impacts, mitigation, and prioritization based on criteria pollutant reductions. We then assess whether the CDFA and CARB’s characterization of several projects as beneficial to disadvantaged communities aligns with SB 859 and CARB’s own guidance with respect to projects characterized as beneficial to disadvantaged communities. Finally, we lay out areas that require further investigation regarding the CDFA program and investments in the dairy digester industry.

A. TRANSPARENCY

CDFA heavily redacted portions of 2017 DDRDP applications provided in response to Leadership Counsel’s PRA requests. Specifically, in response to our October 30, 2017 request, CDFA redacted application identification numbers, herd sizes, economic information related to applicants, and certain formulas, claiming that this information constituted protected trade secrets and was therefore protected from disclosure. Similarly, in response to our August 23, 2018 PRA request, CDFA redacted application identification numbers, site and location, plans and designs, herd sizes, volume of various commodities produced (e.g., milk, dairy manure, methane, biogas, etc.), certain calculation methods/processes, and financial and economic information. While Leadership Counsel requested scoring documents related to 2017 grant awards in a subsequent October 10, 2018 request (review of which is not a subject of this working paper), CDFA’s response has thus far been incomplete and subject to extensive redactions.

This lack of transparency prevents residents of impacted communities from evaluating relevant baseline environmental conditions and potential environmental impacts. The redactions also prevent a comprehensive and accurate analysis of potential impacts and relevant mitigation measures as required in SB 859.

While SB 859 requires identification of any net increases in “criteria pollutants, toxic air contaminants, and hazardous air pollutants; groundwater and surface water impacts; and truck traffic and odor” it is impossible to conduct the required analysis without accurate baseline inventories of current pollutants in each category. Similarly, applications lacked any information related to projected or potential growth in herd sizes of dairies or cumulative impacts associated with the clustering of dairies along gas pipelines and gas infrastructure.

Also, completely absent from the applications we reviewed was consideration of the baseline or projected discharges and emissions from the dairy as a whole. The applications focused instead on the emissions and discharges from the portion of the dairy included in the digester project. A partial analysis that looks solely at just the manure pit or pits that will be incorporated into the digester project ignores the relationship between the project and the dairy as a whole, including enteric emissions, discharges from land-applied

manure, increased diesel-powered equipment use, and emissions of volatile organic compounds (VOCs), dust, and other pollutants from dairy operations.

Accordingly, we will continue to pursue information from both state and local agencies to better understand the potential impacts of digester investments and will request that CDFA undertake a comprehensive review of its program to reveal the data necessary for the public to assess the likely or potential impacts of DDRDP investments.

B. OUTREACH

Applicants to the 2017 cycle of the DDRDP did not demonstrate sufficient outreach in areas impacted by the projects. At the very least, an adequate outreach program would include the identification of communities and direct outreach to their residents through mail and canvassing in cooperation with community organizers and leaders. None of the 2017 applicants conducted targeted outreach in any specific communities, relying instead on radio and social media advertising, and limited engagement with select organizations.

C. IMPACTS, MITIGATION, CLAIMED BENEFITS

Pursuant to SB 859, CDFA shall not grant funding to projects unless a project applicant has demonstrated that it has "determined potential adverse impacts of the project" and "committed to measures to mitigate impacts." We reviewed some of the impacts that were either identified or not identified in applications along with proposed mitigation measures, or lack thereof. We also investigate the claimed environmental benefits of the projects. We concentrate our analysis on local impacts as well as purported benefits related to air quality, water quality, truck traffic and odor.

1. AIR QUALITY

Our review revealed that all funded projects have the potential to worsen local and regional air quality. Based on information supplied in response to the PRA, some digester projects will increase air contamination through their operations. Additionally, we make the assumption, based on market trends and anecdotal information available to us that digester projects will support, facilitate, and even incentivize increased herd sizes and/or increased concentration of dairies. An expansion in and concentration of dairies, in turn, leads to concentrated and increased air emissions.

(a) Increased Air Emissions from Digester Operations: Electricity Generation, Diesel Exhaust, Flaring, Pipelines

Several of the funded digester projects will increase emission of criteria air pollutants including nitrogen oxides (NO_x) and particulate matter (PM), further degrading air quality in the region. NO_x contributes to the formation of PM_{2.5} and ground level ozone. Particulate matter can cause both short-term eye and respiratory irritation and can impact long-term lung function and exacerbate asthma and heart disease. Increased diesel engine exhaust directly tied to digester operations, flaring of excess methane at the

digester, and electricity generation by digesters will all emit criteria pollutants and toxic contaminants into the air.

CDFA awarded CalBio grants to install 11 digesters at dairies in Kings, Tulare, and Kern counties, every one of which has also been permitted for a stand-alone 1MW electricity generator "in the event an alternate methane destruction device is required."³³ According to CalBio in its multiple CDFA grant applications, "The LCFS and federal RIN credits are responsible for roughly 90% of revenues. The elimination of the LCFS would force projects to switch to electricity generation and increase the environmental impacts."³⁴ While CalBio's applications and projects anticipate electricity generation, the applications do not consider or quantify the potential greenhouse gas emissions or criteria air pollutant emissions that would accompany electricity generation.

Aligned Digester's (Aligned) application for a stand-alone digester designed to produce biogas predicts increased emissions of local criteria air pollutants (including NOx) due to flaring of 25% of the methane produced.³⁵ Aligned's application also acknowledges that its digester – designed to produce biogas - would lead to increased criteria and toxic air emissions from the transport of gas from the digester to a fueling station "with DOT approved tube trailers, hauled by class 8 tractors."³⁶

It also bears noting that there is anticipated methane leakage from pipelines and gathering lines associated with biomethane injection projects.³⁷ However, it is unclear whether or not that anticipated leakage is considered in CDFA's overall analysis of GHG impacts.

(b) Potential Air Impacts of Increased Herd Sizes and Concentration of Dairies

We are concerned that dairy operators will increase in size in anticipation of or following installation of a digester and/or concentrate near gas infrastructure. Increased herd sizes and increased concentration of dairies would lead to greater concentrations of cows which in turn would increase emissions associated with dairy operations including enteric emissions and increased criteria air emissions from increased feed, manure, dust, and diesel exhaust. None of the funded applications address the potential for increased herd

³³ California Department of Food and Agriculture, 2017 DDRDP Applications Submitted to CDFA, July 19, 2017, available at

https://www.cdfa.ca.gov/oeji/ddrdp/docs/2017DDRDP_ApplicationSubmissionInfo.pdf

³⁴ Leadership Counsel-PRA, p. 4564

³⁵ Leadership Counsel-PRA, p. 3

³⁶ Leadership Counsel-PRA, p. 10

³⁷ Leadership Counsel-PRA, p. 128

sizes, likely not only as a result of digester development, but also in accordance with industry trends.³⁸ Nor do they consider the likely concentration of dairies near gas interconnection sites.

Our experience in the San Joaquin Valley is that dairies increase in size prior to or following digester installation. The Open Sky Dairy, Maddox Dairy, and Bar 20 Dairy located in Fresno County are three examples of dairies that have increased herd size while adding digesters, and have thereby increased impacts due to expanded operations. In 2018, Fresno County approved Maddox Dairy's application for a dairy digester permit and a permit to increase its herd size by 700 cows from 3,309 to 4,000 -- a 24% increase.³⁹ Open Sky also requested a permit to increase the size of their dairy by 700 milking cows following installation of a dairy digester.⁴⁰ Bar 20 received approval for both a methane digester and an increase in herd size of up to 10,839 milking cows and 20,616 non-milking animals on 325 acres.⁴¹

We further anticipate that the impacts of increased herd size will be compounded by the biomethane cluster strategy which will locate these larger herds in closer proximity to one another. Applicants note the potential to double and triple the number of dairies at each cluster. For example, Mass applications highlight that project specifications allow expansion in all directions, to more than double its initial 10-digester size.⁴² Similarly, CalBio notes that one of its projects anchors a cluster of dairies that together will build biogas-to-pipeline infrastructure with capacity to process at least double the cluster's initial dairies' biogas volumes.⁴³ In addition, the application notes, the SoCalGas interconnect has capacity for approximately three times their capacity.⁴⁴

As discussed throughout this paper, there is a lack of available data in applications including a lack of data regarding baseline emissions, baseline herd sizes, projected herd sizes, or consideration of the dairy as a whole as opposed to an analysis of the digester operation as a stand-alone entity. This makes it impossible to assess the full and cumulative impacts of dairy digester installation at a dairy or across several dairies. However, based on our experience in the San Joaquin Valley and the applications themselves, we

³⁸ From 2012-17, although 15% of San Joaquin Valley dairies went out of business or switched to crops such as almonds and pistachios and total cows decreased by 3%. Average herd size at the remaining 1,012 operations rose by 14%. Fresno and Madera counties saw a 20% dairy failure or exit rate and a comparable increase in average herd size. This demonstrates that while San Joaquin Valley dairies are continually exiting the industry, existing dairies grow in size within existing farms (Data available at https://www.cdfa.ca.gov/dairy/dairystats_annual.html)

³⁹ Fresno County Planning Commission, Initial Study Application No. 7325 And Classified Conditional Use Permit Application No. 3582, April 12 2018, available at <http://www.co.fresno.ca.us/Home/ShowDocument?id=24036>

⁴⁰ <https://www.co.fresno.ca.us/home/showdocument?id=22725>

⁴¹ Fresno County Planning Commission's, Initial Study Application No. 7318 and Unclassified Conditional Use Permit Application No. 3580, available at <https://www.co.fresno.ca.us/home/showdocument?id=23880>

⁴² Leadership Counsel-PRA, p. 160

⁴³ Leadership Counsel-PRA, p. 4598

⁴⁴ Ibid.

anticipate that digester development will lead to both increased herd size and increased concentration of dairies which will impact air quality in the following ways:

- *Increased emissions from manure prior to the digestion process, in digester effluent following the digestion process, and from land applied manure*
- *Increased emissions from feed*
- *Increased diesel emissions due to expanded dairy operations, including increased off-road activities from manure spreaders, tractors, and other diesel-powered equipment*
- *Increased enteric emissions*

(c) No Mitigation of Air Quality Impacts

Applicants did not propose mitigation measures for air quality impacts. Maas Energy applications state that "the project will create no negative impacts to disadvantaged communities"⁴⁵ and all applicants, in fact, identified likely air quality benefits. However, those alleged benefits would not address the expected local impacts analyzed above.

Accordingly, since projects are likely to result in local impacts, none of the projects should have been characterized as beneficial to disadvantaged communities pursuant to the provision of in SB 859 which states that a project that results in localized impacts in disadvantaged communities shall not be considered to provide a benefit to disadvantaged communities. More than half of the projects that received funding in 2017, however, claimed that they benefit a disadvantaged community and were characterized as such by the state.

(d) Purported Air Quality Benefits

Digester applicants purport to provide several air quality benefits primarily due to reduced emissions from manure pits and reduced use of diesel. We question, however, whether actual emission reductions will be realized and in particular whether emissions reductions will benefit nearby communities.

As an aside, we challenge the assumptions that the benefits analysis relies on, specifically the assumption that vehicles will only transition from diesel to natural gas with the creation of biogas from the digester and the assumption that manure would remain in uncovered pits if no digester were put in place. There are in fact several options for manure management that actually prevent the creation of methane in the first place, and several incentives in place to facilitate conversion of diesel fleets to less polluting fuels.

Returning to the 2017 grant recipients, while one of the applicants shows data that covering one or more manure lagoons with the digester cover will reduce ammonia (NH₃) and VOC emission, our PRA revealed no information regarding the overall emissions from the dairy as a whole. This partial information provides very little insight as to the incremental benefit of the project on NH₃ or VOC emissions, and does not

⁴⁵ Leadership Counsel-PRA, p. 164

account for the likely increases in ammonia and VOCs from increased herd sizes and concentration of herds.

CalBio highlights potential air quality impacts from the covering of the lagoon. Purported air quality benefits include reduction in VOCs, NH₃, hydrogen sulfide (H₂S) as well as resulting reductions of sulfur oxide (SO_x) and particulate matter which are products of H₂S.⁴⁶ We question the purported benefits, however, especially considering our analysis above that digester investments will lead to increased concentration of cows and lack of information regarding either baseline or projected air emissions from the project dairies as a whole. We are especially interested in better understanding the purported H₂S reductions (and resulting SO_x and PM reductions) as there is little data and research supporting these projections.⁴⁷

CalBio also points to an upgraded irrigation system as a means to achieve reductions in ammonia.⁴⁸ Based on the applicant's description it appears that effluent will flow directly from the digester into the irrigation systems in real time. We question the feasibility of what appears to be reliance on continual irrigation as digester effluent is discharged from a digester. We look forward to speaking with project developers and Cdfa to understand the potential benefits and disadvantages of this technology for air quality and water quality.

According to the applicants, dairy digesters will marginally reduce the need for operation of diesel equipment on the farm. They claim that digester effluent contains less solids and more available nutrients than effluent flowing directly from manure lagoons, which in turn reduces the need to use diesel powered machinery to prepare fields for planting.⁴⁹ As discussed in further detail below, the basis for the claim of increased nutrient availability comes from a paper that was withdrawn in January 2016 because "research misconduct had occurred with respect to fabricating experimental data and falsifying data" and the determination "that the corresponding author did not declare an existing commercial conflict of interest when submitting the paper to the peer-reviewed journal."^{50,51} As discussed throughout this paper, we anticipate that expanded dairy operations will accompany digester development and that there may actually be an increase in use of farm equipment.

Conversion of Diesel Trucks to CNG Trucks

⁴⁶ Leadership Counsel-PRA, p. 119

⁴⁷ Leadership Counsel-PRA, pp. 115-119; 124-25

⁴⁸ Leadership Counsel-PRA, p. 118

⁴⁹ Leadership Counsel-PRA, p. 117

⁵⁰ Doughton, Sandi. "WSU seeks retraction, says researcher faked poop-to-power study data," *The Seattle Times*. 15 Jan 2016. Available at <https://www.seattletimes.com/seattle-news/science/ws-u-seeks-retraction-says-researcher-faked-manure-study-data/>

⁵¹ Wiley Online Library, 16 June 2011, <https://onlinelibrary.wiley.com/doi/abs/10.1002/clen.201000316>

The vast majority of purported air quality improvements would come through changes in vehicle fleets from diesel to biomethane vehicle fuel.⁵² There is no guarantee, however, that gas pumped into the natural gas pipeline will be used as vehicle fuel, and much less a guarantee that any air quality improvements that result from shifting from diesel to natural gas will occur in the San Joaquin Valley. Few of CalBio's applications include any commitments or even letters demonstrating an intention to procure natural gas from the CalBio projects. The one exception to this deficiency is an articulated interest on the part of Hollandia Dairy to procure biomethane from the Hollandia dairy cluster,⁵³ presumably for its fleet in Southern California which distributes milk from its processing facility in San Marcos.⁵⁴

Similarly, Maas includes letters from potential purchasers of biomethane, yet none of these letters provides an actual commitment to purchase; they simply express an intent to consider conversion to natural gas vehicles and procurement from the Calgren gas facility. Each letter commits only to consider procuring gas from the project and/or includes a statement that "this document establishes mutual intent but is not a binding contract and does not require either party to perform any of the terms contemplated herein."⁵⁵ Furthermore, it is difficult to discern how much biogas from Maas's projects will fuel the Calgren ethanol refining and how much - if any - will be reserved for diesel displacing vehicle fuel. Maas Energy's applications state that biogas will replace natural gas to power the ethanol refinery.⁵⁶ The applications also state that the refinery's demand outpaces likely production of biogas from the cluster, and so the refinery could utilize all of the biogas should the anticipated fueling station project and contracts for vehicle fuel be delayed or interrupted.⁵⁷ Despite these uncertainties, Maas provides detailed assumptions of fleet conversion from diesel to biomethane as the basis for its projects' anticipated emission reduction benefits.⁵⁸

2. WATER QUALITY

Applicants do not acknowledge any increased groundwater or surface water discharges as a result of the digester projects. However, the likely increases to herd sizes that would accompany digester projects, and the likely increased concentration of dairies to support dairy cluster projects would threaten to increase discharges to groundwater. As noted in applications, 96% of nitrate contamination of groundwater comes

⁵² Leadership Counsel-PRA, pp. 115-17

⁵³ Leadership Counsel PRA pp 4636-7 ("Hollandia Dairy is interested in procuring its RNG from the Dairy Renewable Natural Gas Project being proposed by Wreden Ranch, Hollandia, and CLOverdale Dairy ...").

⁵⁴ <https://hollandiadairy.com/dairy-farming>

⁵⁵ Leadership Counsel-PRA p. 1333-35

⁵⁶ Leadership Counsel-PRA, pp. 157-58, 170

⁵⁷ Leadership Counsel-PRA, pp. 158, 170

⁵⁸ Leadership Counsel-PRA, p. 457

from nitrogen applied to cropland, with animal manure making up 33% of that land applied nitrogen.⁵⁹ Increased herd sizes will increase manure production and, in turn, manure application and increased leaching of nitrates to groundwater. This trend could similarly threaten increased impacts to surface water.

Purported water quality benefits.

Maas Energy relies on research - that had been discredited due to inadequate data and inappropriate industry influence - to argue that the use of nitrogen-rich solid byproduct of digesters – digestate – as compared to undigested manure improves water quality. The paper claimed that digestate produces irrigation water with more plant-available nitrogen and, as a result, manure is consumed more readily by crops.⁶⁰ The paper was withdrawn in January 2016,⁶¹ because "research misconduct had occurred with respect to fabricating experimental data and falsifying data" and the determination "that the corresponding author did not declare an existing commercial conflict of interest when submitting the paper to the peer-reviewed journal."⁶² Nonetheless, it has found its way into a second academic paper, *Anaerobic Co-digestion on Dairies in Washington State*, that Aligned relied on in its application. CalBio also states in its applications that "the form of the nitrogen is more available for crop uptake thus reducing the loss of nutrients down into the soil"⁶³ but provides no data to support that assertion.

⁵⁹ Harter, T., et al. 2012. *Addressing Nitrate in California's Drinking Water with a Focus on Tulare Lake Basin and Salinas Valley Groundwater. Report for the State Water Resources Control Board Report to the Legislature.* Center for Watershed Sciences, University of California, Davis., p 3.

⁶⁰ Leadership Counsel-PRA, p. 2339

⁶¹ Doughton, Sandi. "WSU seeks retraction, says researcher faked poop-to-power study data," *The Seattle Times*. 15 Jan 2016. Available at. <https://www.seattletimes.com/seattle-news/science/ws-su-seeks-retraction-says-researcher-faked-manure-study-data/>

⁶² Wiley Online Library, 16 June 2011. Available at <https://onlinelibrary.wiley.com/doi/abs/10.1002/clen.201000316>

⁶³ Leadership Counsel-PRA, p. 118



Applicants also point to the lining of dairy lagoons as evidence of future water quality improvements. While we are pleased that dairy lagoons will be lined there is no discussion of the existing contamination in soils that line currently unlined lagoons, the ongoing operation of unlined lagoons, or the timeline within which families and neighborhoods will see any benefit from lagoon lining. Furthermore, any benefits to groundwater quality from lining lagoons should be weighed against potential increases in manure application to cropland as a result of increased herd sizes and increased concentration of dairy operations.

3. TRUCK TRAFFIC, ODOR, and OTHER IMPACTS

(a) Truck Traffic

The Aligned digester project notes that transport of gas to fueling stations will require increased truck trips.⁶⁴ Additionally, likely growth in herd would increase truck traffic at all dairies. One applicant included information regarding the potential benefits of introducing other feedstocks into the digestion process to increase gas production. Such activity would also increase truck traffic.⁶⁵

(b) Odor

Similar to benefits claimed by applicants with respect to air emissions, digester developers point to the reduced off-gassing of ammonia and hydrogen sulfides from lagoons as a means of reducing odor. As noted above, however, the applications do not discuss the share of total odor from the dairy that come from the lagoons nor do applicants consider the odor impacts of likely dairy expansion and clustering. We question the actual impact digesters will have on odor reduction and will seek more information to better understand the role of manure lagoons in producing odors in the context of an entire dairy as well as the likely odor impacts of further concentration of cows, silage, and manure.

(c) Other Impacts

⁶⁴ Leadership Counsel-PRA, p. 3

⁶⁵ Leadership Counsel-PRA, p. 227

Maas Energy is apparently considering co-digestion, the process of adding starchy or fatty waste materials to manure in an anaerobic digester to increase gas production, at its dairy cluster. As noted in supportive documentation submitted with Maas Energy's applications, "a small amount of material (roughly one part by volume co-digestion substrate to six parts manure) added can increase gas production by 300 to 400 percent."⁶⁶ The introduction of co-digestion threatens several impacts including increased traffic, odor, and to groundwater.⁶⁷

D. PRIORITIZATION OF PROJECTS BASED ON CRITERIA POLLUTANT EMISSION BENEFITS

CDFA's Prioritization of projects based on criteria pollutant emission benefits of a project – as required in SB 859⁶⁸ - was not evident in our review of applications, which did not include a review of scoring or application analysis. This issue merits further inquiry and investigation as we review documents related to the scoring of 2017 and 2018 applications.

E. PROJECTS INCORRECTLY CLASSIFIED AS BENEFITING DISADVANTAGED COMMUNITIES

The California Climate Investments Annual Report to the Legislature⁶⁹ classifies 10 of the successful 2017 applications as benefiting a priority population. In all 10 cases, the total amount of GGRF funds allocated to each project are counted as funds that benefit priority populations (a total of \$16.3 million). CARB, as noted in its funding guidelines to administering agencies for Cap and Trade Auction proceeds, requires that investments that are classified as benefiting disadvantaged

⁶⁶ Ibid.

⁶⁷ Leadership Counsel-PRA, p. 81

⁶⁸ SB-859 Public resources: greenhouse gas emissions and biomass, Government Code Section 16428.86

https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=20152016oSB859

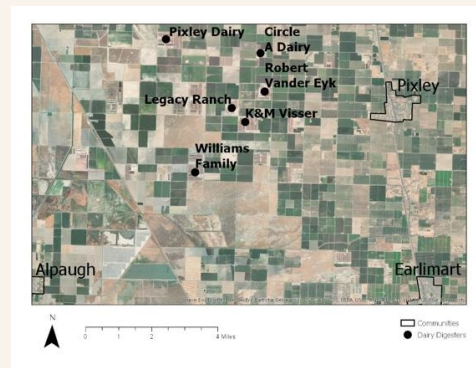
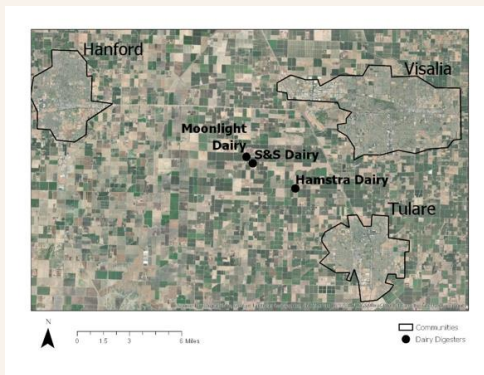
⁶⁹ California Climate Investments, 2017 Annual Report investment list, <http://www.caclimateinvestments.ca.gov/annual-report/>

communities (including those located within disadvantaged communities) provide a direct, meaningful, and assured benefit to one or more disadvantaged communities.⁷⁰

We question the classification of any of the projects as beneficial to disadvantaged communities or priority populations. Purported benefits are aspirational or insignificant especially with respect to their impact to disadvantaged communities, there is insufficient geographic nexus between the investment and the supposedly benefited community or population, and the projects threaten direct and / or indirect negative impact on disadvantaged communities.

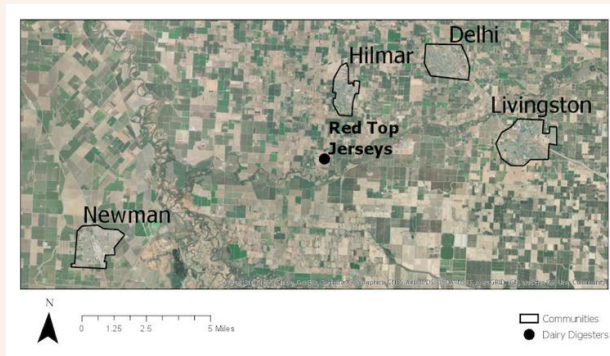
Digesters counted as beneficial to priority populations are distant from nearby population centers – between 1.8 and 6.5 miles from the nearest towns. The figures below demonstrate the geographic relationship between dairy digesters characterized as beneficial to disadvantaged communities and the closest population center. The lack of proximity between the project site and the nearest community alone should raise questions as to the true benefit a project may have and is at odds with CARB’s own guidance with respect characterizing projects as beneficial to disadvantaged communities.⁷¹

Proximity of Dairy Digesters to Disadvantaged Communities



⁷⁰ Funding Guidelines Supplement for FY 2016-17 Funds Cap-and-Trade Auction Proceeds, December 30, 2016, pg 8 (available at <https://ww2.arb.ca.gov/resources/documents/cci-funding-guidelines-administering-agencies>, accessed on January 30, 2019)

⁷¹ Ibid.



As discussed above, several of the digester projects classified as beneficial to disadvantaged communities threaten both direct and indirect negative impacts on disadvantaged communities which should disqualify them from consideration as projects that are beneficial to priority populations. Additionally, we also question the significance and validity of several of the environmental benefits digester developers claimed in their applications.

Each year the California Air Resources Board (CARB) provides a report to the Legislature on California Climate Investments that includes a list of funded projects (project list). The project list identifies which investments are considered beneficial to disadvantaged communities pursuant to statutory mandates and CARB's guidance. It also provides a short description of those benefits. The project list included in the 2018 report to the Legislature notes that Maas Energy's digesters will benefit disadvantaged communities but doesn't include any geographic marker (e.g. census tract information) as a basis for the claim.⁷² The purported benefits are expansion of a CNG fueling station and CNG Vehicle Fleet Expansion. However, as noted above, there is no guarantee that trucks will convert from diesel to CNG in response to the digester projects or if the facility will even produce vehicle fuel for a fueling station as opposed to supplying energy to the ethanol refinery. Additionally, while reduced diesel use is beneficial to the state as a whole, it is also not clear what particular community or communities would benefit from the conversion – if any – from diesel to CNG use attributable to these projects.

The project list also notes water conservation measures as a benefit of Mass Energy's digesters but does not discuss how such conservation would benefit any priority populations in particular and does not consider the increased water use that would accompany increased herd sizes or greater concentration of dairies. As noted above, water quality improvements from lined lagoons should be weighed against the likely increase in land-applied manure should dairies grow in size or should digester clusters catalyze further concentration of dairies in the area. Finally, the project list identifies odor reduction a benefit but does not specify who would benefit nor does it quantify odor reduction in any way. As noted above, an analysis of odor focused solely on manure lagoons rather than the dairy as a whole fails to assess the extent to which digesters will have a significant impact on odor.

⁷² California Climate Investments, 2018 Annual Report and accompanying list of California climate investments, available at <http://www.caclimateinvestments.ca.gov/annual-report/>;

The project list notes that some of CalBio’s projects will benefit disadvantaged communities but includes no geographic marker to describe which communities will actually receive a benefit. The purported benefits, according to the project list, include “clustering and providing small dairy access to pipeline access.” We don’t see how this benefits disadvantaged communities and, to the contrary, are concerned that such clustering will further concentrate dairies, cows, and the emissions and discharges that accompany both. The project list also notes that the CalBio projects will expand the conversion of truck fleets to near-zero emissions. As discussed above, there is no guarantee that biogas developed at CalBio’s digesters will in any way benefit nearby communities. We’ve discussed (and questioned) other benefits identified in the project list throughout this paper: while a lined manure pit will have some impacts on nitrate discharges to groundwater, there is no consideration of likely increases in land-applied manure; while a covered lagoon will reduce ammonia emissions, it is unclear whether those reductions will be significant given dairy-wide emissions, and, furthermore, any emission reduction should be weighed against potential increased ammonia emissions from expanded and concentrated dairy operations.

Aligned’s digester project is also characterized as benefiting disadvantaged communities yet several of the benefits identified – like other proposed digester projects – will have no measurable benefits in disadvantaged communities. Several of the purported benefits are aspirational, e.g., potential decrease in weed seed; several are based on incomplete analyses of environmental impacts of the dairy as a whole, e.g., reduced odor and groundwater impacts; and some are not necessarily beneficial, such as “fertilizer product.” Furthermore, a review of a web page discussing the digester project notes that wastewater will flow from the digester lagoon to the original (presumably unlined) wastewater lagoon where it will await land application.⁷³ It is unclear how this dairy would have any even marginal benefit to groundwater.

CONCLUSION and AREAS FOR FURTHER INQUIRY

Our review of partial applications for CDFA’s DDRDP 2017 grant awards furthered our understanding of the relationship between digesters and environmental quality but unearthed even more questions. We look forward to working with state agencies, digester developers, and other stakeholders to better understand the full environmental picture associated with dairy digestion and related changes to individual dairies and the dairy industry, the suite of subsidies available to digester developers, the short and long term financing of digester development and operation, and the relationship between dairy digestion and state energy policy. Some specific areas for further inquiry include:

- *Baseline herd sizes and baseline pollution levels from the dairy as whole*
- *Projected changes to herd sizes and dairy operations following installation of a digester and the extent to which mechanisms exist to track those changes*

⁷³ <https://www.alignedigesters.com/single-post/Proposed-Anaerobic-Digester-For-Red-Top-Jerseys-Dairy> (accessed on 1/29/19)

- *CDFA's scoring process including the extent to which projects are prioritized according to their criteria air emissions benefits*
- *Baseline inventories of common carrier supply and demand for CNG by vehicle class*
- *The extent to which mechanisms exist to track the amount of diesel displaced as a direct result of the DDRDP*
- *Other state and federal grants and loans already awarded for digester development and operation, and federal and state programs in place designed to award additional funds for dairy digester development and operations*
- *The extent to which funding for digesters classified as matching funds for GGRF investments is public or private*
- *The extent to which the PUC took into consideration community and environmental health impacts in the awards process for \$319 million in "infrastructure investments and operation expenses over the next 20 years" at 45 dairies in six hubs⁷⁴*
- *The potential health and safety threats of gas collection lines associated with dairy digesters and digester clusters*
- *The environmental benefits and impacts of the Alternative Manure Management Program and the Healthy Soils Initiative*
- *The role of Low Carbon Fuel Standard credits in dairy digester development, operation, and financing*
- *The short and long term economic feasibility and economic efficiency of dairy digesters*
- *Potential emissions from flaring and electricity generation at existing and planned digesters*
- *Air emissions profiles for ammonia, hydrogen sulfides, VOCs, TACs, HAPs, and NOx from all sources on dairies*
- *Baseline inventories of synthetic fertilizer use by dairies and amounts projected to be replaced by digestate*
- *The impact of digester operations on land application of manure and nitrate discharges to groundwater and surface water*

⁷⁴ Decision Establishing Implementation and Selection Framework to Implement The Dairy Biomethane Pilots Required By Senate Bill 1383, CPUC.

<http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M201/K352/201352373.PDF>

- *The extent to which co-digestion might be employed at dairy digesters and the potential impacts of this expansion in operations*
- *The environmental impacts of 2018-funded projects*

We look forward to gaining a greater understanding of California's dairy digester programs and will continue to update this working paper as we access additional information.