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June 14, 2021

Liane M. Randolph
Chair
California Air Resources Board
1001 I Street
Sacramento, CA 95812

(Comment submitted electronically via comment portal)

RE: Draft Analysis of Progress toward Achieving the 2030 Dairy and Livestock Sector Methane Emissions Target

Dear Chair Randolph,

On behalf of CleanFuture, this comment provides a substantive policy recommendation regarding the recently released Analysis of Progress toward Achieving the 2030 Dairy and Livestock Sector Methane Emissions Target ("Progress Report"). The comment recognizes and applauds the progress that the California Air Resources Board ("CARB") has made in achieving methane reductions in the dairy and livestock sector primarily through the Low Carbon Fuel Standard ("LCFS"). However, the comment strongly recommends that CARB urgently respond to the Progress Report's finding that the state's current trajectory of methane reduction puts the state on track to fall dramatically short of its methane reduction goals in the sector. To respond to this harsh reality, CARB must make necessary course corrections to meet the SB 1383 requirements. In particular, CleanFuture encourages CARB to fully leverage the LCFS to capture and convert methane to electricity to power California's rapidly growing electric vehicle ("EV") fleet with in-state sub-zero carbon intensity ("CI") power generated by the state's small and medium sized dairies ("Smaller Dairies").

As stated in the report, this LCFS solution with biogas electricity represents the lowest-cost option of all available alternatives which range from $0.7 billion to $3.7 billion. It also represents the only economically viable solution for small and medium sized dairies. The Progress Report appears to dismiss this low-cost solution out of concern that it would result in on-site criteria pollutant emissions. CleanFuture recognizes the importance of controlling criteria pollutants and transitioning to the cleanest commercially available technology and has developed its recommendations to meet this objective. The comment proposes the establishment of a dynamic efficiency standard to enable CARB to work with the dairy sector

401 Spring Street, Suite 205
Nevada City, CA 95959
(530)264-7157
FUELANDCARBONLAW.COM

to fulfill SB 1383 methane reduction requirements, provide economically viable options for small and medium sized dairies, and to strictly control criteria pollutant emissions.

CleanFuture and Methane Reduction at Small Dairies

Through its Pathway to Savings™ Rewards program, CleanFuture is the LCFS credit generator for many of the largest EV fleets in California. On behalf of these fleets, CleanFuture serves as the LCFS regulated entity for thousands of EV assets ranging from light-, medium-, and heavy-duty EVs, including transport and goods movement applications. To increase credit generation by its customers as authorized by the regulation, CleanFuture is leading the effort to establish new LCFS pathways utilizing low CI power produced by small generators (1 MW and lower) located on Smaller Dairies. These projects provide real-world methane reductions on Smaller Dairies. The specific methane reductions are reflected by the CI score for the pathways that CARB certifies. The resulting credit value will provide additional funds back to:

- Smaller Dairies to incentivize methane capture and conversion, and,
- Fleet operators that can be re-invested in more electric vehicles.

Through the establishment of LCFS Guidance 19-06, CARB has established a CI adjustment factor with an efficiency standard that generators operated on Smaller Dairies cannot meet. Due to the adjustment factor, the CI scores of the dairy sourced methane pathways are discounted and fewer LCFS credits can be generated. The efficiency standard therefore results in less revenues for the Smaller Dairies, less investment dollars for the EV fleet operators, and less on-dairy methane reductions. It also severely limits the number of additional projects that can be implemented, thereby reducing the effectiveness of CARB's methane reduction strategy and contributing to the substantial shortfall in methane reduction that is documented by the Progress Report.

SB 1383

The short-lived climate pollutants ("SLCP") statute, SB 1383, provides an important statutory framework for considering the proposed efficiency standard. Because methane released from California's leading dairy industry is the primary source of anthropogenic SLCP emissions, controlling dairy emissions is a central component of the SLCP Strategy that CARB developed in response to SB 1383. Importantly, because of the crucial economic importance of California's dairy industry and the substantial risk of greenhouse gas ("GHG") emissions leakage if the dairy industry migrates away from California to reduce its regulatory costs, SB 1383 contained multiple provisions to maximize incentive-based solutions. The following aspects of SB 1383 are relevant in evaluating the wisdom of an efficiency standard that restricts the most cost-effective methane reductions available in the sector:

- The legislative finding that reducing SLCP emissions "can have an immediate beneficial impact on climate change and on public health." SB 1383(1)(a)(4).
- The requirement that CARB: "(4) Incorporate and prioritize, as appropriate, measures and actions that provide the following cobenefits: (A) Job growth and local economic

benefits in the statute. (B) Public health benefits. (C) Potential for new innovation in technology, energy, and resource management practices." Cal. H&S §39730.5(a)(4).

- The requirement that SLCP regulations in the dairy sector not be implemented until January 1, 2024, and not until CARB in consultation with the Department of Food and Agriculture ("CDFA") determines that the regulations: are technologically feasible and cost effective, that markets exist for the products generated including biomethane, that the measures minimize the potential for leakage; the analysis considers access to common carrier pipelines; and that, "The regulations include an evaluation of the achievements made by incentive-based programs." Cal. H&S §39730.7(b)(1) and §39730.7(b)(4).

Applying SB 1383's provisions to the low CI to EV projects that CleanFuture is pursuing in the dairy sector highlights the importance of the following factors:

- The potential beneficial impacts on climate change and public health that SLCP reductions from low CI to EV projects on Smaller Dairies can provide,
- The foreseeable impacts of the proposed efficiency standard on job growth, economic benefits, public health benefits, and technological innovation,
- The technological feasibility and cost-effectiveness of the proposed efficiency standard,
- Whether Smaller Dairies can access to common carrier pipelines for biomethane, and,
- The optimal policy design of an incentive-based program, the LCFS, to reduce dairy methane emissions from Smaller Dairies.

Setting the Appropriate Standard

From a policy design standpoint, it is appropriate to set an efficiency standard based on what can feasibly be achieved based on existing and anticipated technologies that can be cost-effectively implemented on Smaller Dairies in 2021, and in future years. An efficiency standard for a particular year that cannot be met by a commercially available technology does not change market behavior and has the effect of a discount or penalty.

CleanFuture is working closely with Maas Energy Works in establishing low CI to EV projects and pathways on Smaller Dairies. The comment of Maas Energy Works that was provided on November 5, 2020 in response to the October 2020 staff workshop to discuss potential regulation revisions provides a comprehensive analysis of the technologies CARB utilized to establish the efficiency standard and the current state of commercially available technologies for Smaller Dairies and is attached for reference. **Exhibit A**

The salient points from the Maas Energy Works comment regarding technological feasibility, and cost-effectiveness are:

- Utility-scale combined cycle gas turbine ("CCGT") plants do not provide any foreseeable feasible use for biomethane from Smaller Dairies and therefore do not provide a relevant point of reference for this efficiency standard,

- Solid oxide fuel cells are not commercially available for use at Smaller Dairies and are cost-prohibitive and therefore will not provide a relevant reference point for an efficiency standard for at least five years,
- The benchmark efficiency standard at 37% is reasonable until such time as a California dairy has demonstrated real-world efficiencies with comparable -uptime, for the 24-month period for a certified Tier 2 LCFS pathway. Then that demonstrated efficiency could become the new standard thereafter with a phase-in period or small-digester exemption.

CARB must recognize that biogas-fueled small-scale distributed energy resources operate at lower efficiencies than utility-scale generators fueled on natural gas, this difference is recognized in generator OEM's technical data sheets. Furthermore, the use of selective catalytic reduction (SCR) in the necessary emission controls on reciprocating engine generators also reduces overall efficiency. Therefore, CARB's efficiency benchmark in LCFS Guidance 19-06 is not achievable for Smaller Dairies. Real-world open-source data is available from 319 distribution energy resource of comparable size from New York State Energy Research and Development Authority (NYSERDA) with electrical efficiencies as summarized in Table 1 and also attached for reference. **Exhibit B**

Table 1: Distributed Energy Resources – Data from New York State Project Performance Dashboard

Category	Electric Efficiency %hhv	Sample Size	link to portfolio
Anaerobic Digester Gas (ADG) Projects	25.4%	39	https://der.nyserda.ny.gov/reports/view/portfolio/?p=bmib49SL
Combined Heat and Power (CHP) Projects	22.6%	231	https://der.nyserda.ny.gov/reports/view/portfolio/?p=dTibACCN
Fuel Cell Projects	39.9%	49	https://der.nyserda.ny.gov/reports/view/portfolio/?p=bj8lAnXp
		319	

In addition to considering commercially available technologies, SB 1383 establishes that access to a common carrier pipeline is also a crucial factor. Currently, a Smaller Dairy cannot feasibly interconnect to the common carrier pipeline unless it happens to be located near the one large dairy operational pipeline cluster. The PG&E Biomethane website states that estimated pipeline interconnection costs range from two to five million dollars.[1] Even with the maximum possible reimbursement under AB 2313, a cost of one million dollars precludes pipeline interconnection for Smaller Dairies. Therefore, it is presently only through the use of on-farm stationary generators that Smaller Dairies can feasibly expand biomethane capture and conversion and

[1] Pacific Gas and Electric, Biomethane frequently asked questions, at https://www.pge.com/en_US/for-our-business-partners/interconnection-renewables/interconnections-renewables/biomethane-faq.page?ctx=business

reduce GHG emissions. By imposing an impossible to meet efficiency standard, CARB is limiting its own effectiveness in reducing methane emissions.

Impact on EV Market Expansion

To achieve its GHG and criteria pollutant goals, California has made the expansion of in-state zero emission vehicles (ZEVs) including battery electric vehicles to be a top priority. This has been reflected by multiple statutes, Executive Orders, and policies in the state including SB 498. While CARB clearly does not intend by LCFS Guidance 19-06 to slow the expansion of ZEVs in California, it should be recognized that this is an unintended consequence of the proposed efficiency standard as applied to Smaller Dairies. This is illustrated by the attached supporting letter (**Exhibit C**) from Twin Rivers Unified School District which states:

> *"The proposed approach would reduce LCFS credit revenue from dairy-produced biogas electricity that we plan to use in our electric buses. Fewer credits directly translates to reduced funds to apply towards our transition to electric school buses."*

Recommended Escalating Efficiency Standard

Based on the requirements of SB 1383, the importance of ZEVs to the California's criteria pollutant and GHG reduction goals, and the current state of technological feasibility, cost effectiveness, and pipeline interconnection, it is appropriate for CARB to modify LCFS Guidance 19-06 to set an escalating efficiency standard that is feasible for Smaller Dairies to meet. This standard should be applied to generators that operate at 1 MW or lesser capacity. The efficiency standard should escalate such that it does not penalize existing assets that can provide immediate GHG and methane reduction benefits, but instead ratchets up efficiency on an annual basis based on the date of pathway certification and thereby incentivize progressively more efficient and cleaner generation equipment. By setting an escalating efficiency standard, CARB will send a clear market signal to the industry that to the extent that new generating assets are being acquired, these new assets should meet or exceed the efficiency standard for the year the assets are deployed. The efficiency standard should be based on the best available data from the California Energy Commission as cited in the Maas Energy Works comment, best available real-world open-source data from NYSERDA, and should be linked to commercially available technologies deployed in the early years and CARB's aggressive efficiency targets in years later years as proven with commercial deployments. The following escalating efficiency standard with market-based reference points is recommended:

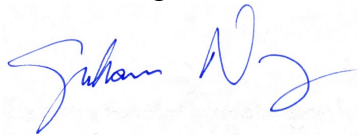
- Pathway certified by January 1, 2024- Efficiency Standard = 22.5%
- Pathway certified by January 1, 2025- Efficiency Standard = 25%
- Pathway certified by January 1, 2026- Efficiency Standard = 30%
- Pathway certified by January 1, 2028- Efficiency Standard = 35%
- Pathway certified by January 1, 2030- Efficiency Standard = 40%

This standard would send the strong market signal that CARB intends, support the rapid deployment and purchase of high efficiency generators, and maximize methane emission

reductions from Smaller Dairies. It would also provide a performance improvement in terms of methane reduction that is clearly necessary based on the findings of the Progress Report.

Thank you for your consideration of these comments and the CleanFuture recommendation. Please advise if any further input on these issues would be constructive.

Best Regards,



Graham Noyes

Enclosures:
Exhibit A: Maas Energy Works LCFS comment dated November 5, 2020
Exhibit B: Distributed Energy Resources Performance Dashboard
Exhibit C: Twin Rivers Unified School District letter dated May 31, 2019

cc: Rajinder Sahota, Division Chief, Industrial Strategies Division
Cheryl Laskowski, Chief, Transportation Fuels Branch
John Thornton, President, CleanFuture, Inc.

Exhibit A

3711 Meadow View Drive
Suite 100
Redding, CA 96003
www.maasenergy.com

November 5, 2020

Daryl Maas, CEO
Maas Energy Works, Inc.
3711 Meadow View Dr. Ste 100
Redding, CA 96002

California Air Resources Board
Attn: Rajinder Sahota & Jim Duffy
1001 I Street
Sacramento, CA 95812

RE: Comment in Response to Implementation of Low Carbon Fuel Standard (LCFS) Guidance 19-06: Efficiency Standard for Dairy Biogas to Electricity Pathways

Dear Ms. Sahota and Mr. Duffy,

Maas Energy Works, Inc. ("Maas") appreciates the opportunity to provide written comments in response to the public LCFS workshop held by CARB Staff on 10/14/2020. Maas is an owner and developer of dairy biogas to electricity and renewable natural gas projects in California. We are thankful for Staff's efforts enabling carbon-negative electricity from dairy digesters to be used for electric vehicle charging under the Low Carbon Fuel Standard. Our comments herein are in reference to the May 2019 Low Carbon Fuel Standard (LCFS) Guidance 19-06: Determining Carbon Intensity of Dairy and Swine Manure Biogas to Electricity Pathways, specifically the implementation of a CI adjustment factor for project specific electrical efficiency. Maas operates dairy digester generators with nearly every digester type in seven separate jurisdictional air authorities in multiple states. We have experimented with a variety of technologies, and this letter provides suggestions based on that experience.

Per conversations with CARB Staff, we support the adoption of a "benchmark efficiency" standard, or similar incentive, to encourage the industry to employ the cleanest, most efficient technologies available to beneficially use dairy methane emissions. We continue to be surprised, however, at CARB Staff's selection of a 50% efficiency standard for implementation into the LCFS Regulation since this level has not been achieved by any existing biogas technologies. We worry that placing too high of an efficiency standard will result in substantially reduced LCFS credits to most or all dairies that participate, and thus fewer projects built—especially on smaller dairies.

The 19-06 guidance document states the 50% efficiency standard is reasonable based on the "average efficiency of NG-derived electricity at California Power Plants…". However the document referenced, a California Energy Commission (CEC) staff paper "Thermal Efficiency of Natural Gas-Fired Generation in California, 2017 Update" demonstrates that the California average efficiency is not 50%, but rather is just 44% (see Table 3 from the CEC report below: (3,412 BTU/kwh divided by State Total heat rate of 7,761 BTU equals 44%).

Exhibit A

Table 3: California Natural Gas-Fired Power Plant Summary Statistics for 2016

Category	Capacity (MW)	Share of Capacity	Energy (GWh)	Share of Energy	Capacity Factor	Heat Rate (Btu/KWh)
State Total (All Types)	44,224	100.0%	105,820	100.0%	25.4%	8,680
State Total (w/o Cogeneration)	38,388	N/A	80,659	N/A	22.3%	7,761
Combined-Cycle	20,026	45.3%	71,172	67.2%	40.5%	7,338
Aging	8,636	19.5%	3,892	3.7%	3.9%	12,312
Peaking	8,898	20.1%	3,898	3.7%	5.0%	10,269
Cogeneration	5,836	13.2%	25,161	23.8%	48.7%	11,627
Miscellaneous	828	1.9%	1,697	1.6%	23.3%	9,296

Source: QFER CEC-1304 Power Plant Data Reporting.

The most efficient technology on in the CEC report was Combined Cycle Gas Turbine, or "CCGT." This technology achieved only 46.5% efficiency. Putting aside the fact that 46.5% is less than 50%, it is highly questionable whether performance achieved by a CCGT is therefore achievable by any dairy digester. As page 6 of the referenced CEC report makes clear, the average size of a California CCGT is 571 MW (the report says California has 35 CCGT's, with a combined 20,000+ MW). In comparison, the average digester engine installed in California is about 0.8 MW. In addition to being about 700 times larger than a digester generator unit, a CCGT runs on pipeline natural gas that is already purified, cleaned, dried, compressed, and delivered on a steady and continuously available basis. None of these factors apply to a dairy digester generator, and thus the "theoretical maximum" conversion to electricity from a digester biogas generator is much less than a pipeline-fed, utility-scale CCGT.

Other than the CCGT technology, all remaining natural gas generation technologies listed on the CEC report are in fact quite similar to digesters in size and employment, such as Peaking systems. These technologies have efficiencies that range from 27.7% to 36.7% (see again Table 3 from CEC report, above). Consequently, a benchmark efficiency standard of just 37% would exceed the efficiency of every installed NG technology category in the state, other than CCGT. Thus, a 37% benchmark efficiency standard would already meet CARB's goal in providing an incentive to increase efficiencies of all categories of biogas generation equipment above the industry average for natural gas.

The 19-06 guidance also states that solid oxide fuel cells can achieve 50%+ efficiency. To document this statement, 19-06 quotes two scholarly articles from Sciencedirect.com. Both articles are pure research into theoretical performance of systems to produce mathematic models showing high efficiency. They are not case studies of any deployed technology and they do not include any field data or even bench-scale tests of experimental equipment. The references are replete with warnings about the challenges faced in actually deploying these future, theoretical systems. It is telling that no real-world biogas fuel cells examples are available to be cited by 19-06. In practical experience, fuel cells have been tried unsuccessfully at two major California biogas sites: City of Tulare Wastewater Treatment Plant and Inland Empire Utilities District digester. Both were built at great cost and later abandoned. No dairy digester is known anywhere in the country to have successfully deployed commercial fuel cells. The 19-06 cites these studies to say 50% efficiency is achievable, but the introduction to the second article conversely states:

"Although the SOFC-gas turbine cycle was first proposed over 30 years ago, the

Exhibit A

> *technology has not yet left the demonstration phase [12,29,30]. Moreover, no system has demonstrated the record level efficiencies predicted from system calculations…"*

Just so. CARB and Air District benchmarks are traditionally based on technologies that meet demonstration standards such as "Achieved in Practice" or "Best Available Control" or result in some recognized technology demonstration, often overseen by CEC or other agencies to show real world data. Biogas fuel cells have met none of these tests, even in highly controlled environments, and 19-06 does not even claim otherwise.

Farmers' willingness to install digesters depends on their confidence that the associated technologies are proven and can be reliably maintained in a farm setting. The vast majority of small and medium sized farms cannot afford a fuel cell, which in many cases costs more than the dairy facilities themselves. American dairies, almost without exception, have used lean burn internal combustion engines with air-district compliant emission catalysts, which operate at 30-35% efficiency under the best possible real-world circumstances. Thus the 50% benchmark efficiency standard results in a 30-40% penalty on LCFS credits received per cow on dairies in the LCFS program—unless those dairies can locate and install fuel cells that actually achieve this unprecedented level of efficiency. Effectively, the 50% requirement is a penalty on all dairies except the largest and most well-funded dairies. The result will be an incentive to experiment with expensive systems on just a few large dairies that can install and maintain highly complex, unproven equipment—likely with large state grants to subsidize the capital cost.

The recent history of digester development already confirms this trend of digesters biased heavily towards large dairies. Other than a some of our company's own clients, 100% of digesters installed since 2014 have been on dairies over 3,000 cows. The 50% efficiency benchmark will exacerbate, not reverse this trend. Four fuel cell digesters were proposed on the 2019 CDFA dairy digester grants, all by the same developer, all with the same fuel cell vendor, on some of the largest dairies in the state. The requested sizes were 3.5 MW, 2.0 MW, and 1.2 MW and 3.5 MW, each needing the maximum $3,000,000 in state grants to proceed. Only a tiny fraction of California dairy herds are large enough support digesters of this scale (and even these appear to need very large grants).

EV charging (without the 19-06 benchmark efficiency reduction in credits) offers the first profitable opportunity for smaller dairies to the enter the digester market—especially those dairies not near a dairy pipeline "cluster," and especially for dairies that have not been able to secure the state grants that so far have tended to fund large, clustered dairies. We should not miss this opportunity to encourage farmers to invest in technology to mitigate manure emissions. We propose the following alternatives tools to modify the proposed 50% benchmark efficiency standard.

1. Use a benchmark efficiency standard of 37% for digester generators below 1 MW capacity, and 50% for larger generators.

2. Set the benchmark efficiency standard for all sites to 37%, until such time as a California dairy has demonstrated higher real-world efficiencies, with comparable up-time, for a 24-month period necessary for a certified LCFS pathway. Make the demonstrated efficiency the new standard thereafter, perhaps with a phase-in period or small-digester exemption. CARB Staff has enough data now through certified dairy biogas to electricity pathways to determine a realistic and accurate efficiency benchmark.

Exhibit A

Each of these approaches may have various attributes for CARB Staff to consider, and the ultimate plan may involve a combination of these and other elements. To achieve the various goals of the state, we suggest that the best program will consider what is technologically possible for California dairies to achieve.

We look forward to collaborating with CARB Staff to implement an appropriate solution.

Sincerely,

Daryl Maas

Chief Executive Officer

Exhibit B: Distributed Energy Resources Performance Dashboard from NYSERDA

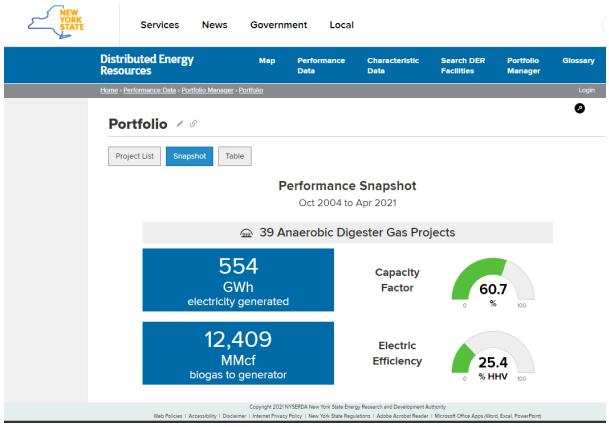


Figure 1 - Anaerobic Digester Gas Projects Performance Dashboard

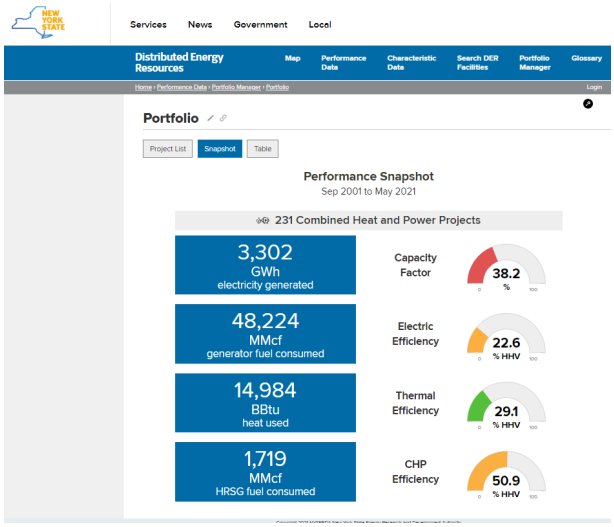


Figure 2- Combined Heat and Power Projects Performance Dashboard

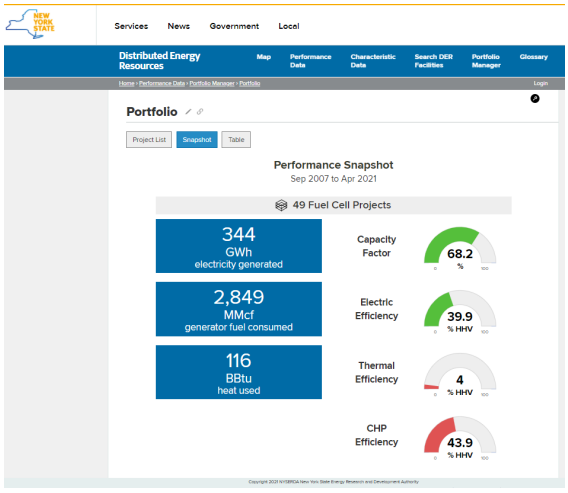


Figure 3 - Fuel Cell Projects Performance Data Dashboard

Exhibit C

TwinRivers
UNIFIED SCHOOL DISTRICT

May 31, 2019

CleanFuture, Inc.
John Thornton
P.O. Box 23813
Portland, OR 97281-3813

Subject: Benchmark Efficiency on Biogas Electricity Pathways Impedes EV Fleet Adoption- for submittal with CleanFuture's Comment Letter to the California Air Resources Board

Dear John,

I am writing to emphasize the importance of Low Carbon Fuel Standard (LCFS) credits to our school's plan to expand our electric vehicle fleet. We plan to fund our EV fleet expansion plans in part by using CleanFuture's Pathway to Savings™ program. In particular, we plan to apply low carbon intensity (low-CI) electricity generated from California dairy digesters to power our fleet and generate LCFS revenues. Our school district has an aggressive goal to quickly transition from diesel school bus transportation to zero-emission electric buses. Our district is located in a Disadvantaged Community and we place a high priority on improving local air quality while providing safe and reliable transportation for our students.

I understand from our conversation that CARB's recently proposed LCFS Guidance that would slow down our transition to electric school buses. The proposed approach would reduce LCFS credit revenue from dairy-produced biogas electricity that we plan to use in our electric buses. Fewer credits directly translates to reduced funds to apply towards our transition to electric school buses.

Twin Rivers Unified School District has committed to procuring 40 electric school buses to use the power to be supplied by the dairy digester projects. We support CleanFuture's position that CARB should not discount the very real greenhouse gas benefits of using dairy digester electricity in our electric school buses. CleanFuture is authorized to submit this letter with your comment letter requesting instead that CARB recognize the full value of this very low carbon intensity transportation fuel that will be used in our zero emission vehicles.

Sincerely,

Timothy Shannon
Director of Transportation
Twin Rivers Unified School District
1400 B Grand Avenue, Sacramento CA 95838
3222 Winona Way, N. Highlands CA 95660 (Mailing Address)