How to Reduce Washington Greenhouse Gas Emissions by One Million Metric Tons of CO_2 Equivalents

May 18, 2024

Washington failed to reduce greenhouse emissions to 90.5 million metric tons of CO_2 equivalents ($MMTCO_2e$) by 2020, as required by RCW 70A.45.020. Instead greenhouse gas emissions have increased.[1,2] How can we turn this around?

We could reduce WA greenhouse gas emissions by one million metric tons or more by moving away from wet manure management systems and by promoting dry manure management – by stopping the practice of storing animal manure in anaerobic lagoons. Read on to learn what it would take to make this happen.

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One component of the current Washington Low Carbon Fuel Standard (LCFS) perpetuates and financially promotes wet manure management. That section of the law is the part that assigns a negative carbon intensity score to biomethane derived from cow and swine manure.[3,4]

As written the current WA LCFS rewards farmers who knowingly and intentionally produce methane by storing cow manure in anaerobic manure lagoons. The LCFS penalizes farmers who

[1] WA State Dept. of Ecology. 2022. WA State Greenhouse Gas Emissions: 1990 – 2019. Available at https://apps.ecology.wa.gov/publications/documents/2202054.pdf

[2] WA State Dept. of Ecology. Washington's Greenhouse Gas Inventory. Available at https://ecology.wa.gov/air-climate/reducing-greenhouse-gas-emissions/tracking-greenhouse-gases/ghg-inventories

[3] See WAC 173-424 as applied to biomethane (Compressed Natural Gas, Liquified Natural Gas, Liquified-Compressed Natural Gas) from cow and swine manure. The GHG emissions of fuel in Table 8 of WAC 173-424-900 is a conservative GHG emission established for temporary pathway using CA-GREET model by California Air Resources Board. The CI score for manure methane in Table 8 is negative 150. When participants use Tier 1 and Tier 2 calculations, CI scores in CA GREET go as low as negative 700's. See Attachment B

[4] "A fuel pathway carbon intensity (CI) consists of the sum of the greenhouse gases emitted throughout each stage of a fuel's production and use, also known as the "well-to-wheels" or "life cycle" emissions for the fuel." Source: California Air Resources Board at https://ww2.arb.ca.gov/resources/documents/apply-lcfs-fuel-pathway#:~:text=A%20fuel%20pathway%20carbon%20intensity,cycle%22%20analysis%20for%20the%20fuel.

invest in manure management methods that do not produce this methane since these more conscientious farmers cannot reap the benefits of selling methane and credits in the market place.

Dairy Management and Manure Methane in Washington State

In 2019, the last year for which Ecology has published greenhouse gas emission data,[5] emissions from manure management were 1.5 $MMTCO_2e$, or about 1.5% of the state's greenhouse gas emissions. These emissions come mostly from dairy lagoons in which cow manure is stored under anaerobic conditions that foster microbial conversion of organic matter into methane and other compounds.

For comparison, emissions from solid waste management in 2019 were 1.6 $MMTCO_2e$, while emissions from wastewater management (septic systems and municipal wastewater treatment plants) were 0.9 $MMTCO_2e$.[3]

Every lactating dairy cow produces about 120 pounds of urine and feces per day – a lot of waste to manage. In the past manure was spread on cropland as fertilizer year round. Now we know that nitrates from this application leach to groundwater in winter months when there are no plants to take up the nitrates. One solution has been to encourage dairies to construct lagoons for manure storage during winter months. These lagoons may be aerobic which does not encourage methane production or anaerobic which does. Another non-methanogenic method of manure storage is to separate liquids from solids and to store the solids in manure piles.[6]

Some dairies keep cows in pens and corrals.[7,8] Others keep cows in barns most of the time. Both systems require sending the cows to milk houses two to three times a day and the milk houses must be cleaned frequently.

Two methods of cleaning barns and milk houses are 1. Flush systems that wash manure to manure lagoons, and 2. Scrape systems that use mechanical scrapers to remove and stack the manure. Flush systems are compatible with use of anaerobic manure lagoons. Flush systems and anaerobic manure lagoons are common practice in Washington state leading to more methane.

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[5] WA State Dept. of Ecology. 2022. WA State Greenhouse Gas Emissions: 1990 - 2019. Table 4, Page 19. Available at https://apps.ecology.wa.gov/publications/documents/2202054.pdf

[6] U.S. Environmental Protection Agency. Practices to Reduce Methane Emissions from Livestock Manure Management. Available at https://www.epa.gov/agstar/practices-reduce-methane-emissions-livestock-manure-management

[7] Dairy Herd Management. 2021. Focus on the Pen, Not Individual Cows to Deliver Profit. Available at https://www.dairyherd.com/news/dairy-production/focus-pen-not-individual-cows-deliver-profits

[8] University of Minnesota Extension. 2021. How Overstocking Affects Cow's Performance. Available at https://extension.umn.edu/dairy-milking-cows/how-overstocking-affects-cow-performance

Manure Methane in the United States

The U.S. Environmental Protection Agency has addressed methane production from animal agriculture, stating: [9]

> *When livestock manure is stored or treated in systems that promote anaerobic conditions (e.g., as a liquid/slurry in lagoons, ponds, tanks, or pits), the decomposition of the volatile solids component in the manure tends to produce CH4. When manure is handled as a solid (e.g., in stacks or dry lots) or deposited on pasture, range, or paddock lands, it tends to decompose aerobically and produce CO2 and little or no CH4.*

The EPA further states:

> *Estimates of CH4 emissions from manure management in 2022 were 64.7 MMT CO2 Eq. (2,312 kt); in 1990, emissions were 39.1 MMT CO2 Eq. (1,398 kt).* ***This represents a 65 percent increase in emissions from 1990.***

Manure Methane in California

California is the leading dairy producing state in our nation. California dairies contribute about 26% of total methane emissions in that state.[10]

According to Climate Action California[11]:

> *It is difficult to overstate the impact of the choice to use the flush/lagoon approach to manure management. Worldwide, methane emissions from managing dairy and beef manure are roughly 15% of the total; enteric emissions[12] make up the other 85%. In the U.S. 24% of livestock methane is from manure management. But in California, manure handling generates 45% of livestock methane emissions, and for dairies it is 56%. As UC Davis researchers said in 2023, "Methane emissions originating from manure are*

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[9] Read entire statement at EPA (2024). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022 U.S. Environmental Protection Agency, EPA 430R-24004. https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2022.

[10] Duren, R.M., Thorpe, A.K., Foster, K.T. *et al.* California's methane super-emitters. *Nature* **575**, 180–184 (2019). https://doi.org/10.1038/s41586-019-1720-3. Available at https://www.nature.com/articles/s41586-019-1720-3#citeas

[11] Climate Action California. 2024. PETITION FOR RULEMAKING TO REQUIRE REDUCTION OF METHANE FROM DAIRIES AND BEEF CATTLE. Available at https://ww2.arb.ca.gov/sites/default/files/2024-03/240301_CAC-methane-petition.pdf

[12] "Methane (CH4) is produced as part of the normal digestive process in animals. During digestion, microbes resident in an animal's digestive system ferment food consumed by the animal. This microbial fermentation process, referred to as enteric fermentation, produces methane as a by-product, which can be exhaled or eructated by the animal." Mangino, Peterson, & Jacobs. Development of an Emissions Model to Estimate Methane from Enteric Fermentation in Cattle. Available at https://www3.epa.gov/ttnchie1/conference/ei12/green/mangino.pdf

produced primarily from anaerobic settling basins and lagoons, which are the most common manure storage systems in the state." This method is used far less in other parts of the U.S.

Anaerobic Digesters – A Proposed Solution

Anaerobic digestion (AD) has been used for many years, even centuries, on a small farm scale.[13] Anaerobic biodigesters have been built into waste water treatment plants for many years.[14]

Current Washington law, incorrectly in our opinion, accepts methane emissions from anaerobic lagoons as inevitable and proposes to reduce the impact of those emissions by harvesting some of that methane and processing it to produce electricity or fuel grade natural gas.

There are many types of manure methane bio-digesters with significant differences in efficiency and environmental impacts[15,16]. Digester types include:

- Covered lagoons
- Complete mix digesters
- Plug flow, Mixed plug flow
- High rate: contact stabilization, fixed film, suspended media, sequencing batch

Recently larger scale anaerobic digesters (hub and spoke models) have been proposed to gather manure from multiple concentrated animal feeding operations for processing in centralized industrial scale methane plants. Such large scale biodigesters concentrate emissions in rural communities and add problems related to leakage from the plants and pipelines, co-existing addition of air pollutants such as ammonia and hydrogen sulfide, emissions related to manure transport via diesel fueled trucking, and impact of digestate on greenhouse gas emissions and soil health.[17]

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[13] Penn State University Extension Service. 2023. A Short History of Anaerobic Biodigestion. Available at https://extension.psu.edu/a-short-history-of-anaerobic-digestion

[14] U.S. Environmental Protection Agency. 2006. Biosolids Technology Fact Sheet. Available at https://www.epa.gov/sites/default/files/2018-11/documents/multistage-anaerobic-digestion-factsheet.pdf

[15] U.S. Environmental Protection Agency. AgStar Project Development Handbook, 3rd Edition. Available at https://www.epa.gov/sites/default/files/2014-12/documents/agstar-handbook.pdf

[16] Oklahoma State University Extension Service. 2017. Anaerobic Digestion of Animal Manures: Types of Digesters. Available at https://extension.okstate.edu/fact-sheets/anaerobic-digestion-of-animal-manures-types-of-digesters.html

[17] Friends of Toppenish Creek. 2024. Appeal of January 2024 Mitigated Determination of Non-Significance for the Sunnyside Renewable Natural Gas Biodigester. Available at

Funding guidelines in Washington rules and regulations treat all manure biodigesters as though they are the same. They are not. Biodigesters differ in cost, volume, ability to kill pathogens, quality of digestate, emissions of ammonia and hydrogen sulfide, risks of fires and explosions, returns to investors, returns to participating dairies, and amount of subsidies available.

Current WA law promotes anaerobic biodigesters in general as the preferred solution to methane emissions from manure management. The laws do this by assigning negative carbon intensity scores to methane produced through anaerobic digestion. Fuels with negative scores are sold in carbon markets at high prices.[18]

Washington Low Carbon Fuel Standard (LCFS) – Necessary to Fund Digesters

The Friends of Toppenish Creek are very concerned because carbon intensities (CI) for compressed natural gas (CNG), liquified natural gas (LNG) and compressed liquified natural gas (CLNG) derived from dairy and swine manure will likely reach values as low as negative 700 if Washington proceeds on the pathways blazed by California. The lower the CI the higher the price traders can ask for renewable natural gas (RNG).

We base this fear on numbers in the California Air Resources Board's (CARB's) Fuel Pathways and Carbon Intensities Spreadsheet for the California Clean Fuel Program.[19] See also Attachment B that shows CI scores as high as negative 790 for electricity generated from dairy manure.

No amount of greenwashing has convinced us that burning natural gas harvested from dairy manure will eliminate methane in the ambient air, or even reduce greenhouse gas levels. FOTC asks the WA State Dept. of Ecology to explain how biomethane from dairy manure could possibly have a CI score of -300 to -800, when for every ton of RNG produced from manure management another ton of methane is released into the ambient air from enteric fermentation.[20]

The Washington LCFS was modeled after California's LCFS. The temporary CI values in Table 8 of WAC 173-424-900 can be used for two quarters of reporting, and then fuel producers

http://www.friendsoftoppenishcreek.org/cabinet/data/SS%20RNG%20FOTC%20Appeal%20January%202024%20III%20(1).pdf

[18] Lazenby. Vermont Law School. 2022. Rethinking Manure Biogas. https://www.vermontlaw.edu/sites/default/files/2022-08/Rethinking_Manure_Biogas.pdf

[19] Fuel Pathways and Carbon Intensities Spreadsheet for the California Clean Fuel Program. Available at https://ww2.arb.ca.gov/resources/documents/lcfs-pathway-certified-carbon-intensities

[20] U.S. Environmental Protection Agency. 2024. Inventory of U.S. Greenhouse Emissions and Sinks: 1990 – 2022. Available at https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2022

need to apply for a site-specific pathway to determine site-specific CI using WA GREET which is modeled after CA GREET.[21]

According to WA Ecology:

> *Compressed natural gas is a diesel substitute that has a conservative carbon intensity of 77.98 gCO2/MJ. That is below the diesel carbon intensity standard for 2034 and onward of 80.09 gCO2/MJ, meaning that a supplier of compressed natural gas as a transportation fuel, even in 2034, would not generate any deficits and would generate a small number of credits, without blending any biomethane. However, the clean fuel standard does provide a financial incentive to blend biomethane into fossil natural gas as this would lower its carbon intensity and make it eligible to generate more credits.*[22]

Fuels are marketed based on their carbon intensity scores. According to the California Air Resources Board (CARB)[23]:

> *A fuel pathway carbon intensity (CI) consists of the sum of the greenhouse gases emitted throughout each stage of a fuel's production and use, also known as the "well-to-wheels" or "life cycle" emissions for the fuel.*

If calculations were truly "wells to wheels" manure methane could not receive a negative score. California "life cycle" calculations ignore significant upstream and downstream greenhouse gas emissions such as enteric emissions, transport emissions, leakage from methane refineries, increases in N_2O, emissions from digestate and digestate application to fields.[22]

In 2021 Public Justice and others petitioned CARB for *Rulemaking to Exclude All Fuels From Biomethane from Dairy and Swine Manure from the Low Carbon Fuel Standard Program.*[24] Petitioners alleged that:

> *A. THE FUEL PATHWAYS FOR BIOMETHANE FROM DAIRY AND SWINE MANURE FAIL TO ACHIEVE THE MAXIMUM TECHNOLOGICALLY FEASIBLE AND COST-EFFECTIVE EMISSIONS REDUCTIONS.*

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[21] Personal communication with Debebe Dererie, Fuel Pathway Specialist, Clean Fuels Program, Air Quality Program, Department of Ecology, May 6, 2024

[22] Personal communication with Justus Phelps in Senator Nikki Torres' office, May 7, 2024

[23] California Air Resources Board. Apply for an LCFS Fuel Pathway. Available at https://ww2.arb.ca.gov/resources/documents/apply-lcfs-fuel-pathway

[24] Public Justice et al. 2021. PETITION FOR RULEMAKING TO EXCLUDE ALL FUELS DERIVED FROM BIOMETHANE FROM DAIRY AND SWINE MANURE FROM THE LOW CARBON FUEL STANDARD. PROGRAM. Available at https://food.publicjustice.net/wp-content/uploads/sites/3/2021/10/Factory-Farm-Gas-Petition-FINAL.pdf

1. The fuel pathways for biomethane from dairy and swine manure fail to incorporate lifecycle emissions, leading to inflated credits.

2. The fuel pathways for biomethane from dairy and swine manure fail to ensure that credited emissions reductions are additional to reductions that would have otherwise occurred.

3. CARB's crediting of non-additional reductions and the inflated credit value from CARB's failure to account for the full quantity of life-cycle emissions both incentivize increased manure generation and manure liquification and constitute a failure to achieve the maximum technologically feasible and cost-effective greenhouse gas emissions.

B. THE FUEL PATHWAYS FOR BIOMETHANE FROM DAIRY AND SWINE MANURE FAIL TO MAXIMIZE ADDITIONAL ENVIRONMENTAL BENEFITS AND INTERFERE WITH EFFORTS TO IMPROVE AIR QUALITY

Agricultural economist Aaron Smith from the University of California at Davis observed in 2022[25]:

. . . an anaerobic digester generates approximately 22.5 MMBTU of biogas per cow per year at a cost of $636. These costs include operating costs and capital cost amortized over 10 years.

*The spot price of natural gas has gone up. It exceeded $5 per MMBTU in the fall, before dropping back below $4. With the winter storms hitting the southeast this week, it is now back above $5. At that price, a cow generates 5*22.5 = $112.50 worth of gas per year.*

In the most recent quarter for which data are available, the LCFS offered subsidies of $11.37 per diesel-gallon equivalent, which translates to $81.50 per MMBTU. This is the average subsidy; it varies across dairies based on their estimated life cycle emissions. So, from its annual 22.5 MMBTU of gas, a cow receives a subsidy of $1,834.

In addition to the LCFS, digesters can earn RIN credits through the federal Renewable Fuel Standard (RFS) program. Our cow's 22.5 MMBTU of gas would generate 292 cellulosic RINs. At the current price of $3.40 per RIN, this subsidy amounts to $993.

A typical California dairy cow produces 230 cwt of milk each year. At the current price of $21.64/cwt, the cow produces $4,977 of milk per year. For comparison, the cow generates 1834+993 = $2,827 of LCFS and RFS subsidies for gas that costs $636 to produce and which it can sell for $112.50.

This is disturbing news from a highly respected economist.

[25] Aaron Smith. 2022. The Dairy Cow Manure Goldrush. Available at https://agdatanews.substack.com/p/the-dairy-cow-manure-goldrush

If Washington state continues to encourage manure production through a misguided Low Carbon Fuel Standard, the result will be increased pollution of ground and surface waters that currently costs tax payers millions of dollars to address in Yakima and Whatcom counties.[26] The result will be aggravated air pollution due to co-pollutants ammonia, hydrogen sulfide, and multiple volatile organic compounds.[27]

Returns for Taxpayer Support of Manure Biodigesters

Washington state subsidizes manure biodigesters.[28, 29] How civic minded are the recipients of these funds?

- The George DeRuyter & Son Dairy in Yakima County built a plug flow manure digester in 2006 with taxpayer assistance. Augean RNG, LLC took over operation of the digester in 2020, received grant funding from Washington taxpayers, and now sends biomethane with a certified carbon intensity of -216.63 to California.[30]
  This dairy is part of a cluster of dairies that have severely polluted groundwater in Yakima County and cost tax payers millions for remediation that is nowhere near completion.[31]
  Citizens have been forced to go to court to enforce consent decrees with the Geroge DeRuyter and Son dairy.[32]
- In 2023 the WA State Dept. of Commerce awarded $500,000 to Pacific Ag Renewables to support the Sunnyside Renewable Natural Gas project.[24]
  This project, if completed, will be located in a low income rural community that is over 80% Latino where 25% of the population does not speak English well.

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[26] WA Ecology. Nitrate in Groundwater Data and Assessment. https://ecology.wa.gov/Water-Shorelines/Water-quality/Groundwater/Nitrate-data-assessment

[27] Holly, Michael A., et al. "Greenhouse gas and ammonia emissions from digested and separated dairy manure during storage and after land application." *Agriculture, Ecosystems & Environment* 239 (2017): 410-419. Available at https://www.sciencedirect.com/science/article/pii/S0167880917300701

[28] WA State Dept. of Commerce. 2020. Commerce Awards $970,000 for Dairy Digester Clean Energy Projects. Available at https://www.commerce.wa.gov/news/community-grants/commerce-awards-970000-for-dairy-digester-clean-energy-projects/

[29] Biomass Magazine. 2023. Washington State Awards Clean Energy Funding to Biogas Projects. Available at https://biomassmagazine.com/articles/washington-state-awards-clean-energy-funding-to-biogas-projects

[30] See Attachment B

[31] U.S. Environmental Protection Agency Region X. Lower Yakima Valley Groundwater. Available at https://www.epa.gov/wa/lower-yakima-valley-groundwater

[32] CARE and Center for Food Safety v. George DeRuyter & Sons Dairy, et al., 1:13-CV-3017-TOR (E.D. Wa., April 14, 2020) Available at http://charlietebbutt.com/cases.html

Proponents have failed to inform the community about the project and have attempted to push through permitting without adequate review under the WA State Environmental Policy Act (SEPA)[33]

Environmental Budgets versus Corporate Budgets – Shipping Hog Slop to China

On July 13, 2021, the Capital Press printed an article[34] entitled, "U.S. dairy exports continue record growth".

One of the reasons for record growth, according to the article, is "a rebuilding of China's hog industry . . . and a structural change in the hog industry is raising demand for whey for feed".

In what universe does it make sense to intensively raise corn & hay, truck it to dairy cows that pollute the air and water, truck the milk to processing plants, convert the milk into whey, market the product, and ship it halfway around the world so people in China can feed it to pigs? Isn't this pretty expensive hog slop?

It is understandable that an industry that overproduces[35, 36] must find markets for surplus product. But someone should calculate the environmental costs for shipping hog slop halfway around the world. Do pigs really need highly refined food?

For the dairy industry many costs, such as environmental and public health costs, are externalized – these costs are not part of the corporate budget sheet.[37, 38, 39] When Washington

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[33] FOTC Questions SEPA Review for an Anaerobic Manure Bio-Digester. 2023. Available http://www.friendsoftoppenishcreek.org/

[34] Capital Press (July 2021) U.S. dairy exports continue record growth. Available at https://www.capitalpress.com/ag_sectors/dairy/u-s-dairy-exports-continue-record-growth/article_853ba7dc-e402-11eb-ba61-73cfde73f65f.html

[35] Bloomberg News. 2023. There's So Much Milk That US Farmers Are Dumping It In The Sewer. Available at https://www.bloomberg.com/news/articles/2023-07-11/milk-oversupply-has-us-farmers-in-the-midwest-dumping-it-in-the-sewer

[36] Dairy Herd Management. 2023. Dairy Report: Over Supply and Plummeting Prices Contribute To Mik Dumping. Available at https://www.dairyherd.com/markets/milk-prices/dairy-report-over-supply-and-plummeting-prices-contribute-milk-dumping

[37] Northeastern University Political Review. 2020. My Beef With Dairy: How the US government Is Bailing Out A Dying Industry. Available at https://nupoliticalreview.org/2020/05/16/my-beef-with-dairy-how-the-us-government-is-bailing-out-a-dying-industry/

[38] Sierra Club. 2023. CAFO Subsidies: Federal Support for the U.S. Dairy Industry. Available at https://www.sierraclub.org/sites/www.sierraclub.org/files/2023-06/SClub%20Fact%20Sheet%20Dairy%20SubsidiesCVreview%20III%20.pdf

[39] Successful Farming. 2023. Dairy Subsidies Could Cost $19 Billion Without New Farm Bill. Available at https://www.agriculture.com/dairy-subsidies-could-cost-usd19-billion-without-new-farm-bill-7852185

looks at climate change it is essential to consider the environmental impacts of policy and not just impacts on the economy.

Please see Attachment A for a table top model of fossil fuel requirements for food transport that factors in requirements for manure transport. In this model miles traveled to transport milk and manure increase by a factor of 3.65 when four small dairies consolidate into one large dairy. No doubt the accountants justify consolidation for many reasons – so called economics of scale. But air emissions from diesel trucks increase significantly with consolidation and mega dairies externalize the resulting environmental and public health costs.

Unintended Consequences of a Negative Carbon Intensity Score for RNG Produced from Manure – Public Funding of Anaerobic Biodigesters

Low Carbon Intensity (CI) scores for manure RNG create financial incentives that promote wet manure management over dry because entrepreneurs can reap huge profits from anaerobic digestion of manure methane.

These incentives encourage increased production of manure. Significant sequelae include increased water usage and falling aquifers, decreasing quality of life in underserved and overburdened communities, and potential spread of disease.

Here are three likely unintended consequences from proposed construction of a manure methane plant in Sunnyside WA that would rely on income generated by the WA LCFS to succeed.

- **Groundwater Depletion:** The proposed SS RNG digester is designed to use slurry which will require at least a gallon of water for every gallon of manure. Pacific AG estimates there will be 140 tanker truck deliveries daily. Each truck will carry 5,500 gallons of slurry [40]. Half of that volume is 2,250 gallons of water. That equates to 315,000 gallons of water per day. That equates to 81,900,000 gallons per year if trucks run 260 days per year, or 114,975,000 gallons per year if they run 365 days per year.

- **Increased Air Emissions:** Trucks that deliver slurry to the digesters will have an impact on air quality and road maintenance in the Sunnyside area. Health problems are linked to pollution from traffic. Tanker trucks will deliver as much as 140 loads of manure to the digesters each day. According to FOTC calculations, the total distance these trucks will travel is 1360 miles per day or approximately half a million miles per year. According to the U. S. Department of Transportation, a large diesel truck emits 2.99 grams of NOx

[40] According to Pacific AG spokesperson Harrison Pettit at the Sunnyside City Council meeting on May 13, 2023.

(nitrogen oxides) per mile.[41] In a year these trucks will emit about 1.7 tons of nitrogen oxides or NOx (i.e., 500,000 miles/year X 2.99 gm/mile = 1,495,000 gm or 1.7 tons).

- **Risk of Disease:** Fecal material contains harmful pathogens. That is why our mothers taught us to wash our hands after going to the bathroom. Cow manure contains microorganisms that impact soil health and pathogens that can infect people. One important pathogen is cryptosporidium, a parasite that kills young calves and causes severe diarrheal illness in humans. Cryptosporidium spores live for long periods of time in soil and water.
  Proponents of anaerobic digestion say that digestion kills most pathogens. This is not strictly true. Mesophilic digesters, such as the proposed SS RNG digester, operate in the range of 86 to 108 degrees Fahrenheit. These temperatures will kill some but certainly not all pathogens and certainly not spores such as cryptosporidium.

The Friends of Toppenish Creek support the WA Climate Commitment Act. At the same time FOTC strongly states that Washington must remove the negative carbon intensity scoring for methane generated from cow and swine manure because the associated incentives would lead to an increase in Washington greenhouse gas emissions and serious unintended consequences.

Sincerely,

Friends of Toppenish Creek

3142 Signal Peak Road
White Swan, WA 98952

[41] International Council on Clean Transportation. 2019. Current State of NOx Emissions from In-Use Heavy-Duty Diesel Vehicles in the United States. https://theicct.org/wp-content/uploads/2021/06/NOx_Emissions_In_Use_HDV_US_20191125.pdf

Attachment A: Emissions Related to Milk and Manure Transport

Consider a hypothetical state that is 100 miles square. The state is divided into four counties that are each 50 miles square.

Suppose each county has a 250 cow dairy at the center. Calculate average miles needed to transport milk to markets and manure to cropland for use as fertilizer if all activities take place within the county.

----------50 miles---------- ----------50 miles----------

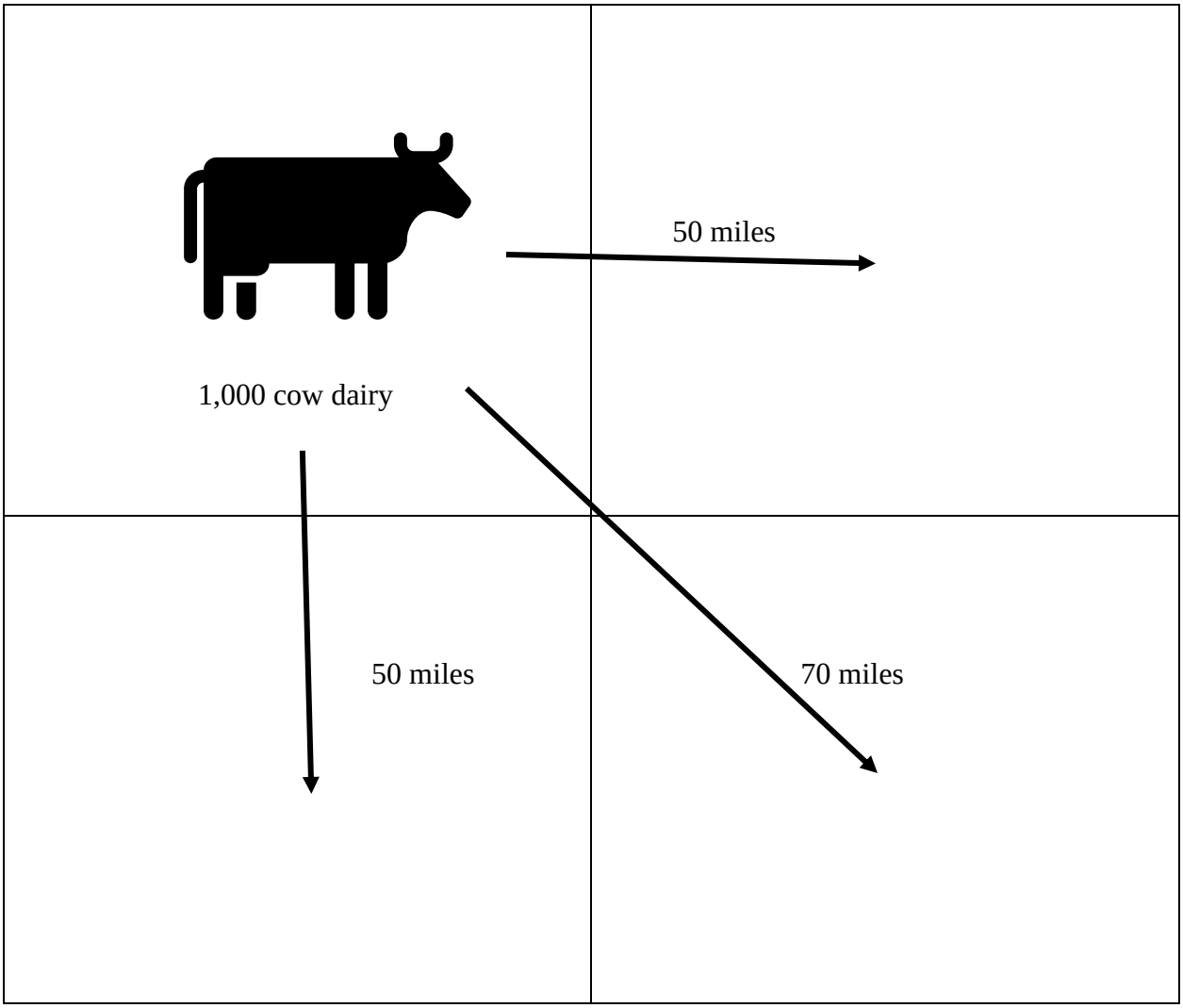
 250 cow dairy	 250 cow dairy
 250 cow dairy	 250 cow dairy

----------50 miles ---------- ----------50 miles ----------

On average, each county transports milk 12.5 miles to market and transports manure 12.5 miles to cropland. 12.5 miles x 1000 cows x 2 = 25,000 miles for transport for the entire state.

How will things change if all the dairies consolidate and re-locate to just one county?

----------50 miles---------- ----------50 miles----------



Travel within the dairy county will remain at 12.5 miles to deliver milk and 12.5 miles to spread manure, but for only 250 cows. 12.5 miles x 250 cows x 2 = 6,250 miles

Average travel to deliver milk to people in two counties will be 50 miles and average travel to spread manure will be 50 miles. This means traveling 50 miles x 500 cows x 2 = 50,000 miles

Average travel time to deliver milk the most distant county will be 70 miles and average travel time to spread manure there will be 70 miles. This means traveling 70 x 250 cows x 2 = 35,000 miles.

The total travel time when all cows are housed in one county is 6,250 + 50,000 + 35,000 = 91,250 miles. This is 3.65 times as much travel time, 3.65 times as much fuel usage, and 3.65 times the emissions from burning diesel fuel.

Attachment B: Fuel Pathways and Carbon Intensities Spreadsheet for Select Participants in the California Clean Fuel Program from https://ww2.arb.ca.gov/resources/documents/lcfs-pathway-certified-carbon-intensities

Applicant & Pathway Description	Location	Fuel Feedstock Fuel Type	Carbon Intensity
Fuel Producer: Clean Energy (5481) Facility Name: Montana-Dakota Utilities Billings Regional Landfill (71193). Montana landfill gas to pipeline-quality biomethane, delivered via pipeline, liquefied in CA; transported by trucks; re-gasified and compressed to L-CNG in CA	Montana	Landfill Gas - L-CNG Compressed Natural Gas	55.39
Fuel Producer: Clean Energy (5481) Facility Name: Cedar Hills Landfill, Bio-Energy, LLC (71109). Washington landfill gas to pipeline-quality biomethane; delivered via pipeline; compressed to CNG in CA	Washington	Landfill Gas - CNG Compressed Natural Gas	30.9
Fuel Producer: Clean Energy (5481) Facility Name: Cedar Hills Landfill, Bio-Energy, LLC (71109). Washington landfill gas to pipeline-quality biomethane, delivered via pipeline, liquefied in CA; transported by trucks; re-gasified and compressed to L-CNG in CA	Washington	Landfill Gas - CNG Compressed Natural Gas	42.78
Fuel Producer: Clean Energy (5481) Facility Name: Cedar Hills Landfill, Bio-Energy, LLC (71109). Washington landfill gas to pipeline-quality biomethane; delivered via pipeline; liquefied to LNG in CA	Washington	Landfill Gas - LNG Liquified Natural Gas	40.21
Fuel Producer: Clean Energy (5481) Facility Name: EIF KC Landfill Gas LLC (71155). Kansas City landfill gas to pipeline-quality biomethane; delivered via pipeline; liquefied to LNG in CA	Kansas	Landfill Gas - LNG Liquified	54.02
Fuel Producer: Nardini Agroindustrial Ltda (4229) Facility Name: Nardini Agroindustrial Ltda (70525): Brazilian sugarcane juice-to-ethanol, with credit for surplus cogenerated electricity export, and mechanized harvesting.	Brazil	Sugarcane Ethanol	46.88
Fuel Producer: Raízen Energia S/A (3805) Facility Name: Benálcool (70549): Brazilian	Brazil	Molasses Ethanol	47.63

sugarcane molasses-based ethanol pathway, with credit for mechanized harvesting			
Fuel Producer: Abengoa Bioenergy Biomass of Kansas (6254) Facility Name: Abengoa Bioenergy Biomass of Kansas, LLC (71183). Corn Stover residue-based cellulosic ethanol with electricity co-product credit	Kansas	Corn Stover Ethanol	32.82
Fuel Producer: Neste Singapore Pte Ltd (4137) Facility Name: Neste Singapore (80327). Asian Used Cooking Oil to Renewable Diesel Produced in Singapore.	Singapore	Asian Used Cooking Oil Renewable Diesel	16.89
Fuel Producer: Archer Daniels Midland Co (4888) Facility Name: ADM Agri Industries (81926): Canola oil (produced in western Canada) biodiesel transported by rail from Lloydminster Alberta, Canada to Los Angeles, CA (the plant is co-located with crushing operation)	Canada	Canola Biodiesel	51.33
Fuel Producer: Archer Daniels Midland Co (4888) Facility Name: ADM Mexico (82791). Soybean oil biodiesel transported by rail from Mexico, Missouri to Richmond, CA	Mexico Missouri	Soybean Biodiesel	50.85
Fuel Producer: REG Grays Harbor, LLC (6326) Facility Name: REG Grays Harbor, LLC (82954). Used Cooking Oil (UCO) to Biodiesel produced in Washington, where cooking is not required; BD transported by rail to California	Hoquiam, WA	Used Cooking Oil Biodiesel	18.62
Fuel Producer: High Mountain Fuels, LLC (4293) Facility Name: Altamont Bio-LNG Plant (70526): Tier 2 Method 2B Pathway; Altamont landfill gas delivered via pipeline to High Mountain Fuels; purified to biomethane and liquefied to LNG in California; fuel dispensed on-site	California	Landfill Gas Liquified Natural Ga	7.39
Fuel Producer: 3 Phases Renewables Inc. (P306) ; Facility Name: 3PR (P1225): Solar-based (Photovoltaic) Electricity for a Single Dual Port Electric Vehicle Charging Station.	California	Solar or Wind Electricity	0
Fuel Producer: Neste Renewable Fuels Oy (3734); Facility Name: Neste Renewable Fuels - Porvoo (80272); Tier 2 Method 2B Pathway: Renewable Diesel produced from Globally Sourced Tallow, Fuel produced in	Finland	Tallow & Animal Fat Renewable Diesel	45.08

Neste Porvoo Plant and transported by ocean tanker to California			
Biomethane produced from the mesophillic anaerobic digestion of wastewater sludge at a California publicly owned treatment works; on-site, high speed vehicle fueling or injection of fuel into a pipeline for off-site fueling.	California	Wastewater Compressed Natural Gas CNG	30.92
Fuel Producer: Tracy Renewable Energy LLC (T534) Facility Name: Tracy Renewable Energy LLC (A0640): Ethanol Produced from California Energy Beets using biogas derived from anaerobic digestion of green wastes, manure and glycerin; with credit for avoided waste management and co-products (compost and animal feed).	California	Sugar Beets Ethanol	7.18
Fuel Producer: BP Products North America, Inc (4320); Facility Name: Cherry Point Refinery (83736); U.S. and Canadian sourced Rendered Animal Fat Oil transported by truck; Grid Electricity, Steam, and Hydrogen; Renewable Diesel produced from co-processing with petroleum feedstock in a hydrotreater in Blaine, Washington; transported by ocean tanker to CA (Provisional)	Washington	Tallow (animal and poultry fat) Renewable Diesel	26.92
Fuel Producer: PUBLIC UTILITY DISTRICT NO. 1 OF KLICKITAT COUNTY (2080); Facility Name: H.W. HILL RENEWABLE NATURAL GAS PROJECT (70301); Biomethane from Landfill in Roosevelt, Washington; upgrading at Public Utility District No. 1 of Klickitat County, pipelined to LNG Boron Plant, California for liquefaction to LNG; trucked to California LNG stations; regassified, and compressed to L-CNG (Provisional)	Washington	Landfill Gas Liquified Compressed Natural Gas	53.11
Fuel Producer: Calgren Dairy Fuels, LLC (C1007); Facility Name: Calgren Dairy Fuels, LLC (F00029); Biomethane produced from Dairy Manure of Robert Vander Eyk & Sons Dairy digester, upgraded at Calgren Biofuels LLC in Pixley, California; pipelined to Fresno and West Sacramento, California,	California	Dairy manure Compressed Natural Gas	-377.83

compressed to CNG for use as transportation fuel in California (Provisional)			
Fuel Producer: Generate Indiana RNG Holdings, LLC (9889); Facility Name: Generate Jasper Upgrader, LLC (71002); Renewable Natural Gas (RNG) from Dairy Manure at T&M Windy Ridge Dairy and upgraded to RNG at Generate Jasper Upgrader in Fair Oaks, Indiana; RNG pipelined to California for transportation use (Provisional)	Indiana	Dairy manure Compressed Natural Gas	-257.58
Fuel Producer: IOGEN D3 BIOFUEL PARTNERS II LLC (7180); Facility Name: WOF PNW Threemile Project (F00100); Renewable Natural Gas (RNG) from Dairy Manure at Columbia River Dairy and Six Mile Farms, upgraded in Boardman, Oregon; RNG pipelined to California for transportation use (Provisional)	Oregon	Dairy manure Compressed Natural Gas	-188.78
Fuel Producer: Clean Energy (5481); Facility Name: Maple Leaf/Grotegut RNG Facility (F00167); Renewable Natural Gas (RNG) produced from Maple Leaf Dairy West and upgraded at Calumet – Maple Leaf/Grotegut RNG Facility, Newton, Wisconsin; RNG pipelined to California for transportation use (Provisional)	Wisconsin	Dairy manure Compressed Natural Gas	-453.10
Fuel Producer: Clean Energy (5481); Facility Name: Calumet - Dairy Dreams (F00127); Renewable Natural Gas (RNG) produced from Dairy Manure at Dairy Dreams Farm and upgraded at Calumet - Dairy Dreams in Casco, Wisconsin; RNG pipelined to California for transportation use (Provisional)	Wisconsin	Dairy manure Compressed Natural Gas	-532.74
Fuel Producer: Trillium Transportation Fuels, LLC (T311); Facility Name: Greengasco, LLC (F00154); Renewable Natural Gas (RNG) produced from Dairy Manure at Etter Dairy and upgraded at GreenGasco in Stratford, Texas; RNG pipelined to California for transportation use (Provisional)	Texas	Dairy manure Compressed Natural Gas	-308.74
Fuel Producer: Calgren Dairy Fuels, LLC (C1007); Facility Name: Calgren Dairy Fuels, LLC (F00029); Renewable Natural	California	Dairy manure Compressed Natural Gas	-417.35

Gas (RNG) produced from Dairy Manure at K&M Visser and upgraded at Calgren Dairy Fuels in Pixley, California; RNG pipelined to California for transportation use (Provisional)			
Fuel Producer: California Bioenergy LLC (B194) ; Facility Name: ABEC Bidart-Old River LLC (F00113); Low-CI electricity from dairy manure biogas using reciprocating engine at ABEC Bidart-Old River in Bakersfield, California for use as transportation fuel in California.	California	Dairy manure Electricity	-562.50
Fuel Producer: CleanFuture, Inc. (C1001); Facility Name: Hilarides (F00006); Low-CI Electricity from Dairy Manure Biogas using reciprocating engine at Hilarides Dairy in Lindsay, California for use as transportation fuel in California. (Provisional)	California	Dairy manure Electricity	-758.46
Fuel Producer: Element Markets Renewable Energy, LLC (5877); Facility Name: South Meadows Farm (F00195); Renewable Natural Gas (RNG) from Swine Manure of South Meadows Farm, Browning, Missouri; transported by truck to pipeline injection point; delivered via pipeline to Los Angeles, California (Provisional)	California	Swine manure Compressed Natural Gas	-359.66
Fuel Producer: Element Markets Renewable Energy, LLC (5877); Facility Name: Milford Farm (71483); Renewable Natural Gas (RNG) from Swine Manure from the South Cluster of Milford Farm, Milford, UT; RNG pipelined to multiple California fueling stations (Provisional)	Utah	Swine manure Compressed Natural Gas	-413.67
Fuel Producer: Element Markets Renewable Energy, LLC (5877) ; Facility Name: HOMAN FARM (71343); RNG produced from swine manure of Homan Farm and upgraded at Homan Farm Upgrading, King City, MO; RNG pipelined to California for transportation use (Provisional)	Missouri	Swine manure Compressed Natural Gas	-412.71
Fuel Producer: California Bioenergy LLC (B194); Facility Name: CalBioGas West Visalia LLC (F00337); Renewable Natural Gas (RNG) from Dairy Manure of ABEC #8 LLC dba S&S Dairy Biogas and upgraded at CalBioGas West in Tulare, CA; RNG	California	Dairy manure Compressed Natural Gas	-389.66

pipelined to California for transportation use (Provisional)			
Fuel Producer: DTE ENERGY TRADING, INC. (6545); Facility Name: KEWAUNEE RENEWABLE ENERGY, LLC (71003); Renewable Natural Gas (RNG) from Dairy Manure at Kinnard Farms and upgraded at Kewaunee Renewable Energy, LLC in Casco, WI; RNG is trucked to pipeline injection and pipelined to California for transportation use (Provisional)	Wisconsin	Dairy manure Compressed Natural Gas	-382.83
Fuel Producer: Element Markets Renewable Energy, LLC (5877); Facility Name: Ninety-First Avenue Renewable Biogas LLC (70241); Digester Gas generated at the 91st Ave WWTP; upgraded to pipeline-quality biomethane in Tolleson, Arizona; delivered via pipeline to liquefaction facility in Topock, Arizona; liquefied, and transported by truck to California; re-gasified and dispensed as (Provisional)	Arizona	Waste water sludge Liquified compressed natural gas	44.67
Fuel Producer: Element Markets Renewable Energy, LLC (5877) ; Facility Name: Ameresco San Antonio Biogas (71204); Biomethane generated at the SAWS Dos Rios Water Recycling Center; upgraded to pipeline-quality biomethane in San Antonio, Texas; delivered via pipeline to liquefaction facility in Topock, Arizona; liquefied, and transported by truck to LNG stations in CA	Texas	Waste water sludge Liquified natural gas	54.76
Fuel Producer: SMUD (S338); Facility Name: Van Steyn Dairy Digester (V1125); Low-CI electricity from dairy manure biogas using reciprocating engine at Van Steyn Dairy in Elk Grove, California for use as transportation fuel in California	California	Dairy manure Electricity	-630.72
Fuel Producer: CleanFuture, Inc. (C1001); Facility Name: Coronado Dairy Farm (F00009); Low-CI Electricity from Dairy Manure Biogas using reciprocating engine at Coronado Dairy in Tipton, California for use as transportation fuel in California	California	Dairy manure Electricity	-525.14
Fuel Producer: CleanFuture, Inc. (C1001); Facility Name: Stotz Dairy Southern (F00155); Dairy Biogas produced in Maricopa County, AZ from dairy manure	Arizona	Dairy manure Electricity	-762.09

covered anaerobic lagoons to produce electricity for import into California for electric vehicle charging			
Fuel Producer: Degrees3 Transportation Solutions, LLC (C1111); Facility Name: New Energy One (F00274); Low-CI electricity from dairy manure using reciprocating engine at Cedar Ridge in Filer, Idaho for use as transportation fuel in California	Idaho	Dairy manure Electricity	-698.21
Fuel Producer: SMUD (S338); Facility Name: New Hope Dairy Digester (F00255); Low-CI electricity from dairy manure biogas using a reciprocating engine at New Hope Dairy in Galt, CA for use as a transportation fuel in California. (Provisional)	California	Dairy manure Electricity	-750.81
Fuel Producer: WOF SW GGP 1 LLC (W009); Facility Name: Green Gas Partners Stanfield (F00003); Biogas from dairy manure at Shamrock Farms, T&K Red River, and Zinke Dairy in Stanfield and Maricopa, AZ; upgraded to pipeline quality at Green Gas Partners Stanfield and pipelined to CA for transportation use (Provisional)	Arizona	Dairy manure Compressed natural gas	-362.84
Fuel Producer: California Bioenergy LLC (B194); Facility Name: CalBioGas North Visalia LLC (F00433); Biogas from dairy manure at Mineral King in Visalia, CA; upgraded to pipeline quality at CalBioGas North Visalia and pipelined to CA for transportation use (Provisional)	California	Dairy manure Compressed natural gas	-417.26
Fuel Producer: U.S. Venture, Inc. (5504); Facility Name: YELLOW JACKET LAMB RNG PROJECT (71101); Biogas from dairy manure at Lamb Farm in Oakfield, NY; upgraded to pipeline quality at Yellow Jacket Lamb RNG Project and pipelined to California for transportation use (Provisional)	New York	Dairy manure Compressed natural gas	-311.72
Fuel Producer: California Bioenergy LLC (B194); Facility Name: CalBioGas Kern LLC (F00336); Biogas from dairy manure at Newhouse Dairy in Bakersfield, CA; upgraded to pipeline quality at CalBioGas	California	Dairy manure Compressed natural gas	-411.77

Kern LLC in and pipelined to CA for transportation use (Provisional)			
Fuel Producer: REG Grays Harbor, LLC (6326); Facility Name: REG Grays Harbor, LLC (82954); North American Sourced Soybean Oil transported by rail to Biodiesel plant in Hoquiam, WA; Natural Gas and Grid Electricity; Biodiesel transported by truck and rail to California	Washington	Soybean oil Biodiesel	55.00
Fuel Producer: IOGEN D3 BIOFUEL PARTNERS II LLC (7180); Facility Name: WOF PNW Threemile Project (F00100); Renewable Natural Gas (RNG) from Dairy Manure at Columbia River Dairy and Six Mile Farms, upgraded in Boardman, Oregon; RNG pipelined to California for transportation use	Oregon	Dairy manure Compressed natural gas	-171.65
Fuel Producer: Trillium Transportation Fuels, LLC (T311); Facility Name: Greengasco, LLC (F00154); Renewable Natural Gas (RNG) produced from Dairy Manure at Exum Dairy and upgraded at GreenGasco in Stratford, Texas; RNG pipelined to California for transportation use	Texas	Dairy manure Compressed natural gas	-392.30
Fuel Producer: AgPower Jerome, LLC (C1036); Facility Name: AgPower Jerome RNG Project (F00077); Renewable Natural Gas (RNG) produced from Dairy Manure at Double A Dairy and Double A Dairy #6 and upgraded at AgPower Jerome RNG in Jerome, Idaho; RNG pipelined to California for transportation use	Idaho	Dairy manure Compressed natural gas	-240.91
Fuel Producer: PUGET SOUND ENERGY (6055); Facility Name: CEDAR HILLS LANDFILL RECOVERY GAS PROJECT (71109); Biomethane from Cedar Hills Landfill at Maple Valley, Washington upgrading at Puget Sound Energy, pipelined to California for compression to CNG (Provisional)	Washington	Landfill gas Compressed natural gas	28.80
Fuel Producer: PUGET SOUND ENERGY (6055); Facility Name: CEDAR HILLS LANDFILL RECOVERY GAS PROJECT (71109); Biomethane from Cedar Hills Landfill at Maple Valley, Washington upgrading at Puget Sound Energy, pipelined	Washington	Landfill gas Liquified natural gas	42.58

to Clean Energy Boron, California for liquefaction to LNG; trucked to California LNG stations (Provisional)			
Fuel Producer: PUGET SOUND ENERGY (6055); Facility Name: CEDAR HILLS LANDFILL RECOVERY GAS PROJECT (71109); Biomethane from Cedar Hills Landfill at Maple Valley, Washington upgrading at Puget Sound Energy, pipelined to Clean Energy Boron, California for liquefaction to LNG; trucked to California; regasified, and compressed to L-CNG (Provisional)	Washington	Landfill gas Liquified compressed natural gas	45.67
Fuel Producer: MONTAUK ENERGY HOLDINGS, LLC (6139); Facility Name: Pico Energy, LLC (71221); Biogas from dairy manure at B2 Dairy, B6 Dairy, Crossbred Dairy in Jerome, ID, and B5 Dairy in Wendell, ID; upgraded to pipeline quality at Pico Energy, LLC, and pipeline to CA for transportation use. (Provisional)	Idaho	Dairy manure Compressed natural gas	-260.56
Fuel Producer: Madera Renewable Energy, LLC (C1140); Facility Name: Madera Renewable Energy, LLC (F00436); Low-CI electricity from Dairy Manure biogas using reciprocating engine at Philip Verwey Dairy in Madera, CA for use as transportation fuel in California. (Provisional)	California	Dairy manure Electricity	-758.40
Fuel Producer: U.S. Venture, Inc. (5504); Facility Name: AUGEAN RNG PROJECT (71081); Biogas from dairy manure at Augean RNG project, Outlook, WA; upgraded to pipeline quality at Augean RNG Project; currently trucked to pipeline injection and pipelined to CA for transportation use. (Provisional)	Washington	Dairy manure Compressed natural gas	-216.63
Fuel Producer: IOGEN D3 BIOFUEL PARTNERS II LLC (7180) ; Facility Name: ResilientIG Threemile Acquisition LLC (F00100); Biogas from Dairy Manure at Three Mile Farm in Boardman, OR; upgraded to pipeline quality at ResilientIG Threemile Acquisition LLC; delivered via pipeline to liquefaction facility in Topock, AZ; delivered by truck to CA and regasifed for use as LCNG	Oregon	Dairy manure Liquified compressed natural gas	-156.47

Fuel Producer: IOGEN D3 BIOFUEL PARTNERS II LLC (7180) ; Facility Name: ResilientIG Threemile Acquisition LLC (F00100); Biogas from Dairy Manure at Three Mile Farm in Boardman, OR; upgraded to pipeline quality at ResilientIG Threemile Acquisition LLC ; delivered via pipeline to liquefaction facility in Topock, AZ; delivered by truck to California for use as LNG	Oregon	Dairy manure Liquified natural gas	-152.93
Fuel Producer: Lakeside Pipeline, LLC (C1158); Facility Name: Lakeside Pipeline, LLC (F00480); Biogas from dairy manure at River Ranch Dairy In Hanford, CA; upgraded to pipeline quality at Lakeside Pipeline, LLC; pipelined to California for transportation use. (PROV3.0)	California	Dairy manure Compressed natural gas	-417.71
Fuel Producer: California Bioenergy LLC (B194); Facility Name: Bar 20 Biogas LLC (F00510); Low-CI electricity from dairy manure biogas using Solid Oxide Fuel Cell generator at Bar 20 Dairy in Kerman, CA for use as a transportation fuel in California (PROV3.0)	California	Dairy manure Electricity	-790.41
Fuel Producer: DF-AP #1, LLC (C1122); Facility Name: Big Sky Dairy Digester (F00329); Low-CI Electricity from Dairy Manure Biogas using reciprocating engine at Big Sky Dairy in Gooding, Idaho for use as transportation fuel in California (3.0)	Idaho	Dairy manure Electricity	-506.69
Fuel Producer: Dry Creek RNG LLC (C1098); Facility Name: Dry Creek RNG Project (F00342); Biogas from Dairy Manure at Dry Creek Dairy and Southside Dairy in Hansen, Idaho; Upgraded biomethane pipelined to California for transportation use (3.0)	Idaho	Dairy manure Compressed natural gas	-421.46