Health Professionals for a Healthy Climate

June 5, 2025

Minnesota Public Utilities Commission

RE: In the Matter of a Commission Investigation into a Fuel Life-Cycle Analysis Framework for Utility Compliance with Minnesota's Carbon-Free Standard. PUC Docket Number: E-999/CI-24-352

Dear Executive Secretary Seuffert:

Health Professionals for a Healthy Climate (HPHC) is a non-profit organization supporting a multidisciplinary network of hundreds of health professionals across Minnesota working to protect and improve human health by promoting climate health. HPHC appreciates the opportunity to submit comments to the Minnesota Public Utilities Commission (PUC) on Docket 24-352, pertaining to the implementation of Minnesota's 100% Carbon Free Law. In this letter we respond to:

- Whether biomass, renewable natural gas, and solid waste should be eligible as fully or partially carbon-free generation sources based on a fuel life-cycle energy analysis.
- Are there any other issues or concerns related to this matter?

Whether biomass, renewable natural gas, and solid waste should be eligible as fully or partially carbon-free generation sources based on a fuel life-cycle energy analysis.

In previous comments to the PUC, HPHC asserted our position that biomass and solid waste incineration are not carbon-free technologies. **Both biomass and incineration directly emit carbon and therefore cannot be included under the plain language of the 100% Carbon Free Law.** All biomass emits carbon when it is burned, including waste-to-energy facilities, which burn garbage or biomass and generate large amounts of carbon pollution. Any technology that burns biomass should not be considered carbon free, nor should it receive partial compliance credit. Natural gas, including renewable natural gas (RNG), also emits carbon when burned. **Therefore, RNG should not receive partial credit as carbon-free.** In addition, RNG produces the same harmful air contaminants as burning fossil fuels[1] and its production builds upon fossil-fuel-based natural gas pipeline infrastructure.

However, regarding the counterfactual scenario which poses the question "what were the methane emissions and overall GHG emission impacts associated with waste management

[1] Gittelson, P., Diamond, D., Henning, L., Payan, M., Utesch, L., & Utesch, N. (2022). The False Promises of Biogas: Why Biogas Is an Environmental Justice Issue. Environmental Justice, 15(6), 352–361. https://doi.org/10.1089/env.2021.0025

before the waste was diverted to natural gas production?" RNG could have a lower carbon intensity than fossil-based natural gas, so has potential to reduce carbon emissions, especially if derived from food and animal waste feedstock. Lee et al. (2021) modeled GHG reduction potential for food waste at 34 MMTCO2e (million metric tons CO2 equivalent) and 68 for animal waste.[2] While both food waste and animal waste can provide feedstock for RNG, food waste is a largely necessary waste product, while storage of manure provides a toxic waste product that is unique to CAFOs and completely unnecessary, as there are more sustainable ways to raise livestock that do not require the lagoon-style storage of their waste that leads to disproportionate pollution and harm.

Any benefit of RNG over fossil-fuel-based gas is eliminated when RNG-derived methane leaks at higher rates than fossil gas – all such leakage must be accurately monitored and counted against any RNG projects attempting to provide electric power in Minnesota. Studies have shown that leaks and fugitive emissions rates from RNG production have been shown to be higher than those for fossil methane and oil production, and are close to double the rates assumed by the International Energy Agency.[3] Methane has eighty times the planet-warming potential of CO2 over the next twenty years (the relevant period to Minnesota's decarbonization standards and goals), so any RNG project that doesn't completely control its methane leakage will quickly become net GHG positive when compared to fossil gas. Any attempt to categorize RNG as partially "carbon free" will require round-the-clock monitoring of all leakage from the site using industry leading sensing technology, not just optimistic modeling that assumes leaks are average and predictable.

But the PUC doesn't need to compare RNG and fossil gas – both emit carbon when combusted so both are irreconcilable with compliance with Minnesota's carbon-free standard. RNG should be phased out entirely with all carbon-emitting sources of energy, and the PUC should not impose the cost of this inefficient technology on ratepayers.

While RNG could reduce methane emissions (while increasing CO2 emissions in violation of state law) which would otherwise be released into the atmosphere, when that methane comes from manure waste generated by industrial scale confined animal feeding operations (CAFOs) there should be no lifecycle analysis of any GHG reduction unless external harms from these operations are also considered and counted against the baseline. Allowing credit for avoided methane emissions rewards rather than regulates CAFO methane emitters, which are also significant producers of air and water pollution, and nutrient run-off that contributes to algal blooms.[4] In addition, CAFOs and their associated meatpacking plants are notoriously dangerous places to work and also are often found to have harmed migrant laborers who have little ability to protect themselves from abuses.

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[2] Lee U, Bhatt A, Hawkins TR, Tao L et al. Life cycle analysis of renewable natural gas and lactic acid production from waste feedstocks. Journal of Cleaner Production, 2021; 311:127653.
[3] Semra Bakkaloglu et al., *Methane Emissions Along Biomethane and Biogas Supply Chains are Underestimated*, 5 One Earth 724–736 (June 2022), https://www.sciencedirect.com/science/article/pii/S2590332222002676.
[4] NRDC, Big Ag Is Hiding in Plain Sight and It's Making Us Sick, 2019.

The health, ecosystem, and economic costs of these GHGs reductions are externalized by the companies and then borne by rural communities, allowing industrial-scale CAFO operations to make unjust profits. These operations also crowd out small to medium-sized livestock operations which are more likely to employ grazing-based systems that emit fewer GHGs, are significantly less polluting, contribute to local economies, and sustain long-rooted, perennial pasture, which naturally captures more carbon. The number of dairy farms in Minnesota decreased 40% between 2017 and 2022, due to consolidation into larger operations.[5] Likewise, between 2012 and 2017 the number of hog farms decreased by 130, while the number of hogs increased by 840,000, continuing a trend toward factory-scale farming in Minnesota.[6]

Allowing credit for RNG produced from animal waste will incentivize large-scale factory farms that impact quality of life in rural communities – this harm should be quantified in any life cycle analysis and counted against any benefit from the RNG facility. CAFOs are animal warehouses that keep over 1000 "animal units" confined for over 45 days a year in a small area of land, with no grazing available or possible. In addition to profits from raising animals for food, CAFOs with methane digesters can tap into an opportunity to sell methane to make RNG, which provides an additional profit center that is incentivized by state laws favoring RNG production. Plentiful federal and state dollars and tax credits are available for large CAFOs that operate methane digesters to sell methane (or credits divorced from the actual methane) to fossil fuel companies who use this methane/credit to pollute more than they would otherwise be allowed to. The California Low Carbon Fuel Standard's (CA LCFS) carbon credit system sweetens the pot with financial incentives for large CAFOs to operate methane digesters to sell methane (or credits) for RNG used in transportation fuel.

Inflated credits from the CA LCFS program has encouraged CAFOs and other industrial farms to grow and allow public funds to subsidize digester construction while industrial farms collect millions of dollars for the credits they sell.[7] Because the upfront and operating costs of digesters are significant, the economy of scale only benefits operations processing large amounts of methane, favoring large industrial operations and closing out small and mid-sized farms that cannot tap into such incentives. EPA AgSTAR admits that digesters at swine operations "are not economically viable until greater than 10,000 hogs are incorporated."[8] In a 2022 interview, the CEO of Shell's subsidiary, Nature Energy, divulged that the digesters they plan to own in Minnesota require about 15,000 cows within a 20 to 30 mile radius.[9] Some community anaerobic

[5] McVan M. Minnesota farms are consolidating and other takeways from the census of agriculture. Minnesota Reformer. February 144, 2024.
[6] Lilliston B. IATP. Minnesota agriculture emissions: the CAFO challenge. March 23, 2023.
[7] Gable, J. (2021, October 28). How a California climate program rewards mega-polluting factory farms nationwide. Food & Water Watch. https://www.foodandwaterwatch.org/2021/10/28/how-a-california-climate-program-rewards-mega-polluting-factory-farms-nationwide/
[8] U.S. EPA. (2020). AgSTAR project development handbook: A handbook for developing anaerobic digestion/biogas systems on farms in the United States. https://www.epa.gov/sites/default/files/2014-12/documents/agstar-handbook.pdf
[9] Beach, J. (2022, November 15). Nature Energy brings large-scale manure-to-energy projects from Denmark to Minnesota. Agweek.

digesters have shut down due to the underestimation of operating costs and fluctuating price of renewable Energy Credits.[10] This credit system incentivizes increased livestock herds and land consolidation, creating a grow-or-get-out economy that has led to rural impoverishment and population loss, while putting downstream communities at risk.

Minnesota is home to about 9 million hogs and nearly half a million dairy cows, which produce as much as 50 million to 100 million tons of manure a year.[11] As of 2020, there were over 1,400 CAFOs in Minnesota, primarily located in Southern Minnesota,[12] and six digesters currently in operation.[13] The same year, the Environmental Working Group simulated manure and fertilizer use across Minnesota and found that nitrogen levels in 69 of 72 Minnesota's agricultural counties exceeded recommendations set by the Minnesota Pollution Control Agency (MPCA) and the University of Minnesota.[14] Thus, the existing impacts of consolidated animal husbandry and CAFO pollution has already been felt in Minnesota. The PUC can supercharge this harm if it endorses RNG from CAFOs as a "carbon free" energy source, giving these facilities yet another subsidy.

If RNG as an energy source receives partial credit for reducing methane emissions under Minnesota's 100% Carbon Free standard, the PUC would be providing another incentive and subsidy for large CAFOs which create considerable ecosystem, health, and economic harm, most of which is unaccounted for in life cycle assessment models. These harms must be included in any analysis of any RNG project and projects should not be approved by the PUC for inclusion if they do cause additional harms to rural communities. A presentation by the Great Plains Institute (GPI) to the PUC on April 11, 2025 claims that the GREET LCA model can account for RNG production's intensity of water use, GHG emissions intensities, and air pollutant intensities of VOC, CO, NOX, PM10, PM2.5, SOX, BC, and OC, in addition to energy intensities. Even if this is the case, other externalities are still not accounted for, including public health impacts, economic and social impacts on rural communities, pollution from industrial corn and soybean growing for animal feed, and opportunity costs of lost natural carbon sequestration and loss of more sustainable small to medium-size livestock operations. Any model or analysis that does not account for the destruction of rural economies and environments is not sufficient to assure that environmental benefits are shared by rural communities consistent with Minnesota Statute 216B.1691, Subdivision 9.

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https://www.agweek.com/business/nature-energy-brings-large-scale-manure-to-energy-projects-from-denmark-to-minnesota

[10] Wang, Q., Thompson, E., Tweedy, A., O'Leary, M. L., & Crossman, W. W. (2021). Potentials and obstacles for community anaerobic digesters in the United States: Evidence from a case study in Vermont. Renewable and Sustainable Energy Reviews, 137, 110434. https://doi.org/10.1016/j.rser.2020.110434

[11] Digesters Make Renewable Energy From Manure, but Face Hurdles, September 15, 2023.

[12] Porter, S. (2020, May 28). Manure overload: Manure plus fertilizer overwhelms Minnesota's land and water. Environmental Working Group. http://www.ewg.org/interactive-maps/2020-manure-overload/

[13] U.S. EPA. (2022). Livestock Anaerobic Digester Database. AgSTAR. https://www.epa.gov/agstar/livestock-anaerobic-digester-database

[14] Porter, S. (2020, May 28). Manure overload: Manure plus fertilizer overwhelms Minnesota's land and water. Environmental Working Group. http://www.ewg.org/interactive-maps/2020-manure-overload/

There are already significant GHGs from CAFOs, which will be made worse if the PUC incentivizes CAFO RNG production. CAFOs are a major source of GHG emissions in the agricultural sector, which contributes to 25% of MN's GHG emissions. The agricultural sector is also the largest source of methane and nitrous oxide emissions. Agricultural emissions have risen since 1990, including methane from cows and nitrous oxide from manure and crops on which nitrogen fertilizer is applied.[15] In Minnesota, since 1991 the number of CAFOs has tripled. The number of hogs in our state are rising dramatically, while the number of farmers continues to decrease. The growth of CAFOs also stimulated an increase in acreage devoted to corn and soybeans to meet additional demand for animal feed – industrial corn production requires large amounts of synthetic nitrogen fertilizers and other chemicals, which are a large source of GHG emissions and toxic pollutants due to the way they are produced and applied.

There is already significant pollution from Minnesota CAFOs, which will be made worse if the PUC incentivizes CAFO RNG production. The MPCA estimates the amount of manure generated by livestock in Minnesota would be equivalent to that of a human population of about 50 million – nearly nine times the actual human population. Animal waste from CAFOs is stored in large lagoons, which threaten water quality with excessive nutrients, microbial pathogens, pharmaceuticals, heavy metals, and naturally-secreted hormones.[16] Water pollution from CAFOs is also linked to E.coli infections from crop contamination through dust from feedlots and contamination of irrigation water.[17] Emissions from CAFO lagoons pollute the air with ammonia, hydrogen sulfide, CO2, nitrogen oxides, sulfur dioxide, methane, VOCs and other hazardous pollutants.[18] These pollutants have significant impacts on human health.[19] "Agricultural production in the United States results in 17,900 annual air quality-related deaths, 15,900 of which are from food production. Of those, 80% are attributable to air pollution from the production of animal-based foods, both directly from animal husbandry and indirectly from growing animal feed."[20]

Digestate, a product of the methane digester process, is used in fertilizer and has attendant impacts on health and the environment. One study found that digestate produces more ammonium, the $PM_{2.5}$ precursor, and GHG emissions than manure lagoons.[21] Another study revealed that digested solids that are composted (a common application of digestate in the

[15] Lilliston B. IATP. Minnesota agriculture emissions: the CAFO challenge. March 23, 2023.
[16] Burkholder J, Libra B, Weyer P, Heathcote S et al. Impacts pf waste from concentrated feeding operations on water quality. Environ Health Perspect. 2006;115(2):308-312.
[17] Bahe E. Most California factory farms, close to irrigation canals, threaten U.S. food safety. July 24, 2024.
[18] Gonzalez G. Feeding the Crisis: The Buried Dangers of Concentrated Feeding Operations. December 15, 2024.
[19] Greger M, Koneswaran G. The Public Health Impacts of Concentrated Animal Feeding Operations on Local Communities. Fam Community Health. 2010;33(1):373-382.
[20] Domingo NG, Balasubramanian S, Thakrar SK, Hill J. Air quality-related health damages of food. PNAS. 2021;https://doi.org/10.1073/pnas.2013637118
[21] Alexander, R. (2012, January). Digestate utilization in the U.S. BioCycle. https://www.biocycle.net/digestate-utilization-in-the-u-s/

United States)[22] release such significant levels of N_2O compared to undigested manure solids that the climate benefits of capturing methane through the digestion process are canceled out.[23, 24]

There are already significant health impacts of CAFOs, which will be made worse if the PUC incentivizes CAFO RNG production. CAFOs are responsible for harmful air emissions that cause health impacts such as asthma, respiratory problems, eye irritation, and nausea. Proximity to industrial animal operations has proven to be a major health concern for rural communities.[25, 26] Pollutants from industrial farms and the biomethane lifecycle include excess nitrogen and phosphorus, ammonia, hydrogen sulfide, particulate matter, and pathogens that negatively impact air quality and can lead to respiratory and other health problems and a decline in quality of life.[27] One study found that people living closest to a CAFO had a 66 percent increased odds of being diagnosed with community-acquired pneumonia, putting them at risk for serious illness and premature death.[28]

CAFO farmers routinely dose animals with antibiotics to prevent disease spread in dirty, crowded living conditions. Agriculture accounts for 80% of antibiotics used in the U.S. Overuse of antibiotics in animal agriculture contributes to the rise of antibiotic-resistant bacteria. Antibiotic resistance reduces the arsenal of drugs available for treatment, so contributes to disease spread. “When these antibiotic-resistant bacteria spread to humans through our food supply, via animal to human transfer on farms, or through contaminated waste they can cause serious or even deadly antibiotic-resistant infections in people. Over two million Americans suffer from an antibiotic-resistant infection every year, and 23,000 people die.”[29] By further incentivizing this type of agriculture the PUC will be indirectly contributing to making antibiotics less effective, thus increasing health impacts that could be prevented by phasing out CAFOs instead.

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[22] Holly, M. A., Larson, R. A., Powell, J. M., Ruark, M. D., & Aguirre-Villegas, H. (2017). Greenhouse gas and ammonia emissions from digested and separated dairy manure during storage and after land application. Agriculture, Ecosystems & Environment, 239, 410–419. https://doi.org/10.1016/j.agee.2017.02.007

[23] Climate Change Connection. (2020). CO2 equivalents. https://climatechangeconnection.org/emissions/co2-equivalents/

[24] Gittelson et al, 2022.

[25] Wilson, S. M., Howell, F., Wing, S., & Sobsey, M. (2002). Environmental injustice and the Mississippi hog industry. Environmental Health Perspectives, 110 Suppl 2(Suppl 2), 195–201. https://doi.org/10.1289/ehp.02110s2195

[26] Donham, K. J., Wing, S., Osterberg, D., Flora, J. L., Hodne, C., Thu, K. M., & Thorne, P. S. (2007). Community health and socioeconomic issues surrounding concentrated animal feeding operations. Environmental Health Perspectives, 115(2), 317–320. https://doi.org/10.1289/ehp.8836

[27] Hribar, C. (2010). Understanding concentrated animal feeding operations and their impact on communities. National Association of Local Boards of Health. https://www.cdc.gov/nceh/ehs/docs/understanding_cafos_nalboh.pdf

[28] Poulsen MN, Pollak J, Sills DL, Casey JA et al. High-density poultry operations and community-acquired pneumonia in Pennsylvania. Environmental Epidemiology. 2018; 10.1097/EE9.0000000000000013.

[29] Food & Water Watch, 2021.

There are already significant negative economic impacts of CAFOs, which will be made worse if the PUC incentivizes CAFO RNG production. Studies document economic decline in communities with CAFOs, as few economic benefits accrue to the local community. Typically large, vertically integrated CAFOs do not purchase feed, equipment, and services locally. Studies have found reduced income for certain segments of the community, greater income inequality, and decreased local retail trade, in communities with CAFOs.[30] In one study focused on Minnesota, local farm-related expenditures fell sharply when the scale of livestock operations increased.[31]

A CAFO located in a community is viewed as a negative externality with respect to property values, due to odors, flies, rodents, degradation of water bodies, and air pollution emissions and their health impacts. Outdoor recreation is usually incompatible with the presence of a CAFO in the community. The right of use and enjoyment of a property is of paramount concern with respect to property values. Several studies document depressed home values of properties close to CAFOs.[32]

There is already significant pollution from crops used in CAFO animal feed, which will be made worse if the PUC incentivizes CAFO RNG production. CAFOs rely on purchased feed, rather than grazing. Production of animal feed represents the largest source of livestock industry greenhouse gas emissions. The livestock industry is responsible for an estimated 14.5% of human-caused GHG emissions. Feed production and processing comprises 45% of that sector's emissions, which includes 9% of emissions attributable to expansion of pasture and feed crops – replacing and destroying forests and natural prairie landscapes.[33] Farm policy in the U.S. subsidizes corn and soybean commodity crop production. Seventy percent of soybeans and half of all corn grown in the U.S. goes into animal feed, providing a cheap food source for CAFO animal warehouses.[34]

Along with these increased acres of monocrop industrial corn and soy production comes increased use of pesticides and fertilizers that pollute soil, water, and air and impact human health. As previously noted, in 69 of MN's counties, where agriculture dominates the landscape, water pollution from nitrogen from manure and fertilizer exceeded the MPCA's standards. Excess nitrogen pollutes well water and exposure is linked to thyroid problems, adverse pregnancy outcomes, cancers (particularly colorectal), and methemoglobinemia, also known as blue baby syndrome.[35] Nine Minnesota counties have high levels of phosphate pollution in lakes

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[30] Pew, Impact of Industrial Farm Animal Production on Rural Communities,
[31] Chism JW, Levins RA, Honadle B, Wang Y. Farm Spending and Local Selling: How Do They Match Up?; Changing Fiscal Patterns for Minnesota County Governments. Minnesota Agricultural Economist no. 676. 1994; http://dx.doi.org/10.22004/ag.econ.206493
[32] Ibid..
[33] Gerber, P. J. et al. (2013). Tackling Climate Change Through Livestock: A Global Assessment of Emissions and Mitigation Opportunities. Rome: Food and Agriculture Organization of the United Nations (FAO) at xii.
[34] Williams M. What the 2023 Farm Bill Could Change for Animals and Farmers. Sentient- Food & Farming. June 20, 2023.
[35] MN Depart. of Health, Nitrate in Well Water.

and rivers that can increase the risk for algal blooms, which can expose humans and animals to toxic bacteria.[36]

In conclusion, we urge the PUC to fully consider and account for the health, ecosystem, and economic externalities of allowing any partial credit for RNG derived from large-scale CAFOs. To the extent that the PUC cannot account for the many externalities, leakage, and foreseeable economic and social harms of RNG production and use, it should forbid any RNG project from being considered even partially "carbon free" under Minnesota law. If RNG as an energy source receives partial credit for reducing methane emissions under Minnesota's 100% Carbon Free standard, we would be providing another incentive for large CAFOs which create considerable ecosystem, health, and economic harm, most of which is unaccounted for in life cycle assessment models. These costs are borne by rural communities, while industrial scale CAFOs increase profits. Instead of incentivizing dirty animal warehouses, we must support small to medium-sized livestock operations with grazing-based systems that contribute to local economies and sustain perennial pasture, which naturally captures more carbon.

Burning RNG always emits carbon. The carbon-free standard does not mention or contemplate offsetting actual carbon emissions with methane emissions – the law does not mention "methane" once and certainly does not mention RNG. Thus, the PUC would do well to classify RNG as carbon intensive energy and phase it out entirely consistent with the clear language of the law. Life cycle analysis based on methane emissions is not only bafflingly complex, it is also not called for by the legislature's plain language defining "carbon free."

To the extent that the PUC allows the burning of biomass, renewable natural gas, or solid waste as energy sources going forward, including partial implementation between now and 2040, the tracking process and utility planning should effectively quantify and analyze the deaths and morbidity these facilities cause in overburdened communities in Minnesota and other jurisdictions. Such modeling should also account for economic harm, property value losses, harms to rural population and ways of life, harms to family farming, and a wide galaxy of known pollution impacts that rob rural communities of their health and their futures. This is consistent with the requirement of Minnesota Statute 216B.1691 Subd. 9, as well as the PUC's quantification and inclusion of externalities in planning dockets. Following the command of Subd. 9 in any modeling, and also applying and expanding the externality values and their use would be consistent with the 100 percent law's focus on protecting environmental justice communities from undue harm.

HPHC appreciates the opportunity to submit comments on this important docket.

Kathleen Schuler, MPH

State Policy Director kathleen@hpforhc.org

Health Professionals for a Healthy Climate, PO Box 583013, Minneapolis, MN 55458

[36] Environmental Working Group. 2020. Manure Overload: Manure Plus Fertilizer Overwhelms Minnesota's Land and Water.