Air Pollution from CAFOs in Yakima County – Potential Impact of Digesters that Produce Natural Gas from Cow Manure

Abstract:

Investment groups see an opportunity to capitalize on Washington's recently adopted Climate Commitment Act (CCA) Cap and Invest Program by building Renewable Natural Gas (RNG) facilities in the Lower Yakima Valley (LYV) that would refine methane from cow manure into natural gas that could be pumped into the nearby Northwest Pipeline.

Friends of Toppenish Creek (FOTC) has studied reporting protocols to learn how much methane is emitted in the LYV from concentrated animal feeding operation (CAFO) dairies, how much can be captured, and how much will still be emitted into the atmosphere if RNG projects are approved. According to FOTC calculations methane emissions from animal agriculture in the LYV are over 29,000 metric tons per year or about 0.737 million metric tons (MMT) of CO_2 equivalents per year. Manure digestion converts nitrogen in the manure to ammonia, an undesirable byproduct.

Methane is created when manure is stored under anaerobic conditions in large manure lagoons. An alternative solution to the methane problem is not to create it in the first place by moving dairies toward dry manure management systems that do not involve lagoon storage.

Recent legislation requires WA agencies to engage overburdened communities such as the LYV when the agencies address sources of pollution. This is a challenge because people in overburdened communities such as the LYV often have limited education and limited English proficiency. The WA State Environmental Policy Act (SEPA) also requires community participation in regulatory decision making. FOTC submits that early discussion of the potential impacts at the local level, along with careful implementation of the SEPA are the best ways to ensure thoughtful permitting and policy making with respect to RNG.

Air Pollution from CAFOs in Yakima County – Potential Impact of Digesters that Produce Natural Gas from Cow Manure

Friends of Toppenish Creek has learned that concentrated animal feeding operations (CAFOs) in the Lower Yakima Valley (LYV) produce so much methane gas that investment groups plan to build multi-million dollar anaerobic digesters to capture methane from cow manure, refine it, and sell it on the natural gas market.

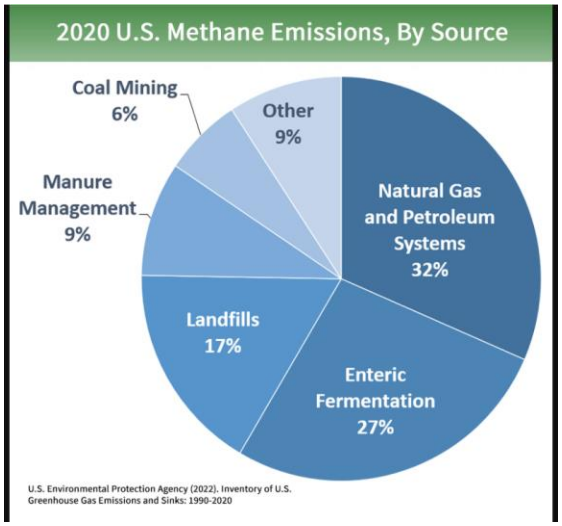
We are told that three different companies are vying for permits to set up operations. One company says they will produce 700,000 to 800,000 million British Thermal Units (MMBTUs) of renewable natural gas (RNG) per year. A million BTUs is approximately equal to the energy in 8 gallons of gasoline, so this company expects to produce the equivalent of 6 million gallons of gasoline per year.

This apparent abundance of methane prompts us to ask how much methane has been going up into the air that people in the LYV breathe in recent years.

With approximately 90,000 milk cows and 16,000 beef animals in the LYV, methane emissions from animal agriculture in the LYV are over 29,000 metric tons per year or about 0.737 million metric tons (MMT) of CO_2 equivalents per year. This is about 18% of all greenhouse gas emissions from animal agriculture in the entire state. The 500 square mile LYV covers 0.7% of Washington.

How much of this methane is available for capture and refining?

There are two main sources of methane emissions from animal feeding operations – enteric fermentation and manure management. Enteric fermentation is belching and farting. This methane cannot be captured and is lost to the air. It is also the largest agricultural source – three times the amount from manure management.



From EPA "Overview of Greenhouse Gasses" at https://www.epa.gov/ghgemissions/overview-greenhouse-gases#methane

In other words, for each metric ton of methane that might be captured, about three tons escape into the ambient air.

How dangerous is methane to public health?

Methane is a precursor to ozone, a known hazard to public health. Methane is usually emitted with other hazardous air pollutants such as benzene, formaldehyde, and ethyl benzene that are associated with serious health problems including cancer.

People die from methane in coal mines. People die due to methane and hazardous gas emissions from manure storage pits.

During the Aliso Canyon leak, the largest methane leak in U.S. history which sent 109,000 metric tons of methane into the ambient air, authorities evacuated 6,800 households due to dizziness, headaches, nausea, eye, nose and throat irritation, and nose bleeds.

What happens within anaerobic manure lagoons?

Methane is produced when bacteria convert volatile organic compounds (VOCs) in manure to methane and carbon dioxide under anaerobic conditions. The gas produced is typically 40% carbon dioxide and 60% methane with traces of other gasses. The justification for capturing and/or producing this methane is to replace natural gas from fossil sources.

Are there better options for managing methane from manure?

There are experts within the agricultural community who recommend changing manure management from wet to dry systems rather than encouraging and prolonging use of manure lagoons by subsidizing biogas production. Approximately a quarter of methane emissions from dairies could be eliminated by moving to dry manure management or pasture based dairies. There are major problems with manure digesters and the amount of energy delivered is small when compared to the effort.

- For every metric ton of methane that is captured in a digester, approximately three metric tons of methane from enteric fermentation go up into the ambient air.
- Producing manure for bio-digesters involves emissions of hydrogen sulfide, ammonia, and volatile organic compounds which ultimately results in higher levels of criteria air pollutants - particulate matter, ozone, and sulfur dioxide in the ambient air.
- Digesters convert nitrogen in manure into ammonia gas and nitrous oxide
- Manure lagoons without double synthetic liners leak and this results in contamination of aquifers that people rely on for drinking water, an unintended adverse side effect.
- Cow manure has the lowest value as a feedstuff for bio-digesters of all the feedstocks evaluated by Washington State University
- The effluent from manure bio-digesters continues to pollute the air after digestion.

The Olympia Physicians Climate Task Force summarized problems with manure lagoons very well in their 2022 comments on Ecology's National Pollutant Discharge Elimination System (NPDES) permits for concentrated animal feeding operations (CAFO's)

> *Science evolves and policy must evolve with the science. The administration has made its methane pledge, and Washington needs to do its part. DOE has failed to consider the impacts of climate change in authorizing CAFO discharge into our waterways. Manure lagoons contribute to global warming. Storing manure in lagoons produces methane, a GHG far more potent than CO2. Washington State sends over a million metric tons of GHG CO2 equivalent into the atmosphere every year from manure lagoons. When cows are kept on pasture, this does not happen. We sympathize with farmers who followed the best available advice when they built lagoons years ago. They were told, and they believed, that lagoons would protect the environment. Now, we know that the side effects are huge, and we wish to see farmers assisted in transitioning away from this practice.*

Are there cumulative impacts when manure bio-digesters are set up in communities?

Yes. Bio-digesters as currently promoted mostly benefit large, concentrated animal feeding operations (CAFOs). The adverse impacts of CAFOs as a method of raising farm animals are well documented. Children who live near CAFOs are more likely to suffer from asthma and CAFO emissions worsen asthma symptoms. Adults who live near CAFOs are more likely to suffer from tension, depression, anger, and anxiety. Property values and quality of life decline in CAFO communities. CAFOs drive small farmers out of business.

While producing the manure that feeds bio-digesters dairies emit large amounts of ammonia, hydrogen sulfide, volatile organic compounds, and particulate matter. Bio-digesters increase production of ammonia.

Part of the digestion process involves scrubbing the bio-gasses for hydrogen sulfide and other contaminants. These gasses must be managed. After methane is removed, manure solids remain. Typically, the solids are composted which leads to further air pollution and generates PM 10.

Proper evaluation requires measurement of upstream and downstream air pollution, as well as chemical reactions within the system – evaluate the entire system of natural gas production.

Should Environmental Impact Statements (EIS) be required before permitting manure bio-digesters in Yakima County?

The purposes of the WA State Environmental Policy Act are:

> (1) "To declare a state policy which will encourage productive and enjoyable harmony between man and his environment
>
> (2) to promote efforts which will prevent or eliminate damage to the environment and biosphere

(3) to stimulate the health and welfare of man

(4) to enrich the understanding of the ecological systems and natural resources important to the state and nation."

The SEPA Rules state that significant "means a reasonable likelihood of more than a moderate adverse impact on environmental quality." If officials determine a likelihood of significant impact, then an EIS is required. There is no doubt that manure lagoons without synthetic liners leach to groundwater and that CAFO dairies emit major air pollutants. If generation of natural gas from manure increases profits, there is a high risk of increasing cow numbers and increasing these adverse effects.

According to Hoard's Dairyman:

> *The profit generated by manure and energy is a new dynamic for dairy farms. A common arrangement is for a third party to invest in the digester and form an agreement with one or more dairy farms for a supply of manure. These contracts can be for 10 to 15 years or longer and pay $80 to $100 per cow per year or more. For a 3,500-cow dairy, that means $350,000 per year or 40 cents per hundredweight based on an 80 pound per day tank average. Some farms own the digesters, taking on the risk, but reaping potentially larger rewards. If the profits are $2 to $3 per hundredweight, they could likely exceed the profit from milk. At that point, milk has become the by-product of manure production.*

Environmental Impact Statements should be mandated as a condition for permitting manure biogas digesters to:

- measure the amounts of air and water pollution generated upstream and downstream from the digesters
- assess increased traffic in rural neighborhoods
- predict impact of flaring excess gas
- evaluate risk from leaks
- evaluate economic and environmental impact on smaller neighboring farms
- characterize the environmental impact if cow numbers increase
- compare the benefits of spending public monies on conversion to dry manure management versus subsidizing liquid manure systems.

At what point does the law require planners to inform the public?

Conditional Use and Building Permits require notice to the public and an opportunity for public comment after all the paperwork has been submitted.

SEPA requires agencies to involve the public during:

> *1. The "scoping" period, where agencies, tribes, and the public are invited to comment on the range of alternatives, areas of impact, and possible mitigation measures that should be evaluated within the EIS; and*

2. The draft EIS review period, where comments are requested on the merits of the alternatives and the adequacy of the environmental analysis.

RCW 70A.02.050 requires affected agencies to strive for equitable community engagement and public participation. This includes facilitating and supporting the inclusion of members of communities affected by agency decision making, and reaching out and communicating with those who face barriers, language or otherwise, to participation

In Yakima County public knowledge of potential changes such as building manure bio-digesters frequently reaches people through the grapevine. Officials only inform the public after permits are in place and a project is ready for approval. Frequently there is only a minimal nod to legal requirements for public involvement.

A more collaborative approach, in touch with the times, would be sharing information early in the process, as recommended by SEPA guidelines. Adverse impacts could be addressed in a thoughtful manner, rather than waiting until after they occur.

In the case of manure bio-digesters, FOTC submits that the information in this statement should be shared with the public. FOTC also submits the following questions regarding Biogas Digesters in the Lower Yakima Valley:

1. How dangerous is the estimated 29,000 metric tons (0.755 MMT CO_2e) of methane emitted every year from LYV animal agriculture to public health?
2. How dangerous is the estimated 29,000 metric tons (0.755 MMT CO_2e) of methane emitted every year from LYV animal agriculture to the local environment?
3. What are the quantities of hazardous air pollutants emitted along with the methane, and how dangerous are they to public health?
4. How much of the 29,000 metric tons of methane emitted every year from LYV animal agriculture converts to ozone?
5. Are the proposed digesters at sites distant from dairies?
6. If so, how will the manure be transported to the digesters?
7. Will this be liquid manure or solid manure?
8. Is the methane already in the manure that is transported to the digesters, or will it be created under anaerobic conditions at the digester site?
9. How can the public be sure the facilities are not creating methane and then charging the taxpayers for cleaning it and selling it to natural gas companies?
10. How many trips from dairies to digesters do you anticipate?
11. Will this increase wear and tear on public roadways?
12. Will the digesters be covered?

13. If so, does this increase the risk of asphyxiation for workers at the digester sites?
14. Is flare-off required when methane levels under the cover are too high?
15. Would flare off be allowed during winter inversions?
16. Does Washington have laws that require workers at digesters to wear monitors so they can tell when odorless and poisonous gases are present?
17. How can we access this information?
18. How can workers and families ensure that the facilities comply with worker safety laws?
19. How often will the sites be inspected for compliance with safety standards?
20. How can workers and their families access affordable health and safety insurance to cover potential injury and death?
21. Which hazardous gasses will be monitored, and which will not?
22. Are there plans to sample LYV air for methane and compare to the estimates now in use?
23. Are there plans to sample LYV air for ammonia, hydrogen sulfide, and ozone?
24. Are there plans to follow up on the Yakima Air Winter Nitrate Study?
25. Is the WA State Dept. of Agriculture air quality specialist working on renewable natural gas in the LYV?

Air Pollution from CAFOs in Yakima County – Potential Impact of Digesters that Produce Natural Gas from Cow Manure – With Citations

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We are told that three different companies are vying for permits to set up operations. One company says they will produce 700,000 to 800,000 million British Thermal Units (MMBTUs) of renewable natural gas (RNG) per year.[1, 2, 3] A million BTUs is approximately equal to the energy in 8 gallons of gasoline, so this company expects to produce the equivalent of 6 million gallons of gasoline per year.[4]

This apparent abundance of methane prompts us to ask how much methane has been going up into the air that people in the LYV breathe in recent years.[5]

With approximately 90,000 milk cows and 16,000 beef animals in the LYV[6], methane emissions from animal agriculture in the LYV are over 29,000 metric tons per year or about 0.737 million metric tons (MMT) of CO_2 equivalents per year.[7] This is about 18% of all greenhouse gas emissions from animal agriculture in the entire state.[8] The 500 square mile LYV covers 0.7% of Washington.[9]

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[1] Notice of Construction Application Supporting Information Report, Sunnyside RNG LLC Proposed Renewable Natural Gas Facility, Yakima County, Washington

[2] Smeenk Properties LLC Anaerobic Digester File Number: CUP2021-00059/SEP2021-00044

[3] 1 cubic foot of natural gas equals 1,000 BTUs. Natural gas typically weighs between 0.6 and 0.7 lbs per cubic foot.

[4] The British thermal unit (BTU or Btu) is a unit of heat. One BTU is defined as the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit

[5] FOTC asked the WA State Dept. of Ecology (Ecology) and the Yakima Regional Clean Air Agency (YRCAA). Neither one gave us much of an answer. We then looked at estimates from the U.S. Environmental Protection Agency (EPA). See Attachment 1 for these guidelines.

[6] We do not have good data for the number of cows on feedlots due to WA laws that require reporting only in ranges. We calculated 16,000 head of beef cattle at the Horse Heaven Feedlot based on calculations from EPA reporting guidelines and reported GHG emissions from WA Ecology at https://data.wa.gov/Natural-Resources-Environment/GHG-Reporting-Program-Publication/idhm-59de/data

[7] Emissions for 90,000 milk cows from EPA Formulas & Reporting – Attachment 1

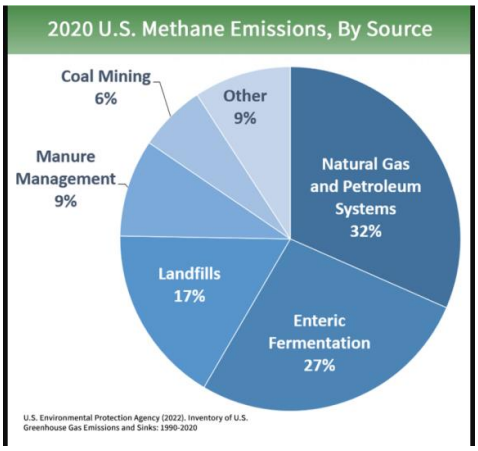
- Methane Enteric Fermentation (150.9 kg/year/milk cow) = 13,581 metric tons per year
- Methane Manure Management (156.5 kg/year/milk cow) = 14,985 metric tons per year

Emissions for 16,000 beef cattle from EPA Formulas & Reporting – Attachment 1

- Methane Enteric Fermentation (100.5 kg/yr/head) = 1,608 metric tons per year
- Methane Manure Management (2 kg/year/head) = 32 metric tons per year

How much of this methane is available for capture and refining?

There are two main sources of methane emissions from animal feeding operations – enteric fermentation and manure management. Enteric fermentation is belching and excretion. This methane cannot be captured and is lost to the air. It is also the largest agricultural source – three times the amount from manure management.



From EPA "Overview of Greenhouse Gasses" at https://www.epa.gov/ghgemissions/overview-greenhouse-gases#methane

In other words, for each metric ton of methane that might be captured, about three tons escape into the ambient air.

How dangerous is methane in the ambient air to public health?

Methane is a precursor to ozone, a known hazard to public health.[10] Methane is usually emitted with other hazardous air pollutants such as benzene, formaldehyde, and ethyl benzene that are associated with serious health problems including cancer.[11, 12, 13]

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[8] Washington State Greenhouse Gas Emissions Inventory: 1990 - 2018. Available at https://apps.ecology.wa.gov/publications/documents/2002020.pdf

[9] Farmland in the Lower Yakima Valley, including land on the Yakama Reservation, covers approximately 500 square miles. Most LYV dairies are located in the 273 square mile LYV Groundwater Management Area (GWMA)

[10] West, J. Jason, et al. "Global health benefits of mitigating ozone pollution with methane emission controls." *Proceedings of the National Academy of Sciences* 103.11 (2006): 3988-3993.Available at https://www.pnas.org/doi/full/10.1073/pnas.0600201103

[11] Earth Justice (2021) Methane: A dangerous problem, an easy solution. Available at https://earthjustice.org/features/methane-everything-you-need-to-know

[12] Ramirez-Dorronsoro, J.C., H.S. Joo, P. Ndegwa, and A.J. Heber. 2010. National Air Emissions Monitoring Study: Data from Two Dairy Freestall Barns in Washington WA5B, Final Report. Purdue University, West Lafayette, IN, July 30. https://archive.epa.gov/airquality/afo2012/web/pdf/wa5bsummaryreport.pdf

[13] Elser, Holly, et al. "Air pollution, methane super-emitters, and oil and gas wells in Northern California: the relationship with migraine headache prevalence and exacerbation." *Environmental Health* 20.1 (2021): 1-14. Available at https://link.springer.com/article/10.1186/s12940-021-00727-w

People die from methane in coal mines. [14, 15, 16, 17] People die due to methane and hazardous gas emissions from manure storage pits. [18, 19. 20, 21, 22, 23, 24, 25, 26, 27, 28, 29]

During the Aliso Canyon leak, the largest leak in U.S. history which sent 109,000 metric tons of methane into the ambient air, authorities evacuated 6,800 households due to dizziness, headaches, nausea, eye, nose and throat irritation, and nose bleeds.[30]

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[14] Radio Free Europe. 2021. We had it coming with methane: How 51 people died in a Siberian coal-mine tragedy. Available at https://www.rferl.org/a/russia-coal-mine-disaster/31585477.html

[15] Reuters. 2022. Polish coal mine blast kills five, others trapped in shafts. Available at https://www.reuters.com/world/europe/four-dead-after-probable-methane-explosion-polish-coal-mine-2022-04-20/

[16] Los Angeles Times. 2018. 23 dead in methane blasts at two Pakistan coal mines. Available at https://www.latimes.com/world/asia/la-fg-pakistan-mines-20180506-story.html

[17] Center for Disease Control. 2012. Recent Developments in Coal Mining Safety in the United States. Available at https://www.cdc.gov/niosh/mining/UserFiles/works/pdfs/rdicm.pdf

[18] Center for Disease Control National Institute for Occupational Safety and Health. 1990. Preventing deaths of farm workers in manure pits. Available at https://www.cdc.gov/niosh/docs/90-103/default.html

[19] Live Science. 2021. 3 men die in manure pit: Here's why it's a 'death trap.' Available at https://www.livescience.com/brothers-die-manure-pit-fumes-toxic.html

[20] Farm and Dairy. 2021. Manure pit fatalities spur awareness. Available at https://www.farmanddairy.com/news/manure-pit-fatalities-spur-awareness/679630.html

[21] USA Today. 2015. Iowa father, son die from manure pit fumes. Available at https://www.usatoday.com/story/news/nation/2015/07/28/iowa-father-son-die-manure-pit-fumes/30811157/

[22] CBS News. 2007. Gas from manure pit kills 5 on dairy farm. Available at https://www.cbsnews.com/news/gas-from-manure-pit-kills-5-on-dairy-farm/

[23] WA State Dept. of Labor & Industries. 2016. Manure storage dangers at dairy farms. Available at https://www.lni.wa.gov/safety-health/preventing-injuries-illnesses/hazardalerts/ManurePitHazardAlertEnglish.pdf

[24] Michigan State University. 2018. The dangers of manure gas and strategies for mitigation. Available at https://www.canr.msu.edu/news/the-dangers-of-manure-gas-and-strategies-for-mitigation

[25] Washington Post. 2017. Deaths of farmworkers in cow manure ponds put oversight of dairy farms into question. Available at https://www.washingtonpost.com/national/deaths-of-farmworkers-in-cow-manure-ponds-put-oversight-of-dairy-farms-into-question/2017/09/24/da4f1bae-8813-11e7-961d-2f373b3977ee_story.html

[26] Cornell University. 2022. Five cattle dead in manure gas poisoning incident on Finger Lakes dairy farm. Available at https://blogs.cornell.edu/ccefieldcropnews/2022/02/01/five-cattle-dead-in-manure-gas-poisoning-incident-on-finger-lakes-dairy-farm/

[27] PA man, sons found dead in manure pond. 2012. Available at https://www.cecildaily.com/pa-man-sons-found-dead-in-kent-manure-pond-updated/article_62f173de-a616-11e1-8480-0019bb2963f4.html

[28] Des Moines Register. 2021. Kossuth County man dies after being overcome by fumes at north Iowa hog facility. Available at https://www.desmoinesregister.com/story/money/agriculture/2021/09/08/kossuth-county-iowa-farmer-dies-overcome-fumes-manure-pit-hog-facility/5768710001/

What happens within anaerobic manure lagoons?

Methane is produced when bacteria convert volatile organic compounds (VOCs) in manure to methane and carbon dioxide under anaerobic conditions. The gas produced is typically 40% carbon dioxide and 60% methane with traces of other gasses.[30] The justification for capturing and/or producing this methane is to replace natural gas from fossil sources.

Are there better options for managing methane from manure?

There are experts within the agricultural community who recommend changing manure management from wet to dry systems rather than encouraging and prolonging use of manure lagoons by subsidizing biogas.[31, 32, 33] Approximately a quarter of methane emissions from dairies could be eliminated by moving to dry manure management or pasture based dairies. There are major problems with manure digesters and the amount of energy delivered is small when compared to the effort.[30, 31, 32, 33]

- For every metric ton of methane that is captured in a digester, approximately three metric tons of methane from enteric fermentation go up into the ambient air.[34]
- Producing manure for bio-digesters involves emissions of hydrogen sulfide, ammonia, and volatile organic compounds which ultimately results in higher levels of criteria air pollutants - particulate matter, ozone, and sulfur dioxide in the ambient air.[30, 33, 35]
- Digesters convert nitrogen in manure into ammonia and nitrous oxide
- Manure lagoons without double synthetic liners leak and this results in contamination of aquifers that people rely on for drinking water, an unintended adverse side effect.[36]
- Cow manure has the lowest value as a feedstuff for bio-digesters of all the feedstocks evaluated by Washington State University
- The effluent from manure bio-digesters continues to pollute the air after digestion[33]

[29] Yakima Herald Republic. 2015. February death of Mabton dairy worker could have lasting impact on industry. Available at https://www.yakimaherald.com/news/local/february-death-of-mabton-dairy-worker-could-have-lasting-impact-on-industry/article_ef41ced8-9668-11e5-9538-a3bec8e94d4a.html

[30] California Air Resources Board. 2016. Determination of Total Methane Emissions from the Aliso Canyon Natural Gas Leak Incident. Available at https://ww2.arb.ca.gov/sites/default/files/2020-07/aliso_canyon_methane_emissions-arb_final.pdf

[31] Fulhage, C.D., Sievers, D., & Fischer, J.R. 2018. Generating Methane Gas from Manure. University of Missouri Extension. Available at https://extension.missouri.edu/publications/g1881

[32] National Sustainable Agriculture Coalition. 2020. A Climate Friendly Approach to Managing Manure. Available at https://sustainableagriculture.net/blog/a-climate-friendly-approach-to-managing-manure/

[33] California Department of Food and Agriculture. 2020. Alternative Manure Management Program. Available at https://www.cdfa.ca.gov/oefi/AMMP/

[34] 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

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[35] EPA "Greenhouse Gasses" at https://www.epa.gov/ghgemissions/overview-greenhouse-gases#methane

[36] California Air Resources Board (ND) Hydrogen sulfide and health. Available at https://ww2.arb.ca.gov/resources/hydrogen-sulfide-and-health

[37] Environmental Protection Agency, Lower Yakima Valley Groundwater, Consent Order Plans and Reports. 2022. Available at https://www.epa.gov/wa/lower-yakima-valley-groundwater

[38] WA State University. 2017. Harnessing Renewable Natural Gas for Low-Carbon Fuel: A Roadmap for Washington State. Available at http://www.commerce.wa.gov/wp-content/uploads/2018/02/Energy-RNG-Roadmap-for-Washington-Jan-2018.pdf

[39] WA State Dept. of Ecology. 2022. Concentrated Animal Feeding Operation (CAFO) General Permits Public Comments. Available at https://wq.ecology.commentinput.com/comment/extra?id=5gTtQ#

[40] Sierra Club Guidance: Methane Digesters and Concentrated Animal Feeding Operation (CAFO) Waste. Available at https://www.sierraclub.org/sites/www.sierraclub.org/files/methane_digesters.pdf

[41] FOTC Comments on Overburdened Communities and the Climate Commitment Act with Literature Review. 2022. Available at https://scs-public.s3-us-gov-west-1.amazonaws.com/env_production/oid100/did1008/pid_203276/assets/merged/2605io1_document.pdf?v=WCRANM8PB

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[42] Loftus, C., Yost, M., Sampson, P., Arias, G., Torres, E., Vasquez, V. B., ... & Karr, C. (2015). Regional PM2. 5 and asthma morbidity in an agricultural community: a panel study. *Environmental Research*, *136*, 505-512. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4425279/

[43] Loftus, C., Afsharinejad, Z., Sampson, P., Vedal, S., Torres, E., Arias, G., ... & Karr, C. (2020). Estimated time-varying exposures to air emissions from animal feeding operations and childhood asthma. *International journal of hygiene and environmental health*, *223*(1), 187-198. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7020853/

[44] Loftus, C., Yost, M., Sampson, P., Torres, E., Arias, G., Vasquez, V. B., ... & Karr, C. (2015). Ambient ammonia exposures in an agricultural community and pediatric asthma morbidity. *Epidemiology (Cambridge, Mass.)*, *26*(6), 794. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4587379/

[45] Hribar, C., 2010. Understanding concentrated animal feeding operations and their impact on communities. Available at https://www.cdc.gov/nceh/ehs/docs/understanding_cafos_nalboh.pdf

[46] Fulhage, C.D., Sievers, D., & Fischer, J.R. 2018. Generating Methane Gas from Manure. University of Missouri Extension. Available at https://extension.missouri.edu/publications/g1881

[47] Koirala et al. 2013. Impact of anaerobic digestion of liquid dairy manure on ammonia volatilization process. Available at https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.719.5381&rep=rep1&type=pdf

The SEPA Rules state that significant "means a reasonable likelihood of more than a moderate adverse impact on environmental quality." If officials determine a likelihood of significant impact, then an EIS is required. There is no doubt that manure lagoons without synthetic liners leach to groundwater and that CAFO dairies emit major air pollutants. If generation of natural gas from manure increases profits, there is a high risk of increasing cow numbers and increasing these adverse effects.

According to Hoard's Dairyman [48]:

> *The profit generated by manure and energy is a new dynamic for dairy farms. A common arrangement is for a third party to invest in the digester and form an agreement with one or more dairy farms for a supply of manure. These contracts can be for 10 to 15 years or longer and pay $80 to $100 per cow per year or more. For a 3,500-cow dairy, that means $350,000 per year or 40 cents per hundredweight based on an 80 pound per day tank average. Some farms own the digesters, taking on the risk, but reaping potentially larger rewards. If the profits are $2 to $3 per hundredweight, they could likely exceed the profit from milk. At that point, milk has become the by-product of manure production.*

Environmental Impact Statements should be mandated as a condition for permitting manure biogas digesters to:

- measure the amounts of air and water pollution generated upstream and downstream from the digesters
- assess increased traffic in rural neighborhoods
- predict impact of flaring excess gas
- evaluate risk from leaks
- evaluate economic and environmental impact on smaller neighboring farms
- characterize the environmental impact if cow numbers increase
- compare the benefits of spending public monies on conversion to dry manure management versus subsidizing liquid manure systems.

At what point does the law require planners to inform the public?

Conditional Use and Building Permits require notice to the public and an opportunity for public comment. SEPA requires agencies to involve the public during:

1. *The "scoping" period, where agencies, tribes, and the public are invited to comment on the range of alternatives, areas of impact, and possible mitigation measures that should be evaluated within the EIS; and*

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[47] Leaking Manure Lagoons – Lower Yakima Valley. 2022. Available at http://www.friendsoftoppenishcreek.org/cabinet/data/Manure%20Lagoons%20Leak%20LYV.pdf

[48] Energy Revenue Could Be a Game Change for Dairy Farms. 2021. Hoards Dairyman. Available at https://hoards.com/article-30925-energy-revenue-could-be-a-game-changer-for-dairy-farms.html

2. The draft EIS review period, where comments are requested on the merits of the alternatives and the adequacy of the environmental analysis

RCW 70A.02.050 requires affected agencies to strive for equitable community engagement and public participation. This includes facilitating and supporting the inclusion of members of communities affected by agency decision making, and reaching out and communicating with those who face barriers, language or otherwise, to participation

In Yakima County public knowledge of potential changes such as building manure bio-digesters frequently reaches people through the grapevine. Officials only inform the public after permits are in place and a project is ready for approval. Frequently there is only a minimal nod to legal requirements for public involvement.

A more collaborative approach, in touch with the times, would be sharing information early in the process, as recommended by SEPA guidelines. Adverse impacts could be addressed in a thoughtful manner, rather than waiting until after they occur.

In the case of manure bio-digesters, FOTC submits that the information in this statement should be shared with the public in a timely manner. FOTC also submits the following questions regarding Biogas Digesters in the Lower Yakima Valley:

1. How dangerous is the estimated 29,000 metric tons (0.755 MMT CO_2e) of methane emitted every year from LYV animal agriculture to public health?
2. How dangerous is the estimated 29,000 metric tons (0.755 MMT CO_2e) of methane emitted every year from LYV animal agriculture to the local environment?
3. What are the quantities of hazardous air pollutants emitted along with the methane, and how dangerous are they to public health?
4. How much of the 29,000 metric tons of methane emitted every year from LYV animal agriculture converts to ozone?
5. Are the proposed digesters at sites distant from dairies?
6. If so, how will the manure be transported to the digesters?
7. Will this be liquid manure or solid manure?
8. Is the methane already in the manure that is transported to the digesters, or will it be created under anaerobic conditions at the digester site?
9. How can the public be sure the facilities are not creating methane and then charging the taxpayers for cleaning it and selling it to natural gas companies?
10. How many trips from dairies to digesters do you anticipate?
11. Will this increase wear and tear on public roadways?
12. Will the digesters be covered?

13. If so, does this increase the risk of asphyxiation for workers at the digester sites?
14. Is flare-off required when methane levels under the cover are too high?
15. Would flare off be allowed during winter inversions?
16. Does Washington have laws that require workers at digesters wear monitors so they can tell when odorless and poisonous gases are present?
17. How can we access this information?
18. How can workers and families ensure that the facilities comply with worker safety laws?
19. How often will the sites be inspected for compliance with safety standards?
20. How can workers and their families access affordable health and safety insurance to cover potential injury and death?
21. Which hazardous gasses will be monitored, and which will not?
22. Are there plans to sample LYV air for methane and compare to the estimates now in use?
23. Are there plans to sample LYV air for ammonia, hydrogen sulfide, and ozone?
24. Are there plans to follow up on the Yakima Air Winter Nitrate Study?
25. Is the WA State Dept. of Agriculture air quality specialist working on renewable natural gas in the LYV?

Thank you for Reading