Facts on

Heating with Biomethane

Biomethane, what industry groups call "renewable natural gas'' or RNG, is methane made from organic sources. It is the same as the methane in natural, fossil, or fracked gas. Describing biomethane as "renewable" is misleading. No matter what it's called, methane is a powerful greenhouse gas.

Gas utilities are proposing to pipe biomethane, blended with fossil methane, into Massachusetts homes and businesses for heating, cooking, and hot water.

Biomethane:

- Is the same as fossil gas, just from a different source.
- Degrades the climate and harms public health.
- Is much more expensive than fossil gas.
- Prolongs health and economic inequities.
- Is not available in sufficient quantities to heat buildings.

Biomethane is best used on site for electricity generation, industrial processes, and specialized transportation.

How is biomethane made?

Biomethane is made one of two ways, from the gas emitted by decaying material, biogas, or from thermal gasification, or heating materials until they give off gas.

Anaerobic Digestion

Landfills, livestock waste, and sewage treatment plants give off biogas as waste decays in an anaerobic environment. Biogas is produced when organic materials are broken down by microorganisms anaerobically, that is, in the absence of oxygen. Currently, there are four sources of anaerobic biogas used to produce biomethane in the United States:

- **Solid waste landfills**. Decomposing organic waste in landfills produces biogas. Federal and state regulations govern whether biogas emissions are burned off or captured.
- **Livestock farms**. Decomposing livestock manure produces biogas. Some livestock farms capture the biogas.
- **Wastewater treatment facilities**. Sewage treatment plants use anaerobic digestion to treat sewage sludge that makes biogas.
- **Standalone digesters** generate biogas by anaerobically processing food waste that would otherwise be put into a landfill or combusted.

Biogas:

- Starts with a low methane content of 45–65%.
- Is treated to remove moisture, particulates, contaminants, and other gases such as carbon dioxide, ethane, nitrogen, and hydrogen sulfide.
- Qualifies as biomethane once the methane content is 90% or greater.
- Uses 3%–6% of the energy in the gas to fuel the biomethane production process.[1]

At a methane content of 96–98%, biomethane can be used like fossil methane.

The right thing to do is prevent biogas from forming through alternative resource and waste management practices.[2] However, capturing biogas from the above four sources rather than letting it escape reduces damaging emissions into the atmosphere.

Thermal Gasification

Methane can also be made through thermal gasification**.** This process heats materials to a high temperature to break them down with some resulting methane. This process was once widely used to make town gas, the precursor to the methane we currently use. The finished gas is sometimes referred to as syngas, sometimes as biomethane.

[1] Wikipedia, Biogas, https://en.wikipedia.org/wiki/Biogas
[2] Michael Sainato, California subsidies for dairy cows' biogas are a lose-lose, campaigners say, The Guardian, February 4, 20222, https://www.theguardian.com/environment/2022/feb/04/california-subsidies-biogas-dairy-cows-emissions-climate

Some of the materials used in thermal gasification are:

- Construction debris, plastic, or textiles at a solid waste treatment facility.
- Crops such as grasses or algae that are grown specifically to produce energy.
- Forest or agricultural residues.

Proposals are appearing to use arable land to grow crops just for thermal gasification.[3]

Environmental impact of biomethane

Facilities where biomethane is produced can exacerbate air and water pollution impacts in nearby communities if strong regulation based on science is not in place.

The United States legislates against release of landfill gas because it contains volatile organic compounds that reduce air quality. Landfill owners producing more than 50 metric tons per year of non-methane organic compounds are required to collect the gas and flare it or use it to produce electricity.[4]

Costs of biomethane

The production of biomethane is 4 to 17 times[5] more expensive per therm than fossil gas.

- Biogas undergoes extensive and costly refinement for use in pipelines, which requires installation of new equipment for refining and a source of water.
- Just delivering biomethane to the gas distribution system requires financing and building more gas infrastructure.
- While there may be minimal climate benefit to using biomethane in some instances, using it in buildings prolongs the transition off of gas.

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[3] E. Larson, C. Greig, J. Jenkins, E. Mayfield, A. Pascale, C. Zhang, J. Drossman, R. Williams, S. Pacala,R.Socolow, EJ Baik, R. Birdsey, R. Duke, R. Jones, B. Haley,E. Leslie, K.Paustian, and A. Swan, Net-Zero America: Potential Pathways, Infrastructure, and Impacts, Final report, Princeton University, Princeton,NJ,29 October 2021. https://www.dropbox.com/s/ptp92f65lgds5n2/Princeton%20NZA%20FINAL%20REPORT%20%2829Oct2021%29.pdf?dl=0

[4] Wikipedia, Biogas, https://en.wikipedia.org/wiki/Biogas#Contaminants

[5] Pye Russell, Dana Lowell, and Brian Jones, Renewable Sources of Natural Gas: Supply and Emissions Reduction Assessment, American Gas Foundation, 12/1/2019, https://drive.google.com/file/d/14yGZqHPmC5Jeuzs9LkvcUlZMAD-AvM2G/view?usp=sharing

In addition to paying a high price for making biomethane fuel, ratepayers would:

- Pay a delivery cost at least one and a half times the cost of the biomethane itself.
- Pay more to operate a gas furnace or boiler instead of a new, efficient electric heat pump.
- Suffer adverse health impacts and incur health care costs from poor air quality.

Safety and health of biomethane

If biomethane is piped into homes through the existing gas distribution network, fires and explosions will continue to happen as before.

Like fossil and fracked gas, when burned, biomethane produces particulate matter and nitrogen oxides that harm human health. The resulting air pollution leads to increased rates of asthma, chronic obstructive pulmonary disease (COPD), and cardiovascular disease. A recent Harvard study found that air pollution from burning fossil fuels in buildings caused more than $8 billion in adverse health impacts in Massachusetts.[6]

Further, biomethane perpetuates long standing community health inequities. Black people, Indigenous people and people of color (BIPOC) are exposed to more ambient air pollution from burning fossil fuels than white people.[7]

Climate impact of biomethane

Capturing and using the biogas generated as a result of human activities is better than releasing it into the atmosphere, however there are still associated emissions:

- Leaking and burning biomethane produces the same carbon pollution as fossil gas. Over the past six years, gas utilities have reported around 14,000 leaks each year in Massachusetts despite spending billions on pipe replacement.[8]

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[6] *Environmental Research Letters* in May 2021.

[7] Tessum, C. W., Paolella, D. A., Chambliss, S. E., Apte, J. S., Hill, J. D., & Marshall, J. D. (2021). PM2.5 polluters disproportionately and systemically affect people of color in the United States. Science Advances, 7(18), eabf4491.

[8] Dorie Seavey, *GSEP at the Six-Year Mark: A Review of the Massachusetts Gas System Enhancement Program*, version 1.0, October 2021, https://gasleaksallies.org/gsep.

- Different jurisdictions have different methods for counting these emissions. For instance, some jurisdictions count the carbon dioxide from combusting biomethane, while others consider it part of the natural carbon cycle.

Experts see methane reduction as an important way to slow global warming.

The United Nations IPCC states: "Limiting warming to 1.5°C implies . . . deep reductions in emissions of non-CO_2 forcers, particularly methane."

Steeper declines in methane are important. The UN Environment Programme called for a 45 percent decline in methane emissions by 2030.[9]

The White House Office of Domestic Climate Policy committed to a 30 percent reduction in methane from 2020 levels of emissions by 2030.[10]

Biomethane supply

Many sectors, including hard-to-electrify industries such as wood materials, pulp and paper, plastics feedstock, and aviation fuels, currently plan to use biomethane as a means to lower greenhouse gas emissions. But the amount of methane needed far exceeds a sustainable supply. Too much demand heightens the risks of unsustainable growth that can lead to deforestation, biodiversity loss, soil depletion, and environmental injustices.

The potential supply of biomethane is a small fraction of current fossil gas demand. The gas industry's own research found that after two decades of ramping up supply and production, biomethane could only replace 13% of the existing demand for fossil gas, leaving fossil gas as more than 80% of the gas supply.[11]

[9] UNEP. Global Assessment: Urgent steps must be taken to reduce methane emissions this decade. May 21, 2021. https://www.unep.org/news-and-stories/press-release/global-assessment-urgent-steps-must-be-taken-reduce-methane Accessed 1/12/2022.

[10] Wintour, P. Biden unveils pledge to slash global methane emissions by 30%. The Guardian. Nov 2, 2021. https://www.theguardian.com/environment/2021/nov/02/joe-biden-plan-cut-global-methane-emissions-30-percent Accessed 11/30/21

[11] Pye Russell, Dana Lowell, and Brian Jones, Renewable Sources of Natural Gas, American Gas Association, December 2019, https://gasfoundation.org/2019/12/18/renewable-sources-of-natural-gas/

National Grid's estimate of renewable natural gas potential by state[12]

Bcf = billion cubic feet

STATE	TECHNICAL RENEWABLE GAS POTENTIAL (BCF/Y)	POTENTIAL AS A PERCENTAGE OF OVERALL DEMAND	POTENTIAL AS A PERCENTAGE OF DEMAND WITHOUT POWER GENERATION
MA	39	10%	18%
NY	193	17%	25%
NH	23	35%	100%
RI	13	15%	35%
TOTAL	**268**	**16%**	**25%**

Moreover, blending biomethane with fossil gas does not provide a path to decarbonizing the gas system sufficiently to meet Massachusetts emission reduction goals and could ultimately exacerbate environmental damage. Due to limited supply and high cost, biomethane should be used to decarbonize sectors where there are few or no lower-cost solutions. Heating buildings is not one of those uses.

We need policies[13] that:

- Enforce strong regulations to ensure that biogas is sustainably sourced.
- Restrict use of biomethane to hard-to-electrify sectors with appropriate sunset provisions.
- Support key technologies that enable efficient, sustainable supply and use of biomethane.
- Simultaneously develop policies that enable non-emitting, non-polluting technologies and implementation of a just transition from heating with methane.

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[12] https://www9.nationalgridus.com/non_html/ng_renewable_wp.pdf

[13] Adapted from Energy Transition Commissioners, Bioresources within a Net-Zero Emissions Economy: Making a Sustainable Approach Possible, 2021, https://www.energy-transitions.org/wp-content/uploads/2021/07/ETC-bio-Report-v2.5-lo-res.pdf