FACT SHEET: Landfill Gas

Toxic Landfill Gas: More than Methane

"Landfill gas" is not the same as "natural gas" or "methane." They are three separate terms that mean different things. The term "landfill methane" is deceiving as it implies that landfill gas is simply methane.

Landfill gas is about 45-55% methane, with the remainder being mostly carbon dioxide (CO_2). It also contains hundreds of toxic contaminants known as Non-Methane Organic Compounds (NMOCs) as well as inorganic toxic contaminants like mercury and sometimes even radioactive contaminants like tritium. NMOCs include such toxic compounds as benzene, toluene, chloroform, vinyl chloride, carbon tetrachloride, and 1,1,1 trichloroethane, which, although less than 1% by weight, are hazardous.

A study of women living near 38 New York landfills where gas is escaping found a significant four-fold increased risk of bladder cancer and leukemia.

What the Regulations Require

Laws requiring collection of landfill gas are not based on the global warming impact of methane, but on the toxic hazards of NMOCs.

Federal regulations require that if the landfill has a total permitted capacity greater than or equal to 2.5 million cubic meters of waste, the landfill's annual Non-Methane Organic Compound (NMOC) emissions must be estimated. If the NMOCs are estimated at more than 55 tons per year, the landfill must adhere to rules that include submitting compliance reports, installing a gas collection system, "destroying" landfill gas at 98% efficiency, and adhering to specified operation and maintenance procedures. Since matter cannot be created or destroyed, burning gas doesn't "destroy" it, but just changes it into a different set of pollutants. While burning the gas is most common, non-burn alternatives for managing the gas exist.

Landfill Gas: To Burn or Not to Burn

There are non-burn options for managing the toxins as well as the methane and CO_2 in landfill gas. These are rarely done, however, as the typical method is to flare (burn) the gas.

Landfill gas advocates argue that if gas isn't burned for "green" energy, that it'll just be vented into the atmosphere, contributing to global warming. In fact, at most landfills where gas would be used for energy production, gas is already being captured and flared, so the comparison is false. It's typically a matter of burning it one way (flaring) vs. another (producing energy from the gas). Using internal combustion engines or turbines to produce electricity from landfill gas is more polluting than flaring, with far higher nitrogen oxide and particulate matter emissions, but lower carbon monoxide emissions.

Some justify burning landfill gas since the small amount of energy produced would displace some need for more electricity from other – allegedly dirtier – sources like coal.

Dirtier than Fossil Fuels

A report by the Environmental Protection Agency documents that burning landfill gas releases more pollution per unit of energy produced than burning non-renewable natural gas and - by some measures (carbon monoxide, CO_2, NMOCs and methane) – is even dirtier than coal.

Toxins Not Filtered Out

Toxic contaminants are not filtered out of landfills gas before it's burned. Nearly all projects that utilize landfill gas filter out only sulfur and water vapor.

Dioxins and Furans

The many chlorinated contaminants in landfill gas can create dioxins (and related chemicals called furans) when burned. Dioxins are the most toxic chemicals known to science. The most potent form of dioxin is proven to be a known human carcinogen, causing cancer at doses so low that scientists have affirmed that there is no "safe" dose small enough not to cause cancer. Dioxin is also known to cause severe reproductive and developmental problems (at levels 100 times lower than those associated with its cancer causing effects). Dioxin is well-known for its ability to damage the immune system, interfere with hormonal systems, reduce sperm counts, and cause endometriosis, birth defects, diabetes, learning disabilities, immune system suppression, lung problems, skin disorders, lowered testosterone levels and much more.

Dioxin emissions cannot be measured since the air emissions are released at a temperature above the dioxin formation range, meaning that the dioxins will still be forming as the emissions cool down after they leave the burner and are traveling in the air.

Mercury Worse than Coal Plants

Mercury is found in landfill gas in concentrations comparable to those found in the exhaust gas of coal-fired power plants, yet most is released in a more dangerous form. Mercury in landfills comes from fluorescent bulbs, thermometers, batteries, latex paint, dental amalgam filling capsules and contaminated plumbing. Mercury scrubbed from coal power plant exhaust can also be dumped in landfills. Landfill environments can form methylated forms of mercury (the most dangerous kind). This form of mercury is fat-soluble and can readily climb the food chain, making animal products highly contaminated. When landfill gas is burned, methyl mercury is converted back to less-dangerous elemental mercury, yet since most landfill gas isn't captured, most escapes as methyl mercury.

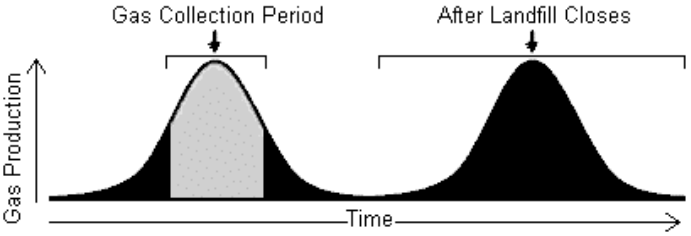
Only about 10% of Landfill Gas gets Captured

Not all landfills are required to collect their gas. About half of the waste is buried in smaller landfills that aren't required to collect the gas because the estimated NMOC levels are too low. EPA's rules mandating gas collection at larger landfills cover only 54% of the waste in the ground.

Even if public policies promoted gas collection at these other landfills, gas production may not be great enough to make operating a gas collection system economically viable. It may also be technically unworkable if there isn't enough gas to maintain needed pressure.

At landfills where gas *is* collected, gas is only collected during the prime gas production years during the operating life of the landfill (the first wave of gas production). Much gas generation occurs before collection systems are installed and after they're removed.

Roughly half of the total gas generated by landfills will occur after the gas collection systems are removed and the landfill is closed. Once the landfill cover breaks down and water once again penetrates the site, a second wave of gas will be produced, at a time when no gas collection is required and when the landfill operator has almost certainly walked away, leaving the liability with the public.



Even while gas collection systems are operating, much of the gas still isn't collected, due to various limitations inherent in gas collection systems. Gas collection wells cannot be placed too deeply in the landfill, since they'd risk puncturing the bottom liner as the landfill settles over time. Gas cannot be collected too close to the surface without the risk of drawing outside air into the system. Some gas gets caught in pockets that won't reach the collection wells. Also, gas collection systems can clog.

EPA assumes that gas collection systems collect 75% of the gas, yet this is a best-case scenario. EPA assumes this is always the case, but on average, only about 50% of the gas is collected – and this is during only about 32% of the landfill's lifetime gas generation. Another 12% of the time, the collection rate is far lower, averaging around 25%. The rest of the time, no gas gets collected.

The International Panel on Climate Change now estimates a landfill lifetime gas capture rate of only 20%. This is over the lifetime of landfills where gas is collected. Factoring in the landfills where gas isn't collected, only about 10% of all landfill gas produced at U.S. landfills will ever be collected.

Thus, it's quite deceptive to promote the burning of landfill gas for electricity in the name of combating global warming. The emphasis must be on gas *prevention* (keeping organic wastes out of landfills).

Global Warming Pollution

Burning landfill gas for energy releases 20-40% more greenhouse gas pollution than flaring, since more gas escapes unburned when landfills are managed in order to increase methane concentration to allow for effective energy use. EPA estimates that landfills are responsible for 2% of U.S. greenhouse gas emissions, yet average lifetime greenhouse gas emissions from landfills are really at least four times higher than EPA assumptions.

Encourages Landfill Mismanagement

Landfills can make significant profits by selling electricity from burning landfill gas – as much as $1-2 per ton of waste dumped. Landfills selling their power as "green" energy through energy marketers or using the power to meet a state Renewable Portfolio Standard can make as much as $5/ton or more. This subsidizes landfills, encouraging poor waste management practices. By creating incentives to produce as much gas as possible, landfills are encouraged to accept as much organic waste as possible. It also encourages operators to delay covering the working face of the landfill, so that more rainwater will enter the landfill. This practice increases community exposure to odors, mercury and other toxins.

Green Marketing

Landfill gas is not clean, green or renewable and shouldn't be considered such. Allowing landfill gas to count in green energy programs like Green-*e* has enabled energy marketers and utilities to sell products that are 95% landfill gas and only 5% wind to customers who assume they're getting mostly wind power. Since landfill gas is cheaper than wind, allowing both technologies to compete evenly within green pricing programs and renewable energy mandates means landfill companies will gain where wind power would otherwise benefit.

Alternatives

The proper thing to do with landfill gas is as follows:

1) Ban organic wastes from landfills (digest or compost them, then monofill it (place in separate landfill cells); if it's super-clean (not contaminated with toxins), it can be used as clean fill or in landscaping (not for growing food).

2) At existing landfills, landfill operators ought to collect as much gas as possible (without trying to maximize gas production or methane concentrations) and filter the toxins in the gas into a solid medium like a carbon filter. The carbon filters ought to be containerized and stored on-site. They should not go to a carbon "regeneration" or "recycling" facility, since they simply incinerate the chemicals – letting them back out into the environment by burning them out of the carbon filters.

3) Once the gas is purified, it may be acceptable to burn it for steam or electricity, however, this may not be possible without mismanaging the landfill and releasing more gas. Other alternative technologies include piping it into natural gas lines, producing hydrogen or segregating the CO_2 and methane to be sold as industrial chemical feedstocks.

If landfill gas is burned for electricity, it should not be considered renewable, since that allows it to compete with (and undercut) clean sources like wind power. Subsidizing landfill companies also puts source reduction, reuse, recycling and composting at a competitive disadvantage.

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