Getty Images

How Much Could RNG Cut Methane Emissions From Organic Waste?

Arlene Karidis | Feb 25, 2022

In the fall of 2021, the U.S. and 110 other countries committed to reduce methane emissions 30% by 2030, which some believe could be a call to action for the solid waste management industry, as about 30% of U.S. emissions come from decomposing organic waste.

Proponents of renewable natural gas (RNG), derived from organics, believe this fuel can play a role in quickly addressing and mitigating these emissions.

Most mainstream media coverage is focused on the need to reduce methane emissions from the oil and gas sector, which is essential, says Matt Tomich, president of Energy Vision. But that 30% from decomposing organics has caught his nonprofit's attention, and so has what it sees as potential for RNG to help curb those emissions.

Based on the nonprofit's research, capturing half of the methane emitted by decomposing organics to produce RNG can achieve 50% of the pledged total methane emissions reduction by 2030.

With methane front and center in the climate fight, and new transportation technologies evolving, Energy Vision put out a report, The Refuse Revolution , to assess and compare some of those technologies, specifically nine options that refuse fleets –there are 180,000 on the road in the U.S. today—can consider to lower the industry's impact.

Options range from biodiesel and renewable diesel, to fossil and renewable natural gas, to battery electric vehicles (BEV), among others.

The criteria used to compare each included:

- Cutting greenhouse gases (GHG);
- reducing nitrogen oxides (NOx) and particulate emissions;
- fuel availability and cost;
- environmental impacts of fuel production; and
- overall performance and commercial status.

Specific to environmental and health impacts, RNG, fossil gas, and battery electric vehicles showed to be the cleanest, based on data from Argonne National Lab and an Argonne model that examines GHG profiles of different fuels.

RNG, whether from landfill, wastewater, or digester gas came with the greatest overall lifecycle carbon reduction.

"If you look at electric vehicles running on the grid in the Northeast, which is the cleanest grid in the country given its growing renewable supply, the overall life cycle carbon impact of CO_2e per mile is 641 grams.

The carbon intensity of RNG varies by feedstock [RNG from landfill gas, is 524 grams CI]. But of all RNG sources produced nationally the average carbon intensity is -11,132, so it's highly net negative," Tomich says

Biodiesel and renewable biodiesel had relatively limited GHG and pollution reductions; with biodiesels composed of a 20% blend yielding a 5% reduction in GHG.

BEVs rank the cleanest in one particular area; they have zero tailpipe emissions. Some caveats pointed out by Energy Visions' report: The weight of the batteries needed to propel a refuse truck can result in high particulate matter pollution associated with tire and brake wear. And the electricity that powers the batteries is still sourced mainly from fossil fuels.

"So, for battery electric trucks to be a sustainable alternative to petroleum diesel trucks, their batteries would have to be powered by renewable energy sources. And the labor, toxic pollution, and land degradation problems with battery production and disposal would have to be solved," Tomich says.

He punctuated he is not saying battery electric vehicles aren't going to work, but it's early in their evolution, with less than 50 EV refuse trucks on the road in the U.S. today.

On the cost front: the Argonne model shows BEV prices have dropped significantly in the last year but are still at a 60% premium over diesel.

For comparative costs of varied options: BEVs are estimated to run $500,000; a standard diesel refuse truck is estimated at $300,000; and refuse trucks running on RNG are estimated at $330,000 to $340,000. Though pricing is variable.

Overall, Energy Vision's report found that trucks with RNG engines powered by organic waste-derived fuel achieved the greatest benefits at the lowest cost.

But which metrics matter most to who?

It will likely depend on size, type, and location of fleet.

“Our suggestion is metrics should be weighed collectively, but they may be weighted differently by different fleets depending on factors such as if public dollars are available,” Tomich says.

Then comes the question: for smaller and midsized waste management companies interested in renewable fuel, how can they afford to transition? From a business stand there are major capital and operating cost considerations.

The answer? Pay a premium for nonpetroleum diesel, or if they are considering RNG or battery electric they can take on high capital expenditures to convert the trucks.

So, it’s a wholesale shift in how you do business. This is where state and federal support and other programs come into play, Tomich says.

With RNG the private sector is pursuing creative financing to help cover incremental costs of vehicles and to ensure pricing is competitive with diesel. In California and Oregon who have low-carbon fuel standards (LCFS), RNG suppliers can offer fuel at a significant discount to diesel and fossil natural gas. The economic incentives the programs afford make it feasible for fleets to move off of petroleum.

In California’s Sacramento County, the collection and transfer fleet is fueled 100% by RNG. RNG is also used in nine Class 8 dump trucks and five medium-duty service trucks. The county anticipates increasing its RNG-powered collection and transfer fleet by 25% in the next several months to comply with California's organic food waste diversion regulations.

The transition has been relatively easy, says Keith Leech Sr., chief, Fleet Services Division & Parking Enterprise for Sacramento County.

“RNG is already readily available with significant cost savings, compared to petroleum diesel, to public fleets based in California. This is through the State of California Natural Gas Services Program,” he says.

Outside of California and Oregon converting trucks to use RNG (or any non-petroleum fuel) is more challenging, due to the lack of LCFS programs, though several states are exploring policy.

Marianne Mintz, principal Transportation Energy Analyst

at Argonne National Laboratory, agrees that refuse fleets present good opportunity for reducing GHG, especially if vehicles can offload and refuel at the landfill.

“With many non-petroleum technologies competing for space in the transportation sector, [Energy Vision’s] new report presents a strong case for RNG as a cost-effective, low carbon, drop-in fuel for municipalities, private fleet operators, DOE Clean Cities affiliates, and state and federal officials grappling with clean fuel and climate change challenges,” she says.

The big “aha” moment for Energy Vision, reflects Tomich, was in looking at all lifecycle emissions data, particularly on particulate matter and NOx, and realizing that potential value of any option is about more than tailpipe emissions.

“Having no tailpipe emissions is a great benefit for communities where these vehicles work. But the reality is every fuel and vehicle type generates emissions somewhere in its lifecycle, from raw material or fuel extraction/production to energy consumption. So, I think unless you are assessing on a full environmental lifecycle basis you aren’t doing that apples-to-apples comparison that deserves to be done.”

Some stats/data from Energy Vision’s report:

- Trucks running on RNG cut NOx emissions 90% and significantly reduce particulate emissions compared to diesel.
- Currently, enough methane is captured and refined to produce nearly 500 million gallons of RNG a year, but that is roughly just 5% of overall production potential
- Tripling current RNG production to 1.5 billion gallons a year would produce enough fuel for every refuse truck in the U.S.
- Full potential RNG fuel production from all feedstocks would be about 10 billion gallons a year.
- There are only 50 BEV refuse trucks in service today, and their capital costs are more than 60% higher than that of diesel trucks though they have no tailpipe emissions.
- There are nearly 8,000 refuse trucks burning fossil natural gas on the road. More than half of the refuse trucks on order today are for natural gas models.
- Fossil compressed natural gas (CNG) yields a 90% reduction in NOx emissions and a 60% reduction in particulate matter compared diesel.

Source URL: https://www.waste360.com/food-waste/how-much-could-rng-cut-methane-emissions-organic-waste