



LANDFILL EMISSIONS:

Going to the dump? You might make electricity

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U.S. EPA is turning its focus to one of the more silent contributors to climate change: America's landfills.

The agency released a revised set of guidelines in July that's meant to push landfill owners into cutting down on methane emissions. These guidelines address a key component in the climate mitigation strategy, since all large waste disposal sites emit landfill gas — a potent mix of carbon dioxide, methane and other toxics.

Almost 20 percent of methane emissions generated by human activity in the country comes from landfills.

The guidelines introduce a new emissions threshold under which landfill owners will be held accountable for setting up their own mechanisms to prevent harmful gases from being released into the atmosphere. While environmentalists are applauding the move, others worry that a combination of tightening regulations and poor cost analysis by EPA might put some smaller landfills out of business.



A landfill gas collection system, pictured here, captures methane that can be used to produce electricity.

"We thought that the EPA costs were low, to be honest," said Pat Sullivan, senior vice president at SCS Engineers, an environmental consulting firm. "We didn't think they did a good job of recognizing [the differences in cost] when you're looking at smaller landfills. They used the data they had, which was submitted to them from the larger facilities."

Essentially, the emissions guidelines have introduced a new threshold beyond which landfill owners will be held accountable for cleaning up their site's emissions.

The threshold is currently 34 megagrams a year of non-methane organic compounds (NMOCs) — a component of landfill gas against which EPA measures and regulates landfill emissions — lowered from a previous 50 Mg. The impact of this, according to EPA, will be a reduction of around 290,000 metric tons of methane a year by 2025: the equivalent of about 7.1 million metric tons of carbon dioxide.

EPA states that the new guidelines will have an annualized net cost of \$54.1 million by 2025, calculated by estimating the cost of setting up, operating and monitoring gas collection systems and then offsetting this with the revenue from the electricity that can be generated with the gas. But some experts remain skeptical of this estimate.

According to Sullivan, the guidelines mean different things for different landfills. Some would probably have triggered the 50 Mg threshold at some point in the future, and for them, this simply means they're going to have to put in their collection systems a little earlier.

But there are also some landfills that never would have hit the threshold. In the case of smaller ones, he says, adhering to these guidelines is probably going to be a more expensive task.

"The EPA's position is that they evaluated the cost for both these scenarios, and that the reductions are still cost-effective at the threshold they've picked. But if you compare both, it'll clearly be a more costly endeavor for smaller sites, and if you ask them, they're probably going to have a different opinion," he explained.

The cost of a gas collection system

The science behind a gas collection system is fairly straightforward.

"It comprises of piping underneath and within the waste, with separate systems for landfill gas and leachate," explained Daniel Hoornweg, an associate professor with the University of Ontario's Institute of Technology. "You collect the gas with negative pressure — so you draw it in — and then you combust it. You can also clean it up and put it back into the natural gas grid system."

Broken down into costs, however, it can amount to quite a bit. There's the initial cost of putting in the main body of the system — which includes extraction wells and other points of collection, thousands and thousands of feet of piping that transfers the gas from these points to a common location, and then a landfill gas flare that destroys the methane and NMOCs. In landfills that convert the gas into energy, there's additional equipment: engines and boilers, for instance.

For smaller landfill facilities, the amount of capital needed for this can be overwhelming. According to Sullivan, a system could easily cost a few million dollars to set up and \$100,000 a year to maintain and operate.

"These aren't the kind of systems that you install once and they continue operating on their own for 25 years," Sullivan said. "Landfills are living, breathing beasts, and as waste settles, it can have an effect on equipment. Moreover, the equipment is exposed to the elements, like wind, rain, snow and fleet. The systems require constant maintaining and monitoring, and the new regulations have requirements of technicians on site, as well."

So the cost of installing these systems is proportionally higher for smaller facilities. Take two examples: a 100-acre landfill and a 500-acre one. The larger landfill will require five times the number of collection points and a scalable amount of piping. However, when it comes to the control system, the difference isn't fivefold.

"Even if I have to buy a flare that's five times bigger, it will only be about 2 ½ times the price— and that's a big chunk of the overall cost," Sullivan said. "It's the same when it comes to operation. The cost of maintaining the larger landfill will not be five times the cost of the smaller one. The economy of scale is with the larger one."

Moreover, a smaller landfill's income is directly linked to its size, since its main source of revenue is through tipping fees — what a landfill charges for deposited waste. Larger landfills take in more waste — and more money.

Alternatives for smaller landfills

So what can smaller landfill facilities do to offset the cost of setting up a gas collection system?

"If they're really concerned about being able to comply with the rule, they have the opportunity to close," said Anne Germain, the director of waste and recycling at the Environmental Industry Associations.

That isn't the ideal situation. Landfill owners can also try adjusting their tipping fees to offset the cost of installing a collection system. But while there isn't any cap on the tipping fee, Germain points out that landfills need to remain competitive, and increasing their fees too much will push waste haulers to other dumps.

The other option is to draw revenue from the gas collection system itself.

"Landfill owners have explored a variety of utilization options," Germain said. "These include direct use, where they build a pipeline directly to a nearby industry and have them collect the gas, or it can be used to generate electricity. More recently, people have tried cleaning it up to pipeline quality and putting it into natural gas pipelines or to [compressed natural gas] quality, after which it's used to fuel trucks."

When these technologies were introduced, they tended to be cost-prohibitive for smaller landfills. But micro-turbine technology has made them more affordable.

"It's more economical for them to be able to enter the market," Germain said. "Of course, much of this is highly dependent on the cost of fuel — and gas prices are currently down —but one of the nice things about natural gas is that it's considered a renewable energy, and so there's an opportunity for it to be sold at a little bit of a premium."

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