BREAKING Energy

Tapping the (Decomposing) Big Apple: NYC's Organic Waste Is Crucial Renewable Energy Resource

By Matt Tomich | May 18, 2015

New York and other cities across the U.S. and around the world are grappling with the imperative to cut greenhouse gas emissions and implement low-carbon energy and fuel systems. Whether the emission reduction goals are 30% by 2020, 50% by 2030, or 80% by 2050, leaders and climate experts agree: the time to act on climate is now.

There is less agreement on how specifically to meet the ambitious goals. Solar, wind, biofuels, energy efficiency and other innovations may all play a role. But each city and region has its own challenges. What works in L.A., where it's sunny and warm all year 'round and everyone owns a car, may not work for New York or Boston, and vice versa.

But waste is a constant in every city, regardless of size or geography. In the U.S., we generate lots of it — more than 250 million tons of municipal solid waste each year. Of this, approximately 28%, or 70 million tons, is food and yard waste. That doesn't even count other large, non-municipal sources of organics like wastewater plants, agricultural operations, food processing, and more.

Newtown Creek Anaerobic Digesters in Green Point, Brooklyn. Credit NYC DEP.

Organic wastes are a potential feedstock to produce renewable energy or ultra-low carbon fuel, as well as organic compost. As they break down – whether in landfills, compost piles or specially designed tanks known as anaerobic digesters — organic wastes produce biogases, a mixture of primarily methane (CH_4) and carbon dioxide (CO_2). If allowed to escape into the atmosphere (an especially large factor at landfills), they contribute significantly to climate change, since methane has a global warming potential 25 times that of CO_2. But if they are captured and used as fuel, they can help combat climate change.

Raw biogas can be used to generate on-site heat or power. But when refined, removing CO_2, moisture and other impurities, the resulting renewable natural gas (RNG), also known as biomethane, is nearly identical to fossil natural gas, and has the same range of uses. It can be transported through the same pipelines and used in the same applications as fossil natural gas — for cooking and heating, generating power or fueling vehicles. For biogas and RNG, the costs and benefits of each end use are different. But from a climate protection perspective, any beneficial use that prevents these gases from escaping into the atmosphere and displaces other fossil fuel use is a big gain.

In terms of climate protection, the highest and best use of RNG is as transportation fuel. We rely nearly exclusively on petroleum in the transportation sector. Despite important advances in and deployment of alternative fuels over the past two decades, U.S. on-road transportation still uses more petroleum than all other sectors combined. In fact, petroleum-derived fuels account for more than 95% of all the energy used in this sector — 158 billion gallons per year.

Astonishingly, heavy-duty buses and trucks, which account for just 4% of all on-road vehicles, consume almost 25% of this total, or approximately 38 billion gallons — almost all diesel. Despite a growing number of alternative fuel options for light- and medium-duty cars and trucks (e.g. electric vehicles) and despite all the available technologies that produce renewable energy (wind, solar, hydro, geothermal, biomass), there are surprisingly few options for displacing diesel fuel for heavy-duty vehicles.

Natural gas (in fossil or RNG form) is one option. There is a growing natural gas infrastructure network, fueling stations, heavy-duty engines and vehicles. RNG can power them as easily as fossil compressed natural gas (CNG). But of the two, RNG is by far the lowest-carbon choice. According to lifecycle analyses by the California Air Resources Board – including production, transport and use – RNG derived from landfill gas reduces greenhouse gas emissions by 88% or more compared to gasoline or diesel (CNG reduces GHG by 20 – 25%). Better yet, RNG produced from separated organic wastes in anaerobic digesters can be net-carbon-neutral or even carbon-negative.

In other words, producing RNG this way and using it actually prevents more carbon from entering the atmosphere than it creates.

Cities may seem like unlikely places for scaling up organics. But as major generators of organic waste and heavy consumers of energy and fuel, which are also increasingly adopting ambitious sustainability goals, cities are ideally positioned to develop organic waste's potential.

New York City is the largest, most densely populated city in the country and produces the most waste, so it has the biggest opportunity. It generates about 8 million tons of residential and commercial waste annually, more than 1.6 million of which is food waste.

Since early 2014, the New York City Department of Sanitation (DSNY) has been running a pilot to collect source-separated organics from 100,000 residents throughout the five boroughs. The NYC Department of Environmental Protection, in partnership with National Grid and Waste Management, has a program to collect and process organics in anaerobic digesters at the Newtown Creek Wastewater Plant in Brooklyn to boost biogas production. On Earth Day last month, Mayor de Blasio announced his "Zero Waste" plan, which calls for the expansion of the organics recycling pilot and aims to divert all waste from landfills by 2030.

Like ambitious sustainability and greenhouse gas reduction plans, setting ambitious landfill diversion and zero waste goals is an effective way to spur the actions cities need to take, even if the mechanics of how to accomplish those goals are less well defined. The organics-to-fuel strategy is one that has proven effective – technologically, logistically and economically – by such early adopters as Toronto, San Francisco and Seattle. As NYC and other cities head down this path, there are a lot of unknowns. But one thing we know for sure is that RNG can help achieve many goals at once: reducing waste, displacing petroleum for transportation fuel and drastically cutting GHGs.

Matt Tomich is Vice President of Energy Vision. The organization's mission is to research, analyze and promote the technologies and strategies — viable today — required to transition toward a sustainable, low-carbon energy and transportation future.