


The Newtown Creek sewage treatment plant is the largest in New York City.

NEW YORK

Food Waste from the Big Apple for Biomethane



Renewable energies such as biogas currently play only a minor role in New York City. However, this is set to change. The city plans to mix food waste and garden refuse with sludge at its largest wastewater treatment plant to produce biomethane. Similar plants are also being developed in the surrounding areas. The potential across the state of New York is significant.

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Apples need water to survive, and the US metropolis of New York City, known as the Big Apple, would scarcely be the same without it. This is not just because of the Hudson River, East River, various Atlantic Ocean inlets, or the torrential rains that occasionally flood the streets, as recently happened in September. Water is also a crucial energy source for the largest city in the USA, visibly evident on many days when steam rises from the streets through approximately three-metre-high, orange-and-white-striped pipes. This steam comes from the grid of pipes underground that delivers hot steam to buildings across the city, such as the Empire State Building, the World Trade Center, and many residential buildings. The steam comes from the condensation of water on the hot pipes below, particularly after rain, or escapes through leaks in the system.

Steam Grid Supplies New York with Heating and Cooling

Approximately 1,500 buildings in New York City are supplied with steam for heating and cooling by a 125-year-old system. According to the operator, Consolidated Edison Inc. (ConEdison), it is by far the

largest such system in the world. The energy-rich steam condensate is produced in several power plants across the city, with one of the largest situated in southern Manhattan near Wall Street, where the pipeline grid begins. Over 95% of the fuel used is natural gas. ConEdison uses the heating oil in its power stations only in winter when gas supplies are scarce.

The inefficiency of this system is evident from the steam venting through the streets of Manhattan. Moreover, the heating systems in many rooms cannot be adjusted. In winter, the only way to regulate the heat is to open a window, as one New Yorker explains. ConEdison is also careful to avoid disclosing specific efficiency metrics.

It is clear that the era of fossil natural gas is coming to an end in New York. By 2030, the state of New York aims to reduce greenhouse gas emissions by 40 percent compared to 1990 levels. Only 7 percent of this target had been achieved by 2019. The city has set sector-specific targets for this period, aiming to reduce emissions from buildings by 40 percent. According to the city administration, buildings are responsible for 70 percent of total emissions. Both the state and the city itself aim to become CO₂-neutral by 2050. The gas supplier plays a significant

PHOTO: NEW YORK WATER



Not very efficient: Steam rises from the underground pipeline system in southern Manhattan.

role in these plans. “We want to lead New York into the new net-zero world,” states a company brochure.

There is much to be done to achieve this noble goal. Firstly, the pipeline network needs to be renovated to minimise leaks and losses. However, complete decommissioning of the network is also being considered. Essentially, ConEdison sees only two alternatives for New York’s heating grid. One would be to decommission the entire steam grid and equip all buildings with heat pumps and/or decentralised burners for renewable gases. The other option is to replace fossil fuels with renewable gases alongside the increasing electrification of heating and to deliver these to customers. ConEdison refers to biomethane and hydrogen as green alternatives. This approach would also allow the gas grid to be preserved. The company argues that switching to renewable gases would be significantly cheaper than full electrification of heating.

Biomethane: Potential to Heat Over Four Million Households

The potential for biomethane, also known as renewable natural gas (RNG) in the USA, is considerable. The New York State Energy and Research and Development Authority (NYSERDA) calculated in a 2022 study that anaerobic digestion of residues such as manure, food waste, sludge and landfill waste could generate up to 84 trillion British Thermal Unit (BTU: 10 BTU = 2,93 Watt) of renewable gas in New York State by 2050.

In addition, agricultural and wood residues, energy crops, and waste could provide a further 188 trillion BTU through thermal gasification and pyrolysis,

totaling 272 trillion BTU. By comparison, New York households consumed about 58 million BTU annually for space heating in 2009, according to the US Energy Information Administration (EIA). This means that biogas alternatives could theoretically heat about 4.5 million New York households annually.

However, ConEdison estimates it can only tap into 5% of this potential. The reason: Its network does not extend far into the rural areas where most of the potential lies. The agricultural hinterland that covers about 140,000 square kilometres (equivalent to Bavaria, Baden-Württemberg, and North Rhine-Westphalia combined), holds the greatest potential.

Biomethane from Food Waste on Long Island

Viridi Energy, a US biomethane trader backed by two US private equity firms, aims to exploit this potential. One of these firms, Green Rocket Energy Partners, also invests in another biomethane specialist, BioTown Biogas. Viridi Energy plans to partner with waste management company American Organic Energy (AOE) on one of the largest US projects to convert food waste into biomethane, processing 210,000 tonnes annually – equivalent to the waste produced by a city the size of Dallas, Texas.

The plant is planned for Yaphank, Long Island, about 90 kilometres from New York City’s border. Currently, food waste from the city is often transported hundreds of kilometres to landfills, where it releases methane into the atmosphere. The new plant will be a first step towards using waste directly for gas production.

The city of New York has also ▶

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Brooklyn residents are starting to collect their organic waste.



taken up the fight against methane emissions from landfills. In the future, it plans to use resources such as food scraps and garden waste for energy production instead of disposing of them in landfills. To this end, the Department of Environmental Protection (DEP) has introduced a curbside programme for collecting organic waste.

Big Apple to Produce Biomethane

The implementation of this can be seen in the boroughs of Brooklyn and Queens. Brown bins have been delivered to households and businesses over the past few months. The programme was first launched in Queens and has been in effect in Brooklyn since the beginning of October. The Bronx, Staten Island, and Manhattan are set to follow in 2024. Waste separation is mandatory from the start of collection. The highlight: The city of New York is using the leftovers to produce biomethane. Together with the sludge, they are to produce biogas. To this end, the waste collection service transports the organic waste to the Waste Management treatment plant in Brooklyn. This company is well-versed in renewable gases, being one of the largest waste processors and landfill operators in the country. It plans to capture landfill gas at several sites and upgrade it to biomethane in the future.

Brown bins are now part of everyday life in Brooklyn.

In Brooklyn, Waste Management first sorts out foreign matter such as plastic from the biowaste. This is followed by homogenisation steps in large steel tanks with the addition of water until a brown and creamy liquid remains, which Waste Management calls EBS (engineered bio slurry).

Currently, 200 tonnes of organic household waste per day can be converted into approximately 190,000 litres (50,000 gallons) of energy mix, according to the New York Water Authority. In the future, this could increase to 250 tonnes. Waste Management explains that the engineered bio slurry (EBS) can generally be added to conventional digesters. However, in Brooklyn, the process is different. There, trucks transport the liquid waste raw material to the city's largest sewage treatment plant at Newtown Creek in Brooklyn.

Mixing Waste and Sludge

There, they mix the slurry from New Yorkers' organic waste with another waste product: Sludge, at a ratio of 1:1.3. The mixture is then placed in silver fermentation towers, similar to those known in Germany, for thirty days. But that's not all. The gas

Residents can also drop off their organic waste at central collection points.



PHOTOS: NEW YORK WATER (1) / OLIVER RISTAU (5)



The wastewater treatment plant in Rockaway Beach currently flares biogas.



In the silver eggs, bacteria produce biogas from food waste and sludge for biomethane production.

grid operator, National Grid, wants to take over the biogas and process it into biomethane. According to National Grid, this project could save approximately 90,000 tonnes of CO₂ annually and provide heat for over 5,200 New York households.

Although the participants, including the city, celebrated the project's official opening at Newtown Creek on the East River in mid-June, National Grid has yet to disclose which technology will be used for biomethane processing or the precise timeline. It is clear that the biomethane will be blended with fossil gas in the pipelines. However, it remains unclear how the company will market the renewable natural gas (RNG).

The introduction of the curbside programme had been repeatedly delayed by New York City, most recently due to COVID-19. One of the main concerns was attracting and feeding the city's large rat population with organic waste left on the streets. As a result, Brooklyn residents are currently being trained on the proper handling of the bins: When to fill them, when to place them on the street, and ensuring they are always securely closed. Regular collection is essential, as with all other waste in New York City, which produces significantly more rubbish than German cities.

New York's Sewage Treatment Plants: Using Biogas Instead of Flaring it

So far, the Brooklyn treatment plant is one of the few that generates and uses significant amounts of bio-sewage gas for its energy needs. Many of the other thirteen treatment plants in the city still flare the excess gas, as production exceeds internal needs. This is also set to change in the medium term. The DEP, the environmental authority responsible for the sewage treatment plants, has set itself the goal of using 100 percent biogas.

"The DEP expects the future sale of biogas to be a profitable service," the authority writes in a tender for the modernisation of the sewage treatment plant sites. Eliminating flaring will also improve air quality in neighbourhoods such as the seaside suburb of Rockaway Beach, where residents and visitors complain of unpleasant odors. "As long as there is a need for fossil gas, it would be a waste for DEP to continue flaring our renewable biogas at the expense of local communities' air quality."

To make this economically viable, as many of the sewage treatment plants as possible, like the one at Newtown Creek, need to be equipped to upgrade biogas to biomethane. There is still a long way to go, as the investment required is substantial. However, if the "Big Apple" is to become greener in the future, New York's biomethane will likely play a crucial role. ◀



Water is almost ubiquitous in New York.

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