

BIOGAS TO LOCAL NATURAL GAS: NYC DEP

New York, New York

PROJECT DESCRIPTION



*Food Waste Feed-In Station at Newtown Creek Wastewater
Resource Recovery Facility
Photo courtesy of Waste Management*

The New York City Department of Environmental Protection (DEP) holds the critical mission of enriching the environment and protecting public health for New Yorkers by providing high quality drinking water, managing wastewater and stormwater, and reducing air, noise, and hazardous materials pollution. Daily, DEP delivers over 1 billion gallons of high-quality drinking water to more than eight million NYC residents, visitors, and commuters, as well as to one million upstate customers. Additionally, DEP treats about 1.3 billion gallons of wastewater per day by operating and maintaining 14 in-city wastewater resource recovery facilities, 96 pumping stations, and over 7,500 miles of sewers.

As the largest water and wastewater utility in the country, DEP is also one of the largest sources of municipal greenhouse gas (GHG) emissions in New York City, accounting for 18 percent of total emissions by City agencies. Primary GHG emissions can be attributed to the wastewater treatment process, mostly from aeration, pumping, and fugitive

methane. Wastewater treatment accounts for 80% of DEP's energy use, with aeration being responsible for roughly 40-50% of that, and most of the remainder coming from thermal needs, pumping, and dewatering centrifuges. Overall, energy use makes up approximately 300,000 of DEP's 500,000 metric tons (MT) of emissions. DEP is currently at about 30% beneficial use of its biosolids and is putting contracts in place to reach 50% by 2025, with the goal of 100% by 2030.

While the processes needed for DEP to successfully carry out its mission make it one of the largest sources of municipal GHGs, it also remains to be one of the city agencies with the greatest potential for achieving energy and carbon neutrality. In working toward this, DEP has invested nearly \$4 billion in a full plant upgrade and state-of-the-art digester system at the Newtown Creek Wastewater Resource Recovery Facility (Newtown Creek). Newtown Creek is DEP's largest wastewater facility, giving it the highest potential for biogas generation due to the volume of wastewater flow it receives. For this project, DEP partnered with National Grid to capture biogas from Newtown Creek and clean it to meet natural gas standards to be used as an alternative energy source in the form of "renewable natural gas", or RNG. DEP is also incorporating food waste through a partnership with a private company, Waste Management, to augment the supply of biogas being generated, which has significant GHG benefits as it would have otherwise been converted to methane in a landfill. This project began in 2018, and is fully constructed and scheduled to come online in early March 2022.

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MAKING THE PROJECT HAPPEN

This project required significant internal coordination between DEP's Energy Office and Bureau of Wastewater Treatment, as well as the Mayor's Office, Department of Sanitation, Waste Management, private haulers for food waste, and National Grid, a private sector energy utility. Different perspectives and insights allowed for a more holistic project. NYC's 2007 strategic plan, PlaNYC, set aggressive GHG reduction goals that were a primary driver in pushing this project forward as it was viewed as a quick win for achieving significant GHG reductions. Additionally, other regulatory drivers, such as local laws, state climate legislation, and community engagement around this issue played an important role in getting support for the project.

IMPLEMENTATION



Successful partnerships between DEP and National Grid were critical for successful implementation, as each were familiar with the respective regulatory landscape associated with this project. In addition to the previously mentioned intra-City government and project partner coordination, DEP did extensive outreach to community groups and the local Solid Waste Advisory Board (SWAB). From a permitting and approvals standpoint, DEP was required to request approval from the Public Service Commission and FDNY, which was a long process that was ultimately successful. National Grid was required to include the gas-to-grid project in their rate case and had to seek approval from the Public Service Commission.

FINANCES

For this project DEP entered into a concession agreement with National Grid, allowing them to operate components of the project. Therefore, DEP did not pay towards capital costs. In total, this project costs about \$50M and can produce 1450 standard cubic feet per minute of natural gas at full capacity. This project was projected to have a 20-25 year payback period, but is now estimated to be under 5 years due to the monetization of environmental attributes through EPA's Renewable Fuel Standard and California's Low Carbon Fuel Standard. It is estimated to produce about \$10-15M in revenue each year, which will be used to pay down the capital investment.



The food waste codigestion program was procured as a No-Cost Demonstration, wherein Waste Management paid the capital investment for both the off-site food waste pre-processing facility, as well as the on-site food waste feed-in station. DEP did not pay towards the capital costs.



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CHALLENGES

For the gas-to-grid project, there were a number of obstacles that contributed to the delay of the project:

1. It was originally conceived that the gas-to-grid facility would be located on DEP's property, but outside the main process areas. After design was underway, it was discovered that the facility would be larger than originally anticipated and there was interference with the underground force main. A new location within the main part of the facility had to be identified, and the design adjusted.
2. DEP's egg-shaped digesters are great for mixing and digestion, but have very little headspace to allow for biogas buffering capacity. There is an in-line Wiggins-style gas holder that provides approximately five hours of biogas storage, and allows the gas-to-grid system to smooth variability in biogas production. During the construction, the gas holder developed a tear and had to be taken offline and repaired, which highlighted that the project would not be able to draw biogas while the gas holder is offline to avoid the risk of drawing a vacuum and damaging the biogas piping or the digesters. DEP is now designing a second gas holder to act as a back-up unit.
3. During the long planning and design period, the cost of natural gas had declined significantly due to the availability of natural gas from fracking. For a period of time, the project economics did not work. The monetization of environmental attributes through the EPA Renewable Fuel Standard and the California Low Carbon Fuel Standard (as well as other programs) have made the economics work.
4. New York State is working toward deep decarbonization goals under the Climate Leadership and Community Protection Act (CLCPA). While the State is still developing the work plan on how to execute the goals of the CLCPA, there has been a lot of opposition against renewable natural gas amongst environmental and climate justice activists. While we will continue to move forward with the gas-to-grid project, DEP is cognizant that on-site use may be the only option at some point within the next 20 years.



For the codigestion program, the largest challenge has been getting high volumes of food waste. Source Separated Organics (SSO) programs take a long time to take hold (over a decade in many cases) in a given municipality, and New York City is no exception. DEP and Waste Management continually struggled with finding enough food waste to source to meet the design loadings. With the onset of the COVID-19 pandemic, organics deliveries to Newtown Creek dropped by 75% because of the closure of school and restaurants.

While loadings have increased recently, DEP is still receiving less than half of pre-pandemic levels. Being aware that SSO programs need time and funding to grow, municipalities should plan to invest in these programs over a long period, and be patient with the slow growth of food waste collected – it takes time for the behavior change necessary to have a successful SSO program take hold.



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ADVICE AND LESSONS LEARNED

It is important to know the full revenue potential of the project, which is key when considering the distribution of revenues. DEP built a codigestion process and financial model to determine how much additional biogas is being produced from food waste addition and what that translates into in terms of revenue from the gas-to-grid system. It also calculated the additional trans-shipment of digestate, dewatering operations, separate centrate treatment associated with increased nitrogen removal, and additional biosolids generated (and associated disposal costs).

This model was a key element to determining the direction DEP would like to take with regards to expanding the codigestion program and installing gas-to-grid systems at other WRRFs.

Regarding gas-to-grid projects, it is critically important to stay abreast of the policy and regulatory landscape in your area. Many parts of the world are moving quickly toward decarbonization and an anti-combustion contingent appears to be accompanying these discussions in several jurisdictions. Gas-to-grid may not be a viable outlet for biogas in the future, depending on the decisions made in these discussions.

Regarding codigestion programs, a lot of coordination and patience is required. As previously mentioned, the behavior changes required to make SSO programs successful take a long time. Coordination across the City from governmental partners to waste haulers to the community are critically important to make codigestion a viable component of a SSO program's strategy.



LEARN MORE

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