# Co-Digestion and Gas to Grid in New York City

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| **Keywords** | biogas, wastewater treatment, gas to grid, sewage, renewable energy |
| **City Population** | 8,516,202 |
| **City Area** | 783.84 km$^2$ |
| **City GDP** | 1.286 trillion USD |
| **Climate Zone** | Cfa (humid subtropical) |
| **ARC3.3 Linkage** | Infrastructure for a Net Zero and Resilient Future for Cities |

**Introduction.** The Newtown Creek Wastewater Treatment Plant in New York City is home to one of the first renewable natural gas distribution projects in the US. Biogas, composed primarily of methane, is a byproduct of the wastewater treatment process and is typically flared into the atmosphere. If cleaned, biogas can be injected into existing distribution networks and burned in households like traditional natural gas. In 2013, the NYC Department of Environmental Protection (DEP), which manages all NYC wastewater treatment plants, began a pilot project to increase biogas production through the addition of pre-processed organic matter to wastewater digesters (co-digestion). The success of the pilot project led DEP to begin a large-scale gas-to-grid project with targeted completion in 2023.

Newtown Creek is the largest of New York City's treatment facilities, processing 330 million gallons of wastewater daily from southern and eastern Manhattan, western Queens, and northern Brooklyn. Each year, the Newtown Creek Wastewater Treatment Plant produces more than 500 million cubic feet of biogas, 40 percent of which is reused in boilers that provide heat, and 60% of which is flared into the atmosphere. The co-digestion and gas-to-grid project will reduce greenhouse gas emissions by eliminating flaring and also by diverting organic waste from landfills. The Newtown Creek plant is slated to produce enough renewable natural gas to heat 5,200 NYC homes and to reduce annual greenhouse gas emissions by 90,000 metric tons (Gilbride and Timbers, 2013).

**Governance.** Gas-to-grid is achieved through a public-private partnership between DEP, the contractor Waste Management of New York (WMNY), and the natural gas utility National Grid. WMNY pre-processes and transports organic waste to Newtown Creek. DEP operates the wastewater treatment plant, and National Grid distributes biogas through its pipelines. National Grid financed the design, construction, operation, and maintenance of the biogas purification system. Initially DEP will provide the biogas free of charge. After a five-year period, natural gas profits will be split between DEP and National Grid's customers.

Co-digestion at Newtown Creek is a component of a number of New York's climate action frameworks. PlaNYC, released in 2007, is New York's strategic plan to adapt to climate change, mitigate emissions, strengthen the economy, and improve quality of life for residents, and includes a goal to reduce greenhouse emissions by 30 percent. OneNYC, released in 2015, furthers NYC's commitment to deep decarbonization by setting a goal of carbon neutrality and WRRF energy neutrality by 2050, as well as 100% beneficial use of biosolids and 90% reduction in landfilled food waste by 2030. Of the total 90,000 metric ton greenhouse gas reduction generated by co-digestion, 54,500 tons are from the diversion of organic waste from landfills, 32,400 tons are from the replacement of traditional natural gas, 2,290 are from the elimination of the transport of organic waste, and 840 tons are from the elimination of flaring at the treatment plant (Gilbride and Timbers, 2013).

Local legislation enabling the project includes Local Law 66 of 2014 (One City Built to Last) and Executive Order 26 of 2017, which commit the city to reducing greenhouse gas emissions beyond those spelled out in PlaNYC and to the standards of the Paris Climate Agreement (Executive Order No. 26, 2017; Kallos, 2017). Local Law 146 of 2013 (Commercial Organics Law) authorizes DSNY to require certain food service establishments to recycle organic waste, and Introduction 844 of 2018 establishes a zero waste goal by 2030. Local Law 97 of 2019 accelerated decarbonization interim milestones by mandating that City Agencies achieve a 40% reduction in GHG emissions by 2025 and a 50% reduction by 2030.

**Implementation and Technical Process.** Implementation began with a pilot project during the summer of 2013, in which WMNY's Varick I transfer facility in Brooklyn began processing 2 tons per day of organic food waste collected from local schools (City of New York, 2013). This organic matter was added to two of Newtown Creek's eight wastewater treatment tanks (digesters). At full scale, four digesters will process up to 500 tons of organic food waste per day (City of New York, 2013).

Organic matter is processed through WMNY's proprietary

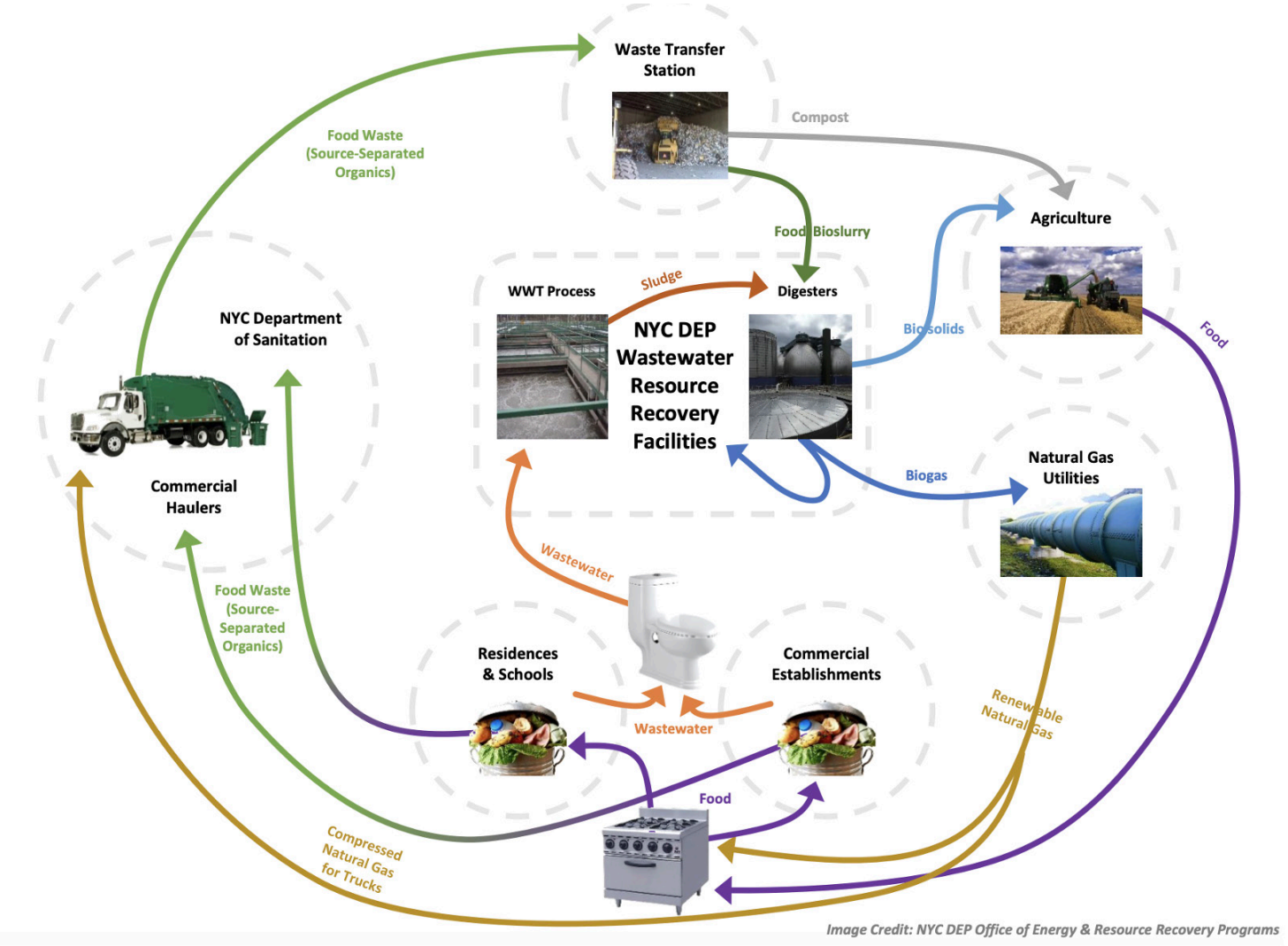


**Figure 1.** *The addition of organic matter to wastewater digesters is part of a wider urban flow of materials and energy (Amar et al., 2019).*

*From Food Waste Co-Digestion Full-Scale Demonstration at Newtown Creek WWRF, NYWEA 91st Annual Meeting and Exhibition, February 6th, 2019.*

Centralized Organic Recycling equipment (CORe)SM to produce a liquified BioSlurry. This is then transported to treatment plants in sealed tankers and added to digesters through designated feeding stations also operated by WMNY. Combined wastewater and organic matter sludge is heated to 35 degrees celsius in an oxygen-free environment for between 15 to 20 days, stimulating the growth of anaerobic bacteria and converting most of the organic material into water, carbon dioxide and biogas. Biogas is predominantly methane and carbon dioxide, but also contains impurities like hydrogen sulfide, siloxanes, and water which must be removed before it can be used for cooking or heating (National Grid, 2022). The addition of food waste significantly increases the total energy value of biogas and has minimal effect on gas quality (Amar et. al, 2019).

**Conflicts and Controversies.** Though Newtown Creek is slated to begin providing natural gas to the grid by early 2023, the project as a whole has been characterized by timeline delays and budget growth. The initial $14.6 million budget ballooned to roughly $47.8 million in February 2021 (Maldonado, 2022). Much of this was the result of communication issues between public and private collaborators, as well as technical setbacks on the part of National Grid in the construction of the purification system.

The project has also sparked controversy with respect to the city's overall sustainability goals. Though biogas is a renewable source of energy, the Newtown Creek project could be perceived as indirectly challenging NYC's electrification transition by perpetuating the maintenance of natural gas infrastructure. However, DEP holds that biogas purification can happen in tandem with general electrification, eventually only supplying the limited users that require the higher temperatures associated with combustion.

The transport of organic material with diesel trucks through the city for processing in addition to treatment

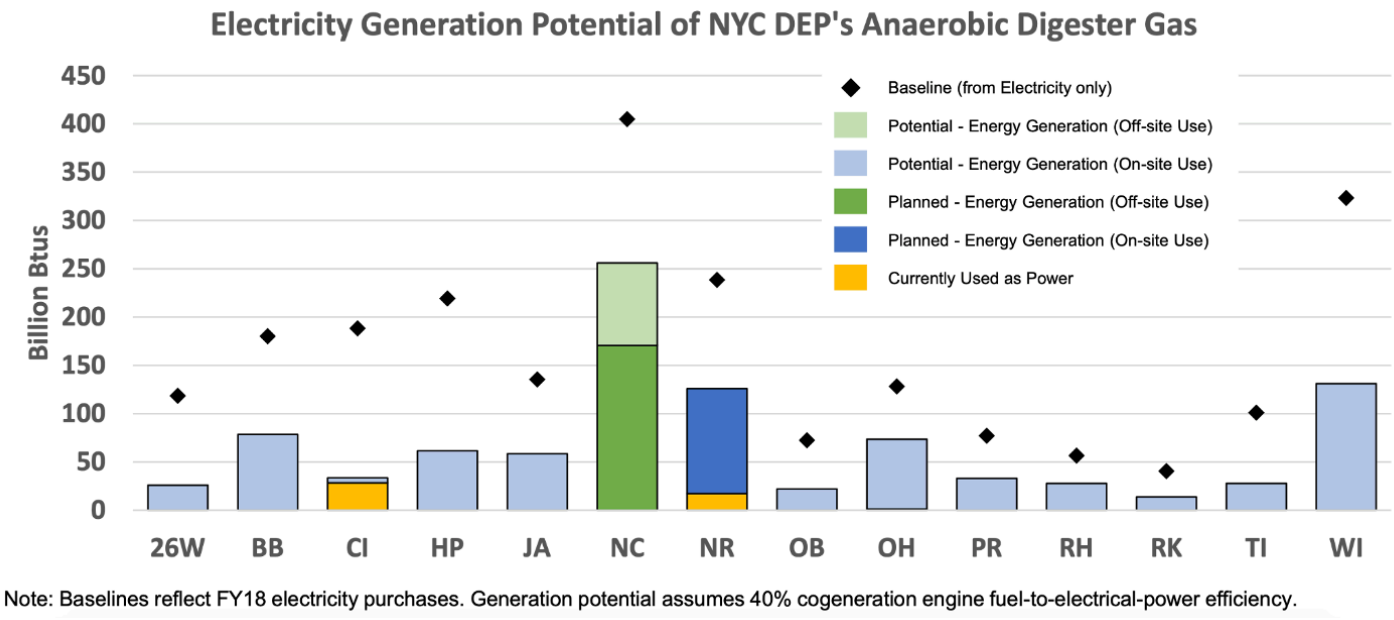


**Figure 2.** *Potential Electricity Generation from NYC DEP Anaerobic Digester Gas*

plants also has ramifications for urban air quality.

**Future Implementation and Concluding Thoughts**. Co-digestion at Newtown Creek is a promising example of local urban renewable energy production and the implementation of circular economy principles. The project illustrates the importance of public-private partnerships in integrated infrastructure systems, but also the necessity of effective communication between these stakeholders. Effective governance systems that outline usable climate action targets are key in keeping these projects on track.

New York's sustainability commitments with set timelines were central in driving the completion of the project. It should be noted, however, that resilience governance is slightly fragmented between bodies like the Mayor's Office of Sustainability, the DEP, the Office of Recovery and Resiliency, and the Mayor's Office of Climate Policy and Programs, which reduces their overall efficacy.

Further research for New York's co-digestion program must address the use of anaerobic bacterial digestate, or the solid remainder of the treatment process. If disinfected, digestate is a nutrient-rich biosolid which can be commercially sold and used as fertilizer or soil conditioner. However, NYC does not have large-scale disinfection capacity. Most of the material is sent to out of state landfills, incurring additional transport emissions and impacting air quality. The city has announced a goal of zero-landfilling of biosolids by 2030, which will require the conversion of more digestate to market-ready Class A biosolids.

Finally, NYC's combined sewer system (CSO) reduces the efficacy of anaerobic digestion by combining stormwater with wastewater, decreasing the amount of methane that can be captured and productively used.

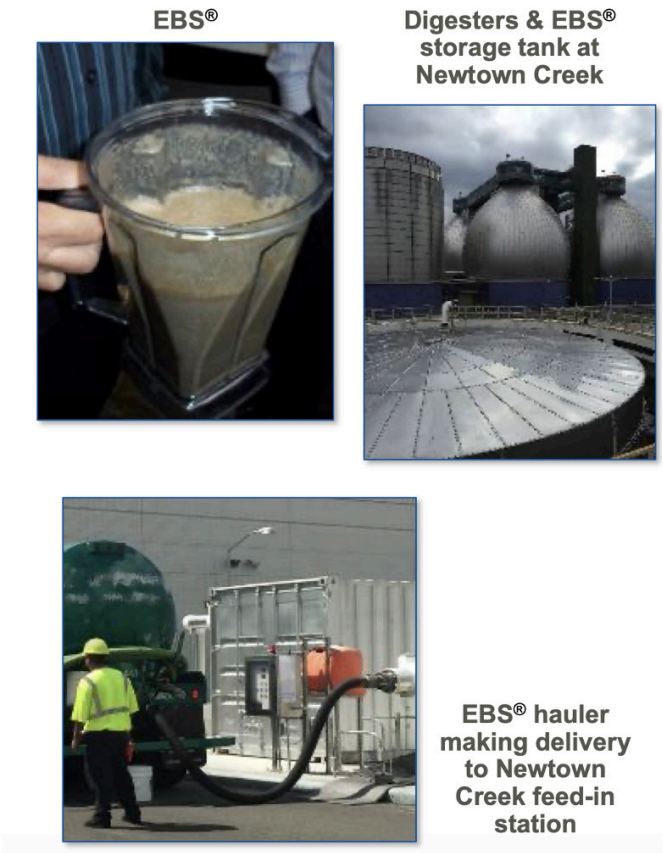


**Figure 3.** *Implementation of wastewater digestion process.*

Addressing this issue may require a large-scale infrastructure overhaul but would have significant implications for emissions reduction and water quality improvement.

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## References


Amar, M., Atkinson Gajwani, J., Sharp, R., & Ecker, J. (2019, February 6). *Food waste co-digestion full-scale demonstration at Newtown Creek WRRF* [Conference session]. NYWEA Annual Meeting. https://www.nywea.org/MemberDocs/Presentations/2019%20Annual%20Meeting/20-Food%20Waste%20Co-Digestion%20Full-Scale%20Demonstration%20at%20Newtown%20Creek%20WRRF.pdf

City of New York. (2013, April 12). *City announces innovative new partnerships to reduce waste and produce renewable energy* [Press release]. NYC.gov. https://www.nyc.gov/html/dep/html/press_releases/13-121pr.shtml

Gilbride, C., & Timbers, T. (2013, December 19). *City announces innovative new partnerships.* NYC Environmental Protection. https://www1.nyc.gov/html/dep/html/press_releases/13-121pr.shtml#.Yzbfky2z00o

Kallos, B. (2018, April 25). *Establishing a goal of zero waste for NYC by 2030.* The New York City Council. https://legistar.council.nyc.gov/LegislationDetail.aspx?ID=3486151&GUID=3AF63E88-E680-44C6-848C-B60504D04B21

Maldonado, S. (2022, April 15). Newtown Creek plant burns off valuable methane daily as waste recycle project lags. *The City*. https://www.thecity.nyc/2022/4/15/23026137/newtown-creek-plant-burns-methane-waste-recycle-lags

National Grid. (2022). *What is biogas?* https://www.nationalgrid.com/stories/energy-explained/what-is-biogas

Office of the Mayor of the City of New York. (2017). *Executive order No. 26: Climate action executive order.* https://www1.nyc.gov/assets/home/downloads/pdf/executive-orders/2017/eo_26.pdf


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## Additional Data

- **Population Density:** 11,313 people/km$^2$
- **Per Capita Gross National Income (GNI):** 85,980 USD (High Income) [2024]
- **Gini Coefficient:** 41.8 [2023]
- **Human Development Index (HDI):** 0.938 (High) [2023]
- **Type of Climate Intervention:** Mitigation

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