



The City of New York Department of Sanitation



2024 Annual Report on Alternative Fuel Vehicle Programs Pursuant to Local Law 38 of 2005



NYC's First Battery-Electric Bike Lane Sweeper

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DSNY Annual Report on Alternative Fuel Vehicle Programs

I. Introduction

The Department of Sanitation (DSNY) operates a sizeable fleet of trucks and other vehicles to carry out its mission to keep New York City clean, safe, and healthy by collecting, recycling and disposing of waste, cleaning streets, attacking the scourge of illegal dumping, and clearing snow and ice. In 2005, the City Council enacted Local Law 38 (LL38/2005), which directs DSNY to report annually on its use and testing of alternative fuel vehicles.¹ This report, which is submitted to the Mayor, the Comptroller and the City Council in accordance with LL38/2005, discusses the testing, analyses and assessments of DSNY's alternative fuel sanitation collection vehicles and street sweepers, and the feasibility of incorporating new alternative fuel sanitation vehicles and technology into DSNY's fleet. As explained in prior annual reports, DSNY previously completed the LL38/2005-mandated evaluation pilot study of Compressed Natural Gas (CNG) sweepers in four sanitation districts with one district in an area with high rates of asthma among residents.

DSNY endeavors to operate the cleanest possible fleet and therefore seeks to minimize emissions of concern from such operations, notably particulate matter (PM), nitrogen oxides (NOx), and greenhouse gases (GHGs) such as carbon dioxide. As of December 2024, DSNY's active fleet of 6,032 vehicles consists of:

Collection Trucks	2,410
Street Sweepers	461
Salt Spreaders	759
Front End Loaders (earth moving)	487
Light Duty Vehicles	1,181
Other (various support vehicles)	734

Based on Fiscal Year (FY) 2024 figures, DSNY's diesel fleet consumed approximately 9 million gallons of biodiesel fuel and 430,000 gallons of unleaded gasoline (E10). Since 2005, DSNY's fleet has cut annual diesel fuel use by 14% and cut its light duty fleet gasoline use by 63%. Since LL 38/2005 was passed, DSNY's heavy-duty truck fleet relies mostly on clean diesel technology while the Department's light- duty fleet utilizes renewable fuel (E10) and increasingly incorporates hybrid-electric, plug-in hybrid-electric and all-electric technology to minimize vehicular emissions.

This report includes the total number of alternative fuel "sanitation vehicles" owned or operated by DSNY by type of alternative fuel used, discusses notable advances in DSNY's clean diesel fleet, and provides information regarding DSNY efforts to further incorporate alternative fuel vehicles into its fleet to further reduce emissions, including GHGs, in accordance with City air quality and sustainability goals. "Sanitation vehicles" are defined by LL38/2005 as vehicles used by DSNY "for street cleaning purposes or for the collection of solid waste or recyclable materials."²

¹ NYC Administrative Code § 24-163.2(c)(1) & (2).

² NYC Administrative Code § 24-163.2(a)(6).

II. Alternative Fuel Vehicles

Despite the success of clean diesel in minimizing PM and NO_x from DSNY fleet emissions, further improvements are possible as technology advances. DSNY therefore continues an active program of testing other kinds of fuels and technologies. Under LL38/2005, “alternative fuels” include natural gas, liquefied petroleum gas, hydrogen, electricity, and any other fuel which is at least eighty-five percent, singly or in combination, methanol, ethanol, any other alcohol or ether. Including collection trucks, sweepers, and light duty vehicles that are not used to collect refuse or recyclables, DSNY currently has 791 vehicles that operate on various alternative fuels, including electric and hybrid-electric vehicles.

Vehicle/Technology	Count
Hybrid Electric Passenger Vehicles	283
Hybrid Electric Street Sweepers	24
Hybrid Electric Rack Trucks	6
Hybrid Electric Tire Trucks	5
Hybrid Electric Plug-in Passenger Vehicles	249
Battery Electric Passenger Vehicles	205
Battery Electric Bike Line Sweepers	11
Battery Electric Street Sweepers	1
Battery Electric Collection Trucks	7

In October 2023, Mayor Adams signed Local Law 140 (LL 140/2023), formally codifying Executive Order 90 of 2021. According to LL 140/2023:

By July 1, 2035, all light-duty vehicles and medium-duty vehicles in active operation shall be zero emission vehicles subject to the commercial availability and reliability of zero emission light-duty vehicles and medium-duty vehicles, and the technical and physical availability of related planned infrastructure, including but not limited to charging stations and depots for zero emission light-duty vehicles and medium-duty vehicles.

By July 1, 2038, all heavy-duty and specialized motor vehicles shall be replaced with zero emission vehicles subject to the commercial availability and reliability of zero emission heavy-duty and specialized motor vehicles, and the technical and physical availability of related planned infrastructure, including but not limited to charging stations and depots for zero emission heavy-duty and specialized motor vehicles.

A. *Light-Duty Vehicles*

DSNY’s light duty fleet currently includes 737 advanced low- or zero-emission vehicles, such as hybrid-electric, plug-in hybrid-electric (PHEVs), and battery-electric vehicles (BEVs). Hybrid-electric vehicles operate on gasoline assisted by battery technology. Plug-in hybrid-electric vehicles can operate in battery mode for a certain distance before the gasoline engine must be used. BEVs operate on electric battery power alone. Consistent with LL38/2005 and LL140/2023, DSNY expects to increase its fleet of light-duty electric vehicles.

Vehicle/Technology	Count	Make & Model
Hybrid-Electric	283	Ford Escape, Fusion / Toyota Camry, Highlander, Prius, RAV4
Plug-In Hybrid Electric	249	Chevy Volt / Ford Fusion (Energi) / Mitsubishi Outlander
Zero-Emission Battery-Electric	205	Chevy Bolt / Ford E-Transit, F-150, Mach-E, Silverado

Zero-emission vehicles have the potential to bring further benefits to local air quality, as well as fuel cost savings and GHG reduction, compared to DSNY's current hybrid fleet. However, such BEVs require additional charging infrastructure, and may limit DSNY's operational flexibility for such sedans and be impractical in winter emergency snow situations due to relatively slow charging times and lack of four-wheel drive capability that is essential in responding to winter emergency weather. As a result, DSNY generally uses hybrid or plug-in hybrid SUVs with four-wheel drive capability in lieu of BEVs and/or plug-in hybrid cars lacking such capability for all jurisdictions responsible for snow-removal operations.

EV chargers are also known as Electric Vehicle Supply Equipment (EVSE). DSNY currently owns/operates 324 EVSE comprised of 261 Level-2 EV charging stations, 63 Direct Current Fast Chargers (DCFC)³ and 18 solar car ports totaling 298 charge-ports citywide. DCFC can deliver a very high rate of charge and are more suitable for heavy-duty vehicles with very large battery-packs. Level-2 EV chargers deliver a much lower rate of charge and are more suitable for light-duty passenger vehicles with much smaller battery packs. Both Level-2 and DCFC can be purchased with various power outputs (Kilowatts) and therefore can have an impact on EV charging rates/times. For instance, see the table below highlighting the significant difference in the power requirements between a sample Level-2 EVSE vs DCFC. Many, if not all of DSNY's existing facilities/structures do not have adequate power to support the transition to full fleet electrification without the need for electrical service upgrades, assuming the local utility provider can support the timelines and power demands. In many cases, an electrical service upgrade will require major space redesign, construction work and consulting services which will weigh heavily on the Department's budget. Two existing DSNY locations recently required costly electrical service upgrades (new feeder cables from the utility) after DCFC installations.

Charger Type	Volts	Amps	# Phases	Output
Level-2	220	50	1	11 kW
DCFC	480	100	3	48 kW

As new zero-emission vehicles come on the market, DSNY intends to conduct further studies on the economic and operational feasibility of incorporating more alternative fuel light-duty vehicles into its fleet.

B. Heavy-Duty Vehicles

1. Heavy Duty Battery-Electric Vehicles

In the past few years, the development of heavy-duty BEVs has advanced. Cummins, Freightliner, Kenworth, and Mack Trucks are among the truck manufacturers who have announced on-going

³ 62 of the 63 DCFC were funded by DCAS.

development of Class-8 BEVs. As noted above, DSNY's EV charging infrastructure has grown over the years to accommodate the increased number of plug-in vehicles in the DSNY fleet. To build on DSNY's experience and success in deploying a fleet of light-duty EVs and continue the progress of reducing GHG emissions from heavy-duty vehicles, DSNY expressed interest to Mack Trucks and Global Environmental Products about exploring the development of a BEV collection truck and street sweeper, respectively. Based on DSNY's pioneering R&D record and expressed interest, both Mack Trucks and Global Environmental Products agreed to begin development of a BEV collection truck and BEV street sweeper, respectively. The pilot/prototype BEV street sweeper and collection truck are among the first in the country in their weight-class. In anticipation of this pilot, DSNY installed its first DCFC at DSNY's Brooklyn District 1 Garage, where the BEV collection truck was assigned.

BEV Collection Truck

Under a Memorandum of Understanding (MOU) and at no cost to the City, on November 18, 2020, DSNY commenced pilot-testing one of the first Mack (Model LRe) BEV refuse collection trucks. The cab/chassis specifications of the Mack LRe is identical to the current DSNY diesel collection truck (72,000 lb. GVW). DSNY installed its first DCFC to accommodate the charging needs of the Mack LRe. After one year (term of MOU) of rigorous testing in the streets of NYC, the Mack LRe yielded impressive test results (payload, state of charge [SOC], uptime, performance) and was well received by DSNY sanitation workers.⁴

Taking into consideration the introduction of LL 140/2023 which orders the City fleet to be 100% electric by 2038, and as a result of the performance metrics described above, for the next phase of testing (R&D) and in the interest of collecting in-use data, DSNY decided to move forward with the procurement of seven (7) Mack LRe units. DSNY utilized federal Congestion Mitigation and Air Quality Improvement Program (CMAQ) funds to help pay for the incremental cost of the seven Mack LRe units.

The next phase of testing (R&D) will allow DSNY to assess the Mack BEV LRe units for refuse collection only as well as expand the testing to one truck per geographical zone. The seven LRe units went into service in FY2024.

BEV Street Sweeper

DSNY was among the first public or private fleets in the country to pilot-test an all-electric BEV street sweeper. Under a Research and Development grant funded by New York State Energy & Research Development Authority (NYSERDA), DSNY was awarded \$255,000 towards the incremental cost of an all-electric street sweeper (compared to the base cost of a diesel hybrid-electric vehicle (HEV) street sweeper).⁵

⁴ As a pre-production unit, this first Mack LRe was not originally designed to plow snow. However, due to the mutual interest in collecting data, Mack and DSNY agreed to up fit the truck with a snow plow hitch to give it the ability to plow snow. DSNY was able to plow snow utilizing the Mack BEV LR on the only two days of snow activity during the pilot period. This preliminary data revealed that the truck lasted no more than two hours on a full charge for plowing snow. Based on these results, Mack is working to develop and advance the technology in its BEV collection trucks.

⁵ The cost of an HEV street sweeper is \$474,998; the cost of a BEV street sweeper is only 30% more (\$664,048).

The DSNY BEV street sweeper is manufactured by Global Environmental Products and is the same “M4” model currently in use by DSNY today. The US Hybrid Corporation (Torrance, CA) designed and built the propulsion on the BEV sweeper. The BEV sweeper incorporates a regenerative braking system designed to capture kinetic energy during braking events when in travel or sweeping modes. Under certain conditions, regenerative braking can help improve the range of BEV. The BEV features a fully integrated electric powertrain with a single traction motor and a 180 kWh battery pack.

After the BEV sweeper arrived in January 2020, DSNY conducted preliminary shakedown testing. DSNY identified various technical issues and worked with Global Environmental Products and US Hybrid to address them. The official launch of the Department's first BEV sweeper was significantly delayed due to COVID-19. The BEV sweeper went into service on May 6, 2021. The BEV sweeper was assigned to DSNY's Brooklyn District 4 (BK4) garage. The BK4 street sweeping routes are in a NYC environmental justice community. After one year of rigorous testing in the streets of New York City, the BEV sweeper yielded impressive test results (payload, SOC, uptime, performance) and was well received by DSNY sanitation workers. The results of a study funded by NYSERDA found that the BEV sweeper is capable of performing the duty cycle of a conventional diesel street sweeper. However, the BEV maintenance costs were more than twice that of a conventional diesel street sweeper.⁶ DSNY believes the performance of future BEV street sweepers will improve and attributes the preliminary test results to the fact that the first unit was a pre-production prototype. Due to the sheer number of street sweepers in the DSNY fleet (461), the commercialization of BEV street sweepers will have a significant impact on the Department's ability to electrify its fleet.

BEV Bike Lane Sweepers

The challenge of sweeping and cleaning over 600 protected bike lane miles in NYC has become one of DSNY's key responsibilities. Being mindful of our environment, DSNY decided to test the effectiveness of utilizing battery-powered bike lane sweepers. As the number of protected bike lane miles grows over time, DSNY seeks to facilitate the sweeping service in an environmentally-friendly and sustainable approach. The manufacturer of the Department's first battery-electric bike lane sweeper is AEBI Schmidt. The eSwingo 200⁺ is the first fully electric compact sweeper from Schmidt. The eSwingo 200⁺ is ideal for daily cleaning and sweeping duties of inner-city and pedestrian walkways. In FY2023, DSNY ordered 9 new battery-electric bike lane sweepers from AEBI Schmidt. In FY2024, DSNY ordered two more battery-electric bike lane sweepers. The first battery-electric bike lane sweeper arrived in April 2023. The delivery of the last eSwingo 200⁺ was completed by the second quarter of 2024. With a battery pack of 75 kWh, the eSwingo 200⁺ has an operating range of approximately 10 hours. The eSwingo 200⁺ is only capable of charging via Level-2, which means the battery pack can be fully charged in less than eight hours. The battery-electric bike lane sweepers have generally performed well; however, various operational and mechanical challenges have emerged, such as battery range limitations, charging reliability and adequate infrastructure, and vacuum efficiency. Despite these challenges, DSNY continues to evaluate the battery-electric bike lane sweepers and looks forward to the addition of next-generation battery-electric bike lane sweepers that can better meet the demands of New York City's street cleaning operations.

2. Heavy Duty Plug-In Hybrid-Electric Vehicles (PHEV)

With resiliency in mind and the challenges of building an adequate EV charging infrastructure

⁶ CALSTART, DSNY Battery Electric Street Sweeper: Final Report, January 2023

citywide, DSNY commissioned the design and construction of the world's first Plug-in Hybrid Electric (PHEV) street sweepers. In FY2023, DSNY ordered thirty-seven (37) new PHEV street sweepers from Global Environmental Products. The PHEV street sweeper is the same make and model as the diesel and hybrid street sweepers currently in use today by DSNY. As street sweepers are currently assigned to eighty percent of DSNY garages citywide, having a sustainable plan is of the utmost importance. With a battery pack of 35 kWh, this new PHEV street sweeper will have an EV (full electric) range of approximately 30 miles. The first PHEV street sweeper is due the beginning of FY2025. DSNY looks forward to the addition of PHEV street sweepers into the DSNY fleet.

C. Renewable Diesel

In June 2018, DSNY was one of several city agencies participating in a Hydrogenation-derived Renewable Diesel Fuel (RD) Pilot. Utilizing a blend of 99% RD with 1% petroleum diesel, the pilot commenced upon receiving a Letter of No Objection from the New York City Fire Department. DSNY was the first city agency to receive a delivery of RD. DSNY expanded the RD pilot to 17 district garages in all five boroughs. DSNY consumed 653,218 gallons of RD throughout the five-month period of the pilot program (June 2018 through October 2018). Test results of random fuel samples indicated that the RD met all ASTM testing specifications. RD did not negatively impact DSNY's fleet or its operation, and no adjustments were necessary to the preventive maintenance schedule of the DSNY fleet.

RD is a fuel made from fats and vegetable oils, such as soybean oil or canola oil, and is processed to be chemically the same as petroleum diesel. It meets the ASTM D975 specification for petroleum in the United States. RD can be used as a replacement fuel or blended with any amount of petroleum diesel. Nearly all domestically produced RD is used in California due to economic benefits under the Low Carbon Fuel Standard. RD can be produced by several different technology pathways. Currently, commercial production facilities are using the traditional hydrotreating pathway, involving the reaction of feedstocks (e.g., fats, oils, and greases) with hydrogen under elevated temperatures and pressures in the presence of a catalyst. RD offers many benefits, including:

- **Engine and infrastructure compatibility**—RD meets the conventional petroleum ASTM D975 specification allowing it to be used in existing infrastructure and diesel engines.
- **Fewer emissions**—The United States National Renewable Energy Laboratory study found RD reduced both CO₂ and NO_x emissions when compared with petroleum diesel. California's Low Carbon Fuel Standard Certified Carbon Intensities shows RD reduces carbon intensity on average by 65% when compared with petroleum diesel.
- **More flexibility**—RD is a replacement for diesel and can be used to fully replace diesel or blended with any amount. RD can be made from multiple feedstocks, and it can be made at plants that also produce sustainable aviation fuel.

On November 29, 2023, New York City Mayor Eric Adams, and New York City Department of Citywide Administrative Services (DCAS) outlined a plan that will make New York City the first city on the East Coast to transition all diesel-powered vehicles in the city's fleet from fossil to renewable fuel. On September 1, 2023, DSNY became the first City Agency to begin the transition to RD citywide. At the time of this report, 100% of the diesel-powered vehicles in the DSNY fleet were utilizing RD. To date, the DSNY diesel fleet consumed well over 7.5 million gallons of RD in FY2024.

V. Conclusion

DSNY endeavors to operate its fleet in the most environmentally sustainable manner, consistent with available resources, and therefore seeks to minimize emissions of concern from such operations, notably PM, NOx, and greenhouse gases such as CO2. The Department is currently working with various manufacturers to help advance the commercialization of environmentally-friendly technologies designed for use in heavy-duty vehicles.

LL 140/2023 seeks to expand on NYC's leadership in fleet sustainability and will allow NYC to serve as a national model for other 21st century cities in fighting climate change. The ambitious goal of LL 140/2023 is for the City of New York to achieve an all-electric fleet by the year 2038. DSNY will continue to assess the industry's ability to produce and deliver BEVs across every vehicle class and type. DSNY seeks to incorporate more BEV street sweepers into its fleet, as well as continuing to incorporate zero-emission light-duty BEVs into its fleet. The implementation and adoption of RD offers DSNY a sustainable and environmentally friendly near-term option as the Department works to overcome the many challenges of electrifying one of the largest and geographically diverse municipal refuse fleets in the world. DSNY will work with all stakeholders to overcome the challenges of electrifying its large fleet of heavy-duty vehicles, expanding its EVSE infrastructure, determining/calculating the proper amount of electrical power needed to sustain an all-electric fleet and to implement a strategic resiliency plan to guard against power outages that may occur during natural or man-made emergencies and disasters.

DSNY has dramatically reduced fuel consumption and GHG emissions from its fleet of light-duty vehicles from the 2005 baseline. DSNY will continue to participate in research and development of new technologies and to evaluate the mechanical reliability and operability of alternative fuel collection trucks to assess their respective environmental and economic performances. DSNY will continue to assess its facilities, build EV infrastructure and work with DCAS and local utilities to receive the necessary funding and service level upgrades to support this major endeavor. DSNY is committed to achieving the goals of LL 140/2023.