

Pilot Green Transport Fund

Final Report
On
Trial of Electric Light Goods Vehicle for
Renovation Service
(Laser Cutting Company Limited)

(24 June 2021)

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The Monitoring and Evaluation Team's views expressed in this report do not necessarily reflect the views of the Environmental Protection Department, HKSAR.

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**Pilot Green Transport Fund
Trial of Electric Light Goods Vehicle for Renovation Service
(Laser Cutting Company Limited)**

**Final Report
(Reporting Period: 1 June 2020 – 31 May 2022)**

Executive Summary

1. Introduction

1.1 The Pilot Green Transport Fund (the Fund) is set up to encourage transport operators to try out green innovative transport technologies, contributing to better air quality and public health for Hong Kong. Laser Cutting Company Limited (Laser Cutting) was approved under the Fund for trial of an electric light goods vehicle for renovation service. Laser Cutting, through the tendering procedures stipulated in the Agreement entered into with the Government, procured a Nissan e-NV200 electric light goods vehicle (EV) for trial.

1.2 PolyU Technology and Consultancy Company Limited has been engaged by the Environmental Protection Department as an independent third party assessor (the Assessor) to monitor the trial and evaluate the performance of the trial vehicle. Laser Cutting assigned a Mercedes Benz diesel light goods vehicle (DV) providing the same service as the conventional counterpart for comparing with the EV.

1.3 This Final Report summarizes the performance of the EV in the 24 months of the trial as compared with its conventional counterpart i.e. the DV.

2. Trial and Conventional Vehicles

2.1 The trial EV – Nissan e-NV200 electric light goods vehicle – has a gross vehicle weight (GVW) of 2,250 kg, capable of carrying a driver with four passengers and goods. It has a 40 kWh lithium-ion battery pack with a travel range of 317 km with air-conditioning off. A designated driver was assigned to drive the EV. The EV was used for the delivery of goods for metal work from Tai Po to Kowloon.

2.2 The DV used for comparison in this trial is a Mercedes Benz diesel light goods vehicle with a GVW of 3,050 kg and capable of carrying a driver and 5 passengers with a cylinder capacity of 2,143 c.c..

2.3 Laser Cutting has installed a designated 7 kW AC charging facility for charging the EV and recording the amount of electricity charged. The EV was not charged every

day and was only charged when necessary.

2.4 Key features of the EV, the charging facility and the DV are in Appendix 1 and their photos are in Appendix 2.

3. Trial Information

3.1 The trial commenced on 1 June 2020 and lasted for 24 months. Laser Cutting was required to collect and provide trial information including the EV's mileage reading before charging, amount of electricity consumed and time used in each charging, and operation downtime due to charging, cost and downtime associated with scheduled and unscheduled maintenances of the EV and the charging facility. Similar data of the DV were also required. In addition to the cost information, reports on maintenance work, operational difficulties and opinions of the driver and Laser Cutting were collected to reflect any problems of the EV.

4. Findings of Trial

4.1 Table 1 summarizes the statistical data of the EV and the DV.

Table 1: Key operation statistics of each vehicle (1 June 2020 – 31 May 2022)

		EV	DV
Total distance travelled (km)		21,126	11,710
Average distance travelled (km) per working day		43	24
Average fuel economy	(km/kWh)	5.00	-
	(km/litre)	-	11.82 ^[3]
	(km/MJ)	1.39	0.33 ^[1]
Average fuel cost (HK\$/km)		0.25 ^[2]	1.39 ^[3]
Average total operating cost (HK\$/km)		0.42	2.29
Downtime/day ^[4]		3	3

^[1] Assuming lower heating value of 36.13 MJ/litre for diesel fuel

^[2] Electricity cost was based on HK\$1.218/kWh for 2020 and 2021, and HK\$1.289/kWh for 2022

^[3] The market fuel price was used for calculation

^[4] Downtime refers to the working days the vehicle is not in operation, which counted from the first day it stops operation till the day it is returned to the operator.

4.2 During the 24 months of the trial, there were 495 working days. The total distance traveled of the EV and DV were 21,126 km and 11,710, respectively. The average daily distance traveled by the EV and DV were 43 km/day and 24 km/day, respectively.

4.3 The average fuel cost of the EV was HK\$1.14/km (82%) lower than that of the DV. The average total operating cost of the EV was HK\$1.87/km (82%) lower than that of the DV.

4.4 Apart from the fuel cost, maintenance cost and other indirect costs which may include parking fee, towing fee, vehicle replacement fee, etc., are also included in Table 1. In the 24 months of the trial, the EV had three scheduled and one unscheduled maintenances, whilst the DV had two scheduled and two unscheduled maintenances. The scheduled maintenances of the EV were for the inspection of new vehicle as required by the EV supplier and for annual examinations while the unscheduled maintenance was for replacement of tyres. For the DV, the scheduled maintenances were for annual examinations while the unscheduled maintenances were for replacement of the damaged hand brake and minor repair of the car body.

4.5 The EV and the DV each had 3 days of downtime for maintenance. The utilization rates were 99.4% for the EV and the DV. The charging facility also had an unscheduled maintenance in which a switch was replaced, but it did not cause any downtime to the EV.

4.6 The driver of the EV had no problem in operating the EV and was satisfied with its performance. However, he considered that the power of the vehicle was not as good as the DV on uphill driving. Overall, Laser Cutting agreed that using the EV is good because it can provide a greener and quiet environment, as well as having a lower fuel cost. Laser Cutting would encourage other transport operators to try the EV and replace all existing conventional vehicle(s) with EV(s).

4.7 There was no indication that the fuel economy of the EV had decreased in the trial period. Also, the deterioration in battery capacity within the 24-month trial period is slight, if any.

4.8 In the 24-month of the trial, the total carbon dioxide equivalent (CO_{2e}) emission from the EV was 1,622 kg. For comparison purpose, based on the mileage of the EV and the fuel economy of the DV, the total CO_{2e} emission from the DV was 4,950 kg. Hence, there was a 3,328 kg (67%) reduction of CO_{2e}, with the replacement of DV by EV in the trial.

5. Summary

5.1 The average fuel cost of the EV was 82% (HK\$1.14/km) lower than that of the DV. The average total operating cost of the EV was 82% (HK\$1.87/km) lower than that of the DV. The utilization rates were 99.4% for the EV and the DV. There was a 3,328 kg (67%) reduction of CO_{2e}, with the replacement of DV by EV in the trial.

5.2 Based on the 12-month moving average fuel economy, there was almost no change in the fuel economy of the EV in the 24 months trial. Also, the deterioration in battery capacity within the 24-month trial period is slight, if any.

5.3 The driver of the EV had no problem in operating the EV and was satisfied with its performance. Laser Cutting agreed that using the EV is good because it can provide a

greener and quieter environment as well as EV has a lower fuel cost. Laser Cutting would encourage other transport operators to try out and replace the existing conventional vehicles with the electric light goods vehicles.

5.4 The findings showed electric light goods vehicles has become a feasible option for the transport trade to save operating cost and reducing CO₂e emissions, provided that the vehicles can get easy access to charging facilities.

Appendix 1: Key Features of the Vehicles and Charging Facility

1. Trial EV and Charging Facility

EV

Registration mark	WR8881
Make:	Nissan
Model:	e-NV200
Class:	Light goods vehicle
Gross vehicle weight:	2,250 kg
Seating capacity:	Driver + 4 passengers
Rated power:	80 kW
Travel range:	317 km (air conditioning off)
Battery material:	lithium-ion
Battery capacity:	40 kWh
Year of manufacture:	2019

Charging Facility

Supplier:	Shun Hing Electric Service Centre Limited
Model:	DH-AC0070XG57-Y
Power:	7 kW, single phase, 220V, 32A
Charging Standard:	GB

2. DV for Comparison

Registration mark	UZ3032
Make:	Mercedes Benz
Model:	116BT
Class:	Light goods vehicle
Seating capacity:	Driver + 5 passengers
Gross vehicle weight:	3,050 kg
Cylinder capacity:	2,143 c.c.
Year of manufacture:	2017

Appendix 2: Photos of Vehicles and Charging Facility

1. Trial EV and Charging Facility

Trial EV



Front view



Rear view



Right side view



Left side view

Charging Facility



Charger



Watt-hour meter

2. DV for Comparison



Front view



Rear view



Right side view



Left side view