Pilot Green Transport Fund

Final Report
On
Trial of Electric Light Goods Vehicle for Eggs Wholesale Industry (Yee Hing Eggs Wholesale Company Limited)

(30 June 2022)

PREPARED BY:
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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 Eggs Wholesale Industry
(Yee Hing Eggs Wholesale Company Limited)

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(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. Yee Hing Eggs Wholesale Company Limited (Yee Hing) was approved under the Fund for trial of an electric light goods vehicle for eggs delivery. Yee Hing, through the tendering procedures stipulated in the Agreement entered into with the Government, procured a Joylong EW5 electric light goods vehicle (EV) for trial. According to the manufacturer, the EV has a travel range of 330 km with its battery fully charged and air-conditioning off.

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. Yee Hing assigned a Ford diesel light goods vehicle (DV) with a Gross Vehicle Weight (GVW) of 3,330 kg and 2,198 c.c. engine and providing similar service as the conventional counterpart for comparison.

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 Key features of the EV, the charging facility and the DV are detailed in Appendix 1 and photos of the vehicles and the charging facility are shown in Appendix 2. The EV and the DV were used for the delivery of eggs in the Kowloon region.

2.2 Yee Hing installed a designated 30 kW DC charging facility inside a garage on Shun Ning Road, Cheung Sha Wan for charging and recording the amount of electricity charged. The EV was charged when it was not in use. Yee Hing also installed another 30 kW DC charging facility at its own cost inside the Egg Market, Cheung Sha Wan Wholesale Food Market for charging the EV when necessary.

3. Trial Information

3.1 The trial commenced on 1 June 2020 and lasted for 24 months. Yee Hing 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, operation downtime due to charging, and 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 Yee Hing were collected to reflect any problems of the EV.

4. Findings of Trial

4.1 The following table summarizes the statistical data of the EV and the DV. The average fuel cost of the EV was HK$1.79/km (80%) lower than that of the DV. The average total operating cost of the EV was HK$2.63/km (77%) lower than that of the DV taking the maintenance cost into account.

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

		EV	**DV**
Total distance travelled (km)		54,530	47,708
Average daily mileage (km/working day)		95	80
Average fuel economy	(km/kWh)	2.64	-
	(km/litre)	-	7.13
	(km/MJ)	0.73	0.197 [1]
Average fuel cost (HK$/km)		0.46 [2]	2.25 [3]
Average total operating cost (HK$/km) [4]		0.775	3.40
Downtime (working day) [4][5]		9	26

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

[2] Electricity cost is based on HK$1.218/kWh for 2020/2021 and HK$1.289/kWh for 2022

[3] Based on market fuel price.

[4] Maintenance due to incident not related to the performance of the vehicle was not included for comparing the performance.

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

4.2 Apart from the fuel cost, maintenance cost and other indirect costs which may include parking fee, towing fee, vehicle replacement fee and cost of operation downtime due to charging and maintenance of the EV are also included in Table 1. There were two scheduled and six unscheduled maintenances for the EV while there were three scheduled and three unscheduled maintenances for the DV in the 24 months of the trial. The scheduled maintenances of the EV were for annual examinations. The unscheduled maintenances included inspection of the wheels, replacement of driver seat, checking of electronic circuit, replacement of tyres, replacement of brake pads and parts of the suspension system, repair of deformed chassis and other parts, repair of car body after a car crash, etc. The scheduled maintenances of the DV included routine replacement of lubricating oil and filter, annual examinations and related maintenances. The unscheduled maintenance included

replacement of clutch, parts of flywheel and gear box, brake pads, battery, etc.

4.3 The EV and the DV had 9 and 26 days of vehicle performance related downtime for maintenance, respectively. The utilization rates were 99% for the EV and 96% for the DV. Based on the above, the average daily mileages of the EV and the DV were 95 km/day and 80 km/day respectively.

4.4 The driver of the EV did not like driving the EV because of the following reasons. First, the driving range of the EV after fully recharged is less than that of the DV after being fully refueled, especially when air conditioning was required. Second, the EV has to be charged every day and is less powerful than the DV on uphill driving. Third, the braking distance is less controllable especially on slippery roads and the EV might slip when restart on roads with very deep slope. Yee Hing considered that using the EV is good because it can provide a greener and quiet environment as well as EV has a lower fuel cost. However, Yee Hing would not replace all existing conventional vehicles with electric vehicles because the performance of the EV had deteriorated during the trial and the drivers prefer driving diesel vehicles.

4.5 The results showed that the 12-month moving average fuel economy of the EV had slightly decreased by 7% in the 24-month trial period, which was mainly caused by the increase in the average cargo capacity of the EV due to business needs and change of the driver's driving habit in the later stage of the trial. However, the deterioration in battery capacity within the 24-month trial period was insignificant, if any.

4.6 Based on the total mileage of the EV and the fuel economy of the DV, the equivalent carbon dioxide (CO_2e) emission from the DV could be estimated for comparison purpose. In the 24-month of the trial, the CO_2e emission from the EV and the DV were 7,874 kg and 21,206 kg respectively. Hence, there was a 13,332 kg (63%) 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 80% (HK$1.79/km) lower than that of the DV. The average total operating cost of the EV was 77% (HK$2.63/km) lower than that of the DV. The utilization rates were 99% for the EV and 96% for the DV. There was a 13,332 kg (63%) 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 7% reduction in the fuel economy of the EV in the 24 months trial due to the increase in the average cargo capacity of the EV because of business needs and change of the driver's driving habit in the later stage of the trial. However, the deterioration in battery capacity within the 24-month trial period was insignificant, if any.

5.3 The driver of the EV did not like driving the EV because of its poorer performance than the DV. Yee Hing considered that using the EV is good because it can provide a greener and quiet environment as well as EV has a lower fuel cost. However, Yee Hing would not

replace all existing conventional vehicles with electric vehicles because the performance of the EV had deteriorated with time and the drivers prefer driving diesel vehicles.

5.4 The findings showed electric light goods vehicles are becoming more affordable and feasible to the transport trade for saving operating cost and reducing CO_2e emissions, provided that the vehicles can get easy access to charging facilities.

Appendix 1: Key Features of Vehicles and Charging Facility

1. Trial EV and Charging Facility

EV

Registration mark	**WP1809**
Make:	Joylong
Model:	HKL5041XXYBEV1 (EW5)
Class:	Light goods vehicle
Gross vehicle weight:	4,300 kg
Seating capacity:	Driver + 4 passengers
Rated power:	100 kW
Travel range:	330 km (air conditioning off)
Battery material:	lithium-ion
Battery capacity:	73.4 kWh
Year of manufacture:	2019

Charging Facility

Make:	Hangzhou AoNeng Power Supply Equipment Co. Ltd.
Model:	ANDC5-500V/60A-1
Type:	3-phase, 380V, movable type
Power:	30 kW, DC (max 500V/60A)
Charging Standard:	GB mode

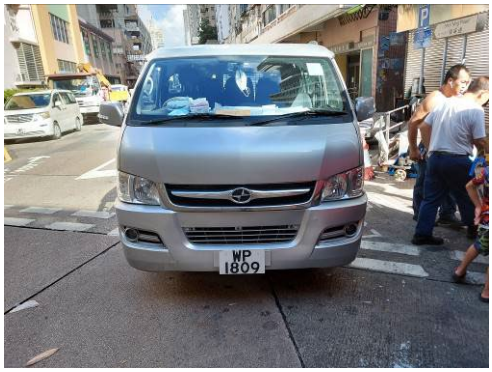
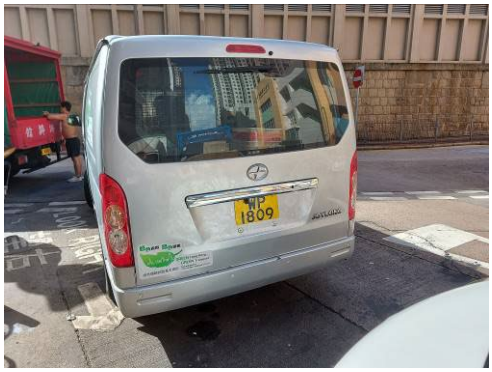
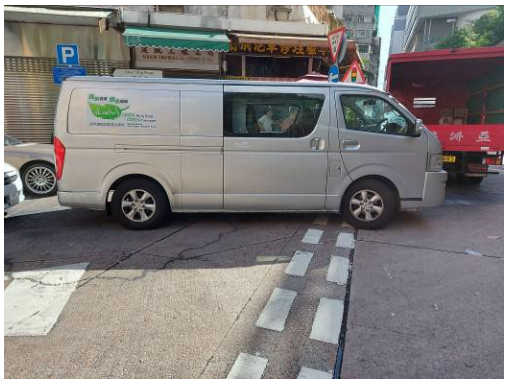
2. DV Used for Comparison

Registration mark	**MD6346**
Make:	Ford
Model:	Transit 2.2 DL LW LR
Class:	Light goods vehicle
Seating capacity:	Driver + 5 passengers
Gross vehicle weight:	3,330 kg
Cylinder capacity:	2,198 cc
Year of manufacture:	2015

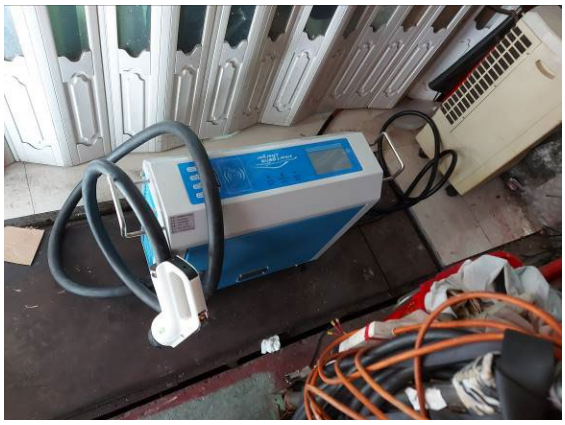
Appendix 2: Photos of Vehicles and Charging Facility

1. Trial EV and Charging Facility

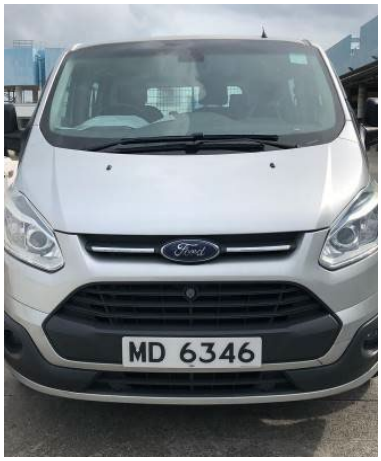
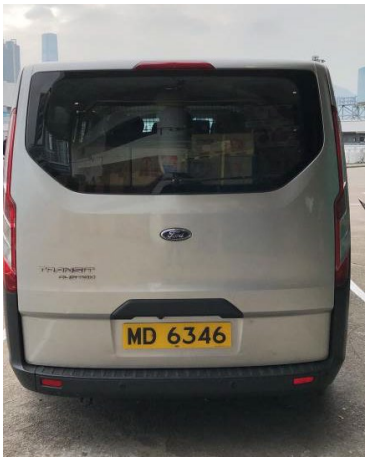
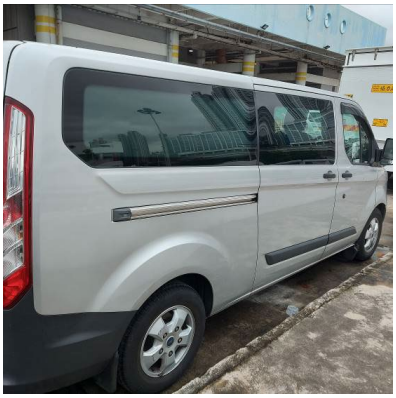
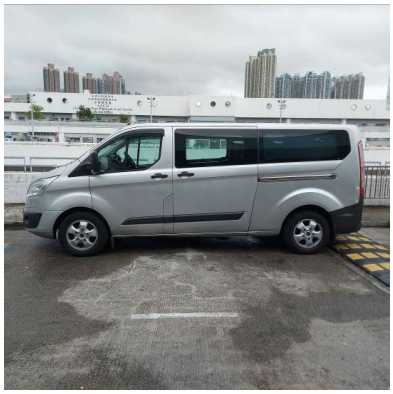
EV

	
EV – front view	EV – rear view
	
EV – right side view	EV – left side view

EV Charging Facility


EV charger

2. Diesel Vehicle (DV) used for Comparison

	
DV - front view	DV - rear view
	
DV – right hand view	DV – left hand view