Pilot Green Transport Fund

Final Report
On
Trial of Electric Light Good Vehicle for Vehicle Maintenance Services (DT Group (HK) Limited)

(28 April 2022)

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(DT Group (HK) Limited)

Final Report
(Trial Period: 1 February, 2020 – 31 January, 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. DT Group (HK) Limited (DT) was approved under the Fund for trial of one electric light goods vehicle (EV) to deliver the vehicle maintenance tools and parts among its site office, its warehouse of suppliers and a number of clients' sites in different areas of Hong Kong. Through the tendering procedure stipulated in the Agreement signed with Government, DT procured one DFSK EC35 electric light goods vehicle (EV) for the trial.

1.2 PolyU Technology and Consultancy Company Limited has been engaged by the Environmental Protection Department (EPD) as an independent third-party assessor (the Assessor) to monitor the trial and evaluate the performance of the trial vehicle. DT assigned a Toyota Hiace diesel light goods vehicle (DV) which provided the same services as the conventional counterpart for comparing with the EV. As the DV was scrapped before the commencement of the trial and with its duty was replaced by the EV, historical operational data of the DV (between September 2017 and August 2019) were used for comparison in this report. The fuel cost of the DV in this report was calculated based on the market fuel price during the trial period.

1.3 This Final Report summarizes the performance of the EV in the 24 months of the trial and compared it with the historical data of its conventional counterpart, i.e. the DV.

2. Trial and Conventional Vehicles

2.1 DT installed a 7 kW DC charging facility at its own cost in the carpark of its site office in Yuen Long and have the EV at there overnight. Key features and photos of the EV, the charging facility and the DV are provided in Appendix 1 and Appendix 2, respectively. As the nature of the delivery of the vehicle maintenance tools and parts was on need-basis, there were no fixed daily routes for the two vehicles. In the 24 months of the trial, the average daily (working day) mileage by the EV was 17 km, while that of the DVs was 100 km. Much lower average daily usage of the EV might be due to the impact of COVID-19 pandemic.

3. Trial Information

3.1 The trial commenced on 1 February 2020 and lasted for 24 months. DT was required to collect and provide trial information including the vehicle mileage reading before recharging, amount of energy in each recharging, cost and downtime associated with scheduled and unscheduled maintenances of the EV. Similar operational data of the DV were also provided. In addition to the cost information, reports on maintenance work, operational difficulties and opinions of the driver and DT were collected and used to reflect any problems of the EVs.

4. Findings of Trial

4.1 The following table summarizes the statistical data of the EV and DV.

Table 1: Key operation statistics of the vehicles (1 February 2020 – 31 January 2022)

		EV	**DV** [4]
Total mileage (km)		10,305	59,982
Average daily distance (km/working day) [7]		17	100
Average fuel economy	(km/kWh)	3.05	-
	(km/litre)	-	12.98
	(km/MJ)	0.85	0.36 [1]
Average fuel cost (HK$/km)		0.40 [2]	1.20 [3]
Average total operating cost (HK$/km) [5]		0.58	1.37
Downtime (working day) [5][6]		0	2.5

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

[2] Electricity cost was based on HK$1.218/kWh in 2020 & 2021, and HK$1.289 in 2022.

[3] The market fuel prices in the period of February 2020 to January 2022 were used for calculations.

[4] These were calculated from the historic operation data of the DV in the period of September 2017 to August 2019.

[5] Maintenance due to incidents unrelated to the performance of the vehicle was not included for comparison.

[6] Downtime refers to the equivalent number of working days in which the vehicle was not in operation due to charging and maintenance, counting from the first day it stopped operation till the day it was returned to the operator.

[7] Net working days within the 24-months trial or operation period was used in the calculations, i.e., loss of working days due to maintenance was taken out.

4.2 In the 24-month trial period, the average fuel cost of the EV was lower than that of the DV by HK$0.8/km (i.e. about 67%).

4.3 After taking into account the maintenance cost in the period, the average operating cost of the EV was lower than that of the DV by HK$0.79/km (i.e., about 58%).

4.4 There were 605 working days in the 24 months of the trial. The EV had one scheduled maintenance, and also two government vehicle examinations, but they did not result in any loss of working day. Hence, the utilization rate was 100% for the EV. The DV had one unscheduled maintenance, five scheduled maintenances and two government annual examination, which resulted in loss of 2.5 working days. Hence, the utilization rate of the DV was about 99.6%.

4.5 During the 24-month trial period, it was observed that there was about a 10% degradation in the fuel economy of the EV, from about 3.2 km/kWh to 2.8 km/kWh. However, with only data collected from one EV of this model in this report, it is unable to conclude whether this trend of dropping in fuel economy is generally valid for the model of this EV or it is a single incident due to problematic battery pack of this particular EV.

4.6 Compared with the carbon dioxide equivalent (CO_2e) emissions of the DV (estimated based on the total mileages of the EV), there was a reduction of 921 kg (i.e., about 42%) CO_2e emissions by using the EV.

4.7 There was no designated driver for the EV. The drivers had no difficulty, in general, in operating the EV and felt that the EV performed satisfactorily. They have overcome the problem of driving range anxiety in the beginning of the trial and eventually have more confidence in using the EV for longer distance trips. DT was also satisfied with the performance of the EV, especially on the saving of the fuel cost.

4.8 Since the electric light goods vehicle market is expanding and its battery technology is improving to extend the driving range, the price difference between EV and its conventional counterpart is narrowing down, and there is not much difference in the utilization rate between the two. 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. However, degradation of battery packs of EVs over time may still be a concern, but that requires more performance data of this EV model for verification.

5. Summary

5.1 During the 24 months of the trial, the average fuel cost of the EV was lower than that of the DV by HK$0.8/km (i.e. about 67%).

5.2 After taking into account the maintenance cost in the period, the average operating cost of the EV was lower than that of the DV by HK$0.79/km (i.e. about 58%).

5.3 There were 605 working days in the 24 months of the trial. The utilization rates of the EV was 100% and that of the DV was 99.6%.

5.4 There was a reduction of 921 kg (i.e. about 42%) CO_2e emissions by using the EV.

5.5 The drivers had no problem in operating the EV and they were satisfied with the performance of the EV. DT was also satisfied with the performance of the EV.

5.6 From the data of the 2-year trial of this EV, it is observed that there was a 10% degradation in fuel economy.

5.7 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. However, possible degradation of battery packs of EVs may still be a concern, which may need more data for verification.

Appendix 1: Key Features of the Vehicles and Charging Facility

1. Trial EV and Charging Facilities

EV

Registration mark	**DONGFENG**
Make:	DFSK(東風小康)
Model:	EC35
Class:	Light Goods Vehicle
Gross vehicle weight:	2,330 kg
Seating capacity:	Driver + 4 passengers
Rated power:	30kW
Travel range:	300 km (air conditioning off)
Battery material:	Lithium-ion
Battery capacity:	41.4 kWh
Year of manufacture:	2019

Charging Facility (at the recipient's own cost)

Make:	深圳市金霆新能源技術有限公司
Model:	JTEV-DC/7
Type:	GB/T18487.1-2015
Input Voltage:	Single-phase, 220V
Rated Power:	7kW DC
IP Protection:	IP30

2. DV Used for Comparison

Registration mark	**DONGFENG**
Make:	Toyota
Model:	Hiace KDH200RSSMDY
Class:	Light Goods Vehicle
Seating capacity:	Driver + 5 passengers
Gross vehicle weight:	2,800 kg
Cylinder capacity:	2,494 cc
Year of manufacture:	2005

Appendix 2: Photos of Vehicles and Charging Facility

1. Trial EV and Charging Facility

EV

	
Front view	Rear view
	
Right side view	Left side view

Charging Facilities (At Subsidy Recipient's own cost)

	
External Appearance	Name Plate

2. DV Used for Comparison

	
Front view	Rear view
	
Right side view	Left side view