Pilot Green Transport Fund

Final Report
On
Trial of Electric Light Good Vehicle for Transportation Industry (Wah Fat Transportation Company)

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Trial of Electric Light Goods Vehicle for Transportation Industry
(Wah Fat Transportation Company)

Final Report
(Trial Period: 1 March, 2020 – 28 February, 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. Wah Fat Transportation Company (Wah Fat) was approved under the Fund for trial of one electric light goods vehicle (EV) to provide general transportation services for a noodles manufacturer among its warehouse and various retails shops, restaurants, canteens, etc. over all Hong Kong. Through the tendering procedure stipulated in the Agreement, Wah Fat procured one EV of model EW5 from Joylong 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. Wah Fat assigned one diesel light goods vehicle (DV), Toyota Hiace (changed to Nissan NV350 at midway), which provided similar services 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 the DV.

2. Trial and Conventional Vehicles

2.1 Wah Fat installed a 30 kW EV charging facility in the carpark of its warehouse, at its own cost. Key features and photos of the EV, the charging facility and the DV are provided in Appendix 1 and Appendix 2, respectively. The two vehicles were deployed for delivery of noodle products, there were no fixed daily routes for the monitored vehicles. The daily distance travelled by each vehicle varies from day to day, with routes covering the whole area of Hong Kong. In the 24 months of the trial, the average daily (working day) mileage by the EV was 103 km, while that of the DV was 67 km, respectively. Low average daily usage of the DV might be due to impacts from the COVID-19 pandemic; whenever business demand was low, Wah Fat would to like operate only the EV as far as possible for saving fuel cost.

3. Trial Information

3.1 The trial commenced on 1 March 2020 and lasted for 24 months. Wah Fat was required to collect and provide trial information including the vehicle mileage reading before recharging/refueling, amount of energy/fuel in each recharging/refueling, cost and downtime associated with scheduled and unscheduled maintenances of the EV, charging facility and the DV. In addition to the cost information, reports on maintenance work, operational difficulties and opinions of the driver and Wah Fat were collected and provided to reflect any problems of the EV.

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 (March 2020 - February 2022)

		EV	**DV** [4]
Total mileage (km)		62,133	40,293
Average daily distance (km/working day) [7]		103	67
Average fuel economy	(km/kWh)	4.97	-
	(km/litre)	-	8.95
	(km/MJ)	1.38	0.25 [1]
Average fuel cost (HK$/km)		0.25 [2]	1.78 [3]
Average total operating cost (HK$/km) [5]		0.25	1.78
Downtime (working day) [5][6]		0	0

[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 March 2020 to February 2022 were used for calculations.
[4] Wah Fat scrapped VR6968 (Toyota Hiace) in early Feb/2021 and acquired XC9257 (Nissan NV350) in late Mar/2021.
[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 maintenance, counting from the first day it stopped operation till the day it was returned to the operator.
[7] Net working days in the two year 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$1.53/km (~86%).

4.3 As there was no maintenance cost in the period for both vehicles, the average operating cost of the EV was also lower than that of the DV by HK$1.53/km (~86%).

4.4 There were 601 working days in the 24 months of the trial. Neither the EV nor DV had scheduled or unscheduled maintenance. Both EV and DV had government annual vehicle examinations, but the costs were waived and the time taken were very short, which leaded to no loss to the service time of the vehicles. Hence, the utilization rate was 100% for both the EV and the DV.

4.5 During the trial period, it seems that there was a slight increase in the 12-month moving average fuel economy of the EV, from about 4.8 km/kWh to 5.2 km/kWh. However, this might

due to the smooth adaption of the drivers' driving behaviour to the characteristics of the EV. Anyway, at least it seems there was no deterioration of the battery pack and the EV in the trial period.

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 14,373 kg (about 74.7%) CO_2e emissions by using the EV.

4.7 The drivers have no difficulty, in general, in operating the EV and felt that the EV performed satisfactorily. They have overcome the problem of driving range anxiety and now have more confidence in using the EV for longer distance trips. Wah Fat 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.

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$1.53/km (~86%). This was the same for the operating cost, as no maintenance for both vehicles in the period.

5.2 There were 601 working days in the 24 months of the trial. The utilization rates of both the EV and the DV were 100%.

5.3 There was a reduction of 14,373 kg (74.7%) CO_2e emissions by using the EV.

5.4 The drivers had no problem in operating the EV and they were satisfied with the performance of the EV. Wah Fat was also satisfied with the performance of the EV.

5.5 From the data of the 2-year trial of this EV, there was no degradation in fuel economy.

5.6 The findings showed that 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 the Vehicles and Charging Facility Involved in the Trial

(a) Trial EV

Registration mark	**WH2092**
Make:	Joylong
Model:	EW5
Class:	Light Goods Vehicle
Gross vehicle weight:	4,300 kg
Seating capacity:	Driver + 4 passengers
Rated power:	100 kW
Travel range:	330 km
Maximum Speed:	120 km per hour
Battery material:	Lithium nickel cobalt manganese oxide
Battery Capacity:	73 kWh
Year of manufacture:	2019

(b) DV Used for Comparison

Registration mark	**VR6968 (scapped in early February 2021)**
Make:	Toyota
Model:	Hiace
Class:	Light Goods Vehicle
Gross vehicle weight:	2,800 kg
Seating capacity:	Driver + 5 passengers
Cylinder capacity:	2,982 cc
Year of manufacture:	2008

Registration mark	**XC9257 (acquired in late March 2021)**
Make:	Nissan
Model:	NV350
Class:	Light Goods Vehicle
Gross vehicle weight:	3,300 kg
Seating capacity:	Driver + 5 passengers
Cylinder capacity:	2,488 cc
Year of manufacture:	2015

(c) Charging Facility

Make:	Only Power Supply
Model:	ANDC5-500V/60A-1
Type:	3-phase, 380V, movable type
Output Power:	30kW
Output voltage:	500V DC
Maximum output current:	60A DC
Format:	Single charging gun

Appendix 2: Photos of Vehicles and Charging Facility

(a) Trial EV

	
Front view	Rear view
	
Right side view	Left side view

(b) DV for Comparison

VR6968 (Scapped in early February 2021)

	
Front view	Rear view
	
Right side view	Left side view

XC9257 (acquired in late March 2021)

	
Front view	Rear view
	
Right side view	Left side view

(c) Charging Facility

	
30 kW, 3-phase DC charger	Specification stated on the charger