New Energy Transport Fund

Final Report
On
Trial of Electric Light Goods Vehicle for Electrical Engineering Industry (Hang Fai Engineering Company)

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(Reporting Period: 1 May 2023 – 30 April 2024)

Executive Summary

1. Introduction

1.1 The New Energy 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. Hang Fai Engineering Company (Hang Fai) was approved under the Fund for trial of one electric light goods vehicle for electrical engineering industry. Hang Fai, through the tendering procedures stipulated in the Agreement entered into with the Government, procured a Joylong EW4 electric light goods vehicle (EV) for trial.

1.2 Hong Kong Productivity Council has been commissioned by the Environment and Ecology Bureau (Environment Branch) (EEB) as an independent third-party assessor (the Assessor) to monitor the trial and evaluate the performance of the trial vehicle. Hang Fai assigned a Toyota Hiace Diesel LWB diesel light goods vehicle (DV) providing same services as the conventional counterpart for comparison.

1.3 This Final Report summarises the performance of the EV in the 12 months of the trial as compared with its conventional counterpart, i.e. the DV.

2. Trial and Conventional Vehicles

2.1 The trial EV, Joylong EW4 electric light goods vehicle, has a gross vehicle weight of 3,700 kg capable of carrying a driver with two passengers and goods. It has a 73 kWh lithium-ion battery pack and a driving range of 300 km with air-conditioning off. The DV, Toyota Hiace Diesel LWB diesel light goods vehicle with a gross vehicle weight of 2,800 kg and a diesel engine with a cylinder capacity of 2,755 c.c., was used as the conventional counterpart for comparison in this trial. The EV and the DV were used for delivering maintenance tools and materials to different construction sites in Hong Kong. There were two designated drivers assigned to drive the EV and the DV.

2.2 Hang Fai installed a designated 30 kW DC charging facility at Shek Po Tsuen for charging and recording the amount of electricity charged. 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.

3. Trial Information

3.1 The trial commenced on 1 May 2023 and lasted for 12 months. Hang Fai 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 drivers and Hang Fai were collected to reflect any problems of the EV.

4. Findings of Trial

4.1 The following table summarises the statistical data of the EV and the DV. The average fuel cost of the EV was HK$1.92/km (about 79%) lower than that of the DV. Taking the maintenance fee and other costs into account, the average total operating cost of the EV was HK$2.74/km (about 79%) lower than that of the DV in the 12 months of the trial.

Table 1: Key operation statistics of each vehicle (1 May 2023 – 30 April 2024)

		EV	**DV**
Total distance travelled (km)		21,554	4,152
Average daily mileage (km/working day)		73	14
Average fuel economy	(km/kWh)	2.92	-
	(km/litre)	-	8.87
	(km/MJ)	0.81	0.25 [1]
Average fuel cost (HK$/km)		0.51 [2]	2.43 [3]
Average total operating cost (HK$/km) [4]		0.72	3.46
Downtime (working day) [4][5]		2	3

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

[2] The electricity cost was calculated using average electricity tariff rates of HK$1.565/kWh (May 2023); HK$1.559/kWh (Jun 2023); HK$1.535/kWh (Jul 2023); HK$1.508/kWh (Aug 2023); HK$1.482/kWh (Sep 2023); HK$1.459/kWh (Oct 2023); HK$1.442/kWh (Nov 2023); HK$1.431/kWh (Dec 2023); HK$1.523/kWh (Jan 2024 – Feb 2024); HK$1.513/kWh (Mar 2024) and; HK$1.507/kWh (Apr 2024) as claimed by CLP.

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

[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 that the vehicle is not in operation due to charging or maintenance, 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. Both the EV and the DV had one scheduled maintenance in the 12 months of the trial period. The scheduled maintenance of the EV included government annual vehicle inspection and battery maintenance, while that of the DV included service for government annual vehicle inspection.

4.3 In the 12 months of the trial period, the EV had 2 days of downtime while the DV had 3 days of downtime. Hence, the utilisation rates of the EV and the DV were 99.3% and 99.0%, respectively. Based on the above, the average daily driving distances of the EV and the DV

were 73 km and 14 km, respectively.

4.4 The drivers of the EV liked driving the EV and had no problem in operating the EV. However, they stated that the power of the EV was not good on uphill. Overall, they were satisfied with the performance of the EV. Hang Fai was satisfied with the EV since the EV could meet the operational requirements and save the operation cost. Given the opportunity, Hang Fai would encourage other transport operators to try the EVs.

4.5 It is observed that the amount of electricity stored in the battery after a full charging operation could be maintained at the level of 73 kWh after the 12-month trial period. Thus, the deterioration in battery capacity within the 12-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 12-month trial period, the CO_2e emission from the EV and the DV were 2,879 kg and 6,739 kg respectively. Hence, there was a 3,860 kg (about 57%) reduction of CO_2e, with the replacement of the DV by the EV in the trial.

5. Summary

5.1 The average fuel cost of the EV was HK$1.92/km (about 79%) lower than that of the DV. Taking the maintenance fee and other costs into account, the average total operating cost of the EV was HK$2.74/km (about 79%) lower than that of the DV. The utilisation rates of the EV and the DV were 99.3% and 99.0%. There was 3,860 kg (about 57%) reduction of CO_2e, with the replacement of the DV by the EV in the trial.

5.2 It is observed that the amount of electricity stored in the battery after a full charging operation could be maintained at the level of 73 kWh after the 12-month trial period. Thus, the deterioration in battery capacity within the 12-month trial period was insignificant, if any.

5.3 The drivers of the EV liked driving the EV and had no problem in operating the EV. However, they stated that the power of the EV was not good on uphill. Overall, they were satisfied with the performance of the EV. Hang Fai was satisfied with the EV since the EV could meet the operational requirements and save the operation cost. Given the opportunity, Hang Fai would encourage other transport operators to try the EVs.

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

Trial EV

Registration mark:	YJ3452
Make:	Joylong
Model:	EW4
Class:	Light goods vehicle
Gross vehicle weight:	3,700 kg
Payload:	1,100 kg
Seating capacity:	Driver + 2 passengers
Rated power:	50 kW
Driving range:	300 km (air conditioning off)
Battery material:	Lithium-ion
Battery capacity:	73 kWh
Year of manufacture:	2022

EV Charging Facility

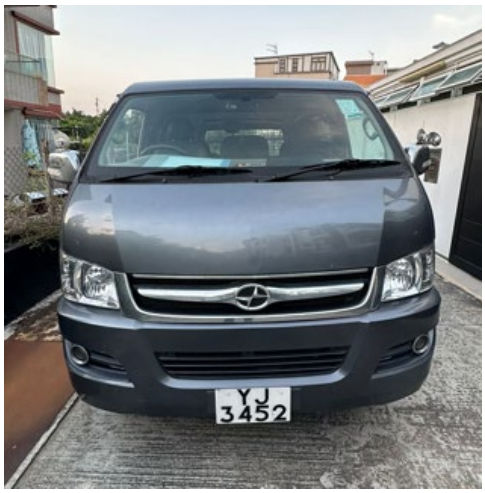
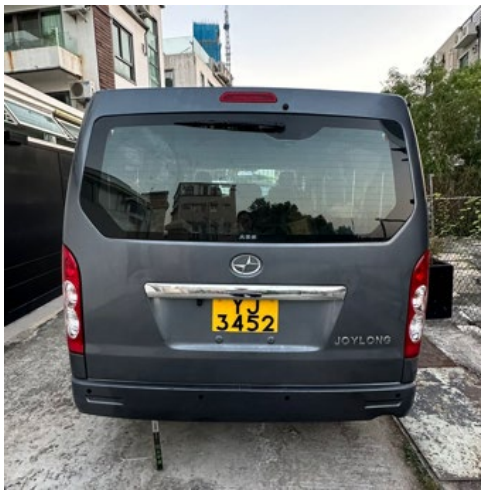
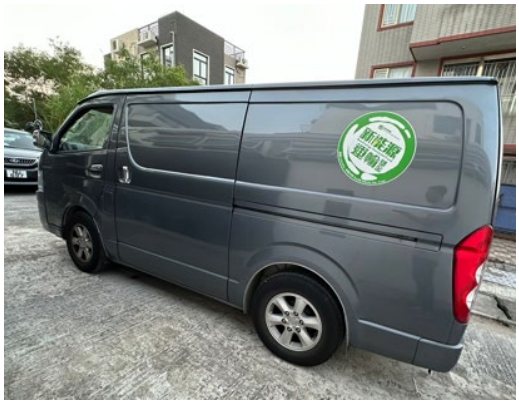
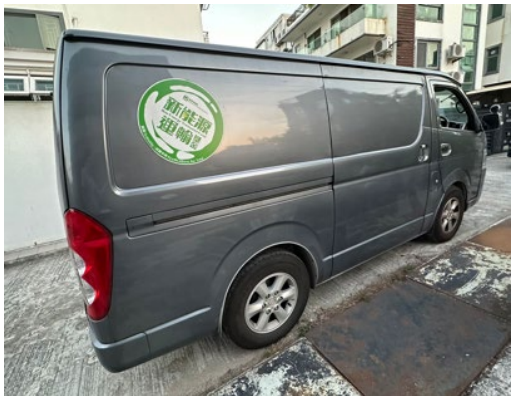
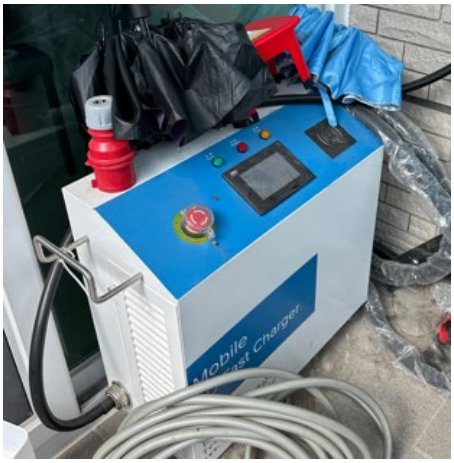
Make:	Only Power Supply (杭州奥能電源設備有限公司)
Model:	ANDC5-500V/60A-1
Power:	30 kW, 500V DC / max. 60A
Charging standard:	GB Mode

2. DV Used for Comparison

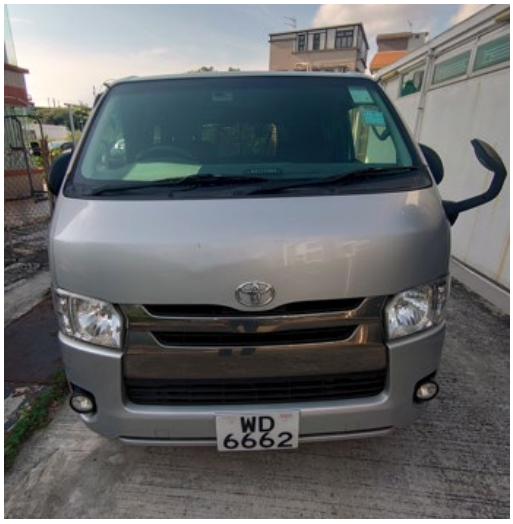
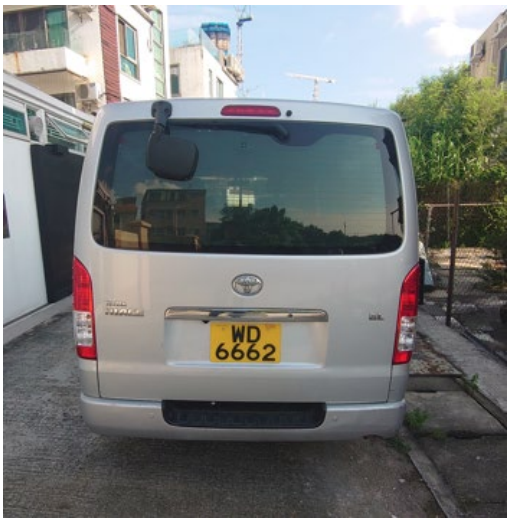
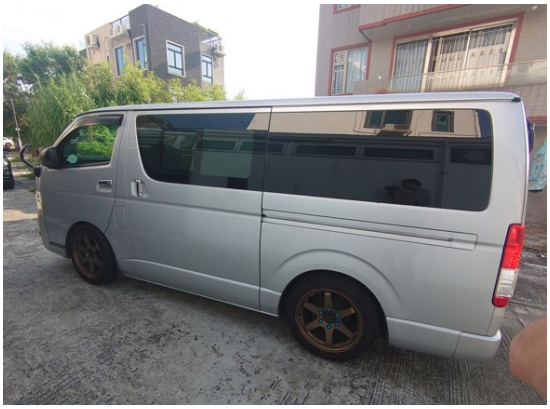
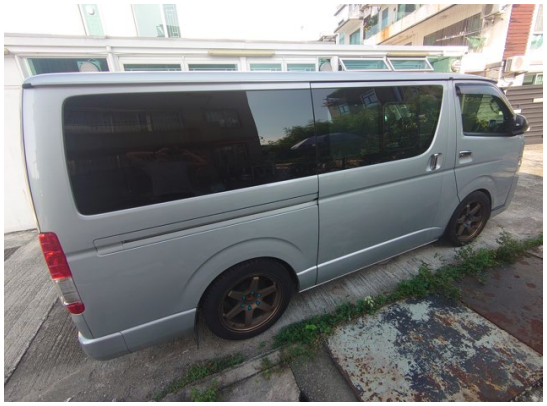
Registration mark:	WD6662
Make:	Toyota
Model:	Hiace Diesel LWB
Class:	Light goods vehicle
Gross vehicle weight:	2,800 kg
Payload:	850 kg
Seating capacity:	Driver + 5 passengers
Cylinder capacity:	2,755 c.c.
Year of manufacture:	2019

Appendix 2: Photos of Vehicles and Charging Facility

1. Trial EV (YJ3452) and Charging Facility

	
Front view of EV	Rear view of EV
	
Left side view of EV	Right side view of EV
	
30 kW DC charging facility	

2. DV (WD6662) Used for Comparison

	
Front view of DV	Rear view of DV
	
Left side view of DV	Right side view of DV