

Pilot Green Transport Fund

Final Report On Trial of Electric Light Goods Vehicle for Renovation Services (Koon Hing Engineering Co.)

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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 Services
(Koon Hing Engineering Co.)**

**Final Report
(Trial Period: 1 August 2020 – 31 July 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. Koon Hing Engineering Co. (Koon Hing) was approved under the Fund for trial of one electric light goods vehicle for renovation services. Through the tendering procedure stipulated in the Subsidy Agreement signed with the Government, Koon Hing procured a JOYLONG EW4-A electric light goods vehicle (EV) for trial.

1.2 PolyU Technology and Consultancy Company Limited has been engaged by the Environmental Protection Department (EPD) as an independent third party assessor to monitor the trial and evaluate the performance of the trial vehicle. Koon Hing assigned a TOYOTA HIACE diesel light goods vehicle (DV) providing the same type of services for comparing with the EV.

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

2. Trial and Conventional Vehicles

2.1 Key features of the EV, DV and charging facility are in Appendix 1 and their photos are in Appendix 2. Both vehicles were used for providing renovation services in all areas of Hong Kong and stationed at the Koon Hing's office carpark in Shatin. According to the EV's manufacturer, the EV has a gross vehicle weight of 3,700 kg and a driving range of 260 km (air conditioning off).

2.2 Koon Hing installed a dedicated 30kW DC charging facility for the EV at its office parking space in Shatin. The EV was charged regularly after work at night.

3. Trial Information

3.1 The trial started on 1 August 2020 and lasted for 24 months. Koon Hing was required to collect and provide trial information including the EV mileage reading before charging, amount of electricity consumed in each charging, time taken for charging, operation downtime due to charging, cost and downtime associated with scheduled and unscheduled maintenances of the EV and the charging facility. A similar set of data from the DV was also required. In addition to the cost information, reports on maintenance work, operational difficulties and opinions of the driver and Koon Hing were collected and provided to reflect any problems of the EV.

4. Findings of Trial

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

Table 1: Key operation statistics of each vehicle (1 August 2020 – 31 July 2022)

		EV	DV
Total distance travelled (km)		15,546	31,879
Average daily mileage (km/working day)		27	54
Average fuel economy	(km/kWh)	3.70	-
	(km/litre)	-	8.25
	(km/MJ)	1.03	0.23 ^[1]
Average fuel cost (HK\$/km)		0.33 ^[2]	2.09 ^[3]
Average total operating cost (HK\$/km) ^[4]		0.87	2.55
Downtime (working day) ^{[4][5]}		5	5

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

^[2] Electricity cost is based on market price of HK\$1.218/kWh in 2020, 2021 and HK\$1.289 /kWh in 2022.

^[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 equivalent number of working days in which the vehicle is not in operation due to maintenance, counting from the first day it stops operation till the day it is returned to the operator.

4.2 The average fuel cost of the EV was HK\$1.76 (about 84%) lower than that of the DV. Taking into account the maintenance costs, the saving in average total operating cost of the EV over the DV was HK\$1.68 (about 66%).

4.3 In the 24-month trial, there were 591 working days for EV and DV. Both EV and DV had two scheduled and no unscheduled maintenances which incurred 5 days of downtime. The utilization rates were about 99% for both the EV and the DV.

4.4 To remove the seasonal fluctuations, 12-month moving averages were used in this report to evaluate the trend of the EV's fuel economy. The 12-month moving average fuel economy varied between 3.38 and 4.00 km/kWh. There was no sign of the deterioration in fuel economy and the performance of the batteries over the trial period.

4.5 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. The CO_{2e} emission from the EV and DV were 1,623 kg and 5,227 kg, respectively and hence the EV emitted 3,604 kg CO_{2e} (about 69%) less than the DV in this trial.

4.6 The operation of the EV was smooth. The EV driver had no problem in operating the EV and felt the EV was cleaner and quieter than the DV. Koon Hing reckoned that the EV served their operational need and was satisfied with the performance of the EV, especially on the saving of operating cost. Koon Hing, however, was not satisfied with the after-sale service, so was hesitant to replace the entire fleet with vehicles of the EV model.

5. Summary

5.1 In the 24- months trial, the average daily mileage of the EV was 27 km, while that of the DV was 54 km. The average fuel cost of the EV was HK\$1.76/km (about 84%) lower than that of the DV.

5.2 Taking into account of the maintenance costs, the average total operating cost of the EV was HK1.68/km (about 66%) lower than those of the DV.

5.3 The utilization rates of the EV and the DV were both about 99%. Based on the 12-month moving average fuel economy, there was no sign of deterioration in fuel economy of the EV.

5.4 There was no sign of deterioration in battery capacity within the 24-month trial period.

5.5 There was about 69% CO_{2e} reduction by using the EV as compared with the DV in the trial.

5.6 The EV driver had no problem in operating the vehicle and felt the EV was quieter and more environmentally friendly; the battery capacity was sufficient to support the full-day operation. Koon Hing was satisfied with the performance of the EV, especially on the saving of operating cost.

Appendix 1: Key Features of Vehicles and Charging Facility

1. Trial EV

Registration Mark:	SC6632
Make:	JOYLONG
Model:	EW4-A
Class:	Light goods vehicle
Gross vehicle weight:	3,700 kg
Seating Capacity:	driver + 5 passengers
Rated Power:	50 kW
Payload:	1,100 kg
Travel range:	260 km (air conditioning off)
Maximum speed:	100 km/hour
Battery Type:	Lithium-ion
Battery capacity:	64.8 kWh
Year of manufacture:	2019

2. Charging Facility

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

3. DV for comparison

Registration Mark:	KR1268
Make:	TOYOTA
Model:	HIACE DIESEL LWB
Class:	Light goods vehicle
Gross vehicle weight:	2,800 kg
Payload:	1,210 kg
Seating Capacity:	driver + 5 passengers
Cylinder capacity:	2,982 cc
Year of manufacture:	2014

Appendix 2: Photos of Vehicles and Charging Facility

1. Trial EV – SC6632

	
<p>Front view</p>	<p>Right side view</p>
	
<p>Left side view</p>	<p>Rear view</p>

2. Charging Facility



30kW DC charging facility



Specification of the DC charger –
500V/ 60A

3. DV for comparison – KR1268



Front view



Right side view



Left side view



Rear view