

# **Pilot Green Transport Fund**

## **Final Report**

**On**

### **Trial of Electric Light Goods Vehicles for Mechanical Plant Maintenance Service (China Wealth Hong Kong Machine Limited)**

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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 Vehicles for Mechanical Plant Maintenance Service**  
**China Wealth Hong Kong Machine Limited**

**Final Report**  
**(Trial Period: 1 December 2020 – 30 November 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. China Wealth Hong Kong Machine Limited (China Wealth) was approved under the Fund for trial of one electric light goods vehicle (EV) general delivery services of the mechanical plant maintenance tools and materials among its site office, its warehouses of suppliers and a number of clients' sites in various locations throughout Hong Kong. Through the tendering procedure stipulated in the Agreement, China Wealth procured a EV of model DFSK (東風小康) EC35 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. China Wealth assigned a diesel light goods vehicle (DV), model Toyota Hiace LWB, providing 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 The trial EV, DFSK EC35 electric light goods vehicle, has a gross vehicle weight (GVW) of 2,510 kg capable of carrying a driver with four passengers and goods. It has a 41.4 kWh lithium-ion battery pack and the driving range is 300 km with air-conditioning off. The DV, Toyota Hiace LWB diesel light goods vehicle with a GVW of 2,800 kg and a cylinder capacity of 2,982 c.c., was used as the conventional counterpart for comparison in this trial. As the nature of the services cover the whole area of Hong Kong, there were no fixed daily routes for the two vehicles. The daily distance travelled by each vehicle varies from day to day. In the 24 months of the trial, the average daily (working day) mileage by the EV was 75 km, while those of the DV was 127 km.

### 3. Trial Information

3.1 The trial commenced on 1 December 2020 and lasted for 24 months. China Wealth was required to collect and provide trial information including the vehicle mileage reading before recharging, amount of energy in each recharging, time taken for charging, operation downtime due to charging, cost and downtime associated with scheduled and unscheduled maintenances of the EV. 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 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 (December 2020 to November 2022)

Items	EV	DV
Total mileage (km)	44,298	76,188
Average daily distance travelled (km/day)	75	127
Average fuel cost (HK\$/km) <sup>[1]</sup>	0.26	2.02
Average fuel economy	4.83 km/kWh	9.24 km/litre
	1.34 km/MJ	0.26 km/MJ <sup>[2]</sup>
Average total operating cost (HK\$/km) <sup>[3]</sup>	0.48	2.03
Downtime (working day) <sup>[3][4]</sup>	10	0

<sup>[1]</sup> The market fuel price was used for calculation.

<sup>[2]</sup> Assuming lower heating value of 36.13 MJ/litre for diesel fuel.

<sup>[3]</sup> Maintenance due to incident not related to the performance of the vehicle was not included for comparing the performance.

<sup>[4]</sup> 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 In the 24-month trial period, there were 601 working days. The EV had two scheduled maintenances and one non-scheduled maintenance, with a loss of 10 working days. The utilization rates of the EV was 98%, while that of the DV was 100%.

4.3 In the 24-month trial period, the total distance traveled and the daily range of the EV were 44,298 km and 75 km; while that of the DV were 76,188 km and 127km. The average fuel cost of the EV was HK\$1.76/km (87%) lower than that of the DV. As there were the maintenance costs for the EV and DV of HK\$9,950 and HK\$800 respectively. The average operating cost of the EV was lower than that of the DV by HK\$1.55/km (about 76%).

4.4 To remove the effect of seasonal fluctuations, the 12-month moving average were used to evaluate the trend of the EV's fuel economy. The 12-month moving average fuel economy varied narrowly from 4.65 to 4.83 km/kWh. There was no sign of the deterioration in fuel economy 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<sub>2</sub>e) emission from the DV could be estimated for comparison purpose. The CO<sub>2</sub>e emission from the EV and DV were 3.573 kg and 13,296 kg, respectively and hence the

EV emitted 9,723 kg CO<sub>2</sub>e (about 73%) less than the DV in this trial

4.6 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, although they felt that the riding was not very comfortable. They have overcome the problem of driving range anxiety in the beginning of the trial and eventually have more confidence in driving the EV for longer distance trips. China Wealth was also satisfied with the performance of the EV, especially on the saving of the fuel cost.

4.7 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<sub>2</sub>e emissions, provided that the vehicles can get easy access to charging facilities.

## **5. Summary**

5.1 In the 24-month trial period, the average fuel cost of the EV was lower than that of the DV by HK\$1.76/km (about 87%).

5.2 After taking into account the maintenance cost, the average operating cost of the EV was lower than that of the DV by HK\$1.55/km (about 76%).

5.3 There were 601 working days in the 24 months of the trial. The utilization rates of the EV was 98%, while that of the DV was 100%.

5.4 There was a reduction of 9,723 kg (i.e., about 73%) CO<sub>2</sub>e emissions by using the EV.

5.5 The drivers and China Wealth had no problem in operating the EV and they were satisfied with the performance of the EV.

5.6 From the data of the 2-year trial of the EV, it is observed that there was no degradation in fuel economy for the EV.

5.7 The findings showed that the application of electric light goods vehicles on the transport trade are becoming more affordable and feasible in terms of saving operating cost and reducing CO<sub>2</sub>e emissions, provided that the vehicles can get easy access to charging facilities.

## Appendix 1: Key Features of the Vehicles Involved in the Trial

### 1. Trial EV and Charging Facility

#### (a) EV

<b>Registration mark</b>	<b>CW8318</b>
Make:	DFSK (東風小康)
Model:	EC35
Class:	Light Goods Vehicle
Gross vehicle weight:	2,330 kg
Seating capacity:	driver + 4 passengers
Travel range:	300 km (air-conditioning off)
Rated Power:	30 kW
Battery type:	Lithium-ion
Battery capacity:	41.4 kWh
Year of manufacture:	2020

#### (b) Charging Facility (At Recipient's own cost)

Phase:	Single-phase
Rated input voltage:	220 V
Rated input frequency:	50 Hz
Rated input current:	32 A
Maximum input power:	7 kW
Output socket:	IEC Type 2 Universal Socket

### 2. DV Used for Comparison

<b>Registration mark</b>	<b>SR1318</b>
Make:	TOYOTA
Model:	Toyota Hiace LWB
Class:	Light Goods Vehicle
Gross vehicle weight:	2,800 kg
Seating capacity:	driver + 5 passengers
Cylinder capacity:	2,982 c.c.
Year of manufacture:	2014

## Appendix 2: Photos of Vehicles

### 1. Trial EV and Charging Facility

#### (a) EV



EV – front view



EV – rear view



EV – right side view



EV – left side view

**(b) Charging Facility**



The charger and the electricity meter



**2. DV Used for Comparison**



DV – front view



DV –rear view



DV – right side view



DV – left side view