

**Pilot Green Transport Fund**

**Interim Report**

**On**

**Trial of Electric Light Goods Vehicle for**

**Civil Engineering Industry**

**(Vast Profit Construction Engineering Limited)**

(10 December 2022)

PREPARED BY:  
Dr. C.S. Cheung

The Monitoring and Evaluation Team's views expressed in this report do not necessarily reflect the views of the Environmental Protection Department, HKSAR.

## **List of Monitoring and Evaluation Team Members**

**Dr. C.S. Cheung (Team Leader)**

Department of Mechanical Engineering  
The Hong Kong Polytechnic University

**Ir. Dr. C. Ng**

Department of Mechanical Engineering  
The Hong Kong Polytechnic University

**Mr. K.S. Tsang**

Department of Mechanical Engineering  
The Hong Kong Polytechnic University

**Dr. Edward W.C. Lo**

Department of Electrical Engineering  
The Hong Kong Polytechnic University

**Dr. W.T. Hung**

PolyU Technology and Consultancy Company Limited  
The Hong Kong Polytechnic University

**Pilot Green Transport Fund  
Trial of Electric Light Goods Vehicle for Civil Engineering Industry  
(Vast Profit Construction Engineering Limited)**

**Interim Report  
(Reporting Period: 1 December 2021 – 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. Vast Profit Construction Engineering Limited (Vast Profit) was approved under the Fund for trial of an electric light goods vehicle. Vast Profit, 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 PolyU Technology and Consultancy Company Limited has been engaged by the Environmental Protection Department as an independent third party assessor to monitor the trial and evaluate the performance of the trial vehicle. Vast Profit assigned a Toyota diesel light goods vehicle (DV) providing the same service as the conventional counterpart for comparing with the EV.

1.3 This Interim Report summarizes the performance of the EV in the first twelve 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 (GVW) of 3,700 kg, capable of carrying a driver with five passengers and goods. It has a 73.4 kWh lithium-ion battery pack with a travel range of 300 km with its battery fully charged when air-conditioning is off. The DV used for comparison in this trial is a TOYOTA HIACE diesel light goods vehicle with a GVW of 3,300 kg and an engine with a cylinder capacity of 2,755 c.c.. The EV and the DV were used for visit of construction sites in the north New Territories region.

2.2 Vast Profit installed a designated 30 kW DC charging facility. The EV was not charged every day, and was charged when it was not in use.

2.3 Key features of the EV, the charging facility and the DV are in Appendix 1 and their photos are in Appendix 2.

### 3. Trial Information

3.1 The trial commenced on 1 December 2021 and would last for 24 months. Vast Profit 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, and operation downtime due to charging, 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, opinions of the drivers and Vast Profit were collected to reflect any problems of the EV.

### 4. Findings of Trial

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

Table 1: Key operation statistics of each vehicle (1 December 2021 – 30 November 2022)

		EV <sup>[1]</sup>	DV
Total distance traveled (km)		10,606	21,792
Average daily mileage (km per working day)		39	74
Average fuel economy	(km/kWh)	4.39	-
	(km/litre)	-	7.36
	(km/MJ)	1.22	0.20 <sup>[2]</sup>
Average fuel cost (HK\$/km)		0.29 <sup>[3]</sup>	2.78 <sup>[4]</sup>
Average total operating cost (HK\$/km)		0.67	3.05
Downtime (working day) <sup>[5]</sup>		1	1

<sup>[1]</sup> Vast Profit employed the vehicle supplier to provide remote logging of data which started in January 2022. The distance traveled and the fuel consumption data for the EV are based on data recorded from January 2022 to November 2022 with a total of 271 working days for this period.

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

<sup>[3]</sup> Electricity cost was based on HK\$1.218/kWh for 2021 and HK\$1.289/kWh for 2022

<sup>[4]</sup> The market fuel price was used for calculation.

<sup>[5]</sup> Downtime refers to the working days the vehicle is not in operation, 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, etc., are also included in the average total operating cost in Table 1. There was one scheduled maintenance for the EV and one scheduled maintenance for the DV in the first twelve months of the trial. The scheduled maintenances were for conducting annual examinations and related maintenance work. There were no unscheduled maintenances for both the EV and the DV in the first twelve months of the trial.

4.3 During the first twelve months of the trial, there were 296 working days in the reporting period, and 271 working days from January to November 2022. The EV and the DV each had 1 day of downtime for maintenance. The utilization rates were therefore

99.6% for the EV and 99.7% for the DV. Based on the above, the average daily mileages of the EV and the DV were 39 km/day and 74 km/day respectively.

4.4 The drivers had no problem in operating the EV and were satisfied with its performance. Vast Profit considered that using the EV is good because it can provide a greener and quieter environment as well as EV has a lower fuel cost. Vast Profit will consider replacing all existing conventional vehicles with EVs.

## **5. Summary**

5.1 In the first twelve months of the trial, the average daily mileage of the EV was 39 km, while that of the DV was 74 km.

5.2 The average fuel cost of the EV was HK\$2.49/km (90%) less than that of the DV. The average total operating cost of the EV was HK\$2.38/km (78%) lower than that of the DV. The utilization rates were 99.6% and 99.7% for the EV and the DV respectively. In the first twelve months of the trial, there was no indication on the deterioration of the EV's performance.

5.3 The drivers had no problem in operating the EV and were satisfied with its performance. Vast Profit considered that using the EV is good because it can provide a greener and quieter environment as well as EV has a lower fuel cost. Vast Profit will consider replacing all existing conventional vehicles with EVs.

5.4 The findings only reflect the performance of the EV in the first twelve months of the trial. The performance and reliability of the EV will be continuously monitored in the 24 months of the trial.

## **Appendix 1: Key Features of the Vehicles and EV Charging Facility**

### **1. Trial EV and Charging Facility**

#### **EV**

<b>Registration mark</b>	<b>FW783</b>
Make:	JOYLONG
Model:	EW4
Class:	Light goods vehicle
Gross vehicle weight:	3,700 kg
Seating capacity:	Driver + 5 passengers
Rated power:	50 kW
Travel range:	300 km (air conditioning off)
Battery material:	lithium-ion
Battery capacity:	73.4 kWh
Year of manufacture:	2021

#### **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 mode

### **2. DV Used for Comparison**

<b>Registration mark</b>	<b>WG6979</b>
Make:	TOYOTA
Model:	HIACE
Class:	Light goods vehicle
Seating capacity:	Driver + 5 passengers
Gross vehicle weight:	3,300 kg
Cylinder capacity:	2,755 cc
Year of manufacture:	2019

## Appendix 2: Photos of Vehicles and Charging Facility

### 1. Trial EV and EV Charging Facility

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

## 2. Diesel Vehicle (DV) for Comparison



DV - Front view



DV - Rear view



DV - Right side view



DV - Left side view