

Pilot Green Transport Fund

Final Report

on

Trial of Electric Light Goods Vehicles

for

Civil Engineering Industry

(Pan Kee Engineering Co. 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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(Pan Kee Engineering Co. Limited)

Final Report
(Trial Period: 1 August 2019 – 31 July 2021)

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. Pan Kee Engineering Limited (Pan Kee) was approved under the Fund for trial of an electric light goods vehicle (EV) to provide general moving services of construction materials and equipment among its site office at Kwok Shui Road in Kwai Chung, its warehouse in Tsing Yi and a number of construction sites in various locations throughout Hong Kong. Through the tendering procedure stipulated in the Agreement signed with the Government, Pan Kee procured one EV of model Joylong EW5 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 EV. Pan Kee assigned one diesel light goods vehicle (DV) which provides similar services, as the conventional counterparts 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 its conventional counterpart, i.e., the DV.

2. Trial and Conventional Vehicles

2.1 Pan Kee installed a 30 kW EV charging facility in its car port at Kwok Shui Road. Key features and photos of the EV, the charging facility, and the DV are provided in Appendix 1 and Appendix 2, respectively. As the nature of the engineering moving services for construction sites, there were no fixed daily routes for the EV and the DV. In the 24 months of the trial, the average daily (working day) mileage of the EV was 79 km, while that of DV was 120 km.

3. Trial Information

3.1 The trial commenced on 1 August 2019 and lasted for 24 months. Pan Kee 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. 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 Pan Kee 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 the DV.

Table 1: Key operation statistics of each vehicle (1 August 2019 to 31 July 2021)

		EV ^[1]	DV ^[2]
Total distance travelled (km)		38,400	58,869
Average daily mileage (km/ working day) ^[3]		79	120
Average fuel economy	(km/kWh)	2.87	-
	(km/litre)	-	8.01
	(km/MJ)	0.80	0.22 ^[6]
Average fuel cost (HK\$/km)		0.42 ^[4]	1.82 ^[5]
Average total operating cost (HK\$/km) ^[7]		0.56	2.01
Downtime (working day) ^{[7][8]}		7	4

^[1] The gross vehicle weight of the EV is 4,300 kg which is heavier than that of the DV (3,300 kg).

^[2] The DV was not in business operation in March 2021 as reported by Pan Kee.

^[3] 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] Electricity cost is based on HK\$1.177/kWh in 2019 and HK\$1.218/kWh in 2020 & 2021 as claimed by CLP Power Hong Kong Ltd.

^[5] The market fuel price was used for calculation.

^[6] Assuming lower heating value of 36.13 MJ/litre for diesel fuel.

^[7] Maintenance due to incidents unrelated to the performance of the vehicle was not included for comparison.

^[8] Downtime refers to the equivalent number of working days in which the vehicle was not in operation due to charging and the period 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.

4.2 In the 24 months of the trial period, the average fuel cost of EV was HK\$1.40/km (i.e., about 77%) lower than that of DV.

4.3 After taking into account the maintenance costs, the average total operating cost of the EV was HK\$1.45/km (72%) lower than that of DV.

4.4 There were 496 working days in the 24-month trial period. The EV had two scheduled maintenances, and also two government vehicle examinations, which resulted in loss of 7 working day. Hence, the utilization rate was 98.6% for the EV. The DV had 4 working day lost, due to government vehicle examinations and scheduled maintenances. Hence, the utilization rate of the DV was about 99.2%. There was no indication that the fuel economy and the battery of the EV had deteriorated during the trial period.

4.5 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 8,064 kg (about 61%) CO_{2e} emissions by using the EV.

4.6 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. Pan Kee 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 CO₂e emissions, provided that the vehicles can get easy access to charging facilities.

5. Summary

5.1 In the 24 months of the trial, the average fuel cost of the EV was lower than that of the DV by HK\$1.40/km (i.e., about 77%).

5.2 After taking into account the maintenance costs, the average total operating cost of the EV was lower than that of the DV by HK\$1.45/km (i.e., about 72%).

5.3 There were 496 working days in the 24 months of the trial. The EV lost 7 working days, hence it had 98.6% utilization rate. The DV lost 4 working day, hence its utilization rate was 99.2%. There was no indication that the fuel economy and the battery of the EV had deteriorated during the trial period.

5.4 There was a reduction of 8,064 kg CO₂e emissions by using the EV.

5.5 The drivers had no problem in operating the EV and have adapted well in driving the EV. The drivers and Pan Kee were also satisfied with the performance of the EV.

5.6 The findings showed electric light goods vehicles are becoming more affordable and feasible to the transport trade for saving operating cost and reducing CO₂e emissions, provided that the vehicles can get easy access to charging facilities.

Appendix 1: Key Features of the Vehicle and Charging Facility

1. Trial EV and Charging Facility

EV

Registration mark:	VY379
Make:	JOYLONG
Model:	EW5
Class:	Light Goods Vehicle
Gross vehicle weight:	4,300 kg
Seating capacity:	Driver + 5 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:	2018

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

2. DV used for Comparison

Registration mark:	SD379
Make:	Nissan
Model:	NV350 URVAN
Class:	Light Goods Vehicle
Gross vehicle weight:	3,300 kg
Seating capacity:	Driver + 5 passengers
Cylinder capacity:	2,488 c.c.
Year of manufacture:	2016

Appendix 2: Photos of Vehicles and EV Charging Facility

1. Trial EV and Charging Facility

EV (VY379)



EV - Front view



EV - Rear view





EV - Right side view



EV - Left side view

EV Charging Facility

	 <p>项目: 30KW500V三相移动式 订单: X19020047 料号: 31600000192 配置: 网外版 单枪5M 型号: ANDC5-500V/60A-1 流水: X19020047-1 编号: 201902001</p>
<p>30 kW, 3-phase input, DC 500V output, charging facility</p>	<p>The specifications stated on the charging facility</p>

2. DV for Comparison

DV (SD379)



DV - Front view



DV - Rear view



DV - Right side view



DV - Left side view