

Pilot Green Transport Fund

Final Report On Trial of Electric Light Goods Vehicle for Courier Service (DHL Express (Hong Kong) 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 Vehicle for Courier Service
(DHL Express (Hong Kong) Limited)**

**Final Report
(Trial Period: 1 November 2014 – 31 October 2016)**

Executive Summary

1 Introduction

1.1 The Pilot Green Transport Fund (the Fund) is set up to encourage transport operators to try out green and innovative transport technologies, contributing to better air quality and public health for Hong Kong. DHL Express (Hong Kong) Limited (DHL) was approved under the Fund for trial of one electric light goods vehicle (EV) for courier service.

1.2 Hong Kong Institute of Vocational Education (Tsing Yi) 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. DHL assigned one diesel vehicle (DV) providing similar service as the conventional vehicle for comparing with the EV.

1.3 This report summarizes the performance of the EV in the 24 months of the trial as compared with its conventional diesel counterpart.

2. Trial Vehicles

2.1 Through the tendering procedures stipulated in the Subsidy Agreement that DHL entered into with the Government, DHL procured one Renault Kangoo Z.E. electric light goods vehicle, i.e. EV, for trial.

2.2 Key features of the EV, DV and charging facility are in Appendix 1 and photos of the vehicles and charging facility are in Appendix 2. The vehicles were used for courier service in New Territories. According to the EV's manufacturer, the model's maximum payload is limited to 650 kg and it has a travel range of 170 km under no load condition with its battery fully charged and air-conditioning off.

2.3 The EV was normally charged using their dedicated 20A charger located at their car park in Cheung Sha Wan during lunch time or overnight after work. It normally takes 8 hours to fully charge the battery.

3 Trial Information

3.1 The trial started on 1 November 2014 and lasted for 24 months. DHL was required to collect and provide trial information including the EV mileage reading before charging, amount of electricity consumed and time used in each charging, operation downtime due to charging, and cost and operation downtime associated with scheduled and unscheduled maintenance of the EV and the charging facility. Similar monthly 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 DHL were collected to reflect any problems of the EV.

4 Findings of Trial

4.1 Table 1 below summarizes the total operating costs of EV and DV. The average total operating cost of the EV was HK\$0.23/km (17%) lower than the DV. The average fuel cost of the EV was HK\$0.97/km (78%) lower than the DV.

Table 1: Key operation statistics of each vehicle (November 2014 to October 2016)

		EV	DV
Total mileage (km)		12,571	59,848
Average fuel economy	(km/kWh)	4.27	-
	(km/litre)	-	8.74
	(km/MJ)	1.19	0.24 ^[1]
Average fuel cost (HK\$/km) ^[2]		0.27	1.24
Average total operating cost (HK\$/km)		1.12	1.35
Downtime (working day) ^{[3][4]}		5	7

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

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

[3] Downtime refers to the equivalent number of working days in which the vehicle is not in operation due to charging, and the period 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] Maintenance due to incidents unrelated to the performance of the vehicle was not included for comparison.

4.2 There were scheduled maintenance and unscheduled maintenance for both EV and DV in this reporting period, leading to 5 days and 7 days of operational downtime respectively. In the trial period, there were 252 working days for the HV, and 493 working days for the DV. The utilization rates of EV and DV were 98% and 99% respectively.

4.3 The driver of EV expressed satisfaction with the operation and performance of the vehicle. The driver found no problem in operating the EV and felt the EV was quiet and environmentally friendly.

4.4 DHL agreed that, in general, using electric vehicle was good because it provided a greener and quieter environment compared with the diesel vehicle. There was no major concern for the operating range of EV since the service area of EV was not far away from the charging station. Also, DHL expressed satisfaction with the cargo capacity of the EV.

4.5 To eliminate the effect of seasonal fluctuations, 12-month moving averages were used to evaluate the trend of the EV's fuel economy. The fuel economy varied from 4.14 to 4.45 km/kWh for the EV. During the 24-month trial period, there was a slight increase in fuel economy of the EV. There was no evidence that the charging capacity of the EV batteries had varied during the trial period.

4.6 The carbon dioxide equivalent (CO₂e) emission from the EV was 1,627 kg while that from the DV was 3,986 kg. Hence there is a reduction of 2,359 kg (about 59%) CO₂e emission.

5. Summary

5.1 The driver found no problem in operating the EV and was satisfied with its performance. It was convenient for the driver to charge the vehicle at lunchtime or at the end of each day using in house charging facility for the next day's use.

5.2 The utilization rates of EV and the DV were 98% and 99% respectively. The EV was used for providing courier services in the Shatin district by DHL

5.3 The trial showed that the EV had average lower fuel cost as compared with its conventional diesel counterpart, with a saving of HK\$0.97/km (78%). Average total operating cost of the EV was HK\$0.23/km (17%) lower than the DV. Also, the EV had 59% lower CO₂e emission compared with the DV.

5.4 At present, the price of EV is higher than that of conventional vehicle, the accumulated fuel saving may not be able to offset the higher vehicle cost within a few years of operation. However, electric vehicle market is expanding and electric vehicle technology is improving, the price difference between electric vehicle and conventional vehicle is narrowing down and more affordable to the transport trade.

Appendix 1: Key Features of Vehicles and Charging Facility

1. Trial EV

Registration Mark	SX8251
Make:	Renault
Model:	Kangoo Z.E. 2-Seater
Class:	Light goods vehicle
Gross vehicle weight:	2,180 kg
Seating capacity:	driver + 1 passenger
Rated power:	44 kW
Travel range:	170 km (air conditioning off)
Maximum speed:	130 km/h
Battery material:	Lithium ion
Batteries capacity:	22 kWh
Year of manufacture:	2014

2 EV Charging Facility

Charging standard:	IEC62196 Type 2
Charging mode:	220V / 20A, A/C

3 DV used for comparison

Registration Mark	SJ1190
Make:	TOYOTA
Model:	Hiace
Class:	Light goods vehicle
Gross vehicle weight:	2,800 kg
Seating capacity:	driver + 2 passenger
Engine capacity:	2,982 c.c.
Year of manufacture:	2013

Appendix 2: Photos of Vehicles and Charging Facility

1. Trial EV and charging facility



EV – front view



EV – rear view



EV – left side view



EV – right side view



EV charging station



EV meter reading

2. DV for comparison



DV – front view



DV – rear view



DV – left side view



DV – right side view