Pilot Green Transport Fund

Final Report On
Trial of Electric Light Goods Vehicle for Catering Service

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Pilot Green Transport Fund
Trial of Electric Light Goods Vehicle for Catering Service
(Cathay Pacific Catering Services (H.K.) 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 (the innovative green technology), contributing to better air quality and public health for Hong Kong. Cathay Pacific Catering Services (H.K.) Limited (CPCS) was approved under the Fund for trial of one electric light goods vehicle (EV) for catering 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 vehicles.

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 Agreement, CPCS procured one Mitsubishi Minicab MiEV EV for trial. One diesel light goods vehicle (DV) providing similar services was assigned as the conventional vehicle for comparing with the EV.

2.2 Key features of the EV and the DV are in Appendix 1 and photos of the vehicles are in Appendix 2. The vehicles were used for delivering materials in different service areas on the Airport Island.

3 Trial Information

3.1 The trial started on 1 November 2014 and lasted for 24 months. CPCS 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, downtime due to charging, cost and operation downtime associated with scheduled and unscheduled maintenance of the EV and the charging facilities. Similar data from the DV was also required. In addition to the cost information, reports on maintenance work, operational difficulties and opinions of the drivers and CPCS were collected to reflect any operational problems of the EV.

4 Findings of Trial

4.1 Table 1 below summarizes the total operating costs of EV and DV. Average total operating cost of the EV was about HK$1.33/km (75%) lower than the DV. The average fuel cost of the EV is HK$0.91/km (75%) lower than the DV.

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

		EV	**DV**
Total mileage (km)		19,961	11,937
Average fuel economy [1]	(km/kWh)	3.83	-
	(km/litre)	-	8.95
	(km/MJ)	1.06	0.25
Average fuel cost (HK$/km) [2]		0.30	1.21
Average total operating cost (HK$/km)		0.45	1.78
Downtime (working day) [3] [4]		28	6

[1] Assuming lower heating value of 36.13MJ/litre for diesel fuel.
[2] The market rate was adopted 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 three scheduled maintenances for both EV and DV in this reporting period, leading to 6 days and 28 days of operational downtime respectively. There were 731 working days in this reporting period, the utilization rates of EV and DV were 99% and 96% respectively.

4.3 The EV driver claimed that the EV battery capacity had dropped to around 80-90% of its original capacity. It is noted during the last quarter of the trial, there were some months with fuel economy figures lower than average. The 12-month moving average shows a slow decline in the fuel economy of the vehicle until the last month of the trial. This suggests there has been deterioration in the battery performance from the charging frequency as well as average fuel economy of the EV.

4.4 CPCS agreed that using electric vehicle was good because it provided a greener and quieter environment compared with diesel vehicle. They also found that the EV was suitable for using in the Airport since the charging points were close to their operating sites. The cargo capacity was sufficient for daily operations. CPCS suggested that the required time for battery recharge could be enhanced to facilitate their daily operations. As the Airport is a fair distance away from the city, CPCS commented that their EV service area would be restricted to the EV battery allowed range. The EV would normally be assigned for duties around the Airport or Tung Chung District. CPCS suggested that the required time for battery recharge could be enhanced to facilitate better daily operations.

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 3.5 to 4.2 km/kWh (i.e. a range of about 17%) for the EV.

4.6 The carbon dioxide equivalent (CO_2e) emission from the EV was 2,838 kg while that from the DV was 6,183 kg. Therefore, there is for the EV a 3,345 kg or 54% decrease of the respective CO_2e emissions from the EV during the trial period.

5 Summary

5.1 The average operating cost of the EV was HK$1.33/km (75%) lower than the DVs. Other than the relatively low fuel cost of electricity, the higher maintenance cost for the DV also contributed to the larger difference of the average operating cost of DV compared to the EV. The average daily mileage of the EV was 27.3 km. The utilization rates of EV and DV were 99% and 96% respectively. There is a total reduction of 3,345 kg (54%) CO_2e emission by using the EV in the trial.

5.2 The EV driver expressed satisfaction with the vehicle performance and there was no difficulty in operating the vehicle. He felt the EV was quiet and environmentally friendly as compared with the DV.

5.3 CPCS agreed that using electric vehicle was good because it provided a greener and quieter environment compared with the diesel vehicle. The cargo capacity was sufficient for daily operations. As the Airport is a fair distance away from the city, CPCS commented that their EV service area would be restricted to the EV battery allowed range. The EV would normally be assigned for duties around the Airport or Tung Chung District. CPCS suggested that the required time for battery recharge could be enhanced to facilitate better daily operations

5.4 The trial found that the EV was suitable for use in the Airport since the charging points were close to their operating sites.

5.5 There was an indication that there was deterioration in the performance of the EV during the trial period. Reviewing the 12-month moving average performance data for the EV, there is an indication of possible slow deterioration of the batteries during the 24-month trial period.

Appendix 1: Key Features of Vehicles Involved in the Trial

1. Trial EV

Registration Mark	**GM 8272**
Make:	MITSUBISHI
Model:	Minicab MiEV
Class:	Light goods vehicle
Gross vehicle weight:	1,660 kg
Seating capacity:	driver + 3 passengers
Rated power:	25 kW
Travel range:	150 km (air conditioning off)
Maximum speed:	130 km/h
Battery material:	Lithium ion
Batteries capacity:	16 kWh
Charging time:	7 hours (Max. current 13A)
Year of manufacture:	2013

2. DV used for comparison

Registration Mark	**MP 5409**
Make:	TOYOTA
Model:	Hi-ace
Class:	Light goods vehicle
Seating capacity:	driver + 5 passengers
Gross vehicle weight:	2.8 tonnes
Engine capacity:	2494 c.c.
Year of manufacture:	2006

Appendix 2: Photos of Vehicles

1. Trial EV

	
EV – front view	EV – rear view
	
EV – left side view	EV – right side view

2. DV used for comparison

	
DV – front view	DV – rear view
	
DV – left side view	DV – right side view