Pilot Green Transport Fund

Interim Report On
Trial of Electric Light Goods Vehicle (Van Type) for Logistics Service II
(LF Logistics)

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PREPARED BY:
Dr. C.S. Cheung

List of Monitoring and Evaluation Team Members

Dr. C.S. Cheung (Team Leader)
Professor
Department of Mechanical Engineering
The Hong Kong Polytechnic University

Dr. W.T. Hung (Deputy Team Leader)
PolyU Technology and Consultancy Company Limited
The Hong Kong Polytechnic University

Ir Dr. C. NG
Senior Technical Officer
Department of Mechanical Engineering
The Hong Kong Polytechnic University

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Interim Report
(Trial Period: 1 May 2017 – 30 April 2018)

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. LF Logistics (Hong Kong) Limited (LF Logistics) was approved under the Fund for trial of two electric light goods vehicles (van type) for logistics service. LF Logistics, through a tendering procedure stipulated in the Agreement entered into with the Government, procured two Nissan e-NV200 electric light goods vehicles (van type) (EVs) for trial. According to the manufacturer, the EV has a travel range of 165 km with its battery fully charged and air-conditioning off.

1.2 PolyU Technology and Consultancy Company Limited (PolyU) has been engaged by the Environmental Protection Department (EPD) as an independent third party assessor to monitor the trial and evaluate the performance of the trial vehicles. LF Logistics assigned two Ford diesel light goods vehicles (van type) (DVs) as the conventional counterparts for comparison. Each had a 2,198 c.c. engine and provided similar service as the EVs.

1.3 This Interim Report summarizes the performance of the EVs in the first twelve months of the trial as compared with their conventional counterparts i.e. the DVs.

2. Trial Vehicles

2.1 Key features of the EVs and DVs are in Appendix 1 and photos of the vehicles and the charging facilities are in Appendix 2. The EVs were used mainly for logistics service from the Yuen Long depot to Tsuen Wan, Kwai Chung, Shatin and Yuen Long. Typical daily journey was less than 100 km.

2.2 LF Logistics has installed a 32-ampere charger for charging and recording the amount of electricity charged for each EV. The EVs were normally charged overnight. Due to the low utilization of the EVs, they were charged only when required.

3. Trial Information

3.1 The trial commenced on 1 May 2017 and will last for 24 months. LF Logistics was required to collect and provide trial information including the EVs' mileage reading before charging, amount of electricity consumed in each charging, charging time and operation downtime due to charging, cost and downtime associated with scheduled and unscheduled maintenance of the EVs and the charging facilities. Similar data of the DVs were also required. In addition to the cost information, reports on maintenance work, operational difficulties and opinions of the drivers were collected to reflect any problems of the EVs.

3.2 The following table summarizes the statistical data of the EVs and the DVs. The average fuel cost of the EVs was HK$1.00/km (83%) lower than that of the DVs. The average total operating cost of the EVs was HK$0.73/km (51%) lower than that of the DVs.

Table 1: Key operation statistics of each vehicle, May 2017 – April 2018

		Electric vans		**Diesel vans**	
		EV-1	**EV-2**	**DV-1**	**DV-2**
Total mileage (km)		8809	7933	48811	50018
Average fuel economy	(km/kWh)	5.91	5.13		
	(km/litre)			10.83	9.72
	(km/MJ)	1.64	1.43	0.30[1]	0.269[1]
Fleet average fuel economy		5.51 km/kWh		10.24 km/litre	
Average fuel cost (HK$/km)		0.193[2]	0.222[2]	1.15[3]	1.26[3]
Fleet average fuel cost (HK$/km)		0.206		1.21	
Average total operating cost (HK$/km)		0.652	0.732	1.26	1.58
Downtime[4][5] (working days)		24	18	2	9
By Vehicle type	Average total operating cost/ (HK$/km)	0.69		1.42	
	Average downtime (working days)	21		5.5	

[1] Assuming lower heating value of 36.13 MJ/litre for diesel fuel
[2] Electricity cost is based on HK$1.13/kWh for 2017 and HK$1.154/kWh for 2018
[3] Market fuel price was used for calculation
[4] Downtime refers to the working days that the vehicle is not in operation, it is counted from the first day it stops operation till the day it is returned to the operator.
[5] Maintenance not related to the performance of the vehicle was not included for comparing the performance of the vehicles.

3.3 Apart from the fuel cost, maintenance cost and other indirect costs, which may include parking fee, towing fee, vehicle replacement fee and cost of operation downtime due to charging and maintenance of the EVs, are also included in Table 1. In this reporting period, EV-1 had one scheduled and three unscheduled maintenances which incurred 24 days downtime. EV-2 had one scheduled and two unscheduled maintenances which incurred 18 days downtime. DV-1 had one scheduled maintenance, with 2 days downtime. DV-2 had three scheduled maintenances, with 9 days downtime. The scheduled maintenance of each EV was for annual inspection and general maintenance service. In September 2017, EV-2 was returned to the vehicle supplier for replacing the gear shift console which was not working properly. In February and March 2018, EV-1 was returned to the vehicle supplier for checking because of poor battery condition. In addition, both EVs increased their seating capacity from two to five.

3.4 EV-1 had 24 days of downtime while EV-2 had 18 days of downtime. DV-1 had 2 days of downtime while DV-2 had 9 days of downtime. The utilization rates were 92% for EV-1 and 94% for EV-2, compared with 99% for DV-1 and 97% for DV-2. Based on the above, the average daily mileages of EV-1, EV-2, DV-1 and DV-2 were 32 km/day, 29 km/day, 166 km/day and 174 km/day respectively.

4. Summary

4.1 The average fuel cost of the EVs was 83% (HK$1.00/km) less than that of the DVs. The average total operating cost of the EVs was 51% (HK$0.73/km) lower than that of the DVs. The utilization rates were 92% for EV-1, 94% for EV-2, 99% for DV-1 and 97% for DV-2.

4.2 The drivers had no problem in operating the EVs and were satisfied with their performance except that the power of the EVs was not good on uphill operation. Moreover, there was concern on the low travel range of the EVs.

4.3 Overall, LF Logistics agrees that using electric vehicle is good because it can provide a greener and quiet environment as well as its much lower fuel cost. However, the travel range of trial EV cannot meet its operational requirements.

4.4 There is significant variation in the fuel economy of both EVs within the first twelve months of the trial. Further monitoring is required to understand the causes of such variation.

4.5 In the reporting period, the total mileage of the EVs was 16,742 km (i.e. 28.3 km per working day per EV on average), compared with 98,829 km (i.e. 167 km per working day per DV on average) for the DVs. LF Logistics should encourage the drivers to increase the utilization of the EVs.

Appendix 1: Key Features of the Vehicles and Charging Facilities

1. Trial EVs

Registration mark	**UG6662 (EV-1), UG8266 (EV-2)**
Make:	Nissan
Model:	e-NV200
Class:	Light goods vehicle
Gross vehicle weight:	2,250 kg
Seating capacity:	2 passengers (including driver) [changed to 5 passengers (including driver) since Oct 2017]
Rated power:	80 kW
Travel range:	165 km (air conditioning off)
Maximum speed:	over 120 km/h
Battery material:	lithium-ion
Battery capacity:	24 kWh
Payload load:	620 kg
Year of manufacture:	2015

2. DV Used for Comparison

Registration mark	**SY5470 (DV-1)**	**TC3918 (DV-2)**
Make:	Ford	Ford
Model:	Transit 2.2D LW LR B	Transit 2.2D LW LR B
Class:	Light Goods Vehicle (van Type)	Light Goods Vehicle (van type)
Seating capacity:	6 passengers (including driver)	3 passengers (including driver)
Gross vehicle weight:	3.33 tonnes	3.33 tonnes
Cylinder capacity:	2,198 cc	2,198 cc
Year of manufacture:	2014	2014

3. Charging Facilities

Maker:	evMega
Model:	EVB-200
Output:	380VAC / 32A
Charging Standard:	IEC62196

Appendix 2: Photos of Vehicles and Charging Facilities

1. Trial EVs

	
EV-1 (UG6662) – front view	EV-1 – end view
	
EV-1 – side view 1	EV-1 – side view 2
	
EV-1 – watt-hour meter	

	
EV-2 (UG8266) – front view	EV-2 – end view
	
EV-2 – side view 1	EV-2 – side view 2
	
EV-2 watt-hour meter	

2. Diesel Vehicles (DV) for Comparison

DV – front view

3. Battery charger