Pilot Green Transport Fund

Interim Report On
Trial of Electric Light Goods Vehicles
for Construction Industry
(Kum Shing (K.F.) Construction Company Limited)

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(Kum Shing (K.F.) Construction Company Limited)

Interim Report
(Trial Period: 1 October 2017 - 30 September 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. Kum Shing (K.F.) Construction Company Limited (Kum Shing) was approved under the Fund for trial of three electric light goods vehicles (hereafter called EVs) for construction industry operation. Through the tendering procedures stipulated in the Subsidy Agreement, Kum Shing procured three EVs - Nissan e-NV200 electric light goods vehicles (EV-1, EV-2 and EV-3) for trial.

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. Kum Shing assigned three Nissan diesel light goods vehicles (DVs: DV-1, DV-2 and DV-3) providing the same type of services as the conventional counterparts for comparing with the EVs.

1.3 This 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, DVs and charging facilities are in Appendix 1 and photos of the vehicles and charging facilities are in Appendix 2. The vehicles were used for transporting equipment for their sites in Kowloon and New Territories. EV-1 and DV-1 both served in Tai Po, Tuen Mun and Tseung Kwan O; EV-2 and DV-2 both served in Tsuen Wan and Kwai Tsing; EV-3 and DV-3 both served in Tuen Mun and Tsing Yi. According to the EV's manufacturer, the EV model maximum payload is 650 kg and it has a travel range of 165 km with its batteries fully charged and air-conditioning off.

2.2 Kum Shing has set up one dedicated 13A, one dedicated 32A and one dedicated 125A chargers for EVs at its car park in To Kwa Wan. The EVs were charged regularly after work. For a long journey, the EV driver would stop at a charging point to top up the battery during lunch time or at the time without any assigned duties even if the battery was far from being depleted.

3. Trial Information

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

3.2 Table 1 summarizes the statistical data of the EVs and the DVs. The average fuel cost comparison were as follows: EV-1 was HK$1.25/km (84.5%) lower than that of DV-1; EV-2 was HK$1.32/km (83.5%) lower than that of DV-2; and EV-3 was HK$1.34/km (84.3%) lower than that of DV-3. The average fuel cost of all three EVs was HK$1.30/km (83.9%) lower than that of the DVs.

Table 1: Key operation statistics of each vehicle (October 2017 to September 2018)

		EVs			**DVs**		
		EV-1	**EV-2**	**EV-3**	**DV-1**	**DV-2**	**DV-3**
Total mileage (km)		8,243	9,567	5,174	16,411	23,268	17,371
Average fuel economy	(km/kWh)	5.06	4.41	4.60	-	-	-
	(km/litre)	-	-	-	8.99	8.34	8.32
	(km/MJ) [1]	1.41	1.23	1.28	0.25	0.23	0.23
Average fuel cost (HK$/km) [2]		0.23	0.26	0.25	1.48	1.58	1.59
Fleet average fuel cost (HK$/km)		0.25			1.55		
Average total operating cost/ (HK$/km)		0.23	0.26	0.25	1.48	2.36	1.59
Fleet Average total operating cost (HK$/km)		0.25			1.81		
Downtime (working day) [3]		0	0	2	0	2	0

[1] Assuming lower heating value of 36.13 MJ/liter for diesel

[2] The market fuel price was used for calculation

[3] Downtime refers to the period the vehicle was not in operation, which counted from the first day it stopped operation till it was returned to the operator

3.3 During the first twelve months of the trial, EV-3 and DV-2 had one scheduled maintenance resulting downtime for 2 working days. There was no scheduled maintenance for EV-1, EV-2, DV-1 and DV-3.

3.4 The three DVs had one unscheduled maintenance each, but they were not included for the comparison as they were unrelated to the vehicle performance. There was no unscheduled maintenance for EV-1, EV-2 and EV-3.

3.5 The utilization rates of EV-1, EV-2, DV-1 and DV-3 were 100%, while those of EV-3 and DV-2 were 99.3% in this reporting period.

4. Summary

4.1 In the first twelve months of the trial, the average daily mileages of EV-1, EV-2 and EV-3 were 29 km, 34 km and 20 km respectively, while those of the DV-1, DV-2 and DV-3 were 56 km, 80 km and 59 km respectively. The EVs incurred a lower fleet average fuel cost which was $1.30/km (83.9%) less than that of the DVs. The fleet average operating cost of the EVs was $1.56/km (86.2%) lower than that of the DVs. The average utilization rates of all the EVs and DVs were both 99.8%.

4.2 All the EV drivers had no problem in operating the EVs and felt the EVs were quieter than the DVs and environmentally friendly. Kum Shing and the drivers needed to plan the driving route and find the location of charging stations before they use the EVs in case they need top-up charging outside. In general, Kum Shing and the drivers were satisfied with the performance of EVs.

4.3 In this reporting period, the average fuel economy as well as charging frequencies of the EVs did not indicate any deterioration in the performances of the EVs and their batteries. More time is needed to test the performance of the batteries and reliability of the EVs.

Appendix 1: Key Features of Vehicles and Charging Facilities

1. Trial EVs

(a) EV-1

Registration Mark	**UP912**
Make:	Nissan
Model:	e-NV200
Class:	Light Goods Vehicle
Gross vehicle weight:	2,250 kg
Seating capacity:	Driver + 4 passengers
Rated Power:	80 kW
Travel range:	165 km (air conditioning off)
Maximum speed:	over 120 km/h
Battery Type:	Lithium-ion
Battery capacity:	24 kWh
Year of manufacture:	2015

(b) EV-2

Registration Mark	**UP1304**
Make:	Nissan
Model:	e-NV200
Class:	Light Goods Vehicle
Gross vehicle weight:	2, 250 kg
Seating capacity:	Driver + 4 passengers
Rated Power:	80 kW
Travel range:	165 km (air conditioning off)
Maximum speed:	over 120 km/h
Battery Type:	Lithium-ion
Battery capacity:	24 kWh
Year of manufacture:	2015

(c) EV-3

Registration Mark	**UM9271**
Make:	Nissan
Model:	e-NV200
Class:	Light Goods Vehicle
Gross vehicle weight:	2,250 kg
Seating capacity:	Driver + 4 passengers
Rated Power:	80 kW
Travel range:	165 km (air conditioning off)
Maximum speed:	over 120 km/h
Battery Type:	Lithium-ion
Battery capacity:	24 kWh
Year of manufacture:	2015

2. Charging Facilities

(a) Charging Station 13A

(b) Charging Station 32A

Charging Standard:	IEC 61851
Charging Mode:	220V / 32A, AC (Mode 3)

(c) Charging Station 125A

Charging Standard:	IEC 62262
Charging Mode:	50-500V / 125A, DC (Mode 4)

3. DVs for comparison

(a) DV-1

Registration Mark	**RN465**
Make:	Nissan
Model:	URVAN
Class:	Light Goods Vehicle
Seating capacity:	Driver + 5 passengers
Gross vehicle weight:	3,300 kg
Engine capacity:	2,953 c.c.
Year of manufacture:	2012

(b) DV-2

Registration Mark	**RB2428**
Make:	Nissan
Model:	URVAN
Class:	Light Goods Vehicle
Seating capacity:	Driver + 5 passengers
Gross vehicle weight:	3,300 kg
Engine capacity:	2,953 c.c.
Year of manufacture:	2011

(c) DV-3

Registration Mark	**PN3222**
Make:	Nissan
Model:	URVAN
Class:	Light Goods Vehicle
Seating capacity:	Driver + 5 passengers
Gross vehicle weight:	3,300 kg
Engine capacity:	2,953 c.c.
Year of manufacture:	2010

Appendix 2: Photos of Vehicles and Charging Facility

1. Trial EVs

(a) EV-1

	
Front view of EV-1	Rear view of EV-1
	
Left Side view of EV-1	Right Side view of EV-1

(b) EV-2

	
Front view of EV-2	Rear view of EV-2
	
Left Side view of EV-2	Right Side view of EV-2

(c) EV-3

	
Front view of EV-3	Rear view of EV-3
	
Left Side view of EV-3	Right Side view of EV-3

2. DVs for comparison

(a) DV-1

	
Front view of DV-1	Rear view of DV-1
	
Left Side view of DV-1	Right Side view of DV-1

(b) DV-2

	
Front view of DV-2	Rear view of DV-2
	
Left Side view of DV-2	Right Side view of DV-2

(c) DV-3

	
Front view of DV-3	Rear view of DV-3
	
Left Side view of DV-3	Right Side view of DV-3

3. Charging Facilities

	
Charging Station 13A	Electricity Meter
	
Charging Station 32A	Electricity Meter
	
Charging Station 125A	Electricity Meter