

Pilot Green Transport Fund

Interim Report On Trial of Electric Van for Beverage Delivery (Swire)

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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 Van for Beverage Delivery (Swire)**

**Interim Report
(Trial Period: 1 September 2014 – 28 February 2015)**

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 green innovative technology), contributing to better air quality and public health for Hong Kong. Swire Beverages Limited (Swire) was approved under the Fund for trial of two electric light goods vehicles (van-type) (hereafter called EVs) for beverage delivery. Through the tendering procedures stipulated in the Subsidy Agreement, Swire procured two Renault Kangoo Vans Z.E. (i.e., EV-1 and EV-2) for trial.

1.2 Hong Kong Institute of Vocational Education (Tsing Yi) 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. Swire assigned two diesel light goods vehicles (van type) (i.e., DVs - DV-1 and DV-2) which were providing similar services as the conventional vehicles for comparing with the EVs.

1.3 This Interim Report summarizes the performance of the EVs in the first six months of the trial as compared with its conventional diesel counterparts.

2. Trial Vehicles

2.1 Key features of EVs (EV-1 and EV-2) and DVs (DV-1 and DV-2) and photos of the vehicles are in Appendix 1 and Appendix 2, respectively. Photos of charging facilities are also in Appendix 2. The vehicles were used for transporting document of beverage business. According to the manufacturer's information, this EV model has a travel range of 170 km with its batteries fully charged and air-conditioning off.

2.2 Swire has set up two dedicated 20A chargers for EVs at its car park in Sha Tin. The EVs were charged regularly overnight after work and it took eight hours to fully charge the batteries.

3. Trial Information

3.1 The trial commenced on 1 September 2014 and will last for 24 months. Swire 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 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 Swire were collected to reflect the problems of the EVs.

3.2 Table 1 summarizes the statistical data of the EVs and the DVs. The average fuel cost of the EVs is \$1.05/km (about 82%) lower than that of the DVs.

Table 1: Key operation statistics of each vehicle (September 2014 to February 2015)

		EV		DV	
		EV-1	EV-2	DV-1	DV-2
Total Mileage (km)		7,488	3,915	8,122	9,283
Average fuel economy	(km/kWh)	5.62	4.57	-	-
	(km/litre)	-	-	9.67	8.46
	(km/MJ) ^[1]	1.56	1.26	0.27	0.23
Average fuel cost (\$/km)		0.20	0.25	1.19 ^[2]	1.37 ^[2]
Average total operating cost (\$/km)		0.56	0.93	1.88	1.71
Downtime (day) ^[3,4]		1	1	3	11
By Vehicle type	Average fuel cost (\$/km)	0.23		1.28	
	Average total operating cost (\$/km)	0.75		1.80	

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

^[2] Market rate of diesel 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] For incidents with operation downtime less than 1 hour, the no. of working days for the vehicle out of service would be counted as 0.

3.3 Apart from the fuel cost, the average total operating cost also include maintenance cost and other indirect costs including towing fee, vehicle replacement fee and cost of operation downtime due to charging and maintenance of the EVs. During the reporting period, both EV-1 and EV-2 had a scheduled maintenance due to general maintenance and inspection services after reaching 5,000 km in travelling mileage. The average total operating cost of the EVs was \$1.05/km (about 58%) lower than that of the DVs.

3.4 Utilization rates of both EV-1 and EV-2 were the same at 99.4% while that of DV-1 and DV-2 were 98.3% and 93.9% respectively.

4. Summary

4.1 The average fuel cost of the EVs was \$1.05/km (about 82%) lower than that of the DVs while the average total operating cost of the EVs was \$1.05/km (about 58%) lower than that of the DVs.

4.2 The drivers expressed satisfaction with driving and operating the EVs. They found no problem in operating the EVs, and felt that EVs were quieter and more environment-friendly than DVs. However, they were of the view that the battery capacity limited the driving range, whereby limiting the service areas of the EVs. They also concerned that the electrical power consumption of EVs would be higher when operating at higher speeds, which could further reduce their driving ranges. Furthermore, one of the drivers was not satisfied with the uphill performance of the EV compared with the DV.

4.3 Swire agreed that the use of EVs provided a greener and quieter environment compared with the diesel vehicles. However, the cargo carrying capacity of the EVs should be improved so that it could accommodate bulkier and/or heavier items.

4.4 The charging frequency and the average fuel economy of the EVs did not indicate any deterioration in the battery performance in the first six month of trial.

4.5 The findings only reflect the performance of the EVs in the first six months of the trial. More time is needed to test the fuel saving performance and the reliability of the EVs.

Appendix 1: Key Features of Vehicles Involved in the Trial

1. Trial EVs

(a) EV-1

Registration Mark	SV 9443
Make:	Renault
Model:	Kangoo Van Z.E.
Class:	Light goods vehicle
Gross vehicle weight:	2.3 tonnes
Seating capacity:	driver + 4 passengers
Rated power:	44 kW
Travel range:	170 km (air conditioning off)
Maximum speed:	130 km/h
Battery material:	Lithium ion
Batteries capacity:	22 kWh
Charging time:	8 hours (Max. current 16A)
Year of manufacture:	2014

(b) EV-2

Registration Mark	SV 9493
Make:	Renault
Model:	Kangoo Van Z.E.
Class:	Light goods vehicle
Gross vehicle weight:	2.3 tonnes
Seating capacity:	driver + 4 passengers
Rated power:	44 kW
Travel range:	170 km (air conditioning off)
Maximum speed:	130 km/h
Battery material:	Lithium ion
Batteries capacity:	22 kWh
Charging time:	8 hours (Max. current 16A)
Year of manufacture:	2014

2. DVs for comparison

(a) DV-1

Registration Mark	SG 8707
Make:	NISSAN
Model:	NV350
Class:	Light goods vehicle
Gross vehicle weight:	3.30 tonnes
Seating capacity:	driver + 5 passengers
Engine capacity:	2488 c.c.
Year of manufacture:	2013

(b) DV-2

Registration Mark	SG 9225
Make:	NISSAN
Model:	NV350
Class:	Light goods vehicle
Gross vehicle weight:	3.30 tonnes
Seating capacity:	driver + 5 passengers
Engine capacity:	2488 c.c.
Year of manufacture:	2013

Appendix 2: Photos of Vehicles and Charging Facilities

1. Trial EVs

(a) EV-1



EV-1 – Front View



EV-1 – Rear View



EV-1 – Left Side View



EV-1 – Right Side View

(b) EV-2



EV-2 – Front View



EV-2 – Rear View



EV-2 – Left Side View



EV-2 – Right Side View

2. DVs for Comparison

(a) DV-1



DV-1 – Front View



DV-1 – Rear View



DV-1 – Left Side View



DV-1 – Right Side View

(b) DV-2



DV-2 – Front View



DV-2 – Rear View



DV-2 – Left Side View



DV-2 – Right Side View

3. Charging Facilities for EVs under Trial

(a) EV-1



Charging Station for EV-1



Electricity Meter for EV-1

(b) EV-2



Charging Station for EV-2



Electricity Meter for EV-2