

Pilot Green Transport Fund

Final Report

On

Trial of Electric Light Goods Vehicles for

Building Renovation Services

(Frans Trading Enterprises Company Limited)

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The Monitoring and Evaluation Team's views expressed in this report do not necessarily reflect the views of the Environment and Ecology Bureau (Environment Branch), HKSAR.

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Trial of Electric Light Goods Vehicles for Building Renovation Services
(Frans Trading Enterprises Company Limited)**

**Final Report
(Trial Period: 1 September 2021 – 31 August 2023)**

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. Frans Trading Enterprises company Limited (Frans Trading) was approved under the Fund for trial of three electric light goods vehicles (EVs) for providing logistics services for building renovation works in Tai Po, Sheung Shui and Yuen Long areas. Through the tendering procedures stipulated in the Agreement signed with the Government, Frans Trading procured three electric light goods vehicles (EVs) of model DFSK EC35 (hereafter called EVs: EV-1, EV-2 and EV-3) for the trial.

1.2 PolyU Technology and Consultancy Company Limited has been engaged by the Environmental Protection Department¹ as an independent third party assessor to monitor the trial and evaluate the performance of the trial vehicles. Frans Trading assigned three diesel light goods vehicles (DV-1, DV-2 and DV-3), providing the same services in the New Territories were assigned as the conventional counterparts for comparing with the EVs.

1.3 This Final Report summarizes the performance of the EVs in the 24 months of the trial as compared with the conventional counterparts, i.e., DVs.

2. Trial and Conventional Vehicles

2.1 Each of the three trial EVs has a gross vehicle weight of 2,330 kg capable of carrying a driver with four passengers and goods. It has a 41.4 kWh lithium-ion battery pack and the driving range is 180 km with air-conditioning off. Any driver of the drivers' team could drive the EVs. Three 2,982 cc Toyota diesel light goods vehicles were used for comparison in this trial. EVs and DVs were used for transportation of building renovation workers as well as equipment and materials in the Tai Po, Sheung Shui and Yuen Long areas.

¹ The Administration of the New Energy Transport Fund was migrated to the Environment Branch of the Environment and Ecology Bureau [EEB (Environment Branch)] since 1 January 2023 after internal re-organisation of EEB (Environment Branch) and EPD.

2.2 Frans Trading installed, at its own cost at its Hung Shui Kiu depot, one 32A single-phase AC charger. All three EVs shared the same charger. Key features of the EVs, DVs, and charging facility are presented in Appendix 1. Photos of the vehicles and charging facility are shown in Appendix 2.

3. Trial Information

3.1 The trial started on 1 September 2021 and lasted for 24 months. Frans Trading 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. A similar set of data of the DVs was also required. In addition to the cost information, reports on maintenance work, operational difficulties and opinions of the driver and Frans Trading were collected and provided to reflect any problems of the EVs.

4. Findings of Trial

4.1 Table 1 summarizes the statistical data of the EVs and DVs.

Table 1: Key operation statistics of each vehicle (1 September 2021 – 31 August 2023)

	EVs			DVs			
	EV-1	EV-2	EV-3	DV-1	DV-2	DV-3	
Total mileage/km	28,008	22,078	45,070	52,235	49,440	54,358	
Average daily mileage (km/working day)	47	39	76	89	84	93	
Average fuel economy/	(km/kWh)	4.25	4.23	4.17	-	-	-
	(km/litre)	-	-	-	7.44	9.87	9.79
	(km/MJ)	1.18	1.18	1.16	0.21 ^[1]	0.27 ^[1]	0.27 ^[1]
Fleet average fuel economy (km/MJ)	1.17			0.25			
Average fuel cost (HK\$/km)	0.33 ^[2]	0.33 ^[2]	0.33 ^[2]	2.69 ^[3]	2.07 ^[3]	2.05 ^[3]	
Fleet average fuel cost (HK\$/km)	0.33			2.27			
Average total operating cost (HK\$/km)	0.59	0.66	0.49	2.87	2.17	2.28	
Fleet average total operating cost (HK\$/km)	0.58			2.44			
Downtime (working day) ^[4]	2.0	3.0	2.0	6.0	5.5	5.0	

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

^[2] Electricity bills not provided, electricity cost is based on market electricity price

^[3] The market fuel price was used for calculation

^[4] Downtime refers to the working days that 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

4.2 During the 24 months of the trial period, the average fuel cost of EV-1 was HK\$2.36/km (i.e., about 88%) lower than that of DV-1; the average fuel cost of EV-2 was HK\$1.74/km (i.e., about 84%) lower than that of DV-2; whilst the average fuel cost of EV-3 was HK\$1.73/km (i.e., about 84%) lower than that of DV-3. The fleet average fuel cost of all three EVs was HK\$1.94/km (i.e., about 86%) lower than that of the three DVs.

4.3 After taking into account the maintenance costs, the average total operating costs of EV-1, EV-2 and EV-3 were HK\$2.27/km (79%), HK\$1.51/km (69%) and HK\$1.78/km (78%) lower than those of DV-1, DV-2 and DV-3, respectively. The fleet average total operating cost of EVs was HK\$1.85/km (i.e., about 76%) lower than that of the DVs.

4.4 There were 592 working days in the 24-month trial period. EV-1, EV-2 and EV-3 had two scheduled maintenances each, involving government vehicle examinations, incurring 2, 3 and 2 working days losses; and EV-2 did not operate in October 2021 owing to COVID; resulting in an extra loss of 24 working days (i.e. 568 total working days). The utilization rates of EV-1 and EV-3 were 99.7% and of EV-2 was 99.4%. DV-1, DV-2 and DV-3 had 6, 5.5 and 5 working days lost, respectively due to maintenance work. The utilization rates of DV-1, DV-2 and DV-3 were 99.0%, 99.1% and 99.2%, respectively. There was no indication that the fuel economy and the batteries of the EVs had deteriorated during the trial period.

4.5 Compared with the carbon dioxide equivalent (CO_{2e}) emissions of the DVs (estimated based on the total mileages of the EVs), there were reductions of 7,872 kg, 4,170 kg and 8,554 kg CO_{2e} emissions by using EV-1, EV-2 and EV-3, respectively. Overall, there was a total reduction of 20,596 kg CO_{2e} emission (i.e., around 70%) in the trial by using the three EVs.

4.6 The drivers of the EVs had no problem in operating the EVs. They were satisfied with the EVs' performance and did not detect deterioration of the EVs' performance. Frans Trading was satisfied with the EVs in particular the significant fuel and operating costs savings.

5. Summary

5.1 In the 24 months of the trial, the average fuel cost of the EV-1 was lower than that of the DV-1 by HK\$2.36/km (i.e. about 88%), while the average fuel cost of the EV-2 was lower than that of the DV-2 by HK\$1.74/km (i.e. about 84%) and the average fuel cost of the EV-3 was lower than that of the DV-3 by HK\$1.73/km (i.e. about 84%). The fleet average fuel cost of all three EVs was HK\$1.94/km (i.e. about 86%) lower than that of the three DVs.

5.2 After taking into account the maintenance costs, the average total operating cost of the EV-1 was lower than that of the DV-1 by HK\$2.27/km (i.e. about 79%), while the average total operating cost of the EV-2 was lower than that of the DV-2 by HK\$1.51/km (i.e., about 69%) and the average total operating cost of the EV-3 was lower than that of the DV-3 by HK\$1.78/km (i.e., about 78%). The fleet average total operation cost of the three EVs was HK\$1.85/km (i.e., about 76%) lower than that of the three DVs.

5.3 There were 592 working days in the 24 months of the trial. EV-1, EV-2 and EV-3 lost 2, 3 and 2 working days resulting in 99.7%, 99.4% and 99.7% utilization rates respectively. DV-1, DV-2 and DV-3 lost 6, 5.5 and 5 workings days respectively, due to maintenance, hence the utilization rates of DV-1, DV-2 and DV-3 were 99.0%, 99.1% and 99.2%, respectively. There was no indication that the fuel economy and the batteries of the EVs had deteriorated during the trial period.

5.4 There are reductions of 7,872 kg, 4,170 kg and 8,554 kg CO₂e emissions by using EV-1, EV-2 and EV-3, respectively. Overall, there was a total reduction of 20,596 kg CO₂e emission (i.e., around 70%) in the trial by using the three EVs.

5.5 The drivers of the EVs had no problem in operating the EVs and were satisfied with the performance of the EVs. The battery capacity was sufficient for the EVs to operate normally for the whole day. Frans Trading was satisfied with the performance of the EVs, in particular the EVs had significant fuel and operating cost savings.

Appendix 1: Key Features of Vehicles and Charging Facility

1. Trial EVs and Charging Facility

Trial EVs

Registration Mark:	WX3166 (EV-1), WX4280 (EV-2) and WX3616 (EV-3)
Make:	DFSK
Model:	EC35
Class:	Light goods vehicle (Van)
Gross vehicle weight:	2,330 kg
Seating Capacity:	driver + 4 passengers
Rated Power:	30 kW
Travel range:	180 km (air conditioning off)
Battery type	Lithium-ion
Battery capacity:	41.4 kWh
Year of manufacture:	2020

Charging Facility (At Recipient's own cost)

No. of Charging Facility:	1
Make:	SKYTEC Wallbox Charging Station
Model:	Mode A Station
Charging Standard:	EN 61851-1:2011 and EN61851-22: 2002
Charging Mode:	BS-B10-BC7.2KW, 32A/60Hz, 1-phase

2. DVs for Comparison

Registration Mark: UE2891 (DV-1)
Make: TOYOTA
Model: HIACE Diesel LWB
Class: Light goods vehicle (Van)
Gross vehicle weight: 2,800 kg
Seating Capacity: driver + 5 passengers
Cylinder capacity: 2,982 cc
Year of manufacture: 2016

Registration Mark: PY1269 (DV-2)
Make: TOYOTA
Model: KDH201RSSPDY
Class: Light goods vehicle (Van)
Gross vehicle weight: 2,800 kg
Seating Capacity: driver + 5 passengers
Cylinder capacity: 2,982 cc
Year of manufacture: 2011

Registration Mark: UE9136 (DV-3)
Make: TOYOTA
Model: HIACE Diesel LWB
Class: Light goods vehicle (Van)
Gross vehicle weight: 2,800 kg
Seating Capacity: driver + 5 passengers
Cylinder capacity: 2,982 cc
Year of manufacture: 2012

Appendix 2: Photos of Vehicles and Charging Facility

1. Trial EVs and Charging Facility

Trial EVs

EV-1 (WX3166)



EV-2 (WX4280)



Front view



Left side view



Right side view



Rear view

EV-3 (WX3616)



Front view



Left side view



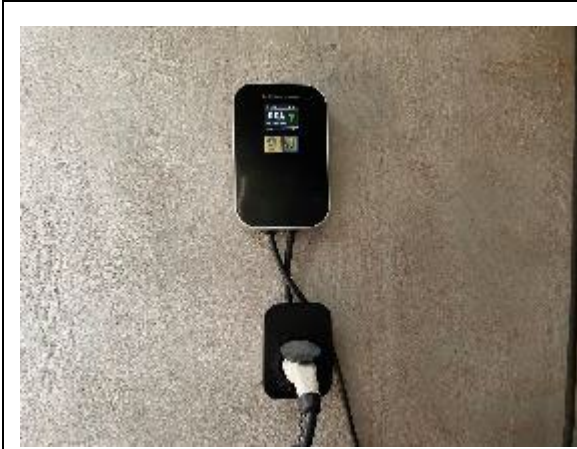
Right side view



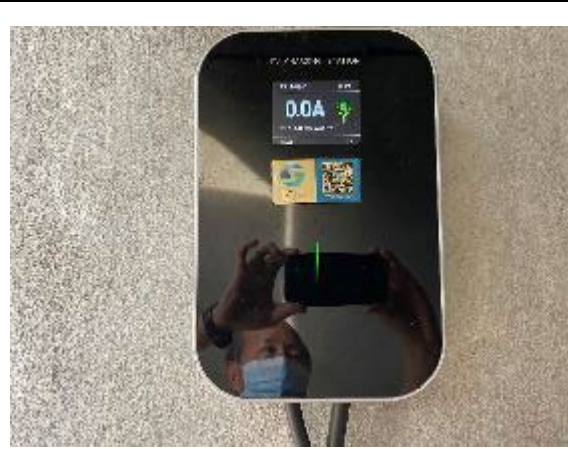
Rear view

Charging Facility

Charging Facility of EV-1 EV-2 and EV-3



The SKYTEC Charging Facility



EV Power 32A Charger Monitor

2. DVs for comparison

DV-1 (UE2891)



Front view



Left side view



Right side view



Rear view

DV-2 (PY1269)



Front view



Left side view



Right side view



Rear view

DV-3 (UE9136)



Front view



Left side view



Right side view



Rear view