Pilot Green Transport Fund

Final Report
On
Trial of Electric Light Goods Vehicle for Food Products Delivery (Four Season Restaurant)

(4 December 2024)

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Trial of Electric Light Goods Vehicle for Food Products Delivery
(Four Season Restaurant)

Final Report
(Reporting Period: 1 December 2021 – 30 November 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. Four Season Restaurant (Four Season) was approved under the Fund for trial of an electric light goods vehicle for delivery of food products. Four Season, through the tendering procedures stipulated in the Agreement entered into with the Government, procured a Joylong EW5 electric light goods vehicle (EV) for trial.

1.2 PolyU Technology and Consultancy Company Limited has been engaged by the Environmental Protection Department[1] as an independent third party assessor to monitor the trial and evaluate the performance of the trial vehicle. Four Season assigned a Toyota diesel light goods vehicle (DV) providing the same service as the conventional counterpart for comparing with the EV, which was replaced by a Hyundai H1 diesel light goods vehicle since November 2022.

1.3 This Final Report summarizes the performance of the EV in the 24 months of the trial as compared with its conventional counterpart, i.e. the DV.

2. Trial and Conventional Vehicles

2.1 The trial EV – Joylong EW5 electric light goods vehicle – has a gross vehicle weight (GVW) of 4,300 kg, capable of carrying a driver with 4 passengers and goods. It has a 73.4 kWh lithium-ion battery pack with a travel range of 330 km with its battery fully charged and air-conditioning off. The DV used for comparison in this trial is a TOYOTA KDH201RSSPNY diesel light goods vehicle with a GVW of 2,800 kg and an engine with a cylinder capacity of 2,982 c.c.. Starting from November 2022, another DV, a Hyundai diesel light goods vehicle with a GVW of 3,230 kg and an engine with a cylinder capacity of 2,497 c.c., was assigned as the conventional vehicle for comparison. The EV and DV were used for the delivery of food products in the New Territories region.

[1] The Administration of the New Energy Transport Fund (previously named Pilot Green 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 Four Season installed a designated 30 kW DC charger for charging the EV and recording the amount of electricity charged. The EV was charged on a daily basis.

2.3 Key features of the EV, the charging facility and the DVs are in Appendix 1 and their photos are in Appendix 2.

3. Trial Information

3.1 The trial commenced on 1 December 2021 and lasted for 24 months. Four Season was required to collect and provide trial information including the EV's mileage reading before charging, amount of electricity consumed and time used in each charging, and operation downtime due to charging, cost and downtime associated with scheduled and unscheduled maintenances of the EV and the charging facility. Similar data of the DV were also required. In addition to the cost information, reports on maintenance work, operational difficulties and opinions of the driver and Four Season were collected to reflect any problems of the EV.

4. Findings of Trial

4.1 Table 1 summarizes the statistical data of the EV and the DV. The EV had a traffic accident on 6 September 2023 and returned to work on 14 March 2024, thus data covered in this report ranged from 1 December 2021 to 31 August 2023 only for both the EV and the DV. The average fuel cost of the EV was HK$2.75/km (89%) less than that of the DV. The average total operating cost of the EV was HK$2.59/km (84%) lower than that of the DV.

Table 1: Key operation statistics of each vehicle (1 December 2021 – 30 November 2023)

		EV [5]	**DV** [5]
Total distance travelled (km)		87,961	22,626
Average daily mileage (km per working day)		140	35
Average fuel economy	(km/kWh)	4.16	-
	(km/litre)	-	6.63
	(km/MJ)	1.16	0.184 [1]
Average fuel cost (HK$/km)		0.338 [2]	3.09 [3]
Average total operating cost (HK$/km)		0.501	3.09
Downtime (working day) [4]		9	1

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

[2] Electricity cost was based on HK$1.218/kWh for 2021, HK$1.289/kWh for January to October 2022, HK$1.451/kWh for November to December 2022, HK$1.544/kWh for January to February 2023, HK$1.552/kWh for March and April 2023, HK$1.565/kWh for May 2023, HK$1.559/kWh for June 2023, HK$1.535/kWh for July 2023, HK$1.508/kWh for August 2023, HK$1.482/kWh for September 2023, HK$1.459/kWh for October and HK$1.442 for November 2023

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

[4] Downtime refers to the working days the vehicle is not in operation, which is counted from the first day it stops operation till the day it is returned to the operator.

[5] The EV had an accident on 6 September 2023 and returned to work in March 2024, thus data covered in this report ranged from 1 December 2021 to 31 August 2023 only, for both the EV and the DV.

4.2 There were 730 days in the trial period, but only 639 working days were considered because the last three months were not accounted for due to the accident of the EV. There were two scheduled and three unscheduled maintenances for the EV and two scheduled maintenances for the DV, in the 24 months of the trial. Scheduled maintenances of the EV and the DV were for annual examinations and related maintenance work. Unscheduled maintenance of the EV was for the repair of a damaged side view glass, replaced the steering shaft bearing parts and a resistor of the air conditioning system. The EV had 9 days of downtime while the DV had one day of downtime, the utilization rates were therefore 98.6% for the EV and 99.8% for the DV.

4.3 In the 24 months of the trial, the total and daily mileages of the EV were 87,961 km and 140 km, respectively; while the total and daily mileages of the DV were 22,626 km and 35 km, respectively. The average fuel cost of the EV was HK$2.75/km (89%) less than that of the DV. The average total operating cost of the EV was HK$2.59/km (84%) lower than that of the DV.

4.4 To eliminate the seasonal effect, a 12-month moving average is used in this report to evaluate the trend of the fuel economy of the EV. Based on the evaluation of the 12-month moving average fuel economy, there was no significant change in the fuel economy of the EV in the 24-month trial period. The deterioration in battery capacity of the EV within the 24-month trial period was estimated to be about 10%.

4.5 For comparison purpose, the carbon dioxide equivalent (CO_2e) emission of a DV can be evaluated based on the mileage of the EV and the fuel economy of the DV. In the 24-month of the trial, the carbon dioxide equivalent (CO_2e) emission from the EV was 8,240 kg while the CO_2e emission from the DV was 36,807 kg. Hence, there was a 28,566 kg (i.e., about 78%) reduction of CO_2e if the DV was replaced by the EV in the trial.

4.6 The driver of the EV had no problem in operating the EV but did not have any particular comments on its performance. Four Season considered that using the EV is good because it can provide a greener and quieter environment as well as EV has a lower fuel cost. However, after the traffic accident, he had the opinion that the EV was not easier and cheaper to maintain and the performance had deteriorated.

5. Summary

5.1 In this trial, the daily mileages of the EV and the DV were 140 and 35 km, respectively. The average fuel cost of the EV was HK$2.75/km (89%) less than that of the DV. The average total operating cost of the EV was HK$2.59/km (84%) lower than that of the DV.

5.2 The utilization rates of the EV and the DV were 98.6% and 99.8%, respectively. There was no significant change in the fuel economy of the EV in the trial period. There was 10% reduction in the battery capacity of the EV.

5.3 There was a 28,566 kg (i.e., about 78%) reduction of CO_2e if the DV was replaced by the EV.

5.4 The drivers of the EV had no problem in operating the EV but did not have any particular comments on the performance of the EV. Four Season considered that using the EV is good because it can provide a greener and quieter environment as well as EV has a lower fuel cost. However, after the traffic accident, he had the opinion that the EV was not easier and cheaper to maintain and the performance had deteriorated.

5.5 The findings showed electric light goods vehicles are becoming more affordable and feasible to the transport trade for saving operating cost and reducing CO_2e emissions, provided that the vehicles can get easy access to charging facilities.

Appendix 1: Key Features of the Vehicles and EV Charging Facility

1. Trial EV and Charging Facility

EV

Registration mark	**XG6115**
Make:	Joylong
Model:	EW5
Class:	Light goods vehicle
Gross vehicle weight:	4,300 kg
Payload:	1,300 kg
Seating capacity:	Driver + 4 passengers
Rated power:	100 kW
Travel range:	330 km (air conditioning off)
Battery material:	lithium-ion
Battery capacity:	73.4 kWh
Year of manufacture:	2019

Charging Facility

Make:	Hangzhou AoNeng Power Supply Equipment Co. Ltd
Model:	ANDC5-500V/60A-1
Power:	30 kW, DC (max 500V / 60A)
Charging Standard:	GB mode

2. DV Used for Comparison (TY908 from Dec/2021, TR9172 since Nov/2022)

Registration mark	**TY908**	**TR9172**
Make:	Toyota	Hyundai
Model:	KDH201RSSPNY	H1 Van AT Euro 5
Class:	Light goods vehicle	Light goods vehicle
Gross vehicle weight:	2,800 kg	3,230 kg
Payload:	N.A.	1,150 kg
Seating capacity:	Driver + 4 passengers	Driver + 5 passengers
Cylinder capacity:	2,982 cc	2,497 cc
Year of manufacture:	2011	2015

Appendix 2: Photos of Vehicles and Charging Facility

1. Trial EV and EV Charging Facility

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>EV – Front view</td><td>EV – Rear view</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>EV – Right side view</td><td>EV – Left side view</td></tr>
<tr><td>  </td><td></td></tr>
<tr><td>30 kW DC charging facility</td><td></td></tr>
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2. Diesel Vehicle (DV) for Comparison (TY908 from Dec/2021, TR9172 since Nov/2022)

DV (TY908)

	
DV – Front view	DV – Rear view
	
DV – Right side view	DV – Left side view

DV(TR9172)

	
DV- Front view	DV- Rear view