New Energy Transport Fund

Final Report
On
Trial of Electric Light Goods Vehicles for Logistics Service
(Tai Shing Hong Company Limited)

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(Reporting Period: 1 September 2023 - 31 August 2024)

Executive Summary

1. Introduction

1.1 The New Energy 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. Tai Shing Hong Company Limited (Tai Shing Hong) was approved under the Fund for trial of two electric light goods vehicles for logistics service. Tai Shing Hong, through the tendering procedures stipulated in the Subsidy Agreement entered with the Government, procured one Joylong EW4 electric light goods vehicle (EV) and one Joylong EW5 electric light goods vehicle for trial.

1.2 Hong Kong Productivity Council has been commissioned by the Environment and Ecology Bureau (Environment Branch) (EEB) as an independent third-party assessor (the Assessor) to monitor the trial and evaluate the performance of the trial vehicles. Tai Shing Hong assigned two diesel light goods vehicles (DV) providing same services as the conventional counterparts for comparison.

1.3 This Final Report summarises the performance of the EV in the 12 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 EW4 electric light goods vehicle, has a gross vehicle weight (GVW) of 3,700 kg, capable of carrying a driver with five passengers and goods. It has a 73 kWh lithium-ion battery pack. According to its manufacturer, it has a driving range of 300 km with air-conditioning off. Another trial EV, Joylong EW5 electric light goods vehicle, has a GVW of 4,300 kg, capable of carrying a driver with four passengers and goods. It has a 73.4 kWh lithium-ion battery pack. According to its manufacturer, it has a driving range of 330 km with air-conditioning off. There are two designated drivers assigned to drive the EVs.

2.2 The DVs, an Isuzu NHR87E-VI diesel light goods vehicle, with a GVW of 3,500 kg and a cylinder capacity of 1,898 c.c. and an Isuzu NMR85F-VI-C diesel light goods vehicle, with a GVW of 5,200 kg and a cylinder capacity of 2,999 c.c., were used as the conventional counterparts for comparison in this trial. There is no designated driver assigned to drive the DVs. The vehicles were used for delivering tyres and batteries to different clients in Hong Kong.

2.3 Tai Shing Hong has installed 2 units of 30 kW DC charging facilities for charging the EVs. Key features of the EVs and the DVs as well as the EV charging facilities are presented

in Appendix 1. The photos of vehicles and the EV charging facilities are shown in Appendix 2.

3. Trial Information

3.1 The trial commenced on 1 September 2023 and lasted for 12 months. Tai Shing Hong 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, operation downtime due to charging, and cost and downtime associated with scheduled and unscheduled maintenances of the EVs and the charging facilities. Similar data of the DV were also required. In addition to the cost information, reports on maintenance work, operational difficulties and opinions of the drivers and Tai Shing Hong were collected to reflect any problems of the EVs.

4. Findings of Trial

4.1 The following table summarises the statistical data of the EVs and the DVs. The fleet average fuel cost of the EVs was HK$2.45/km (about 82%) lower than that of the DVs. Taking the maintenance fee and other costs into account, the fleet average total operating cost of the EVs was HK$2.97/km (about 82%) lower than that of the DVs in the 12 months of the trial.

Table 1: Key operation statistics of each vehicle (1 September 2023 - 31 August 2024)

		EV		**DV**	
		EV-1	**EV-2**	**DV-1** [1]	**DV-2**
Total distance travelled (km)		32,549	44,256	18,275	27,789
Average daily mileage (km/working day)		110	150	64	95
Average fuel economy	(km/kWh)	2.89	2.92	-	-
	(km/litre)	-	-	8.15	7.58
	(km/MJ)	0.80	0.81	0.23 [2]	0.21 [2]
Fleet average fuel economy (km/MJ)		0.81		0.22	
Average fuel cost (HK$/km)		0.52 [3]	0.51 [3]	2.85 [4]	3.09 [4]
Fleet average fuel cost (HK$/km)		0.52		2.97	
Average total operating cost (HK$/km) [4]		0.68	0.63	3.93	3.32
Fleet average total operating cost per km (HK$/km)		0.66		3.63	
Downtime (working day) [5][6]		1	1	13	3

[1] The DV-1 had an engine problem and did not operate under a good condition in Jan 2024 and Mar 24. The fuel economy of the DV-1 in Jan 2024 and Mar 24 was exceptionally higher than those in other months. Thus, the operation data of the DV-1 in Jan 2024 and Mar 24 was excluded in the evaluation of the vehicle performance.

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

[3] The electricity cost was calculated using average electricity tariff rates of HK$1.482/kWh (Sep 2023); HK$1.459/kWh (Oct 2023); HK$1.442/kWh (Nov 2023); HK$1.431/kWh (Dec 2023); HK$1.523/kWh (Jan 2024 – Feb 2024); HK$1.513/kWh (Mar 2024); HK$1.507/kWh (Apr 2024); HK$1.499/kWh (May 2024); HK$1.500/kWh (Jun 2024); HK$1.496/kWh (Jul 2024) and; HK$1.496/kWh (Aug 2024) as reported by CLP.

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

[5] Maintenance due to incident not related to the performance of the vehicle was not included for comparing the performance.

[6] Downtime refers to the working days that the vehicle is not in operation due to charging or maintenance, which is counted from the first day it stops operation till the day it is returned to the operator.

4.2 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 the 12 months of the trial period, both the EVs had one scheduled maintenance. The DV-1 had one scheduled maintenance and two unscheduled maintenance events, while DV-2 had one scheduled maintenance and one unscheduled maintenance.

4.3 In the 12 months of the trial period, both the EVs had one day of downtime, and the DV-1 had 13 days of downtime, and the DV-2 had 3 days of downtime. Hence, the utilisation rates were 99.7%, 99.7%, 95.6% and 99.0% for EV-1, EV-2, DV-1 and DV-2 respectively.

4.4 The drivers of the EVs liked driving the EVs and had no operation difficulties in driving the EVs. Overall, they were satisfied with the performance of the EVs. Tai Shing Hong was satisfied with the EVs since the EVs could meet the operational requirements and save the operation cost. Given the opportunity, Tai Shing Hong would encourage other transport operators to try the EVs.

4.5 It is observed that the amount of electricity stored in the battery after a full charging operation could be maintained at the level of 73 kWh for the EV-1 and 73.4 kWh for the EV-2after the 12-month trial period. Thus, the deterioration in battery capacity within the 12-month trial period was insignificant, if any.

4.6 Based on the total mileage of the EVs and the fuel economy of the DVs, the equivalent carbon dioxide (CO_2e) emission from the DVs could be estimated for comparison purpose. In the 12-month trial period, the total CO_2e emission from the EVs was 10,121 kg while that from the DVs was 27,265 kg. Hence, there was a total reduction of 17,144 kg (about 63%) CO_2e of the fleet, with the replacement of the DVs by the EVs in the trial.

5. Summary

5.1 The fleet average fuel cost of the EVs was HK$2.45/km (about 82%) lower than that of the DVs. Taking the maintenance fee and other costs into account, the fleet average total operating cost of the EVs was HK$2.97/km (about 82%) lower than that of the DVs. The utilisation rates of the EV-1, EV-2, DV-1 and the DV-2 were 99.7% 99.7%, 95.6% and 99.0%, respectively. There was a 17,144 kg (about 63%) reduction of CO_2e, with the replacement of the DVs by the EVs in the trial.

5.2 It is observed that the amount of electricity stored in the battery after a full charging operation could be maintained at the level of 73 kWh for the EV-1 and 73.4 kWh for the EV-2 after the 12-month trial period. Thus, the deterioration in battery capacity within the 12-month trial period was insignificant, if any.

5.3 The drivers of the EVs liked driving the EVs and had no operation difficulties in driving the EVs. Overall, they were satisfied with the performance of the EVs. Tai Shing Hong was satisfied with the EVs since the EVs could meet the operational requirements and save the operation cost. Given the opportunity, Tai Shing Hong would encourage other transport operators to try the EVs.

5.4 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 Vehicles and Charging Facilities

1. Trial EV and Charging Facility

(a) Trial EVs

Registration mark:	**YR8129 (EV-1)**	**YR8078 (EV-2)**
Make:	Joylong	Joylong
Model:	EW4	EW5
Class:	Light goods vehicle	Light goods vehicle
Gross vehicle weight:	3,700 kg	4,300 kg
Payload:	1,100 kg	1,300 kg
Seating capacity:	Driver + 5 passengers	Driver + 4 passengers
Rated power:	50 kW	50 kW
Driving range:	300 km (air-conditioning off)	330 km (air-conditioning off)
Battery material:	Lithium-ion	Lithium-ion
Battery capacity:	73 kWh	73.4 kWh
Year of manufacture:	2023	2023

(b) EV Charging Facilities

Chargers	Charger# 1	Charger# 2
Make:	Only Power Supply	Only Power Supply
Model:	ANDC5-30KW/1000V	ANDC5-30KW/750V
Power:	30 kW, 200-1000V DC / max 100A	30 kW, 200-750V DC / max 100A
Charging standard:	GB Mode	GB Mode

2. DVs Used for Comparison

Registration mark:	**VZ3827 (DV-1)**	**WL6863 (DV-2)**
Make:	Isuzu	Isuzu
Model:	NHR87E-VI	NMR85F-VI-C
Class:	Light goods vehicle	Light goods vehicle
Gross vehicle weight:	3,500 kg	5,200 kg
Payload:	1,000 kg	1,800 kg
Seating capacity:	Driver + 2 passengers	Driver + 2 passengers
Cylinder capacity:	1,898 c.c.	2,999 c.c.
Year of manufacture:	2019	2019

Appendix 2: Photos of Vehicles and Charging Facilities

1. Trial EVs and Charging Facilities

a) Trial EVs

EV-1 (YR8129)

	
Front view of EV1	Rear view of EV1
	
Left side view of EV1	Right side view of EV1

EV-2 (YR8078)

	
Front view of EV2	Rear view of EV2
	
Left side view of EV2	Right side view of EV2

b) Charging Facilities

	
30 kW DC Charging Facility #1	30 kW DC Charging Facility #2

2. DVs Used for Comparison

DV-1 (VZ3827)

	
Front view of DV1	Rear view of DV1
	
Left side view of DV1	Right side view of DV1

DV-2 (WL6863)

	
Front view of DV2	Rear view of DV2
	
Left side view of DV2	Right side view of DV2