

New Energy Transport Fund

Final Report
On
Trial of Electric Light Goods Vehicles for
Construction Industry
(Hanison Construction Company Limited)

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PREPARED BY:
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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 Construction Industry
(Hanison Construction Limited)**

**Final Report
(Reporting Period: 1 March 2023 – 29 February 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. Hanison Construction Company Limited (Hanison) was approved under the Fund for trial of three electric light goods vehicles for construction industry. Through the tendering procedures stipulated in the Agreement entered into with the Government, Hanison procured three Joylong EW5 electric light goods vehicles (EVs) 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. Hanison assigned a Toyota Hiace KDH201RSSMDY diesel light goods vehicle and two Toyota Hiace Diesel LWB diesel light goods vehicles (DVs) providing same services as the conventional counterparts for comparison.

1.3 This Final Report summarises the performance of the EVs in the 12 months of the trial as compared with their conventional counterparts, i.e. the DVs.

2. Trial and Conventional Vehicles

2.1 The trial EV, Joylong EW5 electric light goods vehicle, has a gross vehicle weight of 4,300 kg capable of carrying a driver with four passengers and goods. It has a 73.4 kWh lithium-ion battery pack and a driving range of 330 km with its battery fully charged with air-conditioning off.

2.2 The DVs, a Toyota Hiace KDH201RSSMDY diesel light goods vehicle with a gross vehicle weight of 2,800 kg and a diesel engine with a cylinder capacity of 2,982 c.c. and two Toyota Hiace Diesel LWB with a gross vehicle weight of 2,800 kg and a cylinder capacity of 2,982 c.c., were used as the conventional counterparts for comparison in this trial.

2.3 The EVs and the DVs were used for delivering construction materials and tools of construction machinery between the warehouse in Ping Che and the construction sites in Hong Kong.

2.4 Hanison installed three designated 30 kW DC charging facilities at its warehouse and

two construction sites in Kai Tak and Tuen Mun for charging and recording the amount of electricity charged. Key features of the EVs, the charging facilities and the DVs are detailed in Appendix 1 and photos of the vehicles and the charging facilities are shown in Appendix 2.

3. Trial Information

3.1 The trial commenced on 1 March 2023 and lasted for 12 months. Hanison was required to collect and provide trial information including the EVs' 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 Hanison 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\$1.60/km (about 77%) 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\$1.66/km (about 63%) lower than that of the DVs in the 12 months of the trial.

Table 1: Key operation statistics of each vehicle (1 March 2023 – 29 February 2024)

		EVs			DVs		
		EV-1	EV-2	EV-3	DV-1 ^[1]	DV-2	DV-3
Total distance travelled (km)		7,994	8,827	29,840	25,543	14,621	25,792
Average daily mileage (km/working day)		28	30	101	87	50	87
Average fuel economy	(km/kWh)	3.37	2.95	3.15	-	-	-
	(km/litre)	-	-	-	11.12	10.06	10.69
	(km/MJ)	0.94	0.82	0.88	0.31 ^[2]	0.28 ^[2]	0.30 ^[2]
Average fuel cost (HK\$/km)		0.45 ^[3]	0.51 ^[3]	0.48 ^[3]	1.99 ^[4]	2.15 ^[4]	2.10 ^[4]
Fleet average fuel cost (HK\$/km)		0.48			2.08		
Average total operating cost (HK\$/km) ^[5]		1.13	1.14	0.66	2.24	3.21	2.48
Fleet average total operating cost (HK\$/km) ^[5]		0.98			2.64		
Downtime (working day) ^{[5][6]}		8	4	3	3	4.5	2

^[1] Based on the historical data from 1 July 2022 to 30 June 2023.

^[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\$1.552/kWh (Mar 2023 – Apr 2023); HK\$1.565/kWh (May 2023); HK\$1.559/kWh (Jun 2023); HK\$1.535/kWh (Jul 2023); HK\$1.508/kWh (Aug 2023); HK\$1.482/kWh (Sep 2023); HK\$1.459/kWh (Oct 2023); HK\$1.442/kWh (Nov 2023); HK\$1.431/kWh (Dec 2023) and; HK\$1.523/kWh (Jan 2024 – Feb 2024) as reported by CLP.

^[4] The market fuel prices from 1 March 2023 to 29 February 2024 were 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 EV are also included in Table 1. EV-1, EV-2, EV-3, DV-1 and DV-3 had one scheduled maintenance while DV-2 had two scheduled maintenances. In addition, the EV-1 had two unscheduled maintenances in the 12 months of the trial period.

4.3 There were 297 working days in the 12 months of the trial period. The utilisation rates were 97.3% for EV-1, 98.7% for EV-2 and 99.0% for EV-3, compared with 99.0% for DV-1, 98.5% for DV-2 and 99.3% for DV-3. Based on the above, the average daily mileages of EV-1, EV-2 and EV-3 were 28 km, 30 km, and 101 km respectively. For the DVs, the average daily driving distances were 87 km for DV-1, 50 km for DV-2 and 87 km for DV-3.

4.4 The drivers of the EVs had no operation difficulties in driving the EVs. The drivers agreed that the air was cleaner inside the EVs and the EVs were quieter than the DVs. However, the driver of EV-2 considered that the power of the EV was not good enough on uphill driving comparing with the DV and the performance of the EV has slightly deteriorated. Overall, Hanison was satisfied with the EVs since the EVs could save the operational cost and it was easier and cheaper to maintain the EVs. Thus, given the opportunity, Hanison would replace the existing conventional vehicles with green vehicles.

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

4.6 In the 12 months of the trial period, the total equivalent carbon dioxide (CO_{2e}) emission from the EVs was 5,785 kg. For comparison purpose, based on the mileage of the EVs and the fuel economy of the DVs, the total CO_{2e} emission from the DVs was 12,167 kg. Hence, there was a 6,382 kg (about 52%) reduction of CO_{2e}, with the replacement of three DVs by three EVs in the trial.

5. Summary

5.1 The fleet average fuel cost of the EVs was HK\$1.60/km (about 77%) 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\$1.66/km (about 63%) lower than that of the DVs. The utilisation rates were 97.3% for EV-1, 98.7% for EV-2 and 99.0% for EV-3, compared with 99.0% for DV-1, 98.5% for DV-2 and 99.3% for DV-3. There was a 6,382 kg (about 52%) reduction of CO_{2e}, with the replacement of three DVs by three EVs in the trial.

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

5.3 In general, the drivers of the EVs had no operation difficulties in driving the EVs. Overall, Hanison was satisfied with the EVs since the EVs could save the operational cost and it was easier and cheaper to maintain 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 CO₂e emissions, provided that the vehicles can get easy access to charging facilities.

Appendix 1: Key Features of Vehicles and Charging Facilities

1. Trial EVs and Charging Facilities

EVs

Registration mark:	YH531 (EV-1), YH1324 (EV-2), YL1257 (EV-3)
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
Driving range:	330 km (air conditioning off)
Battery material:	Lithium-ion
Battery capacity:	73.4 kWh
Year of manufacture:	2022

EV Charging Facilities

No. of Charging Facility:	3
Make:	Only Power Supply
Model:	ANDC5-30KW/750V
Power:	30 kW 200 – 750 V DC / max 100A
Charging standard:	GB Mode

2. DVs Used for Comparison

Registration mark:	NN2160 (DV-1)
Make:	Toyota
Model:	Hiace KDH201RSSMDY
Class:	Light goods vehicle
Gross vehicle weight:	2,800 kg
Payload:	850 kg
Seating capacity:	Driver + 5 passengers
Cylinder capacity:	2,982 c.c.
Year of manufacture:	2008

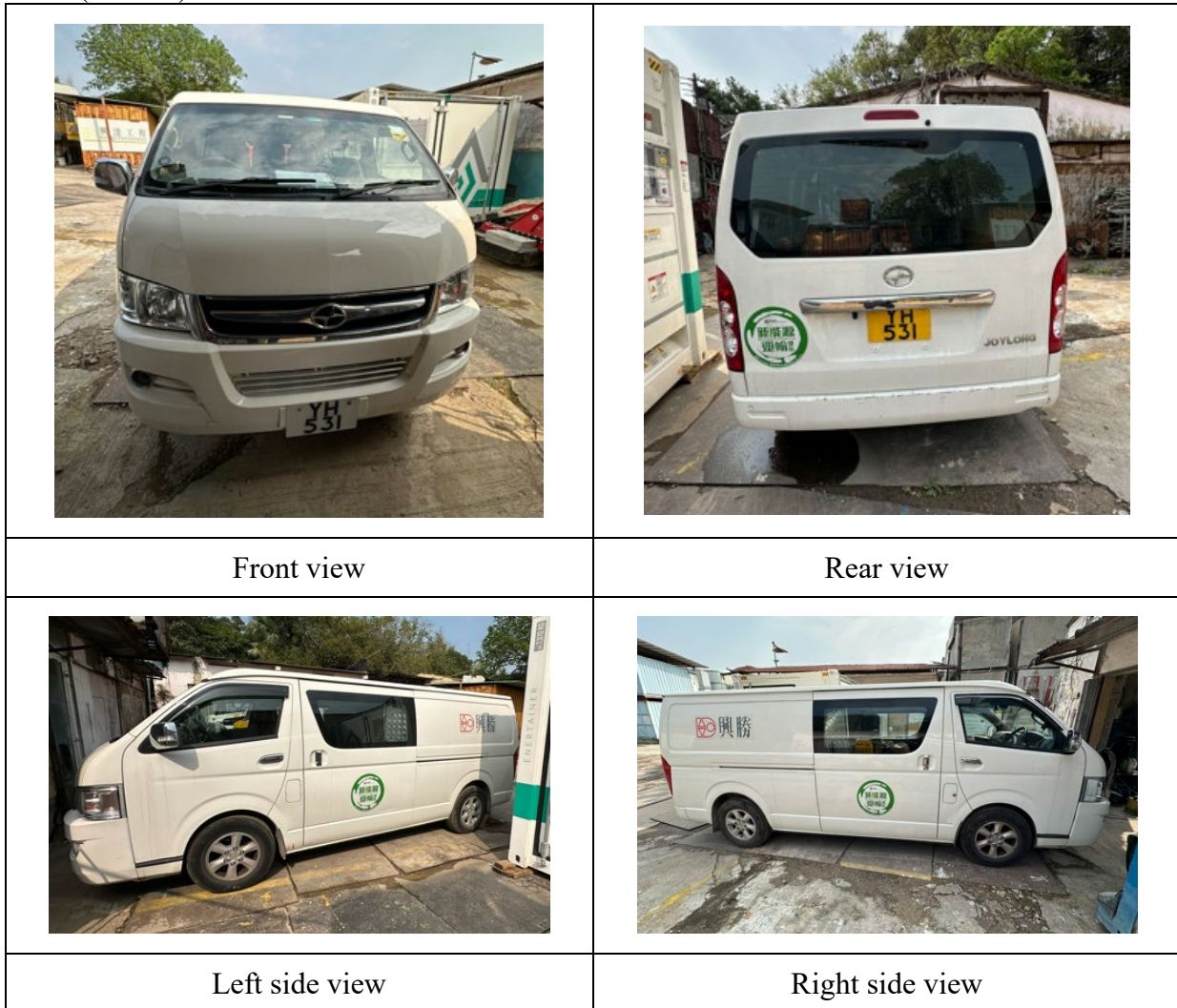
Registration mark:	TZ9486 (DV-2), TZ9667 (DV-3)
Make:	Toyota
Model:	Hiace Diesel LWB
Class:	Light goods vehicle
Gross vehicle weight:	2,800 kg
Payload:	850 kg
Seating capacity:	Driver + 5 passengers
Cylinder capacity:	2,982 c.c.
Year of manufacture:	2016

Appendix 2: Photos of Vehicles and Charging Facilities

1. Trial EVs and Charging Facilities

(a) Trial EVs

EV-1 (YH531)



EV-2 (YH1324)



Front view



Rear view



Left side view



Right side view

EV-3 (YL1257)



Front view



Rear view



Left side view



Right side view

(b) EV Charging Facilities



30 kW DC charger #1 at Ping Che warehouse



30 kW DC charger #2 at Muk On Street construction site, Kai Tak



30 kW DC charger #3 at Hin Fat Lane construction site, Tuen Mun



22 kW three-phase AC charger
(Carried by the EV)

2. DVs used for Comparison
DV-1 (NN2160)



Front view



Rear view



Left side view



Right side view

DV-2 (TZ9486)



Front view



Rear view



Left side view



Right side view

DV-3 (TZ9667)



Front view



Rear view



Left side view



Right side view