

New Energy Transport Fund

Final Report

On

Trial of Electric Light Goods Vehicle for

Electrical and Mechanical Engineering Industry

(Uni-Power Engineering Limited)

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PREPARED BY:

Dr. Rick MO

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.

List of Monitoring and Evaluation Team Members

Dr. Rick MO (Team Leader)

Smart City Division

Hong Kong Productivity Council

Ms. Rachel CHAN

Smart City Division

Hong Kong Productivity Council

Mr. Miracle SUN

Smart City Division

Hong Kong Productivity Council

Mr. Sam SHAN

Smart City Division

Hong Kong Productivity Council

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Industry
(Uni-Power Engineering 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. Uni-Power Engineering Limited (Uni-Power) was approved under the Fund for trial of one electric light goods vehicle for electrical and mechanical engineering industry. Uni-Power, through the tendering procedures stipulated in the Subsidy Agreement entered with the Government, procured a Joylong EW4 electric light goods vehicle (EV) 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 vehicle. Uni-Power assigned one diesel light goods vehicle (DV) providing same services as the conventional counterpart 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 and the driving range is 300 km with air-conditioning off. The DV, Hyundai H-1 A/T Euro 6 diesel light goods vehicle with a GVW of 3,200 kg and a cylinder capacity of 2,497 c.c., was used as the conventional counterpart for comparison in this trial. There is a designated driver assigned to drive the EV and another designated driver is assigned to drive the DV. The vehicles were used for delivering maintenance tools and materials to different sites in Hong Kong.

2.2 Uni-Power has installed a designated 31 kW DC charging facility for charging the EV. Key features of the EV, the charging facility and the DV are detailed in Appendix 1 and photos of the vehicles and the charging facility are shown in Appendix 2.

3. Trial Information

3.1 The trial commenced on 1 September 2023 and lasted for 12 months. Uni-Power 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 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 drivers and Uni-Power were collected to reflect any problems of the EV.

4. Findings of Trial

4.1 The following table summarises the statistical data of the EV and the DV. The average fuel cost of the EV was HK\$4.05/km (about 90%) lower than that of the DV. Taking the maintenance fee and other costs into account, the average total operating cost of the EV was HK\$4.97/km (about 88%) lower than that of the DV in the 12 months of the trial.

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

		EV	DV
Total distance travelled (km)		14,479	9,219
Average daily mileage (km/working day)		49	31
Average fuel economy	(km/kWh)	3.46	-
	(km/litre)	-	5.25
	(km/MJ)	0.96	0.15 ^[1]
Average fuel cost (HK\$/km)		0.43 ^[2]	4.48 ^[3]
Average total operating cost (HK\$/km) ^[4]		0.65	5.62
Downtime (working day) ^{[4][5]}		4	4

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

^[2] 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.

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

^[4] Maintenance due to incident not related to the performance of the vehicle was not included for comparing the performance.

^[5] 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. In the 12 months of the trial period, both the EV and the DV had one scheduled maintenance, and the EV had three unscheduled maintenances.

4.3 In the 12 months of the trial period, both EV and DV had four days of downtime, respectively. Hence, the utilisation rate of the both EV and the DV was 98.7%. Based on the above, the average daily driving distances of the EV and the DV were 49 km and 31 km, respectively.

4.4 The drivers of the EV had no operation difficulties in driving the EV. They pointed out that the power of the EV was not good on uphill, the response of the EV was slow, and the EV

was not quieter. Overall, they were not satisfied with the performance of the EV. Uni-Power was satisfied with the EV since the EV could meet the operational requirements and save the operation cost. Given the opportunity, Uni-Power would encourage other transport operators to try the EVs. However, Uni-Power commented that they will not replace the DV with EV because charging the EV is inconvenient.

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 after 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 EV and the fuel economy of the DV, the equivalent carbon dioxide (CO_{2e}) emission from the DV could be estimated for comparison purpose. In the 12-month trial period, the CO_{2e} from the EV was 1,608 kg while that from the DV based on its average fuel economy was 7,652 kg. Hence, there was a total reduction of 6,044 kg CO_{2e}, which is about 79% reduction, with the replacement of the DV by the EV in the trial.

5. Summary

5.1 The average fuel cost of the EV was HK\$4.05/km (about 90%) lower than that of the DV. Taking the maintenance fee and other costs into account, the average total operating cost of the EV was HK\$4.97/km (about 88%) lower than that of the DV. The utilisation rates of both the EV and the DV was 98.7%. There was a 6,044 kg (about 79%) reduction of CO_{2e}, with the replacement of the DV by the EV 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 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 EV had no operation difficulties in driving the EV. They pointed out that the power of the EV was not good on uphill, the response of the EV was slow, and the EV was not quieter. Overall, they were not satisfied with the performance of the EV. Uni-Power was satisfied with the EV since the EV could meet the operational requirements and save the operation cost. Given the opportunity, Uni-Power would encourage other transport operators to try the EVs. However, Uni-Power commented that they will not replace the DV with EV because charging the EV is inconvenient.

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 Facility

1. Trial EV and Charging Facility

(a) Trial EV

Registration mark:	KT423
Make:	Joylong
Model:	EW4
Class:	Light goods vehicle
Gross vehicle weight:	3,700 kg
Payload:	1,100 kg
Seating capacity:	Driver + 5 passengers
Rated power:	50 kW
Driving range:	300 km (air-conditioning off)
Battery material:	Lithium-ion
Battery capacity:	73 kWh
Year of manufacture:	2023

(b) EV Charging Facility

Make:	SZBAOYUE
Model:	B100031
Power:	31 kW, 200V – 1000V DC / max 100A
Charging standard:	GB Mode

2. DV Used for Comparison

Registration mark:	UZ409
Make:	Hyundai
Model:	H-1 A/T Euro 6
Class:	Light goods vehicle
Gross vehicle weight:	3,200 kg
Payload:	1,060 kg
Seating capacity:	Driver + 5 passengers
Cylinder capacity:	2,497 c.c.
Year of manufacture:	2017

Appendix 2: Photos of Vehicles and Charging Facility

1. Trial EV and Charging Facility

	
Front view of EV	Rear view of EV
	
Left side view of EV	Right side view of EV
	
31 kW DC charging facility	

2. DV Used for Comparison

	
Front view of DV	Rear view of DV
	
Left side view of DV	Right side view of DV