

**Pilot Green Transport Fund**

**Final Report**

**On**

**Trial of Electric Light Goods Vehicle for**

**Retail and Wholesale Industry II**

**(Kau Kee Hong Kong Limited)**

(30 October 2023)

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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 Vehicle for Retail and Wholesale Industry II  
(Kau Kee Hong Kong Limited)**

**Final Report  
(Reporting Period: 1 October 2020 – 30 September 2022)**

**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. Kau Kee Hong Kong Limited (Kau Kee) was approved under the Fund for trial of 24 months on one electric light goods vehicle for retail and wholesale industry. Kau Kee, through the tendering procedures stipulated in the Agreement entered into with the Government, procured one Renault Kangoo Z.E. 33 electric light goods vehicle (EV) for trial.

1.2 PolyU Technology and Consultancy Company Limited has been engaged by the Environmental Protection Department as an independent third-party assessor (the Assessor) to monitor the trial and evaluate the performance of the trial vehicle. Kau Kee assigned a Hino diesel light goods vehicle (DV) providing similar services as the conventional counterpart for comparison.

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, Renault Kangoo Z.E. 33 electric light goods vehicle, has a gross vehicle weight (GVW) of 2,270 kg capable to of carrying a driver with four passengers and goods. The EV contains a 33 kWh lithium-ion battery pack. According to its manufacturer, it has a travel range of 270 km with its battery fully charged and air-conditioning off. A designated driver was assigned for the EV.

2.2 Kau Kee assigned the DV, Hino diesel light goods vehicle, with a GVW of 5,500 kg, capable of carrying a driver and two passengers and goods, and a cylinder capacity of 4,009 c.c. for comparison with the EV.

2.3 The vehicles are mainly used for the distribution of wholesale and retail goods to different areas of Hong Kong. The services are conducted from Monday to Saturday, including public holidays. The operating hours are from 08:00 to 20:00.

2.4 Kau Kee has installed its own 7 kW AC charging facility inside its car-park in Kwai Chung where the EV was normally parked overnight. The AC charging facility was used for charging and recording the amount of electricity consumed. Key features of the EV, the charging facility and the DV are in Appendix 1 and their photos are in Appendix 2.

### 3. Trial Information

3.1 The trial commenced on 1 October 2020 and lasted for 24 months. Kau Kee 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, cost and downtime associated with scheduled and unscheduled maintenances of the EV and the charging facility. Similar set of data of the DV was also required. In addition to the cost information, reports on maintenance work, operational difficulties and opinions of the driver and Kau Kee 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.

Table 1: Key operation statistics of each vehicle (1 October 2020 to 30 September 2022)

	<b>EV</b>	<b>DV</b>
Total mileage (km)	28,327	28,321
Average daily mileage (km/working day)	47	46
Average fuel economy	(km/kWh)	5.21
	(km/litre)	-
	(km/MJ)	1.45
Average fuel cost (HK\$/km)	0.24 <sup>[2]</sup>	3.43 <sup>[3]</sup>
Average total operating cost (HK\$/km) [4]	0.52	4.13
Downtime (working day) <sup>[4][5]</sup>	28	6.5

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

<sup>[2]</sup> Electricity cost was based on the market price HK\$1.218/kWh for 2020/2021 and HK\$1.289 for 2022

<sup>[3]</sup> The market fuel price was used for calculation

<sup>[4]</sup> Maintenance and downtime not related to vehicle performance was not included in comparison

<sup>[5]</sup> Downtime refers to the working days in which 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, there were 626 working days. The EV had 28 days of downtime and the DV had 6.5 days of downtime. Hence, the utilization rates were 95.5% and 99% for the EV and the DV, respectively. The average daily mileages of the EV and the DV were 47 km/day and 46 km/day respectively.

4.3 During the 24 months of the trial, the total mileage and the average daily mileage of the EV were 28,327 km and 47 km/day, respectively while those of the DV were

28,321 km and 46 km/day, respectively. The average fuel cost of the EV was HK\$3.19/km (93%) lower than that of the DV. Taking maintenance fee into account, the average total operating cost of the EV was HK\$3.61/km (87%) lower than that of the DV.

4.4 To remove the effect of seasonal fluctuations, the 12-month moving average were used to evaluate the trend of the EV's fuel economy. The 12-month moving average fuel economy increased by 8% in the 24-month trial period. The deterioration in the battery capacity of the EV was slight, if any.

4.5 In the 24-month of the trial, the total carbon dioxide equivalent (CO<sub>2e</sub>) emission from the EV was 1,866 kg. For comparison purpose, based on the mileage of the EV and the fuel economy of the DV, the total CO<sub>2e</sub> emission from the DV was 13,500 kg. Hence, there was a 11,634 kg (i.e., about 86%) reduction of CO<sub>2e</sub>, with the replacement of DV by EV in the trial.

4.6 The driver of the EV had no problem in operating the EV and was satisfied with its performance. However, he preferred to drive the DV rather than the EV as the DV was more powerful going uphill. Kau Kee considered that using the EV is good because it can provide a greener and quieter environment with a lower fuel cost, but would look for a model with larger power and capacity in the future.

## **5. Summary**

5.1 In this trial, the average daily mileage of the EV was 47 km/day while that of the DV was 46 km/day. The average fuel cost of the EV was HK\$3.19/km (i.e., about 93%) lower than that of the DV. The average total operating cost of the EV was HK\$3.61/km (i.e., about 87%) lower than that of the DV.

5.2 The utilization rates were 95.5% for the EV and 99% for the DV. In the trial period, there was no deterioration in the fuel economy of the EV. Based on the data available, it could not be judged if there is the deterioration in the battery capacity of the EV.

5.3 Compared with the DV, there was about 86% CO<sub>2e</sub> emission reduction by using the EV.

5.4 The driver of the EV had no problem in operating the EV and was satisfied with its performance. However, he preferred to drive the DV rather than the EV as the DV was more powerful going uphill. Kau Kee considered that using the EV is good because it can provide a greener and quieter environment with a lower fuel cost, but would look for a model with larger power and capacity in the future.

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<sub>2e</sub> emissions, provided that the vehicles can get easy access to charging facilities.

## **Appendix 1: Key Features of the Vehicles and Charging Facility**

### **1. Trial EV and Charging Facility**

#### **EV**

<b>Registration mark</b>	<b>RA2668</b>
Make:	Renault
Model:	Kangoo Z.E. 33
Class:	Light goods vehicle
Gross vehicle weight:	2,270 kg
Seating capacity:	Driver + 4 passengers
Rated power:	44 kW
Travel range:	270 km (air conditioning off)
Battery material:	lithium-ion
Battery capacity:	33 kWh
Year of manufacture:	2019

#### **Charging Facility**

Make:	EV Power
Model:	EVC-32NK
Output:	7 kW, 220V AC / max 32A
Charging Standard:	IEC62196-2 Type 2

### **2. DV Used for Comparison**

<b>Registration mark</b>	<b>EU1192</b>
Make:	HINO
Model:	XZU425RHKFQD3
Class:	Light goods vehicle
Seating capacity:	Driver + 2 passengers
Gross vehicle weight:	5,500 kg
Cylinder capacity:	4,009 c.c.
Year of manufacture:	2007

## Appendix 2: Photos of Vehicles and Charging Facilities

### 1. Trial EV and Charging Facilities

	
EV – front view	EV – rear view
	
EV – right side view	EV – left side view
	
Charging facility – 7kW AC charger	Charging facility – watt-hour meter

2. Diesel Vehicle (DV) for Comparison



DV – front view



DV – rear view