# Pilot Green Transport Fund

# Final Report
# On
# Trial of Electric Light Goods Vehicle for Electrical Engineering Industry (Sendon Electrical Service)

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PREPARED BY:
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**Pilot Green Transport Fund**
**Trial of Electric Light Goods Vehicle for Electrical Engineering Industry**
**(Sendon Electrical Service)**

**Final Report**
**(Trial Period: 1 December 2020 – 30 November 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. Sendon Electrical Service (Sendon) was approved under the Fund for trial of 24 months on one electric light goods vehicle for providing electrical installation and maintenance services. Through the tendering procedures stipulated in the Subsidy Agreement signed with the Government, Sendon procured a Joylong EW4-A electric light goods vehicle (EV) for trial.

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

1.3 Due to serious deterioration of the DV, the DV has been idled since 1 August 2022. The EPD has approved Sendon's application to dispose the DV in September 2022, as it is impossible for the DV to pass the annual vehicle examination in September 2022.

1.4 This Final Report summarizes the performance of the EV in the 24 months of the trial and compares it with the performance of its conventional counterpart, i.e. DV.

## 2. Trial and Conventional Vehicles

2.1 The trial EV, Joylong EW4-A electric light goods vehicle, has a gross vehicle weight (GVW) of 3,700 kg capable of carrying a driver with five passengers and goods. The EV contains a 64.8 kWh lithium-ion battery pack. According to its manufacturer, it has a driving range of 260 km with air-conditioning off. A designated driver was assigned for the EV.

2.2 Sendon assigned the DV, Nissan URVAN 3.0L DIESEL M/T HPV diesel light goods vehicle, with a GVW of 3,300 kg capable of carrying a driver and five passengers and goods, and a cylinder capacity of 2,953 cc for comparison with the EV.

2.3 The vehicles are mainly used to provide electrical installation and maintenance services in the New Territories, Kowloon and Hong Kong Island. The services are conducted from Monday to Sunday, except Lunar New Year holiday. The operating hours are from 09:00 to 18:00.

2.4 Sendon has installed a 30 kW, 3-phase DC charger at its carpark. It takes around 3 hours for fully charging the EV. Key features of the EV, the charging facility and the DV are presented in Appendix 1 and their photos are shown in Appendix 2.

## 3. Trial Information

3.1 The trial commenced on 1 December 2020 and lasted for 24 months. Sendon was required to collect and provide trial information including the EV mileage reading before charging, amount of electricity consumed in each charging, time taken for charging, operation downtime due to charging, cost and downtime associated with scheduled and unscheduled maintenances of the EV and 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 were collected and provided 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 December 2020 – 30 November 2022)

| | | **EV** | **DV** [1] |
|---|---|---|---|
| Total mileage (km) | | 54,551 | 39,497 |
| Average daily mileage (km/working day) | | 76 | 66 |
| Average fuel economy | (km/kWh) | 3.34 | - |
| | (km/litre) | - | 9.54 |
| | (km/MJ) | 0.93 | 0.26 [2] |
| Average fuel cost (HK$/km) [3] | | 0.38 | 1.91 |
| Average total operating cost per km (HK$/km) | | 0.54 | 2.52 |
| Downtime (working day) [4] | | 7 | 10 |

[1] Due to serious deterioration of the DV, the DV has been idled since 1 August 2022. EPD has approved Sendon to dispose the DV in September 2022. There were 601 working days for the DV in the trial period.

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

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

[4] Downtime refers to the working days that 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 723 working days and 601 working days for the EV and the DV, respectively. The EV had 7-day downtime due to 2 scheduled maintenances, while the DV had 10-day downtime due to a scheduled maintenance and an unscheduled maintenance. The utilization rate of the EV and the DV were 99.0% and 98.3%, respectively.

4.3 During the 24 months of the trial, the total mileage and the average daily mileage of the EV were 54,551 km and 76 km/day, respectively while those of the DV were 39,497 km and 66 km/day, respectively. The average fuel cost of the EV was HK$1.53/km (80%) lower than that of the DV. Taking maintenance fee into account, the average total operating cost of the EV was HK$1.98/km (79%) 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 varied narrowly from 3.24 to 3.4 km/kWh. There was no sign of the deterioration in fuel economy over the trial period.

4.5 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. The $CO_2e$ emission from the EV and DV were 6,363 kg and 15,853 kg, respectively and hence the EV emitted 9,490 kg $CO_2e$ (about 60%) less than the DV in this trial.

4.6 The operation of the EV was smooth. The EV driver had no problem in operating the EV. Both the driver and Sendon were satisfied with the EV performance.

## 5. Summary

5.1 In this trial, the average daily mileage of the EV was 76 km/day while that of the DV was 66 km/day. The average fuel cost of the EV was HK$1.53/km (80%) lower than that of the DV. The average total operating cost of the EV was HK$1.98/km (79%) lower than that of the DV.

5.2 The utilization rates of the EV and the DV were 99.0% and 98.3%, respectively. In the trial period, there was no sign of deterioration in fuel economy of the EV.

5.3 Compared with the DV, there was about 60% $CO_2e$ emission reduction by using the EV.

5.4 The driver had no problem in operating the EV. Sendon was also satisfied with the EV performance in general.

5.5 The findings showed electric light goods vehicle is becoming more affordable and feasible to the transport trade for saving operating cost and reducing $CO_2e$ emissions, provided that the vehicle 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:** | **WR8083** |
| Make: | Joylong |
| Model: | EW4-A |
| Class: | Light goods vehicle |
| Gross vehicle weight: | 3,700 kg |
| Seating capacity: | Driver + 5 passengers |
| Rated power: | 50 kW |
| Travel range: | 260 km (air conditioning off) |
| Maximum speed: | 100 km/h |
| Battery material: | Lithium-ion |
| Battery capacity: | 64.8 kWh |
| Year of manufacture: | 2019 |

### (b) Charging Facility

| | |
|---|---|
| Make: | Hangzhou AoNeng Power Supply Equipment Co. Ltd. |
| Model: | ANDC5-500V/60A-1 |
| Type: | 3-phase, 380V, movable type |
| Power: | 30 kW, DC (max 500V / 60A) |
| Charging Standard: | GB |

### 2. DV for Comparison

| | |
|---|---|
| **Registration mark** | **DR791** |
| Make: | Nissan |
| Model: | URVAN 3.0L DIESEL M/T HPV |
| Class: | Light goods vehicle |
| Gross vehicle weight: | 3,300 kg |
| Seating capacity: | Driver + 5 passengers |
| Cylinder capacity: | 2,953 cc |
| Year of manufacture: | 2010 |

## Appendix 2: Photos of Vehicles and Charging Facility

### 1. Trial EV and Charging Facility

<table>
<tr><td> 
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<tr><td>Front view of EV</td><td>Rear view of EV</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Left side view of EV</td><td>Right side view of EV</td></tr>
<tr><td> 
</td><td></td></tr>
<tr><td>30 kW, 3-phase DC charger</td><td></td></tr>
</table>

## 2. DV for Comparison

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