# New Energy Transport Fund

# Final Report
# On
# Trial of Electric Light Goods Vehicle for Container Maintenance Service (Container System Limited)

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PREPARED BY:
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**New Energy Transport Fund**
**Trial of Electric Light Goods Vehicle for Container Maintenance Service**
**(Container System Limited)**

**Final Report**
**(Reporting Period: 1 March 2022 – 28 February 2023)**

## 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. Container System Limited (Container System) was approved under the Fund for trial of one electric light goods vehicle for container maintenance service. Container System, through the tendering procedures stipulated in the Agreement entered into 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 Environmental Protection Department[1] as an independent third party assessor (the Assessor) to monitor the trial and evaluate the performance of the trial vehicle. Container System assigned a Toyota Hiace KDH201RSSMDY 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 of 3,700 kg capable of carrying a driver with five passengers and goods. It has a 73 kWh lithium-ion battery pack and a driving range of 300 km with its battery fully charged and air-conditioning off. The DV, 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., was used as the conventional counterpart for comparison in this trial. Both the EV and the DV were used for delivering company documents and spare parts of containers in the New Territories.

2.2 Container System installed a designated 30 kW DC charging facility at the office in Lau Fau Shan for charging and recording the amount of electricity charged. 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.

[1] The Administration of the New Energy Transport Fund was migrated to the Environment Branch of the Environment and Ecology Bureau [EEB (Environment Branch)] since 1 January 2023 after internal re-organisation of EEB (Environment Branch) and EPD.

## 3. Trial Information

3.1 The trial commenced on 1 March 2022 and lasted for 12 months. Container System 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 maintenance 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 driver and Container System 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$1.99/km (about 81%) lower than that of the DV. The average total operating cost of the EV was HK$2.06/km (about 70%) lower than that of the DV taking the maintenance cost into account.

Table 1: Key operation statistics of each vehicle (1 March 2022 – 28 February 2023)

| | | **EV** | **DV** |
|---|---|---|---|
| Total distance travelled (km) | | 10,601 | 6,311 |
| Average daily mileage (km/working day) | | 36 | 21 |
| Average fuel economy | (km/kWh) | 2.90 | - |
| | (km/litre) | - | 8.58 |
| | (km/MJ) | 0.81 | 0.24 [1] |
| Average fuel cost (HK$/km) | | 0.47 [2] | 2.46 [3] |
| Average total operating cost (HK$/km) [4] | | 0.89 | 2.95 |
| Downtime (working day) [4][5] | | 1 | 2 |

[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$1.289/kWh (Mar 2022 – Oct 2022); HK$1.451/kWh (Nov 2022 – Dec 2022) and; HK$1.544/kWh (Jan 2023 – Feb 2023) as claimed 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 the vehicle is not in operation, 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. There was one scheduled maintenance for both the EV and the DV in the 12 months of the trial. The scheduled maintenance of the EV included regular service, preparation for Government inspection, replacement of wiper blades and glove box. The scheduled maintenance of the DV was the service for the annual inspection.

4.3 The EV and the DV had 1 and 2 days of maintenance downtime related to vehicle performance, respectively. The utilisation rates of the EV and the DV were 99.7% and 99.3%. Based on the above, the average daily driving distances of the EV and the DV were 36 km/day and 21 km/day, respectively.

4.4 The drivers of the EV liked driving the EV and had no problem in operating the EV. They agreed that the power of the EV was good even on uphill and the air was cleaner inside the cabin. Overall, they were satisfied with the performance of the EV and would like to promote the EV to other drivers. Container System was satisfied with the EV since the EV could meet the operational requirements and save the operation cost. Thus, given the opportunity, Container System would consider replacing all existing conventional vehicles with EVs and encourage other transport operators to try the EVs.

4.5 After the 12-month trial period, a full charging operation could be maintained at the level of 73 kWh. Thus, the deterioration in battery capacity within the 12-month trial period was insignificant.

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 $CO_2e$ emission from the EV and the DV were 1,428 kg and 3,426 kg respectively. Hence, there was a 1,998 kg (about 58%) reduction of $CO_2e$, 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$1.99/km (about 81%) lower than that of the DV. The average total operating cost of the EV was HK$2.06/km (about 70%) lower than that of the DV. The utilisation rates of the EV and the DV were 99.7% and 99.3%, respectively. There was a 1,998 kg (about 58%) reduction of $CO_2e$, with the replacement of the DV by the EV in the trial.

5.2 After the 12-month trial period, a full charging operation could be maintained at the level of 73 kWh. Thus, the deterioration in battery capacity within the 12-month trial period was insignificant.

5.3 The drivers of the EV liked driving the EV and were satisfied with the performance of the EV. Container System was satisfied with the EV since the EV could meet the operational requirements and save the operation cost. Thus, given the opportunity, Container System would consider replacing all existing conventional vehicles with 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 Facility

### 1. Trial EV and Charging Facility

**EV**

| | |
|---|---|
| **Registration mark:** | **XU1752** |
| 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: | 2021 |

**EV Charging Facility**

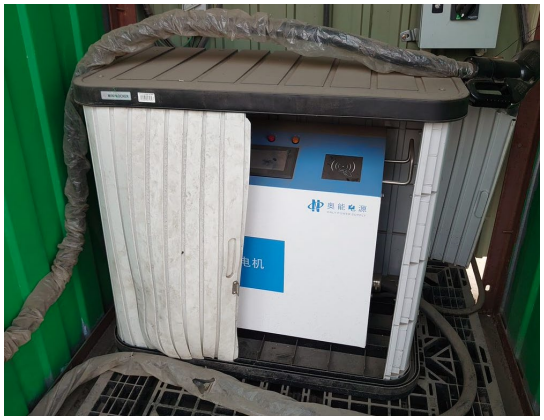
| | |
|---|---|
| Make: | Only Power Supply |
| Model: | ANDC5-500V/60A-1 |
| Power: | 30 kW, 500V DC / max 60A |
| Charging standard: | GB Mode |

### 2. DV Used for Comparison

| | |
|---|---|
| **Registration mark:** | **PA4760** |
| 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: | 2009 |

## Appendix 2: Photos of Vehicles and Charging Facility

### 1. Trial EV (XU1752) and Charging Facility

| | |
|---|---|
|  |  |
| Front view of EV | Rear view of EV |
|  |  |
| Left side view of EV | Right side view of EV |
|  | |
| 30 kW DC charging facility | |

## 2. DV (PA4760) Used for Comparison

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