

**Pilot Green Transport Fund**

**Final Report**  
**On**  
**Trial of Hybrid Light Goods Vehicle for**  
**Logistics Service**  
**(Kei Shun International Logistic Limited)**

(27 January 2021)

PREPARED BY:

Dr. C. Ng

The Monitoring and Evaluation Team's views expressed in this report do not necessarily reflect the views of the Environmental Protection Department, HKSAR.

## **List of Monitoring and Evaluation Team Members**

**Prof. C.S. CHEUNG (Team Leader)**

Department of Mechanical Engineering  
The Hong Kong Polytechnic University

**Dr. C. NG**

Department of Mechanical Engineering  
The Hong Kong Polytechnic University

**Dr. Edward W.C. Lo**

Department of Electrical Engineering  
The Hong Kong Polytechnic University

**Dr. W.T. HUNG**

PolyU Technology and Consultancy Company Limited  
The Hong Kong Polytechnic University

**Dr. David Yuen**

PolyU Technology and Consultancy Company Limited  
The Hong Kong Polytechnic University

**Pilot Green Transport Fund  
Trial of Hybrid Light Goods Vehicle for Logistics Service  
(Kei Shun International Logistic Limited)**

**Final Report  
(Trial Period: 1 December 2018 – 30 November 2020)**

**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. Kei Shun International Logistic Limited (Kei Shun) was approved under the Fund for trial of one diesel-electric hybrid light goods vehicle. Through the tendering procedures stipulated in the Subsidy Agreement, Kei Shun procured one Hino 300 series 5,500 kg diesel-electric hybrid light goods vehicle (HV) 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. Kei Shun assigned a diesel light goods vehicle (DV) providing same service as the conventional counterpart for comparison.

1.3 This Final Report summarizes the performance of the HV in the 24 months of the trial as compared with its conventional counterpart.

**2. Trial and Conventional Vehicles**

2.1 The Hino 300 series HV had a gross vehicle weight (GVW) of 5,500 kg and was capable of carrying a driver with two passengers and goods. The conventional counterpart for comparison – Hino 300 series DV had a GVW of 5,500 kg and was capable of carrying a driver with two passengers and goods. The vehicles were used mainly for providing logistics service in the New Territories and Kowloon. The delivery was conducted from Monday to Saturday, excluding Sunday and public holidays. The operating hours were from 9:00 to 18:00. Key features of the HV and the DV and photos of the vehicles are provided in Appendix 1 and Appendix 2 respectively.

**3. Trial Information**

3.1 The trial commenced on 1 December 2018 and lasted for 24 months. Kei Shun was required to collect and provide trial information including the HV mileage reading before refilling, amount of fuel refilled in each refilling, cost and downtime associated with scheduled and unscheduled maintenances of the HV. Similar data set from the DV was also required. In addition to the cost information, reports on maintenance work, operational difficulties and opinions of the drivers and Kei Shun were collected and provided to reflect any problems of the HV.

## 4. Findings of Trial

4.1 The following table summarizes the statistical data of the HV and the DV.

Table 1: Key operation statistics of each vehicle (December 2018 – November 2020)

	<b>HV</b>	<b>DV</b>
Total distance traveled (km)	41,940	54,143
Average daily distance traveled (km/day)	71	92
Average fuel economy (km/litre) <sup>[1]</sup>	4.52	4.11
Average fuel cost (HK\$/km) <sup>[1]</sup>	3.16	3.46
Average total operating cost per km (HK\$/km)	3.52	3.75
Downtime (working day) <sup>[2] [3]</sup>	3	2

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

[2] Downtime refers to the equivalent number of working days in which the vehicle was not in operation due to maintenance, counting from the first day it stopped operation till the day it was returned to the operator.

[3] Maintenance due to incidents unrelated to the performance of the vehicle was not included for comparison.

4.2. The average fuel cost of the HV was HK\$0.30/km (9%) lower than that of the DV. Including maintenance cost, the average total operating cost of the HV was \$0.23/km (6%) lower than that of the DV. Compared to DV, using HV has economic advantage.

4.3 There were 592 working days in the 24 months of the trial. The utilization rates of the HV and the DV were 99.5% and 99.7% respectively.

4.4 To remove the effect of seasonal fluctuations, 12-month moving averages were used to evaluate the trend of the HV's fuel economy. There was a trend of dropping in fuel economy of the HV in the first 20 months of the trial, but the fuel economy climbed up again steadily in the rest of the trial. This phenomenon could be explained by two factors. Kei Shun has changed a new HV driver since March 2020, and the HV battery has been replaced by a new one in a scheduled maintenance in August 2020.

4.5 Based on the total mileage of the HV in the 24 months of the trial, the CO<sub>2</sub> equivalent (CO<sub>2</sub>e) emission from HV was 25,711 kg, while that from using DV was 28,270 kg. Hence the total reduction of CO<sub>2</sub>e emission for HV was 2,559 kg (9%) in the trial.

## 5. Summary

5.1 During the 24 months of the trial, the average daily mileage of the HV was 71 km, while that of the DV was 92 km.

5.2 The HV had a better fuel economy than the DV. The average fuel cost of the HV was 9% lower than that of the DV. Including the maintenance costs, the average total operating cost of HV was 6% lower than that of the DV. The total CO<sub>2</sub>e emission reduction by using HV was 9%.

5.3 The utilization rates of the HV and the DV were 99.5% and 99.7% respectively.

5.4 The trend of the HV fuel economy showed that the performance of the battery set had dropped significantly after 20 months of the trial. After replacing the new battery set in August 2020, the fuel economy climbed up again steadily in the rest of the trial.

5.5 The operation of the HV was smooth. The drivers of the HV had no problem in operating the vehicle. The subsidy recipient, Kei Shun was satisfied with the performance of HV in its vehicle fleet.

## Appendix 1: Key Features of Vehicles

### 1. Trial HV





<b>Registration Mark:</b>	VS6496
<b>Make:</b>	Hino
<b>Model:</b>	300 Series Hybrid XKU720R-HKUQS3
<b>Class:</b>	Light goods vehicle
<b>Gross vehicle weight:</b>	5,500 kg
<b>Seating capacity:</b>	driver + 2 passengers
<b>Cylinder capacity:</b>	4,009 cc
<b>Year of manufacture:</b>	2018
<b>Maximum output (ps/rpm)</b>	150/2,500
<b>Battery type</b>	Nickel-Metal Hydride Battery

### 2. DV for Comparison

<b>Registration Mark:</b>	VC5066
<b>Make:</b>	Hino
<b>Model:</b>	300 Series XZU720R-HKFQT3
<b>Class:</b>	Light goods vehicle
<b>Gross vehicle weight:</b>	5,500 kg
<b>Seating capacity:</b>	driver + 2 passengers
<b>Cylinder capacity:</b>	4,009 cc
<b>Year of manufacture:</b>	2017

## Appendix 2: Photos of Vehicles

### 1. Trial HV – VS6496

	
Front view of HV	Rear view of HV
	
Left side view of HV	Right side view of HV

2. DV for Comparison – VC5066



Front view of DV



Rear view of DV



Left side view of DV



Right side view of DV