

Pilot Green Transport Fund

Final Report On Trial of Hybrid Light Goods Vehicle for Vegetable Delivery Service (Kam Lung Trading Company Limited)

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

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**Pilot Green Transport Fund
Trial of Hybrid Light Goods Vehicle for Vegetable Delivery Service
(Kam Lung Trading Company Limited)**

**Final Report
(Trial Period: 1 December 2014 – 30 November 2016)**

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. Kam Lung Trading Company Limited (Kam Lung) was approved under the Fund for trial of one diesel-electric hybrid light goods vehicle (LGV) for vegetable delivery service. Through the tendering procedures stipulated in the Agreement, Kam Lung procured one Mitsubishi FUSO 300 series diesel-electric hybrid LGV with a gross vehicle weight (GVW) of 5,500 kg (HV) for trial.

1.2 The Hong Kong Institute of Vocational Education (Tsing Yi) (IVE(TY)) has been engaged by the Environmental Protection Department as an independent third-party assessor to monitor the trial and evaluate the performance of the trial vehicle. One Isuzu diesel LGV with a GVW of 5,500 kg (DV) serving the same purpose was assigned as the conventional vehicle for comparing with the HV.

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 Kam Lung procured one Mitsubishi FUSO 300 series diesel-electric hybrid LGV (i.e. HV) with a gross vehicle weight (GVW) of 5,500 kg for the trial. One Isuzu diesel light goods vehicle (i.e. DV) with a GVW of 5,500 kg was assigned for comparison with the HV in this trial. The HV and the DV were used for vegetable delivery service.

2.2 The service hours of the vehicles were from 7:00 am to 5:00 pm on Monday to Sunday and public holidays. Key features of the HVs and DVs are shown in Appendix 1 and their photos are shown in Appendix 2.

3. Trial Information

3.1 The trial started on 1 December 2014 and lasted for 24 months. Kam Lung was required to collect and provide trial information including the mileage reading at refuelling, date of refuelling and refuelling amount, costs and operation downtime associated with scheduled and unscheduled maintenances of the HV. Similar monthly data from the DV were also required. In addition to the cost information, reports on maintenance work, operational difficulties and opinions of the driver and Kam Lung were collected to reflect any problems of the HV.

4. Findings of Trial

4.1 Table 1 summarises the key operation statistics of the HV and DV. The average fuel cost of the HV was HK\$0.90/km (i.e. about 32%) lower than that of the DV. The average total operating cost of the HV was HK\$0.92/km (i.e. about 31%) lower than that of the DV.

Table 1: Key operation statistics of each vehicle (December 2014 – November 2016)

	HV	DV
Total distance travelled (km)	100,797	42,027
Average fuel economy (km/litre)	5.72	3.95
Average fuel cost (HK\$/km) ^[1]	1.88	2.78
Average total operating cost (HK\$/km)	2.08	3.00
Downtime (working day) ^{[2] [3]}	7	5

[1] The market rate was adopted for calculation.

[2] Downtime refers to the equivalent number of 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.

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

4.2 During the trial period, the HV had seven scheduled maintenances and no unscheduled maintenance while the DV had five scheduled maintenances and one unscheduled maintenance. The HV had 7 days of operational downtime while the DV had 5 days of operational downtime. The utilization rates of the HV and DV were both 99%.

4.3 Kam Lung designated one driver for the HV. Initially, the driver of the HV was not satisfied with its performance as he was unable to drive it at the desired road speeds. After the first month of the trial, the driver adapted to the HV. Whilst the performance was lower than the driver's expectation, he found no further problem in operating the HV.

4.4 Overall, Kam Lung agreed that, in general, using hybrid vehicle was good because it is comfortable, quiet and fuel efficient. However, they expressed their concern on the maintenance as the HV could only be repaired by the supplier. Apart from this, they think that the supplier maintenance appointment time/duration is too long and can waste a lot of time.

4.5 To eliminate the effect of seasonal fluctuations, 12-month moving averages were used to evaluate the trend of the HV's fuel economy. The fuel economy varied for the HV from 5.67 to 5.77 km/l (i.e. about 2% variation). During the 24-month trial period, the variation in the fuel economy of the HV was not significant, indicating there was no significant deterioration of the HV during the trial period.

4.6 Based on the total mileage of the HV in the 24 months of the trial for comparison purpose, the carbon dioxide equivalent (CO₂e) emission from the HV was 48,846 kg while that from DV was 71,488 kg. Overall, compared with the DV, there was a total reduction of 22,624 kg (i.e. about 32%) CO₂e emission by using the HV during the trial period.

5. Summary

5.1 The driver found the performance of the HV lower than his expectation, but had adapted to the differences in HV operation. From the point of view of Kam Lung, they were satisfied with the performance of the HV and found it suitable for their company. However, they expressed their concern on the maintenance as the HV could only be repaired by the supplier. Apart from this, they think that the supplier maintenance appointment time/duration is too long and can waste a lot of time.

5.2 The HV incurred a lower average fuel cost of HK\$0.90/km (about 32%) compared to the DV. Taking into account the scheduled and unscheduled maintenances, the average total operating cost of the HV was HK\$0.92/km (about 31%) lower than that of the DV. Also, the total CO₂e emission from the HV was about 32% lower than that from the DV. The utilisation rates of the HV and DV were both 99%.

5.3 During the 24-month trial, the variation in fuel economy of the HV was not significant, indicating that there was no significant deterioration of the HV in the trial period.

Appendix 1: Key Features of Vehicles Involved in the Trial

1. Trial HV

Registration Mark	DS1311
Make:	MITSUBISHI
Model:	FUSO 300 series
Class:	Light goods vehicle
Gross vehicle weight:	5,500 kg
Seating capacity:	2 seats
Engine capacity:	2,998 c.c.
Year of manufacture:	2014

2. DV for comparison

Registration Mark	DW 311
Make:	ISUZU
Model:	NPR
Class:	Light goods vehicle
Seating capacity:	2 seats
Gross vehicle weight:	5,500 kg
Engine capacity:	4,751 c.c.
Year of manufacture:	2009

Appendix 2: Photos of Vehicles

1. Trial HV



HV – front view



HV – rear view



HV – left side view



HV – right side view

2. DV for comparison



DV – front view



DV – rear view



DV – left side view



DV – right side view