Pilot Green Transport Fund

Final Report On
Trial of Hybrid Light Goods Vehicle for Recycling Industry
(E-Tech Management (Hong Kong) Limited)

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PREPARED BY:

Dr. Joe K.W. LO
Mr. Bruce ORGAN

List of Monitoring and Evaluation Team Members

Dr. Joe K.W. LO (Team Leader)
Centre Manager
Jockey Club Heavy Vehicle Emissions Testing and Research Centre
Hong Kong Institute of Vocational Education (Tsing Yi)

Mr. Bruce ORGAN (Team Member)
Emission Manager
Jockey Club Heavy Vehicle Emissions Testing and Research Centre
Hong Kong Institute of Vocational Education (Tsing Yi)

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Final Report
(Trial Period: 1 May 2015 – 30 April 2017)

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. E-Tech Management (Hong Kong) Limited (E-Tech) was approved under the Fund for trial of one diesel-electric hybrid light goods vehicle (LGV) in recycling industry**.** Through the tendering procedures stipulated in the Subsidy Agreement, E-Tech procured a 5,500kg Hino series 300 diesel-electric hybrid LGV (HV) for trial.

1.2 The Hong Kong Institute of Vocational Education (Tsing Yi) (IVE) 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. E-Tech assigned a 5,500 kg diesel LGV providing the same type of service as the conventional counterpart 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 diesel counterpart.

2. Trial and Conventional Vehicles

2.1 E-Tech procured Hino series 300 hybrid LGV (i.e. HV) with a gross vehicle weight (GVW) of 5,500 kg and a cylinder capacity of 4,009 c.c. The HV was used for recycling industry logistics service.

2.2 One Mitsubishi Fuso Canter diesel LGV (DV) with a GVW of 5,500 kg and a cylinder capacity of 3,907 c.c. was assigned for comparison with the HV in this trial. The HV and DV were used for transporting materials in the recycling industry.

2.3 Key features of the HV and DV are shown in Appendix 1 and photos are shown in Appendix 2.

3. Trial Information

3.1 The trial started on 1 May 2015 and lasted for 24 months. E-Tech was required to collect and provide trial information including the HV's mileage reading at refuelling, date of refuelling and refuelled 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 drivers and E-Tech were collected to reflect any problems of the HV.

4. Findings of Trial

4.1 Operating Costs

4.1 Table 1 below summarises the key statistical data of the HV and the DV. The average fuel cost of the HV was HK$0.07/km (i.e., about 4%) higher than that of the DV. The average total operating cost of the HV was HK$0.49/km (i.e., about 21%) lower than that of the DV.

Table 1: Summary of all the costs (May 2015 – April 2017)

	HV	**DV**
Total distance traveled (km)	22,848	29,390
Average fuel economy (km/litre)	6.27	6.35
Average fuel cost (HK$/km) [1]	1.75	1.68
Average total operating cost (HK$/km)	1.84	2.33
Downtime (working day) [2][3]	17	12

[1] 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 incidents unrelated to the performance of the vehicle were not included for comparison.

4.2 During the trial period, the HV had two scheduled maintenances and 2 unscheduled maintenances, resulting in 17 days of operation downtime. The DV had two scheduled maintenances and one unscheduled maintenance resulting in 12 days of operation downtime. The utilization rates of the HV and DV were 97% and 98% respectively.

4.3 E-Tech did not have a designated driver for the HV. The drivers initially preferred to use the DV rather than the HV. It had taken a number of months before they became comfortable with the differences and driving the HV. The drivers reflected that the acceleration pace and response time of the HV were slower than those of the DV and the braking time for the HV was longer as well. The drivers also found there were some instances when the HV could not drive up steep slopes.

4.4 Overall, E-Tech considered that the performance of the HV could meet their expectation on operational requirements, but not on fuel cost saving.

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 between 5.80 and 6.42 km/l (i.e. about 10% variation) for the HV. There was no evidence that the charging capacity of the HV batteries had decreased during the trial period.

4.6 Based on the total distance travelled of the HV in the trial and the equivalent fuel consumption of the DV in the trial, the relative carbon dioxide equivalent (CO_2e) emission can be evaluated based on the CO_2e emission per litre of fuel consumed. The CO_2e emission from the HV was 10,098 kg while that from the DV on the same total distance travelled of the HV was 9,982 kg. Hence, the CO_2e emission from the HV was 117 kg (i.e., about 1%) higher than that from the DV during the trial period.

5 Summary

5.1 The drivers initially preferred to use the DV rather than the HV. It had taken a number of months before they became comfortable with the differences and driving the HV. The drivers adapted to the differences in the HV operation. However, they were disappointed with the acceleration and braking performance of HV, as well as its gradeability. From the view of E-Tech, the performance of the HV could meet their expectation on operational requirements, but not on fuel cost saving.

5.2 The utilization rates of the HV and DV were 97% and 98%, respectively. During the 24-month trial period, there was no significant capacity deterioration of the HV's batteries. The usage of the HV was on the low side as reflected in the difference in the total mileage travelled between the HV (22,848 km) and the DV (29,390 km).

5.3 The HV incurred a higher average fuel cost of HK$0.07/km (i.e., about 4%) compared to the DV. Taking into account the maintenance costs, the average total operating cost of the HV was about HK$0.49/km (i.e., about 21%) lower than that of the DV. The CO_2e emission from the HV was 117 kg (i.e., about 1%) higher than that from the DV during the trial period.

Appendix 1: Key Features of Vehicles Involved in the Trial

1. Trial HV

Registration Mark	TG4686
Make:	Hino
Model:	300 SERIES HYBRID XKU710R-HKUQS3
Class:	Light Goods Vehicle
Gross vehicle weight:	5,500 kg
Seating capacity:	driver + 2 passengers
Cylinder capacity:	4,009 c.c.
Year of manufacture:	2014

2. DV for comparison

Registration Mark	PC3672
Make:	Mitsubishi
Model:	Fuso Canter FE639E6SRDAA
Class:	Light Goods Vehicle
Seating capacity:	driver + 2 passengers
Gross vehicle weight:	5,500 kg
Cylinder capacity:	3,907 c.c.
Year of manufacture:	2004

Appendix 2: Photos of Vehicles

1. Trial HV

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

2. DV for Comparison

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