

Pilot Green Transport Fund

Final Report On Trial of Hybrid Light Goods Vehicle for Logistics Service (DKSH Hong Kong 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 Logistics Service
(DKSH Hong Kong Limited)**

**Final Report
(Trial Period: 1 January 2015 – 31 December 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 and innovative transport technologies, contributing to better air quality and public health for Hong Kong. DKSH Hong Kong Limited (DKSH) was approved under the Fund for trial of one hybrid diesel-electric light goods vehicle for logistics service. Through the tendering procedures stipulated in the Agreement, DKSH procured a Hino 300 Series Hybrid diesel-electric light goods vehicle with a gross vehicle weight (GVW) of 5,500 kg (HV) for trial.

1.2 The Hong Kong Institute Vocational Education (Tsing Yi) 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. A Mitsubishi diesel light goods vehicle 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 DKSH procured one Hino 300 Series diesel-electric hybrid light goods vehicle (i.e. HV) which has a GVW of 5,500 kg, for the trial.

2.2 One Mitsubishi diesel light goods vehicle (i.e. DV) with a GVW of 5,500 kg was assigned for comparison with the HV in the trial. The HV and the DV were used logistics service in Hong Kong.

2.3 The service hours of the vehicle were from 8:00 am to 5:00 pm Monday to Saturday except Sundays and public holidays. Key features of the HV and DV are shown in Appendix 1 and their photos are shown in Appendix 2.

3. Trial Information

The trial started on 1 January 2015 and lasted for 24 months. DKSH 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 DKSH 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 HV was HK\$0.29/km (i.e., about 10%) lower than that of the DV. This shows that the HV has a minor fuel cost saving compared to the DV. The average total operating cost of the HV was HK\$1.29/km (i.e. about 29%) lower than that of the DV.

Table 1: Key operation statistics of each vehicle (January 2015 – December 2016)

	HV	DV
Total distance travelled (km)	28,622	31,964
Average fuel economy (km/litre)	4.25	3.81
Average fuel cost (HK\$) ^[1]	2.54	2.83
Average total operating cost (HK\$/km) ^[3]	3.10	4.39
Downtime (working day) ^{[2][3]}	9	32

^[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 traffic accident or incidents unrelated to the performance of the vehicle was not included for comparison.

4.2 During the trial period, the HV had four scheduled maintenances for regular checks-ups but no unscheduled maintenance related to vehicle performance was required, resulting in a total of 9 days of operation downtime. The DV had one scheduled maintenance for regular check-ups and 8 unscheduled maintenances related to vehicle performance, resulting in a total of 32 days of operation downtime. The utilization rates of the HV and the DV were 98% and 95%, respectively.

4.3 DKSH did not have a designated driver for the HV. The HV drivers shared that compared with the DV, the HV was quiet and environmentally friendly. Also, the drivers agreed that the power of the HV is good even when driving uphill.

4.4 Overall, DKSH was satisfied with the performance and reliability of the HV and found that it was a suitable vehicle for their company needs. Since there was no fixed driver for the HV, DKSH agreed that different driving habits of the HV drivers might affect the fuel economy of the vehicle.

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 from 4.08 to 4.61 km/l (i.e. about 12% variation) for the HV improving over the duration of the trial. This suggests there was no significant deterioration of the HV and the charging capacity of its batteries during the trial period.

4.6 The carbon dioxide equivalent (CO_{2e}) emission from the HV was 18,670 kg while that from the DV was 20,854 kg. Therefore, there was a reduction of 2,184 kg (i.e., about 10%) CO_{2e} emission from the HV during the trial period.

5. Summary

5.1 The drivers had adapted to the differences in the HV operation. The HV drivers shared that compared with the DV, the HV was quiet and environmentally friendly. Also, the drivers agreed that the power of the HV is good even when driving uphill. From the point of view of DKSH, they were satisfied with performance of the HV and found that it was a suitable vehicle for their company needs.

5.2 The HV incurred lower average fuel cost of HK\$0.29/km (i.e., about 10%) compared to the DV. Taking into account the scheduled and unscheduled maintenances, the average total operating cost of the HV was HK\$1.29/km (i.e., about 29%) lower than that of the DV. Also, the CO₂e emission from the HV was about 10% lower than that from the DV. The utilisation rates of the HV and DV were about 98% and 95%, respectively.

5.3 During the 24-month trial period, 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

1. Trial HV

Registration Mark	TB2321
Make:	Hino
Model:	300 Series Hybrid XKU710R-HKUQS3
Class:	Light Goods Vehicle
Gross vehicle weight:	5,500 kg
Seating capacity:	Driver + 2 passengers
Engine capacity:	4,009 c.c.
Rated output (HP/rpm):	150/2500
Battery Type:	Nickel-metal hydride battery
Year of manufacture:	2014

2. DV for comparison

Registration Mark	JG7410
Make:	Mitsubishi
Model:	FE639E6SRDA
Class:	Light Goods Vehicle
Seating capacity:	Driver + 2 passengers
Gross vehicle weight:	5,500 kg
Engine capacity:	3,907 c.c.
Year of manufacture:	1999

Appendix 2: Photos of Vehicles

1. HV



Front view of HV



Rear view of HV



Left side view of HV



Right side view of HV

2. DV for comparison

 <p>2015-03-10 08:21:09</p>	 <p>2015-03-10 08:21:44</p>
<p>Front view of DV</p>	<p>Rear view of DV</p>
 <p>2015-03-10 08:21:23</p>	 <p>2015-03-10 08:21:25</p>
<p>Left side view of DV</p>	<p>Right side view of DV</p>