

# **Pilot Green Transport Fund**

## **Final Report On Trial of Hybrid Medium Goods Vehicles 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 Medium Goods Vehicles for Logistics Service**

**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 two hybrid diesel-electric medium goods vehicles for logistics service. Through the tendering procedures stipulated in the Agreement, DKSH procured two Hino 300 Series Hybrid diesel-electric medium goods vehicles with a gross vehicle weight (GVW) of 8,500 kg (HVs) for trial.

1.2 The Hong Kong Institute Vocational Education (Tsing Yi) (IVE(TY)) 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 vehicles. Two Mitsubishi diesel medium goods vehicles with GVWs of 12,960 kg (DVs) serving the same purpose were assigned as the conventional vehicles for comparing with the HVs.

1.3 This Final Report summarizes the performance of the HVs in the 24 months of the trial as compared with their conventional diesel counterparts.

**2 Trial and Conventional Vehicles**

2.1 DKSH procured two Hino 300 Series hybrid diesel-electric medium goods vehicles (i.e. HVs) which have a gross vehicle weight (GVW) of 8,500 kg and 150 HP rated power, for the trial.

2.2 Two Mitsubishi diesel medium goods vehicles (i.e. DVs) with a GVW of 12,960 kg were assigned for comparison with the HVs in the trial. The HVs and the DVs were used logistics service in Hong Kong.

2.3 The service hours of the vehicles were from 8:00 am to 5:00 pm Monday to Saturday, except Sunday and public holiday. Key features of the HVs and DVs 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 mileage reading at refuelling, date of refuelling and refuelled amount, costs and operation downtime associated with scheduled and unscheduled maintenances of the HVs. Similar monthly data from the DVs 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 HVs.

### 4 Findings of Trial

4.1 Table 1 summarises key operation statistics of the HVs and DVs. The fleet average fuel cost of HVs was HK\$0.38/km (i.e., 13%) lower than that of the DVs. This shows that the HV has a minor fuel cost saving compared to the DVs. The fleet average total operating cost of the HVs were HK\$0.79/km (i.e., about 19%) lower than that of the DVs.

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

	<b>HV-1</b>	<b>HV-2</b>	<b>DV-1</b>	<b>DV-2</b>
Total distance travelled (km)	30,298	21,070	48,013	36,958
Average fuel economy (km/litre)	4.05	4.11	3.32	3.79
Fleet Average fuel economy (km/litre)	4.08		3.56	
Average fuel cost (HK\$/km) <sup>[1]</sup>	2.67	2.64	3.23	2.83
Fleet average fuel cost (HK\$/km)	2.65		3.03	
Average total operating cost (HK\$/km) <sup>[4]</sup>	3.44	3.49	4.97	3.56
Fleet average total operating cost (HK\$/km)	3.47		4.26	
Downtime (working day) <sup>[2][3]</sup>	15	4	23	19

<sup>[1]</sup> The market price was used for calculation.

<sup>[2]</sup> 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.

<sup>[3]</sup> Downtime due to traffic accident or incident unrelated to the performance of the vehicle is not counted.

<sup>[4]</sup> Maintenance due to traffic accident or incident unrelated to the performance of the vehicle was not included for comparison.

4.2 During the trial period, HV-1 had four scheduled maintenances and two unscheduled maintenances. HV-2 had one scheduled maintenance and three unscheduled maintenances. DV-1 had two scheduled maintenances and 11 unscheduled maintenances while DV-2 had two scheduled maintenances and 7 unscheduled maintenances. HV-1 had 15 days of downtime and HV-2 had 4 days of downtime, while DV-1 had 23 days of downtime and DV-2 had 19 days of downtime. The utilization rates of HV-1 and HV-2 were 97% and 99%, respectively, as compared with 96% for DV-1 and 97% for DV-2.

4.3 DKSH did not have designated drivers for the HVs. The HV drivers shared that, when compared with DVs, the HVs were quiet and environmentally friendly. However, the acceleration and the throttle/accelerator response time of the HVs were slow especially at the time of turning on the ECO mode. They were also not satisfied with the vehicle power for driving uphill.

4.4 Overall, DKSH was satisfied with the performance of the HVs. Since there were no designated drivers for the HVs, DKSH was of the view that different driving habits of HV drivers might affect the fuel economy of the vehicles. They also suggested that if a hybrid medium goods vehicle with higher GVW, which could accommodate more bulky items, could be introduced into the market, it would be more suitable for their operational needs.

4.5 To eliminate the effect of seasonal fluctuations, 12-month moving averages were used to evaluate the trend of the HVs' fuel economy. The fuel economy varied from 3.97 to 4.35 km/litre for HV-1 and 3.73 to 4.58 km/litre for HV-2. This suggests that there was no significant deterioration of the HVs and the charging capacity of their batteries during the trial period.

4.6 The carbon dioxide equivalent (CO<sub>2</sub>e) emission from HV-1 was 19,721 kg and from HV-2 was 13,533 kg while that from DV-1 was 24,094 kg and from DV-2 was 14,662 kg. Therefore, compared with the DVs, there was a reduction of 4,372 kg CO<sub>2</sub>e emission (i.e. about 18%) for HV-1 and a reduction of 1,129 kg CO<sub>2</sub>e emission for HV-2 (i.e. about 8%). Overall, there was a total reduction of 5,501 kg (i.e. about 14%) CO<sub>2</sub>e emission by using the HVs during the trial period.

## 5 Summary

5.1 The drivers had adapted to the differences in the HVs' operation. The HV drivers shared that compared with the DVs, the HVs were quiet and environmentally friendly. However, the acceleration and the throttle/accelerator response time of the HVs were slow especially when the ECO mode was turned on. They were also not satisfied with the HVs' power when driving uphill. From the point of view of DKSH, they were satisfied with the performance of the HVs and found that they were suitable vehicles for their company. They also suggested that if a hybrid medium goods vehicle with higher GVW, which could accommodate more bulky items, could be introduced into the market, it would be more suitable for their operational needs,

5.2 The HVs incurred a lower fleet average fuel cost of HK\$0.38/km (i.e. about 13%) compared to the DVs. Taking into account the scheduled and unscheduled maintenances, the fleet average total operating cost of the HVs was HK\$0.79/km (i.e. about 19%) lower than that of the DVs. Also, the total CO<sub>2</sub>e emission from the HVs was about 14% lower than that from the DVs. The utilisation rates of HV-1 and HV-2 were 97% and 99%, respectively, as compared with 96% for DV-1 and 97% for DV-2.

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

## Appendix 1: Key Features of Vehicles

### 1. Trial HVs

<b>Registration Mark</b>	<b>TB644 (HV-1) / TB1541 (HV-2)</b>
Make:	Hino
Model:	300 Series Hybrid XKU720R-HKUTS3
Class:	Medium Goods Vehicle
Gross vehicle weight:	8,500 kg
Seating capacity:	Driver + 2 passengers
Engine capacity:	4,009 c.c.
Maximum Output(ps/rpm):	150/2500
Battery Type:	Nickel-metal hydride battery
Year of manufacture:	2014

### 2. DVs for comparison

<b>Registration Mark</b>	<b>ME795 (DV-1) / ME6211 (DV-2)</b>
Make:	Mitsubishi
Model:	FK61FK1HRDAA
Class:	Medium Goods Vehicle
Seating capacity:	Driver + 2 passengers
Gross vehicle weight:	12,960 kg
Engine capacity:	7,545 c.c.
Year of manufacture:	2005

## Appendix 2: Photos of Vehicles

### 1. HV-1

 <p>A front-facing view of a white Daihatsu truck. The truck has a blue grille with the Daihatsu logo and '300' on the right side. The license plate is 'TB 644'. A person is standing to the left of the truck. A timestamp '09/04/2015 08:19' is visible in the bottom right corner.</p>	 <p>A rear-facing view of the white truck. The back of the cargo box features the 'LEEO' logo in red, a green 'GREEN' logo, and the text 'GREEN HONG KONG GREEN PROGRAM'. Two red and white striped flags are attached to the sides. The license plate is 'TB 644'. A timestamp '09/04/2015 08:20' is visible in the bottom right corner.</p>
<p>Front view of HV-1</p>	<p>Rear view of HV-1</p>
 <p>A left-side view of the white truck. The cargo box has 'Consumer Goods' and the 'DKSH' logo printed on it. A green 'GREEN' logo is also visible. A timestamp '09/04/2015 08:19' is visible in the bottom right corner.</p>	 <p>A right-side view of the white truck. The cargo box has 'Consumer Goods' and the 'DKSH' logo printed on it. A green 'GREEN' logo is also visible. A timestamp '09/04/2015 08:20' is visible in the bottom right corner.</p>
<p>Left side view of HV-1</p>	<p>Right side view of HV-1</p>

## 2. HV-2



Front view of HV-2



Rear view of HV-2



Left side view of HV-2



Right side view of HV-2

### 3. DV-1

	
<p>Front view of DV-1</p>	<p>Rear view of DV-1</p>
	
<p>Left side view of DV-1</p>	<p>Right side view of DV-1</p>

#### 4. DV-2



Front view of DV-2



Rear view of DV-2



Left side view of DV-2



Right side view of DV-2