

**Pilot Green Transport Fund**

**Twelve-Month Interim Report**

**On**

**Trial of Hybrid Medium Goods Vehicles for**

**Logistics Service (Kerry Distribution)**

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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 (Kerry Distribution)**

**Interim Report  
(Trial Period: 1 April 2013 – 31 March 2014)**

**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. The Fund has subsidized Kerry Distribution (Hong Kong) Limited (Kerry) to try three hybrid medium goods vehicles for logistics service.

1.2 PolyU Technology and Consultancy Company Limited (PolyU) has been engaged by Environmental Protection Department as an independent third party assessor to monitor the trials and evaluate the operational performance of the trial vehicles. PolyU regularly visited Kerry to collect information for evaluating the performance of the hybrid medium goods vehicles (HVs) as compared with the diesel medium goods vehicles (DVs) for control purposes, which provided the same service in the same areas. The information collected includes the said vehicles' operation data, fuel bills, maintenance records, reports on operation difficulties, and opinions of the HV drivers from survey questionnaires.

1.3 This Interim Report summarizes the performance of the HVs for logistics service in the first twelve months of the trial as compared with their conventional counterparts.

**2. Trial Vehicles**

2.1 Kerry procured three 7.5 tonnes GVW Mitsubishi FUSO Canter Eco Hybrid medium goods vehicles (HV-1, HV-2 and HV-3) of 2988 cc cylinder capacity for trial.

2.2 Three 9.0 tonnes GVW Mitsubishi FUSO Canter diesel medium goods vehicles (DV-1, DV-2 and DV-3) of 4899 cc cylinder capacity and of same service areas were assigned for comparison with the three HVs.

2.3 Key features and photos of the HVs and DVs are in Appendices 1 and 2 respectively.

**3. Trial Information**

3.1 The 24-month trial started on 1 April 2013. All the HVs and DVs are stationed at Kerry Cargo Centre at Kwai Chung. Each HV shares the same service areas with its diesel counterpart. The vehicles provide service from Monday to Saturday and the number of working hours per day is twelve.

3.2 During this twelve-month report period, HV-1, HV-2 and HV-3 travelled about 26,610 km, 24,811 km and 42,277 km respectively whereas DV-1, DV-2 and DV-3 travelled about 28,793 km, 32,761 km and 26,220 km respectively. The performance of the HVs, and their average operating costs as compared with the DVs in the first twelve months of the trial are summarized below:

Table 1: Average fuel economy and average fuel cost of trial vehicles

	Hybrid Medium Goods Vehicle			Diesel Medium Goods Vehicle		
	HV-1	HV-2	HV-3	DV-1	DV-2	DV-3
Average fuel economy	6.14 km/litre	6.71 km/litre	7.01 km/litre	4.37 km/litre	4.87 km/litre	4.26 km/litre
Average fuel cost <sup>[1]</sup>	\$2.05/km	\$1.87/km	\$1.79/km	\$2.87/km	\$2.57/km	\$2.94/km
Average total operating cost <sup>[1],[2]</sup>	\$2.73/km	\$2.63/km	\$2.33/km	\$4.21/km	\$3.45/km	\$3.76/km

[1] The market fuel price was used for calculation

[2] Including costs incurred from maintenance. Kerry did not pay for the labour cost of the first two scheduled maintenance of the HVs.

3.3 The average fuel costs of HV-1, HV-2 and HV-3 were lower than their conventional counterparts by 29%, 27% and 39% respectively. In fact, the vehicle operating conditions and the drivers' driving habit would affect its fuel saving performance. According to the manufacturer's information, the trial vehicle could save up to about 20% fuel per km as compared with its diesel counterpart if it travels in urban areas at an average speed of 20 km/h with frequent start-stops. If it travels in suburban areas or on highways at an average speed of 44 km/h, the fuel saving performance would however be reduced to about 12% because the energy recovered by the electric generator at start-stops is much reduced. All the HVs travelled partly on suburban and highways, and hence it was anticipated that they were unable to achieve the best fuel saving performance according to the manufacturer because of less start-stops to recover the energy by the electric generator as compared to traveling in urban areas. However, on an average, the HVs saved 32% of fuel as compared to the DVs, a possible explanation for the higher fuel saving performance of the HVs is that they have smaller GVW than their counterparts. In general, the heavier the vehicle, the lower will be the fuel economy. To discount the effect due to higher GVW of the DVs, the fuel economy of the HVs were also compared with the 5.5 tonnes diesel light goods vehicles used for comparison in other trials under the Fund. The average fuel saving was found to be 22%. Given that these diesel LGVs have lower GVW than the HVs, it is considered that the HVs in general have better fuel economy than the DVs.

3.5 The HVs had fuel economy ranged from 6.14 km/litre to 7.01 km/litre, which were in general higher than that of the hybrid light goods vehicles tried out in other trials under the Fund. This could be due to the relatively lighter loading, an average of 1 to 2 tonnes, carried by HVs in this trial. Besides, good driving habit might also contribute to higher fuel economy.

3.6 Besides fuel costs, maintenance cost and other costs associated with breakdowns, such as replacement of components and parts, were also accounted for in calculating the total operating cost. It should be noted that in the first two maintenance of the hybrid vehicles, the labour cost was waived and only the parts to be replaced were charged. The total operating cost of HV-1, HV-2 and HV-3 was 35%, 24% and 38% lower than DV-1, DV-2 and DV-3 respectively.

#### 4. Maintenance and Downtime

4.1 During the report period, HV-1 had undergone three scheduled maintenance and one unscheduled maintenance due to oil leakage in the tail lift hydraulic system. The cause of the unscheduled maintenance was unrelated to the performance of the vehicle. The total operation downtime for HV-1 was 6 days. HV-2 had undergone four scheduled maintenance but no unscheduled maintenance. The total operation downtime for HV-2 was 6 days. HV-3 had undergone four scheduled maintenance and one unscheduled maintenance due to a failure in starting the engine. The total operation downtime for HV-3 was 10 days. The utilization rate of HV-1, HV-2 and HV-3 were 98%, 98% and 97% respectively, which are close to the DVs.

#### 5. Summary of Findings

5.1 The vehicle operating conditions and the drivers' driving habit would affect the fuel saving performance of the hybrid vehicles. On an average, the HVs saved 32% fuel cost as compared to the DVs. To discount the effect due to higher GVW of the DVs, the fuel economy of the HVs were also compared with the 5.5 tonnes diesel light goods vehicles used for comparison in other trials under the Fund and the average fuel saving was found to be 22%. Therefore, the HVs in general have better fuel economy than the DVs.

5.2 The HV drivers reflected that they had to adjust their driving habits in the first month but after familiarization with the vehicle, they had no problem in its operation. Generally speaking, all drivers were satisfied with the performance of the HVs.

5.3 The HVs had regular scheduled maintenance similar to the DVs. The HVs seldom had any failure and out of the 298 working days in the twelve month trial period, HV-1, HV-2 and HV-3 had lost 6, 6, and 10 days only and the utilization rate were 98%, 98% and 97% respectively.

5.4 No deterioration in the performance of the HVs was observed from the reported data.

5.5 The findings only reflect the performance of the HVs in the first twelve months of the trial. More time is needed to test the fuel saving performance and the reliability of the HVs.

## Appendix 1: Key Features of Vehicles

### 1. Trial HV

**Registration Mark:** **RW5120 (HV-1)**  
**Make:** Mitsubishi Fuso  
**Model:** Canter Eco Hybrid FEB74GR3SDAG  
**Class:** Medium goods vehicle  
**Gross vehicle weight:** 7,500 kg  
**Seating Capacity:** 2  
**Cylinder Capacity:** 2998 cc  
**Year of manufacture:** 2012

**Registration Mark:** **RW5185 (HV-2)**  
**Make:** Mitsubishi Fuso  
**Model:** Canter Eco Hybrid FEB74GR3SDAG  
**Class:** Medium goods vehicle  
**Gross vehicle weight:** 7,500 kg  
**Seating Capacity:** 2  
**Cylinder Capacity:** 2998 cc  
**Year of manufacture:** 2012

**Registration Mark:** **RW6258 (HV-3)**  
**Make:** Mitsubishi Fuso  
**Model:** Canter Eco Hybrid FEB74GR3SDAG  
**Class:** Medium goods vehicle  
**Gross vehicle weight:** 7,500 kg  
**Seating Capacity:** 2  
**Cylinder Capacity:** 2998 cc  
**Year of manufacture:** 2012

## **2. DV used for comparison**

**Registration Mark:** NF6306 (DV-1)  
**Make:** Mitsubishi Fuso  
**Model:** Canter FE85DGZSRDA  
**Class:** Medium goods vehicle  
**Gross vehicle weight:** 9000 kg  
**Seating Capacity:** 2  
**Cylinder capacity:** 4899 cc  
**Year of manufacture:** 2007

**Registration Mark:** PW3240 (DV-2)  
**Make:** Mitsubishi Fuso  
**Model:** Canter FE85DGZSRDAA  
**Class:** Medium goods vehicle  
**Gross vehicle weight:** 9000 kg  
**Seating Capacity:** 2  
**Cylinder capacity:** 4899 cc  
**Year of manufacture:** 2008

**Registration Mark:** PW3372 (DV-3)  
**Make:** Mitsubishi Fuso  
**Model:** Canter FE85DGZSRDA  
**Class:** Medium goods vehicle  
**Gross vehicle weight:** 9000 kg  
**Seating Capacity:** 2  
**Cylinder capacity:** 4899 cc  
**Year of manufacture:** 2007

## Appendix 2: Photos of Vehicles

### 1. Trial HVs



HV-1 (RW5120) (front view)



HV-1 (RW5120) (end view)



HV-1 (RW5120) (side view)



HV-1 (RW5120) (side view)



HV-2 (RW5185) (front view)



HV-2 (RW5185) (end view)





HV-2 (RW5185) (side view)



HV-2 (RW5185) (side view)



HV-3 (RW6258) (front view)



HV-3 (RW6258) (end view)



HV-3 (RW6258) (side view)



HV-3 (RW6258) (side view)

## 2. DVs used for comparison



DV-1 (NF6306) (front view)



DV-1 (NF6306) (end view)



DV-1 (NF6306) (side view)



DV-1 (NF6306) (side view)



DV-2 (PW3240) (front view)



DV-2 (PW3240) (end view)





DV-2 (PW3240) (side view)



DV-2 (PW3240) (side view)



DV-3 (PW3372) (front view)



DV-3 (PW3372) (end view)



DV-3 (PW3372) (side view)



DV-3 (PW3372) (side view)