

**Pilot Green Transport Fund**

**Interim Report On**  
**Trial of Hybrid Public Light Buses**  
**for Green Minibus Service**  
**(Pokfulam Maxicab Company Limited)**

(24 October 2019)

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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 Public Light Buses for Green Minibus Service**  
**(Pokfulam Maxicab Company Limited)**

**Interim Report**  
**(Trial Period: 1 April 2018 – 30 September 2018 for HV-1**  
**and 1 September 2018 – February 2019 for HV-2)**

**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. Pokfulam Maxicab Company Limited (Pokfulam Maxicab) was approved under the Fund for trial of two hybrid public light buses for green minibus service. Through the tendering procedures stipulated in the Subsidy Agreement, Pokfulam Maxicab procured two GMI hybrid public light buses (HVs – HV-1 and HV-2) for trial.

1.2 Hong Kong Institute of 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 vehicles. Two Toyota liquefied petroleum gas (LPG) public light buses (GVs – GV-1 and GV-2) serving the same purpose were assigned as the conventional counterpart for comparing with the HVs.

1.3 This Interim Report summarizes the performance of the HVs in the first six months of the trial as compared with its conventional counterpart.

**2. Trial Vehicles**

2.1 The vehicles were used for providing green minibus services on Hong Kong Island, with HV-1 and GV-1 serving the GMB route no. 23/23M between Kennedy Town station and Chi Fu Fa Yuen at Pok Fu Lam, and HV-2 and GV-2 serving the GMB route no. 22/22S/22X between Pok Fu Lam Garden and Central (Exchange Square).

2.2 According to the manufacturer, the HVs each had a gross vehicle weight of 7,000 kg and a cylinder capacity of 2,776 cc. Key features and photos of the HVs and the GVs are in Appendix 1 and Appendix 2 respectively.

### 3. Trial Information

3.1 The trial of HV-1 and HV-2 started on 1 April 2018 and on 1 Sep 2018 respectively, and would last for 24 months. Pokfulam Maxicab was required to collect and provide trial information including the HV's odometer readings, the dates of refueling, the refueled amount, cost and operation downtime associated with scheduled and unscheduled maintenance of the HVs. Similar set of data from the GVs were also required. In addition to the cost information, reports on maintenance work, operational difficulties and opinions of the drivers were also collected to reflect any problems of the HVs.

### 4. Findings of Trial

4.1 Table 1 summarizes the statistical data of the HVs and the GVs. The average fuel costs of the HV-1 and HV-2 were higher than those of the GV-1 and the GV-2 by HK\$1.13/km (60.1%) and HK\$1.32/km (87.4%) respectively. The average total operating costs of the HV-1 and HV-2 were higher than those of the GV-1 and GV-2 by HK\$0.22/km (7.1%) and HK\$0.29/km (11%) respectively.

Table 1: Key Operation Statistics of Each Vehicle

		<b>HV-1</b>	<b>GV-1</b>	<b>HV-2</b>	<b>GV-2</b>
Total mileage	(km)	22,520	30,505	15,624	28,740
Average fuel economy	(km/litre)	4.51	1.90	4.86	2.39
	(km/MJ)	0.125 <sup>[4]</sup>	0.080 <sup>[5]</sup>	0.135 <sup>[4]</sup>	0.101 <sup>[5]</sup>
Fuel cost/ HK\$ <sup>[1]</sup>		67,784	57,433	44,171	43,521
Average fuel cost (HK\$/km)		3.01	1.88	2.83	1.51
Maintenance cost (HK\$) <sup>[2]</sup>		6,900	37,168	1,550	32,439
Total operating cost/ (HK\$)		74,684	94,601	45,721	75,960
Average total operating cost (HK\$/km)		3.32	3.10	2.93	2.64
Downtime/ working day <sup>[2] [3]</sup>		16	6	10	6

<sup>[1]</sup> Market rate was adopted for calculation.

<sup>[2]</sup> Maintenances due to traffic accident or incidents unrelated to the performance of the vehicle were not included for comparison.

<sup>[3]</sup> Downtime refers to the equivalent number of working days in which the vehicle was not in operation due to maintenance, counting from the first day it stopped operation till the day it was returned to the operator.

<sup>[4]</sup> Assuming lower heating value of 36.13 MJ/litre for diesel fuel.

<sup>[5]</sup> Assuming lower heating value of 23.67 MJ/litre for LPG fuel.

4.2 During the first six months of the trial, there were one scheduled maintenance for each of the HVs and six for each of the GVs.

4.3 There were five unscheduled maintenances for the HV-1 and two for the HV-2, while none for the GVs.

4.4 The HV-1 had a downtime of 16 days and the HV-2 had a downtime of 10 days, while the GVs each had a downtime of 6 days.

## 5. Summary

5.1 In the first six months of trial, the average daily mileage of the HV-1, HV-2, GV-1 and GV-2 were 135 km, 91 km, 172 km, and 164 km respectively. Although the average fuel economy of the HV-1 and HV-2 were higher than those of the GV-1 and GV-2 by 56% and 34%, the average fuel costs of the HV-1 and the HV-2 were higher than those of the GV-1 and the GV-2 by HK\$1.13/km (60.1%) and HK\$1.32/km (87.4%) respectively. It is because the HVs consumed diesel and GVs consumed LPG. The average unit price of diesel was higher than that of the LPG by about 279%. The utilization rates of the HV-1, the HV-2 and the GVs were 91.3%, 94.5% and 96.7% respectively.

5.2 Pokfulam Maxicab had a designated driver for each of the HVs. The drivers felt that the HVs produced less air pollutants. They ran quieter when they were not charging, but while charging they were noisier compared with LPG public light buses. Also, the HV-1 driver expressed that the suspension of the HV-1 was unstable and the steering wheel was very heavy. Thus, it was difficult to control the vehicle's dynamic and the passengers felt uncomfortable.

5.3 The passengers in general felt that the HVs emitted less air pollutants and improved the roadside air quality. However, they all expressed that the HVs were noisier compared with LPG public light buses. The noise problem of HV-2 was especially serious and Pokfulam Maxicab received complaint from the public. GMI added sound absorbing linings in the engine compartment to lessen and improve the noise problem afterwards.

5.4 In general, Pokfulam Maxicab and the drivers were moderately satisfied with the performance of the HVs after improvement work has been done by the manufacturer.

5.5 The findings only reflect the performance of the HVs in the first six months of the trial. The performance and reliability of the HVs will be further tested under this 24-month trial.

## **Appendix 1: Key Features of Vehicles**

### **1. Trial HVs**

<b>Registration Mark</b>	<b>EJ8882 (HV-1), LA4381 (HV-2)</b>
Make:	GMI
Model:	GEMINI
Class:	Public Light Bus
Gross vehicle weight:	7,000 kg
Seating capacity:	Driver + 19 passengers
Engine capacity:	2,776 c.c.
Battery Type:	LiFePO4
Year of manufacture:	2017

### **2. GVs for comparison**

#### **GV-1**

<b>Registration Mark</b>	<b>LA4381 (Apr 2018), LG2081 (starting from May 2018)</b>
Make:	Toyota
Model:	BZB40RZCMSCYY
Class:	Public Light Bus
Gross vehicle weight:	4,000 kg
Seating capacity:	Driver + 16 passengers
Engine capacity:	4,104 c.c.
Year of manufacture:	2003

#### **GV-2**

<b>Registration Mark</b>	<b>RN9056</b>
Make:	Toyota
Model:	BZB40RZCMSCYY
Class:	Public Light Bus
Gross vehicle weight:	4,000 kg
Seating capacity:	Driver + 16 passengers
Engine capacity:	4,104 c.c.
Year of manufacture:	2002

Appendix 2: Photos of Vehicles

1. HVs

A front-facing view of a yellow and green minibus. The destination sign at the top reads '23M 置富花園' (23M Greenfield Estate) and 'CHI FU FA YUEN'. The license plate is 'EJ 8882'. There are several stickers on the front, including a 'GMI 增程式 電動 HYBRID ELECTRIC' logo and a 'GREEN HONG KONG' logo. A timestamp '2019/01/18 10:41' is visible in the bottom right corner.	A rear-facing view of the same minibus. The license plate is 'EJ 8882'. There are several stickers on the rear, including a 'GREEN HONG KONG' logo and a 'GREEN Transport' logo. A timestamp '2019/01/18 10:41' is visible in the bottom right corner.
Front view of HV-1 (EJ8882)	Rear view of HV-1
A side view of the minibus from the left. The license plate is 'EJ 8882'. There are several stickers on the side, including a 'GREEN HONG KONG' logo and a 'GREEN Transport' logo. A timestamp '2019/01/18 10:41' is visible in the bottom right corner.	A side view of the minibus from the right. The license plate is 'EJ 8882'. There are several stickers on the side, including a 'GREEN HONG KONG' logo and a 'GREEN Transport' logo. A timestamp '2019/01/18 10:41' is visible in the bottom right corner.
Left side view of HV-1	Right side view of HV-1





Front view of HV-2 (LA4381)



Rear view of HV-2



Left side view of HV-2



Right side view of HV-2



2. GVs

LA 4381: Apr 2018

LG 2081: Starting from May 2018



Front view of GV-1 (LA 4381)



Rear view of GV-1 (LA 4381)



Left side view of GV-1 (LA 4381)



Right side view of GV-1 (LA 4381)



Front view of GV-1 (LG 2081)



Rear view of GV-1 (LG 2081)



Left side view of GV-1 (LG 2081)



Right side view of GV-1 (LG 2081)





Front view of GV-2



Rear view of GV-2



Left side view of GV-2



Right side view of GV-2