

Pilot Green Transport Fund

Interim Report

On

Trial of Electric Single-deck Bus for Coach Hiring Service
(Best Power (HK) Services 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 Electric Single-deck Bus for Coach Hiring Service
(Best Power (HK) Services Limited)**

**Interim Report
(Trial Period: 1 December 2019 – 30 November 2020)**

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. Best Power (HK) Services Limited (Best Power) was approved under the Fund for trial of one electric single-deck bus. Through the tendering procedures stipulated in the Subsidy Agreement, Best Power procured one BYD C9R electric single-deck bus (EV) for trial.

1.2 The PolyU Technology and Consultancy Company Limited has been engaged by the Environmental Protection Department (EPD) as an independent third party assessor (the Assessor) to monitor the trial and evaluate the performance of the trial vehicle. A diesel single-deck bus (DV) providing the same service as the EV was assigned as the conventional counterpart for comparison.

1.3 This Interim Report summarizes the performance of the EV in the first twelve months of the trial and compares it with the performance of its conventional counterpart, i.e. DV.

2. Trial and Conventional Vehicles

2.1 The trial EV, BYD C9R electric single-deck bus, has a gross vehicle weight (GVW) of 18,000 kg capable of carrying a driver and 65 passengers, and it is equipped with a 324 kWh lithium iron phosphate battery pack. It has a driving range of 250 km with air-conditioning off. No designated driver was assigned to drive the EV.

2.2 Best Power had not had a diesel single-deck bus running the same route as the EV during the trial period. To have a better comparison with the EV, the Assessor has adopted a Scania diesel single-deck bus (i.e. DV) which had provided the same service in the same route as the EV during the trial period, as the conventional counterpart. The DV had a GVW of 16,000 kg capable of carrying a driver and 65 passengers and a cylinder capacity of 9,290 cc for comparison with the EV. Owing to COVID-19 pandemic, the DV has not been operated since Nov 2020. This report will use the 12-month data of the DV (from Nov 2019 to October 2020) to achieve a better comparison.

2.3 The vehicles are mainly used to provide shuttle bus service for Next Digital Limited for 24 hours every day. The service route is a fixed round-trip route. From hour 06:50 to 24:00, they provide service between Tseung Kwan O Industrial Estate and the Tiu Keng Leng MTR station; while from hour 00:00 to 06:15, they provide service between Tseung Kwan O Industrial Estate and Tseung Kwan O, Kwun Tong and Mong Kok. In the first 12 months of the trial, the average daily distance traveled of the EV was around 222 km/day, while that of DV was around 319 km/day.

2.4 Best Power rents a designated 80 kW, 3-phase AC quick charger for charging the EV from BYD at its own cost and it takes around 4 ~ 5 hours for fully charging the EV. Key features of the EV, the charging facility and the DV are in Appendix 1 and their photos are shown in Appendix 2.

3. Trial Information

3.1 The trial commenced on 1 December 2019 and would last for 24 months. Best Power was required to collect and provide trial information including the EV mileage reading before charging, amount of electricity consumed in each charging, time taken for charging, operation downtime due to charging, cost and downtime associated with scheduled and unscheduled maintenance of the EV. Similar data of the DV were also collected for comparison purpose. In addition to the cost information, reports on maintenance work, operational difficulties and opinions of the drivers and Best Power were collected and provided to reflect any problems of the EV.

4. Findings of Trial

4.1 Table 1 summarizes the statistical data of the EV and the DV.

Table 1: Key operation statistics of each vehicle (1 December 2019 – 30 November 2020)

		EV	DV
Total distance traveled (km)		80,497	115,318
Average daily distance traveled (km/day)		222	319
Average fuel economy	(km/kWh)	1.05	-
	(km/litre)	-	3.94
	(km/MJ)	0.29	0.11 ^[1]
Average fuel cost (HK\$/km) ^[2]		1.16	3.62 ^[3]
Average total operating cost per km (HK\$/km)		1.20	3.74 ^[3]
Downtime (working day) ^[4]		4	4

[1] Assuming lower heating value of 36.13 MJ/litre for diesel fuel.

[2] The market fuel price was used for calculation.

[3] Owing to COVID-19 pandemic, the DV has not been operated since Nov 2020. The 12-month data of the DV (from Nov 2019 to October 2020) are used for better comparison purpose.

[4] Downtime refers to the working days that 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.

4.2 In the first twelve months of trial, there were 366 working days. The EV had undergone a scheduled maintenance, resulting in 4 working days downtime; while the DV had undergone two scheduled maintenances, resulting in a total of 4 working days downtime. The utilization rates of the EV and the DV were both 99%.

4.3 During the first twelve months of the trial, the total distance traveled and the average daily distance traveled of the EV were 80,497 km and 222 km/day, respectively while those of the DV were 115,318 km and 319 km/day, respectively. The average fuel cost of the EV was HK\$2.46/km (68%) lower than that of the DV while the average total operating cost of the EV was HK\$2.54/km (68%) lower than that of the DV taking into account the maintenance required.

5. Summary

5.1 In the first twelve months of the trial, the average daily distance travelled of the EV was 222 km/day while that of the DV was 319 km/day. The average fuel cost of the EV was HK\$2.46/km (68%) lower than that of the DV. The average total operating cost of the EV was also HK\$2.54/km (68%) lower than that of the DV.

5.2 The utilization rates of both EV and DV were 99%.

5.3 The drivers had no problem in operating the EV. Passengers also had positive feedback on the EV. Best Power was satisfied with the EV's performance in general.

5.4 The findings only reflect the performance of the EV in the first twelve months of the trial. The performance and reliability of the EV will be continuously monitored in the 24 months of the trial.

Appendix 1: Key Features of Vehicles and Charging Facility

1. Trial EV and Charging Facility

(a) EV

Registration mark	WK9249
Make:	BYD
Model:	C9R
Class:	Single-deck bus
Gross vehicle weight:	18,000 kg
Seating capacity:	Driver + 65 passengers
Rated power:	300 kW
Travel range:	250 km (air conditioning off)
Maximum speed:	100 km/h
Battery material:	Lithium iron phosphate
Battery capacity:	324 kWh
Year of manufacture:	2018

(b) Charging Facility (rented from BYD)

Make:	BYD
Model:	EVA080KG/01
Power:	80 kW, 3-phase AC
Charging standard:	GB mode
Weight:	30 kg
Year of manufacture:	2018

2. DV Used for Comparison

Registration mark:	SS5402
Make:	Scania
Model:	K280IB4X2NB
Class:	Single-deck bus
Gross vehicle weight:	16,000 kg
Seating capacity:	Driver + 65 passengers
Cylinder capacity:	9,290 cc
Year of manufacture:	2013

Appendix 2: Photos of Vehicles and Charging Facility

1. Trial EV and Charging Facility

	
Front view of EV	Rear view of EV
	
Left side view of EV	Right side view of EV
	
80 kW, 3-phase AC quick charger (rented from BYD)	

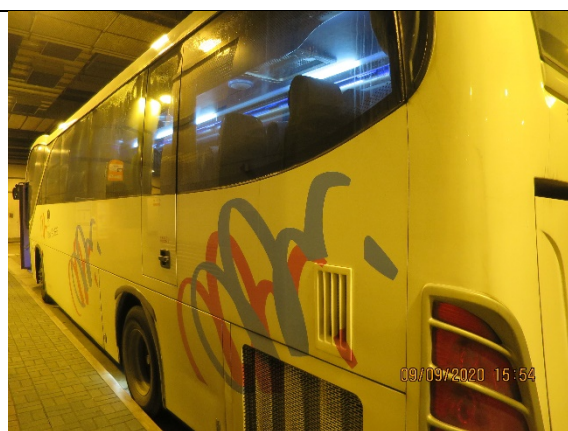
2. DV for Comparison



Front view of DV



Rear view of DV



Left side view of DV



Right side view of DV