Pilot Green Transport Fund

Interim Report
On
Trial of Electric Light Goods Vehicle for Wastewater Treatment Service (Hong Kong Wastewater Treatment Plant Management Company Limited)

(22 April 2021)

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(Reporting Period: 1 July 2019 – 30 June 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. Hong Kong Wastewater Treatment Plant Management Company Limited (HK Wastewater) was approved under the Fund for trial of one electric light goods vehicle for wastewater treatment service. HK Wastewater, through the tendering procedures stipulated in the Agreement entered into with the Government, procured one Nissan e-NV200 electric light goods vehicle (EV) for trial.

1.2 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. HK Wastewater assigned a Toyota diesel light goods vehicle (DV) with a GVW of 2,800 kg and 2,982 c.c. engine and provided similar service 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 as compared with its conventional counterpart i.e. the DV.

2. Trial and Conventional Vehicles

2.1 Key features of the EV, the charging facility and the DV are in Appendix 1 and photos of the vehicles and the charging facility are in Appendix 2. The EV was used for the delivery of tools and parts for maintenance work in Fanling and Yuen Long regions. According to the manufacturer, the EV has a travel range of 317 km with its battery fully charged and air-conditioning off.

2.2 HK Wastewater installed a 32-ampere AC charger for the EV. The charger is installed inside the carpark of its office in Fanling for charging and recording the amount of electricity charged. The EV was charged on a daily basis. However, due to operational requirement, the driver returned the EV to the company's carpark for charging only twice a week. On the other working days, the EV was charged using public charging facilities.

3. Trial Information

3.1 The trial commenced on 1 July 2019 and would last for 24 months. HK Wastewater was required to collect and provide trial information including the EV's mileage reading before charging, amount of electricity consumed and time used in each charging, and operation downtime due to charging, cost and downtime associated with scheduled and unscheduled maintenance of the EV and the charging facility. Similar data of the DV were also required. In addition to the cost information, reports on maintenance work, operational difficulties and opinions of the driver and HK Wastewater were collected to reflect any problems of the EV.

4. Findings of Trial

4.1 The following table summarizes the statistical data of the EV and the DV. The average fuel cost of the EV was HK$1.19/km (i.e. about 83%) lower than that of the DV. The average total operating cost of the EV was HK$1.41/km (i.e., about 85%) lower than that of the DV taking the maintenance cost into account.

Table 1: Key operation statistics of each vehicle (1 July 2019 – 30 June 2020)

		EV	**DV**
Total distance travelled (km)		12,676	23,969
Average distance travelled (km) per working day		42.8	80.7
Average fuel economy	(km/kWh)	5.05	-
	(km/litre)	-	9.92
	(km/MJ)	1.40	0.27[1]
Average fuel cost (HK$/km)		0.24[2]	1.43[3]
Average total operating cost (HK$/km)		0.24	1.65
Downtime (working day)[4]		1	0

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

[2] Electricity bills not provided, electricity cost is based on HK$1.177/kWh for 2019 and HK$1.218 for January to June 2020

[3] The market fuel price was used for calculation

[4] Downtime refers to the working days the vehicle is not in operation, which counted from the first day it stops operation till the day it is returned to the operator.

4.2 Apart from the fuel cost, maintenance cost and other indirect costs which may include parking fee, towing fee, vehicle replacement fee and cost of operation downtime due to charging and maintenance of the EV are also included in Table 1. There were two scheduled maintenances for the EV and one scheduled maintenance for the DV in the first twelve months of the trial. The scheduled maintenances of the EV were for the inspection of new vehicle as required by the EV supplier and for annual examination while the scheduled maintenance of the DV was for annual examination. No unscheduled maintenance is required for the EV and the DV.

4.3 The EV had 1 day of downtime while the DV did not have any downtime. The utilization rates were 99.7% for the EV and 100% for the DV. Based on the above, the average daily mileages of the EV and the DV were 42.8 km/day and 80.7 km/day respectively.

4.4 The EV and DV recorded higher fuel economy in winter time than summer time probably due to air-conditioning requirement. In the 12 months of the trial, there was no indication on the deterioration of the EV performance.

5. Summary

5.1 The average fuel cost of the EV was HK$1.19/km (i.e., about 83%) less than that of the DV. Taking the maintenance into account, the average total operating cost of the EV was about HK$1.41/km (i.e., about 85%) lower than that of the DV. The utilization rates were 99.7% for the EV and 100% for the DV. In the 12 months of the trial, there was no indication on the deterioration of the EV performance.

5.2 In general, the driver of the EV had no problem in operating the EV and was satisfied with the performance of the EV. However, he did not like driving the EV because of its limited driving range in comparison with a diesel vehicle, such that frequent charging was required. Overall, HK Wastewater agreed that using the EV is good because it can provide a greener and quiet environment as well as EV has a lower fuel cost.

5.3 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 the Vehicles and Charging Facility

1. Trial EV and Charging Facility

EV

Registration mark	**VZ6317**
Make:	Nissan
Model:	e-NV200
Class:	Light goods vehicle
Gross vehicle weight:	2,250 kg
Seating capacity:	Driver + 4 passenger
Rated power:	80 kW
Travel range:	317 km (air conditioning off)
Battery material:	lithium-ion
Battery capacity:	40 kWh
Year of manufacture:	2018

Charging Facility

Make:	EN-plus Technologies Co. Ltd
Model:	AC7000-AG-05
Power:	7 kW, single-phase AC (220V / 32 A)
Charging Standard:	Type 2 (GB/T 18487.1-2015)

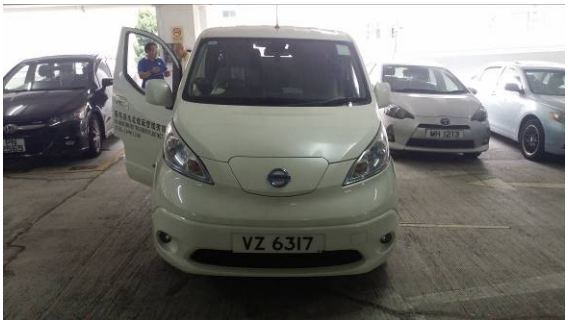
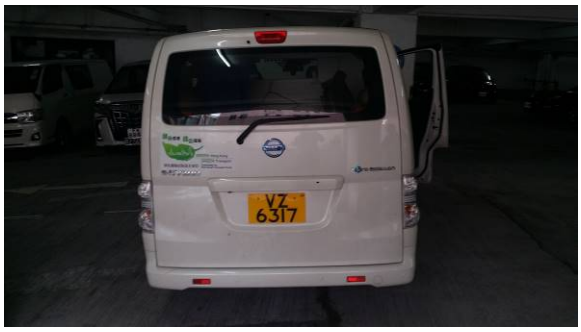
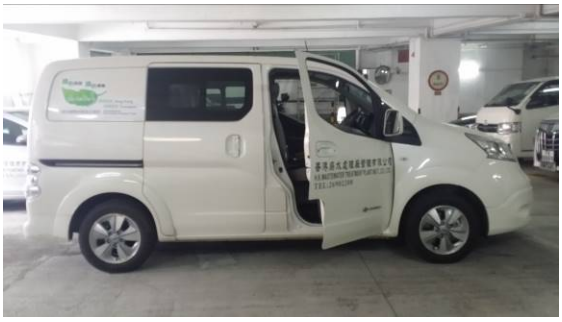
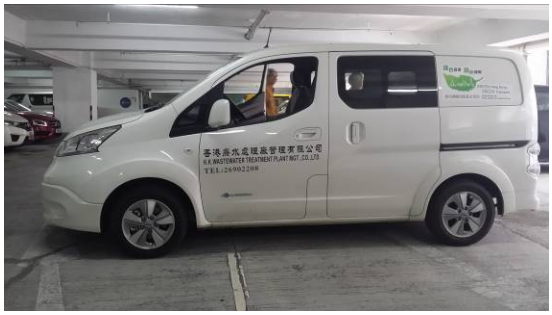
2. DV Used for Comparison

Registration mark	**PL5181**
Make:	Toyota
Model:	KDH201RSSMDY
Class:	Light Goods Vehicle
Seating capacity:	Driver + 5 passengers
Gross vehicle weight:	2,800 kg
Cylinder capacity:	2,982 cc
Year of manufacture:	2010

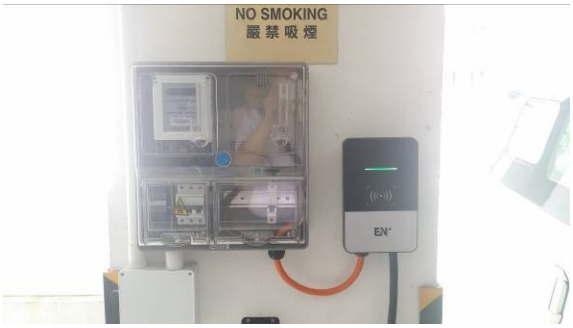
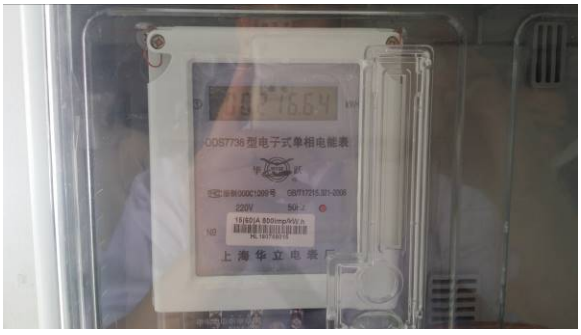
Appendix 2: Photos of Vehicles and Charging Facility

1. Trial EV and Charging Facility

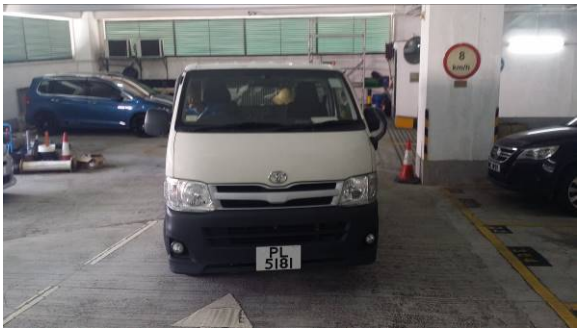
EV

	
EV – front view	EV – end view
	
EV – side view 1	EV – side view 2

Charging Facility

	
EV – watt-hour meter and charger	EV – watt-hour meter

2. Diesel Vehicle (DV) for Comparison



DV Front View