

Pilot Green Transport Fund

Final Report On Trial of Electric Light Goods Vehicle for Cleaning Service (New Method Cleaning 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 Light Goods Vehicle for Cleaning Service
(New Method Cleaning Services Limited)**

**Final Report
(Trial Period: 1 August 2015 – 31 July 2017)**

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 (the green innovative technology), contributing to better air quality and public health for Hong Kong. New Method Cleaning Services Limited (NMC) was approved under the Fund for trial of one Nissan eNV200 electric light goods vehicle (EV) for their cleaning services.

1.2 The Hong Kong Institute of Vocational Education (Tsing Yi) (IVE) 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 vehicle. NMC assigned one diesel light goods vehicle (DV) providing similar services as the conventional counterpart for comparing with the EV.

1.3 This Final report summarizes the performance of the EV in the 24 months of the trial as compared with its conventional diesel counterpart.

2. Trial and Conventional Vehicles

2.1 Key features of the EV, the DV and the charging facility are shown in Appendix 1 and their photos are shown in Appendix 2. Both the EV and DV were used for transporting materials, tools and staff for cleaning services around Hong Kong. According to the EV's manufacturer, the EV has a maximum payload of 515 kg and a travel range of 165 km under no load condition with its battery fully charged and air-conditioning off.

2.2 NMC has set up one dedicated 20A charger at their office. The EV was mainly charged using this charger. It takes about 8 hours to fully charge the batteries. NMC had a designated driver for the EV.

3. Trial Information

3.1 The trial started on 1 August 2015 and lasted for 24 months. NMC was required to collect and provide trial information including the EV mileage reading before charging, amount of electricity consumed and time used in each charging, downtime due to charging and operation downtime associated with scheduled and unscheduled maintenance of the EV. Similar monthly data from the DV were also required. In addition to the cost information, reports on maintenance work, operational difficulties and opinions of the driver and NMC were collected to reflect any problems of the EV.

4. Findings of Trial

4.1 Table 1 below summarizes the key operation statistics of the EV and the DV. The average fuel cost of the EV was HK\$1.15/km (i.e., about 80%) lower than that of the DV. No scheduled or unscheduled maintenance was required for both the EV and the DV, therefore, the average total operating cost of the EV was also HK\$1.15/km (i.e., about 80%) lower than that of the DV.

Table 1: Key operation statistics of each vehicle (1 August 2015 – 31 July 2017)

	EV	DV
Total distance traveled (km)	36,834	63,942
Average daily distance traveled (km/day)	62.3	108.2
Average fuel economy	(km/kWh)	3.99
	(km/litre)	-
	(km/MJ)	0.21 ^[1]
Average fuel cost (HK\$/km) ^[2]	0.28	1.43
Average total operating cost (HK\$/km)	0.28	1.43
Downtime (working day) ^{[3] [4]}	0	0

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

[2] The market diesel and electricity prices were used for calculation.

[3] Downtime refers to the equivalent number of working days in which the vehicle is not in operation due to charging, and the period 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] Maintenance due to incidents unrelated to the performance of the vehicle was not included for comparison.

4.2 During the trial period, the EV and the DV had no scheduled or unscheduled maintenance, therefore, the utilization rates of the EV and the DV were both 100%.

4.3 The EV driver consistently expressed satisfaction with the operation and performance of the vehicle. The driver found no problem in operating the EV and felt the EV was quiet and environment-friendly.

4.4 Overall, NMC agreed that, in general, using the EV was good because it provided a greener and quieter environment compared with the diesel vehicles. However, NMC was not satisfied with the limited travel range of the EV.

4.5 To eliminate the effect of seasonal fluctuations, 12 month moving averages were used to evaluate the trend of the EV's fuel economy. The fuel economy of the EV varied from 3.93 to 4.07 km/kWh (i.e. about 3.4% variation). There was no evidence that the charging capacity of the EV batteries had deterioration during the trial period.

4.6 Based on the mileage of the EV, the equivalent fuel consumption by the DV in the trial and hence the relative carbon dioxide equivalent (CO_{2e}) emission from the DV can be evaluated based on the CO_{2e} emission per litre of fuel consumed. The CO_{2e} emissions from the EV and DV were 4,945 kg and 13,321 kg, respectively and hence, there was a reduction of 8,376 kg which is about a 63% reduction compared with the DV during the trial period.

5. Summary

5.1 The EV driver expressed satisfaction with the operation and performance of the vehicle. Generally, the driver found no problem in operating the EV and felt the EV was quiet and environment friendly. However, NMC was not satisfied with the limited travel range of the EV.

5.2 The utilization rates of EV and DV were both 100%. The usage of the EV was lower as reflected by the difference in the total mileage travelled between the EV (36,834 km i.e. an average of 62.3 km between daily recharging) and the DV (63,924 km, i.e. an average of 108.2 km per working day) in the trial.

5.3 The fuel cost of the EV was significantly lower than that of the DV. The average fuel cost of the EV is HK\$1.15/km (about 80%) lower than that of the DV and the average total operating cost of the EV was also HK\$1.15/km (about 80%) lower than that of the DV. There is a total reduction of 8,376 kg (i.e. about 63%) CO₂e emission by using EV in the trial. There was no evidence that the charging capacity of the EV batteries had deterioration during the trial period.

5.4 At present, the price of electric vehicle is higher than that of a conventional vehicle, so the accumulated fuel saving may not be able to offset the higher vehicle cost shortly. However, electric vehicle market is expanding and electric vehicle technology is improving, the price difference between electric vehicle and conventional vehicle is narrowing down and will be more affordable to the transport trade

Appendix 1: Key Features of Vehicles and Charging Facility Involved in the Trial

1. Trial EV and the charging facility

(a) Trial EV

Registration Mark	TN 1931/SN2629 (registration mark was subsequently changed to SN2629)
Make:	Nissan
Model:	eNV200
Class:	Light goods vehicle
Gross vehicle weight:	2,400 kg
Seating capacity:	driver + 4 passengers
Rated power:	80 kW
Travel range:	165 km (air-conditioning off, no load)
Maximum speed:	123 km/h
Battery material:	Lithium ion
Batteries capacity:	24 kWh
Charging time:	8 hours (Max. current 20A)
Payload:	515 kg
Year of manufacture:	2015

(b) Charging Facility

Charging standard:	IEC62196 Type 2
Charging mode:	220V / 20A, AC

2. DV used for comparison

Registration Mark	RY 2870
Make:	NISSAN
Model:	URVAN 2.5L
Class:	Light goods vehicle
Seating capacity:	5 seats
Gross vehicle weight:	3,300 kg
Engine capacity:	2,488 c.c.
Year of manufacture:	2013

Appendix 2: Photos of Vehicles and Charging Facility

1. Trial EV and the charging Facility



EV - front view



EV - rear view



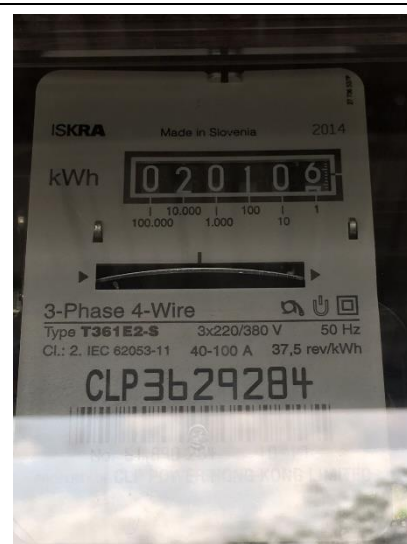
EV – right side view



EV – left side view



Charger at the EV owner's office



Watt-hour meter for the charger

2. DV for Comparison



DV front view



DV rear view



DV left side view



DV right side view