

New Energy Transport Fund

Final Report

On

Trial of Electric Light Goods Vehicle

for Transportation Service

(Sun Cheong Transportation

Hong Kong Company Limited)

(15 February 2024)

PREPARED BY:

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The Monitoring and Evaluation Team's views expressed in this report do not necessarily reflect the views of the Environment and Ecology Bureau (Environment Branch), HKSAR.

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(Reporting Period: 1 January 2022 – 31 December 2022)

Executive Summary

1. Introduction

1.1 The New Energy 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. Sun Cheong Transportation Hong Kong Company Limited (Sun Cheong) was approved under the Fund for trial of one electric light goods vehicle for transportation service. Sun Cheong, through the tendering procedures stipulated in the Agreement entered into with the Government, procured a Nissan e-NV200 Half Panel Van electric light goods vehicle (EV) for trial.

1.2 Hong Kong Productivity Council has been commissioned by the Environmental Protection Department (EPD)¹ as an independent third party assessor (the Assessor) to monitor the trial and evaluate the performance of the trial vehicle. Sun Cheong assigned a Land Rover Defender 110 AD diesel light goods vehicle (DV) providing same services as the conventional counterpart for comparison.

1.3 This Final Report summarizes the performance of the EV in the 12 months of the trial as compared with its conventional counterpart, i.e. the DV.

2. Trial and Conventional Vehicles

2.1 The trial EV, Nissan e-NV200 Half Panel Van electric light goods vehicle, has a gross vehicle weight of 2,250 kg capable of carrying a driver with four passengers and goods. It has a 40 kWh lithium-ion battery pack and a driving range of 317 km with its battery fully charged and air-conditioning off. The DV, Land Rover Defender 110 AD diesel light goods vehicle with a gross vehicle weight of 3,050 kg and a diesel engine with a cylinder capacity of 2,198 c.c., was used as the conventional counterpart for comparison in this trial. The EV and the DV were used for the delivering maintenance tools and money boxes for its public light buses on Hong Kong Island.

¹ The Administration of the New Energy Transport Fund was migrated to the Environment Branch of the Environment and Ecology Bureau [EEB (Environment Branch)] since 1 January 2023 after internal re-organisation of EEB (Environment Branch) and EPD.

2.2 Sun Cheong installed a designated 7.4 kW single-phase AC charging facility at the office in Kennedy Town at its own cost for charging and recording the amount of electricity charged. Key features of the EV, the charging facility and the DV are detailed in Appendix 1 and photos of the vehicles and the charging facility are shown in Appendix 2.

3. Trial Information

3.1 The trial commenced on 1 January 2022 and lasted for 12 months. Sun Cheong 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, operation downtime due to charging, and 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 Sun Cheong 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\$2.45/km (88%) lower than that of the DV. The average total operating cost of the EV was HK\$4.30/km (86%) lower than that of the DV taking the maintenance cost into account.

Table 1: Key operation statistics of each vehicle (1 January 2022 – 31 December 2022)

		EV	DV
Total distance travelled (km)		7,525	2,510
Average daily mileage (km/working day)		21	9
Average fuel economy	(km/kWh)	4.03	-
	(km/litre)	-	7.41
	(km/MJ)	1.12	0.21 ^[1]
Average fuel cost (HK\$/km)		0.35 ^[2]	2.80 ^[3]
Average total operating cost (HK\$/km) ^[4]		0.69	4.99
Downtime (working day) ^{[4][5]}		1	7

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

^[2] The electricity cost was calculated using average electricity tariff rates of HK\$1.353/kWh (Jan 2022 – Oct 2022); and HK\$1.868/kWh (Nov 2022 – Dec 2022) as claimed by HEC.

^[3] The market fuel price was used for calculation.

^[4] Maintenance due to incident not related to the performance of the vehicle was not included for comparing the performance.

^[5] Downtime refers to the working days the vehicle is not in operation due to charging or maintenance, which is 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 was one scheduled maintenance for the EV while there were one scheduled and one unscheduled maintenance for the DV in the 12 months of the trial. The scheduled maintenance of the EV was the service for the annual inspection. The scheduled maintenance of the DV was the regular maintenance service including inspection. The unscheduled maintenance of the DV was expected to be a body repair due to a damage caused by the garage door.

4.3 The EV and the DV had 1 and 7 days of maintenance downtime related to vehicle performance, respectively. The utilization rates of the EV and the DV were 99.7% and 98.1%. Based on the above, the average daily driving distances of the EV and the DV were 21 km/day and 9 km/day, respectively.

4.4 The drivers of the EV liked driving the EV and had no problem in operating the EV. They agreed that the power of the EV is good even on uphill and the air is cleaner inside the cabin. Overall, they were satisfied with the performance of the EV and would like to promote the EV to other drivers. Sun Cheong was satisfied with the EV since the EV could meet the operational requirements and save the operation cost. Sun Cheong agreed that it was easier and cheaper to maintain the EV. Thus, given the opportunity, Sun Cheong would consider replacing all existing conventional vehicles with EVs and encourage other transport operators to try the EVs.

4.5 After the 12-month trial period, a full charging operation could be maintained at the level of 40 kWh. Thus, the deterioration in battery capacity within the 12-month trial period was insignificant.

4.6 Based on the total mileage of the EV and the fuel economy of the DV, the equivalent carbon dioxide (CO_{2e}) emission from the DV could be estimated for comparison purpose. In the 12-month trial period, the CO_{2e} emission from the EV and the DV were 1,270 kg and 2,814 kg respectively. Hence, there was a 1,545 kg (about 55%) reduction of CO_{2e}, with the replacement of the DV by the EV in the trial.

5. Summary

5.1 The average fuel cost of the EV was HK\$2.45/km (about 88%) lower than that of the DV. The average total operating cost of the EV was HK\$4.30/km (about 86%) lower than that of the DV. The utilization rates of the EV and the DV were 99.7% and 98.1%, respectively. There was a 1,545 kg (about 55%) reduction of CO_{2e}, with the replacement of the DV by the EV in the trial.

5.2 After the 12-month trial period, a full charging operation could be maintained at the level of 40 kWh. Thus, the deterioration in battery capacity within the 12-month trial period was insignificant.

5.3 The drivers of the EV liked driving the EV and were satisfied with the performance of the EV. Sun Cheong was satisfied with the EV since the EV could meet the operational requirements and save the operation cost. Given the opportunity, Sun Cheong would consider replacing all existing conventional vehicles with EVs.

5.4 The findings showed electric light goods vehicles are becoming more affordable and feasible to the transport trade for saving operating cost and reducing CO_{2e} emissions, provided that the vehicles can get easy access to charging facilities.

Appendix 1: Key Features of Vehicles and Charging Facility

1. Trial EV and Charging Facility

EV

Registration mark:	XP7072
Make:	Nissan
Model:	e-NV200 Half Panel Van
Class:	Light goods vehicle
Gross vehicle weight:	2,250 kg
Payload:	658 kg
Seating capacity:	Driver + 4 passengers
Rated power:	80 kW
Driving range:	317 km (air conditioning off)
Battery material:	Lithium-ion
Battery capacity:	40 kWh
Year of manufacture:	2018

EV Charging Facility (At Recipient's own cost)






Make:	Wallbox
Model:	Pulsar Plus
Power:	7.4 kW, 220V AC / max 32A single-phase
Charging standard:	SAE J1772 Type 1

2. DV Used for Comparison

Registration mark:	AA7868
Make:	Land Rover
Model:	Defender 110 AD
Class:	Light goods vehicle
Gross vehicle weight:	3,050 kg
Payload:	1,000 kg
Seating capacity:	Driver + 4 passengers
Cylinder capacity:	2,198 c.c.
Year of manufacture:	2015

Appendix 2: Photos of Vehicles and Charging Facility

1. Trial EV (XP7072) and Charging Facility

	
<p>Front view of EV</p>	<p>Rear view of EV</p>
	
<p>Left side view of EV</p>	<p>Right side view of EV</p>
	
<p>7.4 kW single-phase AC charging facility (At Recipient's own cost)</p>	

2. DV (AA7868) Used for Comparison



Front view of DV



Rear view of DV



Left side view of DV



Right side view of DV