New Energy Transport Fund

Interim Report
On
Trial of Electric Light Goods Vehicles for Container Terminals Operation (Modern Terminals Limited)

(3 January 2024)

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(Modern Terminals Limited)

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(Trial Period: 1 September 2022 – 28 February 2023)

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. Modern Terminals Limited (MTL) was approved under the Fund for trial of two electric light goods vehicles. Through the tendering procedures stipulated in the Subsidy Agreement entered into with the Government, MTL procured two Nissan e-NV200 electric light goods vehicles (EVs) for trial.

1.2 Hong Kong Productivity Council has been engaged by the Environmental Protection Department [1] as an independent third-party assessor to monitor the trial and evaluate the performance of the trial vehicle. MTL assigned two diesel light goods vehicles (DVs) providing same services as the conventional counterpart for comparison.

1.3 This Interim Report summarizes the performance of the EVs in the first six months of the trial as compared with their conventional counterparts.

2. Trial and Conventional Vehicles

2.1 The trial EV, Nissan e-NV200 electric light goods vehicle, has a gross vehicle weight (GVW) of 2,250 kg capable of carrying a driver with 4 passengers and goods. It has a 40 kWh lithium-ion battery pack and the driving range is 317 km with air-conditioning off. The DV, Hyundai H-1 A/T Euro 6 diesel light goods vehicle with a GVW of 3,200 kg and a cylinder capacity of 2,497 c.c., was used as the conventional counterpart for comparison in this trial. Both EVs and DVs are non-road vehicles and used mainly for patrolling within the container terminals. There are no designated drivers assigned to drive either the EVs or the DVs.

2.2 MTL has installed two sets of charging facility for charging the EVs, including a 50 kW DC quick charger at Container Terminal 2 and another 50 kW DC quick charger at Container Terminal 9 (South). Key features of the EVs and the DVs as well as the EV charging facility are presented in Appendix 1. The photos of vehicles and the EV charging facility are shown in Appendix 2.

[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.

3. Trial Information

3.1 The trial commenced on 1 September 2022 and would last for 12 months. MTL was required to collect and provide trial information including the EVs' 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 maintenances of the EVs. Similar data of the DVs were also required. In addition to the cost information, reports on maintenance work, operational difficulties and opinions of the drivers were collected and provided to reflect any problems of the EVs.

4. Findings of Trial

4.1 Table 1 summarizes the statistical data of the EVs and the DVs in the first six months of the trial period.

Table 1: Key operation statistics of each vehicle (1 September 2022 – 28 February 2023)

		EV		**DV**	
		EV-1	EV-2	DV-1	DV-2
Total distance travelled (km)		10,277	11,576	2,904	9,639
Average daily distance travelled (km/working day)		61	72	69	112
Average fuel economy	(km/kWh)	2.34	2.74	-	-
	(km/litre)	-	-	2.50	3.39
	(km/MJ)	0.65	0.76	0.07 [1]	0.09 [1]
Average fuel cost (HK$/km)		0.60 [2]	0.52 [2]	8.37 [3]	6.23 [3]
Fleet average fuel cost (HK$/km)		0.56		7.30	
Average total operating cost (HK$/km)		1.04	0.85	9.53	7.18
Fleet average total operating cost (HK$/km)		0.95		8.36	
Downtime (working day) [4]		12	21	139	95

[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$1.289/kWh (September 2022 – October 2022), HK$1.451/kWh (November 2022 – December 2022) and HK$1.544/kWh (January 2023 – February 2023) as claimed by CLP.

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

[4] Downtime refers to the working days that the vehicle is not in operation due to charging or maintenance, counting from the first day it stops operation till the day it is returned to the operator.

4.2. During the six months of the trial, there were 181 working days. The total distance travelled and the average daily distance travelled of the EVs were higher than those of the DVs. The fleet average fuel cost of the EVs was HK$6.74/km (about 92%) lower than that of the DVs. Taking maintenance fee and other costs for both EVs and DVs into account, the fleet average total operating cost of the EVs was HK7.41/km (about 89%) lower than that of the DVs.

4.3 In the first six months of the trial period, both EV-1 and EV-2 had 1 day of downtime for scheduled maintenance. There were 2 unscheduled maintenances for both DV-1 and DV-2, which DV-1 and DV-2 had 139 and 95 days of downtime for maintenance respectively. In addition, EV-1 and EV-2 had 12 and 21 days of downtime for top-up charging. Thus, the

utilization rates were 93.4% for EV-1, 88.4% for EV-2, 23.2% for DV-1 and 47.5% for DV-2. Based on the above, the average daily driving distances of EV-1 and EV-2 were 61 km and 72 km respectively, compared with 69 km and 112 km for DV-1 and DV-2 respectively.

4.4 The drivers of the EVs had no problem in operating the vehicles and were satisfied with the performance of the EVs.

5. Summary

5.1 The fleet average fuel cost of the EVs was HK$6.74/km (about 92%) lower than that of the DVs. The fleet average total operating cost of the EVs was HK7.41/km (about 89%) lower than that of the DVs. The utilization rates were 93.4% for EV-1, 88.4% for EV-2, 23.2% for DV-1 and 47.5% for DV-2. In the first six months of the trial, there was no indication on the deterioration of the EVs' performance.

5.2 The drivers of the EVs had no problem in operating the vehicles and were satisfied with the performance of the EVs.

5.3 The findings only reflect the performance of the EVs in the first 6 months of the trial. The performance and reliability of the EVs will be continuously monitored in the 12 months of the trial.

Appendix 1: Key Features of Vehicles and Charging Facility

1. Trial EVs and Charging Facility

(a) EVs

Registration mark:	**CY68 (EV-1), CY69 (EV-2)**
Make:	Nissan
Model:	e-NV200
Class:	Light goods vehicle
Gross vehicle weight:	2,250 kg
Payload:	658 kg
Seating capacity:	Driver + 4 passengers
Rated power:	80 kW
Travel range:	317 km (air conditioning off)
Battery material:	Lithium-ion
Battery capacity:	40 kWh
Year of manufacture:	2021

(b) EV Charging Facility

No. of Charging Facility:	2
Make:	Lafon Technologies
Model:	Pulse QC50
Power:	Max. 50 kW
Charging standard:	CHAdeMO, IEC 62196-2, CCS Combo 2

2. DVs Used for Comparison

Registration mark:	**CY67 (DV-1)**
Make:	Hyundai
Model:	H-1 A/T Euro 6
Class:	Light goods vehicle
Gross vehicle weight:	3,200 kg
Payload	1,060 kg
Seating capacity:	Driver + 5 passengers
Cylinder capacity:	2,497 c.c.
Year of manufacture:	2020

Registration mark:	**CY66 (DV-2)**
Make:	Hyundai
Model:	H-1 A/T Euro 6
Class:	Light goods vehicle
Gross vehicle weight:	3,200 kg
Payload	1,060 kg
Seating capacity:	Driver + 5 passengers
Cylinder capacity:	2,497 c.c.
Year of manufacture:	2018

Appendix 2: Photos of Vehicles and Charging Facility

1. Trial EVs and Charging Facility

(a) Trial EVs

EV-1 (CY68)

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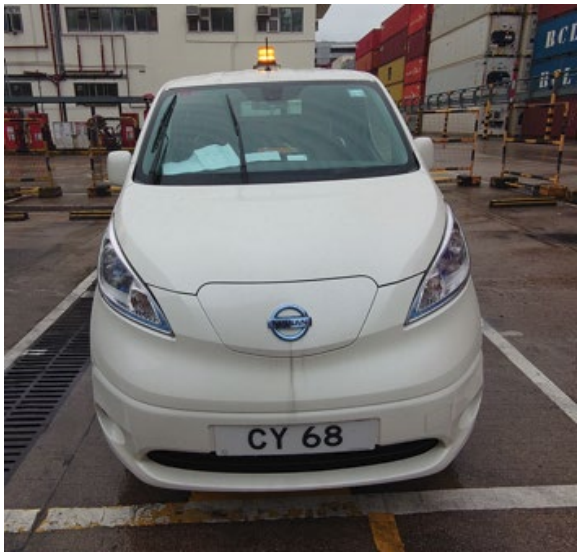
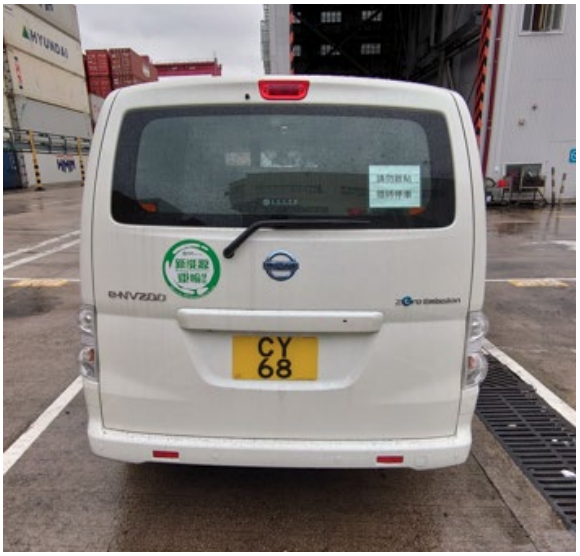
<tr><td> 
</td><td> 
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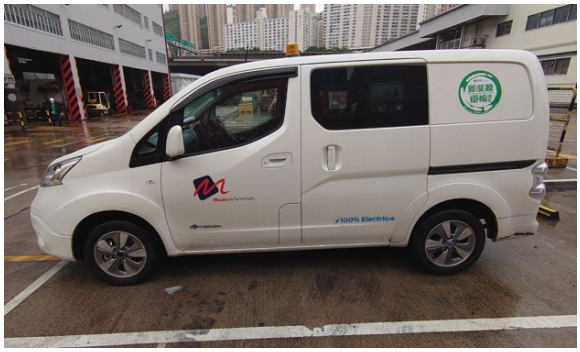
<tr><td>Front view of EV-1</td><td>Rear view of EV-1</td></tr>
<tr><td>  </td><td> 
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<tr><td>Left side view of EV-1</td><td>Right side view of EV-1</td></tr>
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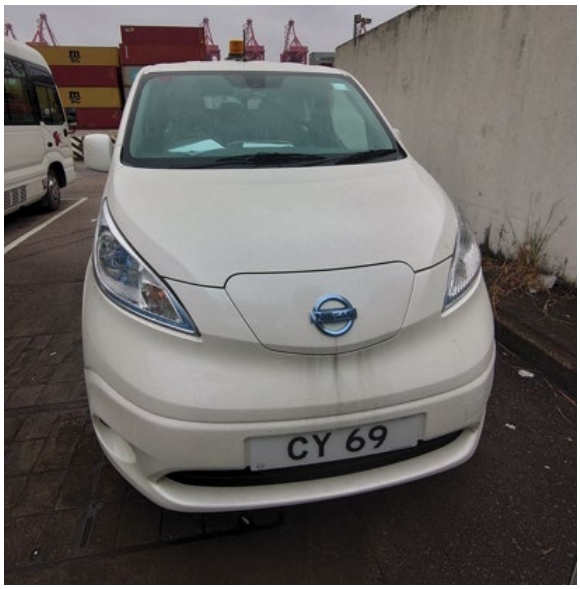
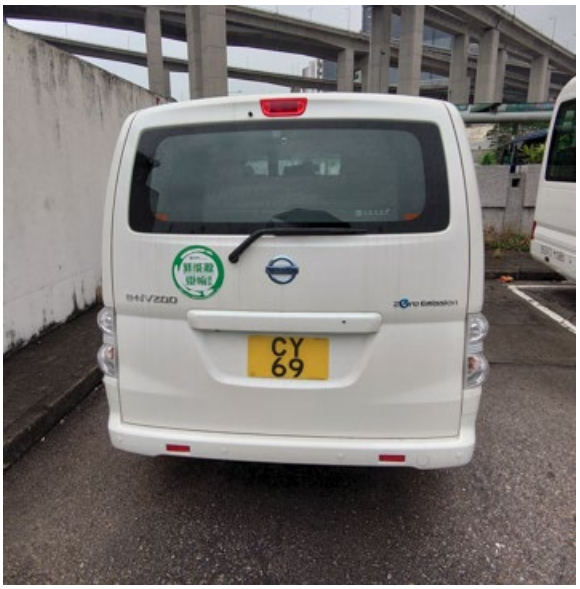
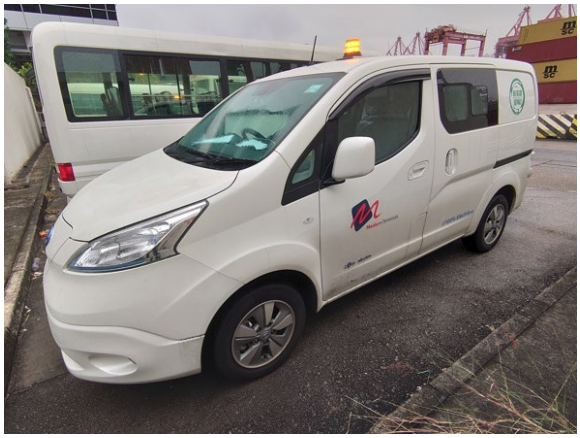
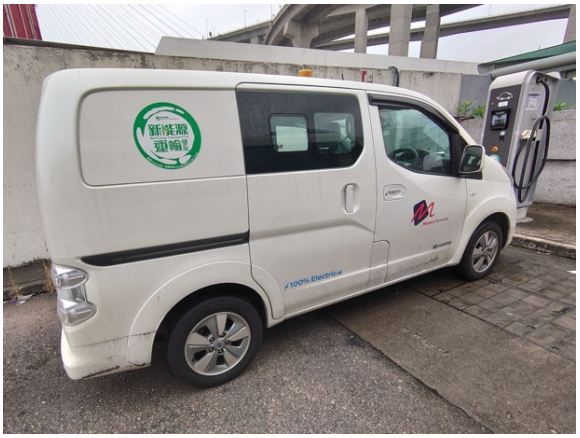
EV-2 (CY69)

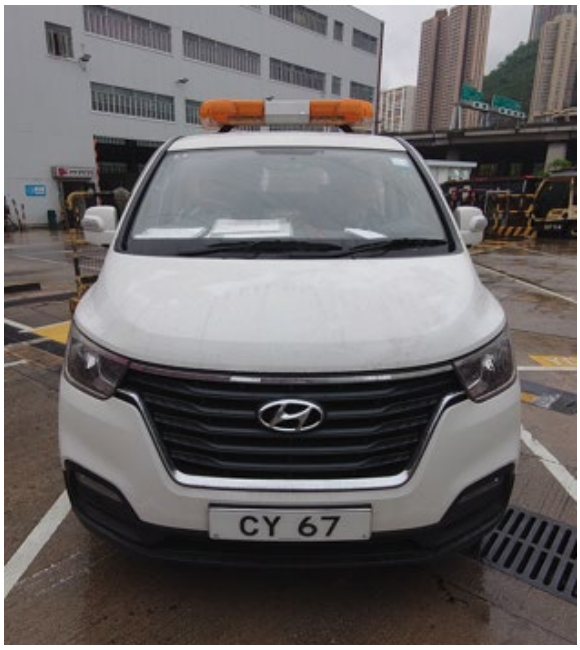
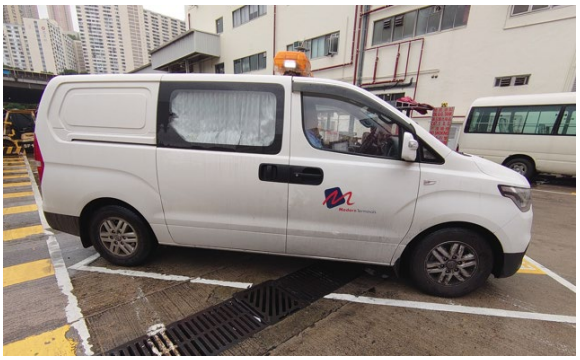
	
Front view of EV-2	Rear view of EV-2
	
Left side view of EV-2	Right side view of EV-2

(b) Charging Facility

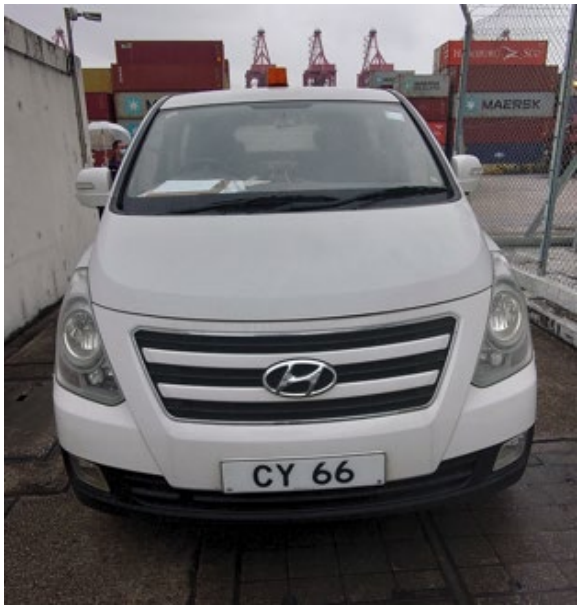
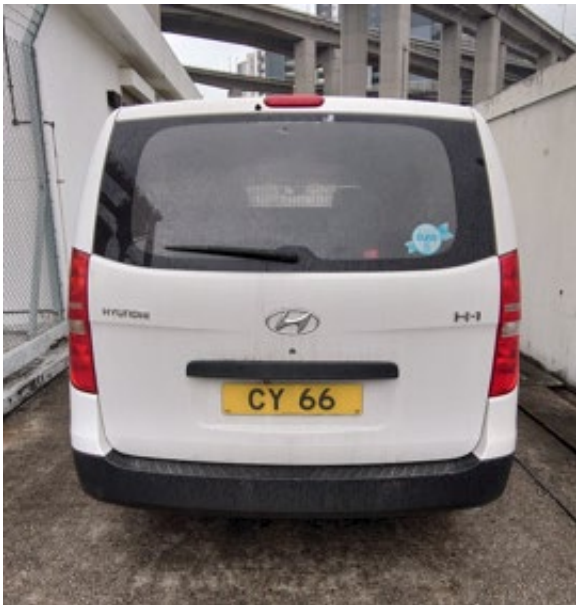
	
Charging facility – 50 kW DC quick charger in Container Terminal 2	Charging facility – 50 kW DC quick charger in Container Terminal 9 (South)

2. DVs Used for Comparison

DV-1 (CY67)

	
Front view of DV-1	Rear view of DV-1
	
Left side view of DV-1	Right side view of DV-1

DV-2 (CY66)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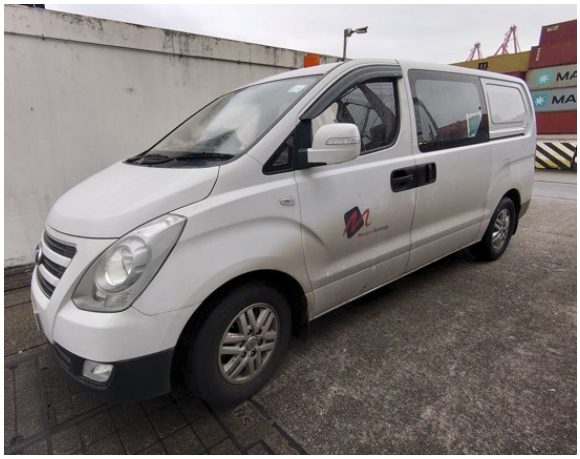	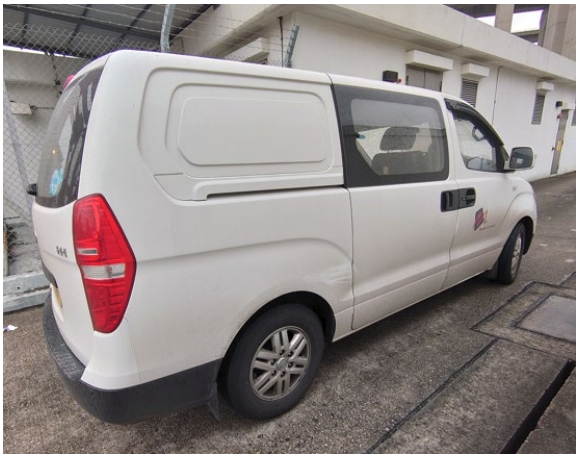
Left side view of DV-2	Right side view of DV-2